Designing The Future

KDDI

au

TRIBRID project

The low carbonization of Mobile communication's BTS (Base Transceiver Station) by the Introduction of "TRIBRID system" in Indonesia

KDDI Corporation

Company Profile

Personal Segment

Tele-communication services for consumers

Value Segment

Content application and payment services for consumers

Business Segment

Telecommunication and IT solution/Cloud services for enterprises

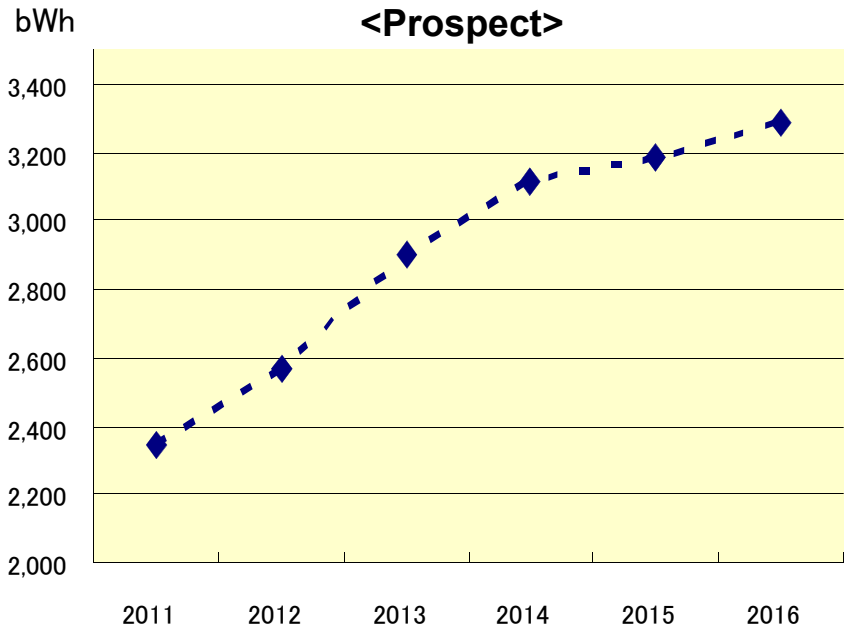
Global Segment

Telecommunication and IT solution services for consumers and enterprises

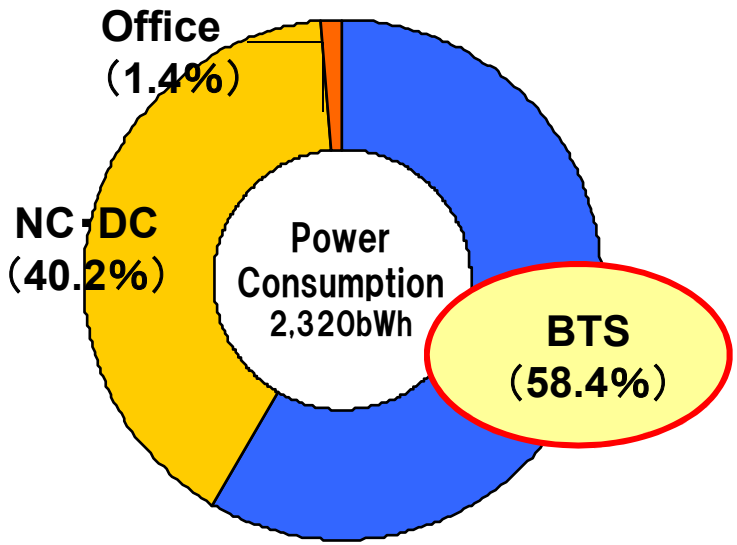
Strength in Mobile + Fixed Networks & Global Capability

Electric Power Consumption in KDDI

KDDI Electric Power Consumption



Year2011 Breakdown



～Electric Power Consumption is increasing～

98.6%: facilities

58.4%: BTS

Reduce Electric Power Consumption

“KAIZEN” is required

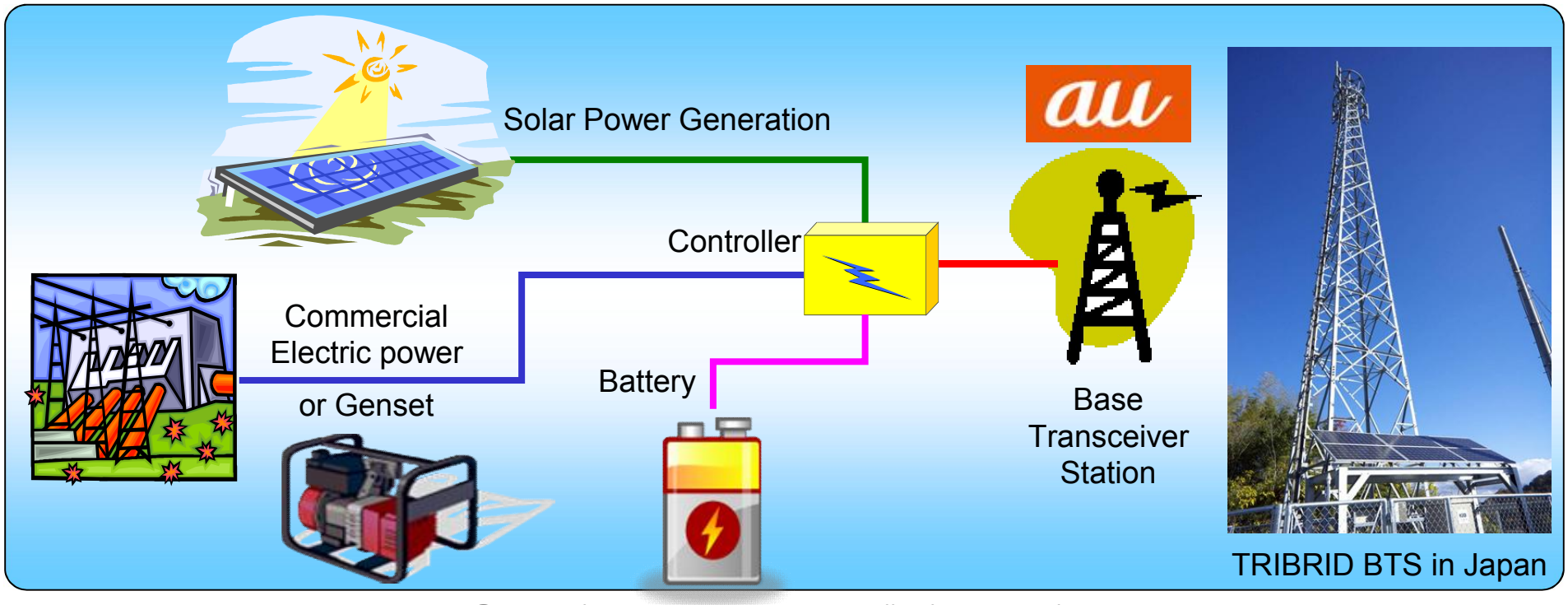
KDDI's Technology: "TRIBRID"

Control three powers

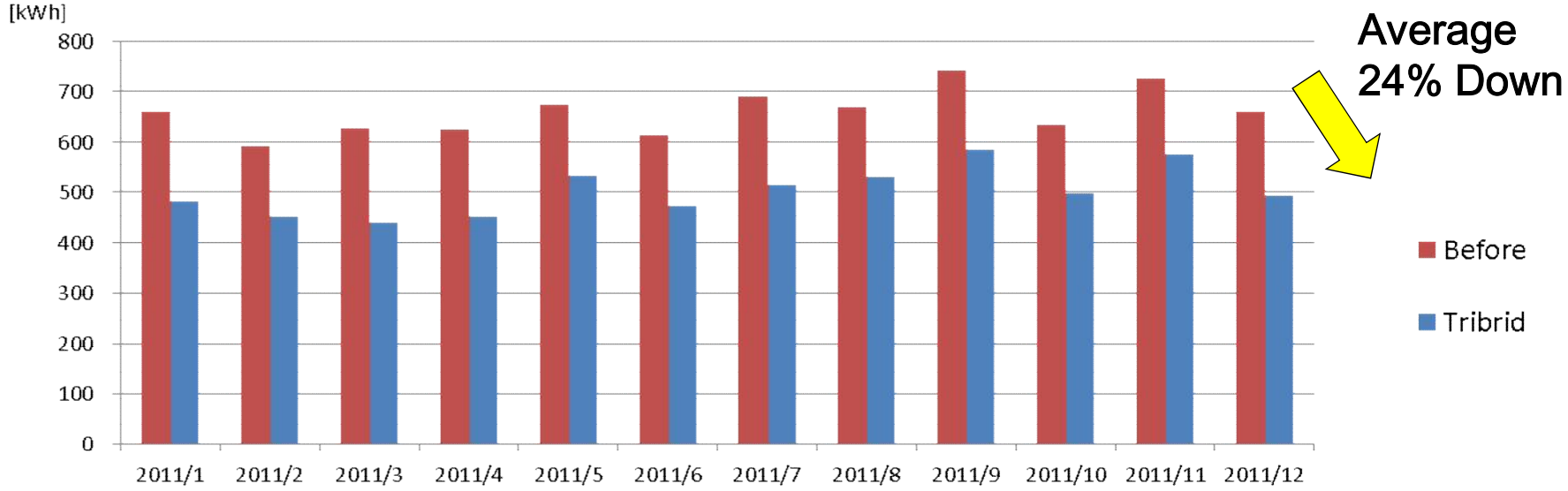
- ✓ These three types of power; generated by solar panels, stored power in batteries, commercial power or generated power by Genset, are efficiently provided for each time period to the base station.

Reduction of power and CO2 emissions

- ✓ Aiming at a 20%-30% reduction of the commercial power and CO2 emissions of the base station.



Effect of TRIBRID



Climate data for Jakarta

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average low °C (°F)	24.2 (75.6)	24.3 (75.7)	25.2 (77.4)	25.1 (77.2)	25.4 (77.7)	24.8 (76.6)	25.1 (77.2)	24.9 (76.8)	25.5 (77.9)	25.5 (77.9)	24.9 (76.8)	24.9 (76.8)	24.98 (76.97)
Rainfall mm (inches)	402 (15.83)	284 (11.18)	219 (8.62)	131 (5.16)	113 (4.45)	90 (3.54)	58 (2.28)	61 (2.4)	64 (2.52)	101 (3.98)	128 (5.04)	204 (8.03)	1,855 (73.03)
Avg. rainy days	19	17	16	11	9	7	6	5	6	8	12	14	130
Mean daily sunshine hours (h)	6.1	6.4	7.7	8.5	8.4	8.5	9.1	9.5	9.7	9	7.7	7.1	**8.1**
Tokyo Mean daily sunshine hours (h)	6	5	6	7	6	4	3	5	5	4	5	5	**5.1**

Jakarta

Tokyo

Source #1: World Meteorological Organization,[54] Climate-Data.org *for mean temperatures and precipitation*[53]

Source #2: climatemps.com *for rain days, sunshine and humidity,*[55] Danish Meteorological Institute *(sun and relative humidity)*[56]

Schedule

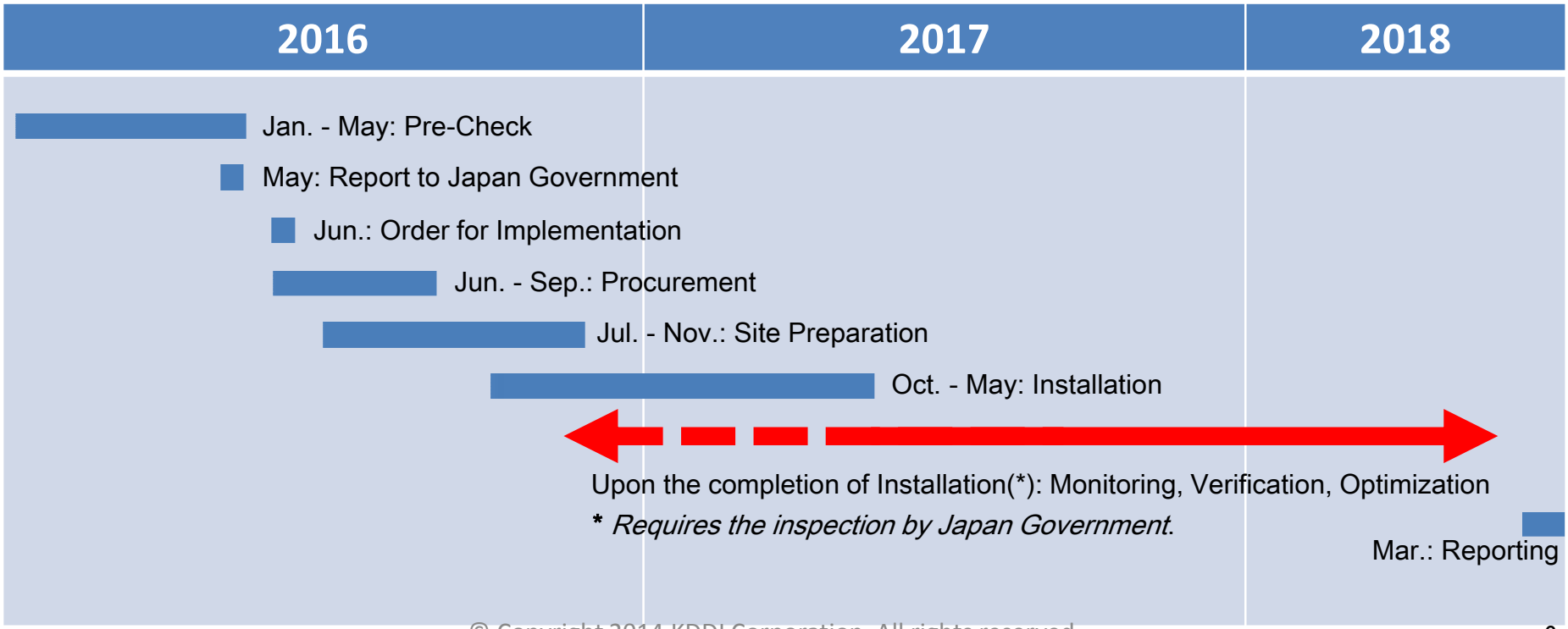
Support by
Japan Government

Feasibility Study — Done (2014)

Actual Proof Experiment

- **Pre-check** — Jan. 2016～May 2016
- **Implementation** — Jun. 2016～Feb. 2018

Further Business Expansion

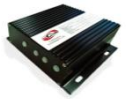


Potential of Business Expansion

KDDI R&D LABS

KDDI Engineering

Tribrid
Controller



KDDI Indonesia

PV, Battery
Genset, etc.

Indonesia Market

TELKOMSEL

indosat

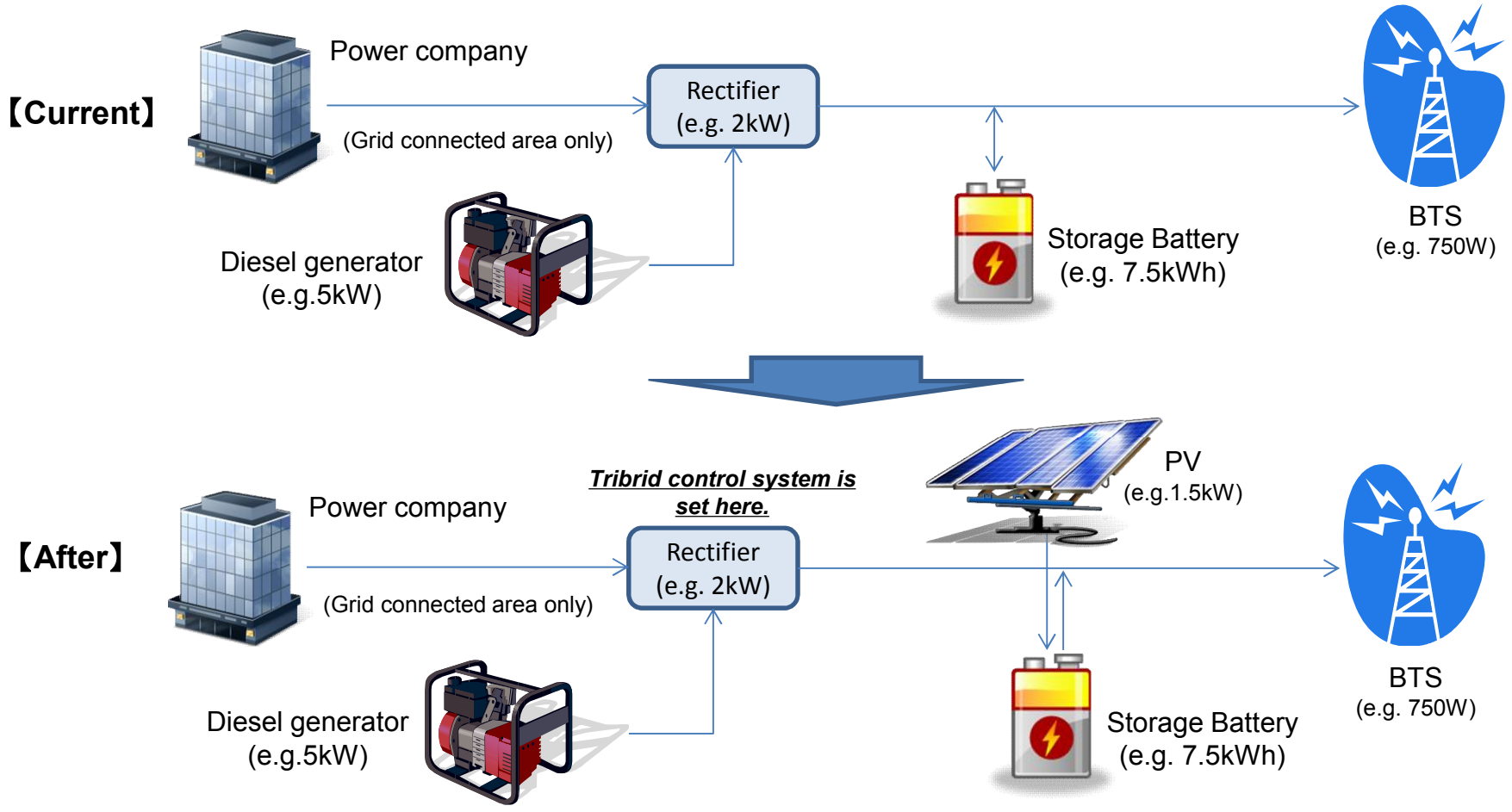
TOWER BERSAMA GROUP

PROTELINDO

ibs

GHG emission reduction measures

Reduces the amount of fossil fuels used in diesel electric power generation and the amount of power used that is imported from the grid (in grid connected areas) by introducing solar power generation and electric power control systems (KDDI's tribrid control systems).



Summary of the MRV methodology-1 (Reference Emissions)

【Reference Emissions】

For grid connected areas: The power for BTS is supplied by grid electricity and supplemental diesel electric power generation. Reference emissions are calculated under the assumption that all electricity is covered by grid electricity to allow simplified and conservative calculation. In case, the grid emission factor exceeds the emission factor for the diesel electric power generation, the emission factor for the diesel electric power generation is used instead, in order to ensure the conservativeness of the calculation.

For off-grid areas: The power for BTS is fully supplied by diesel electric power generation. The emission factor used for diesel electric power generation is 0.8tCO_2/MWh (figure for small-scale CDM methodology AMS-I.A.).

$$\mathbf{RE_p} = \sum_{\mathbf{i}} \left(\mathbf{EC_{PJ,i,p}} \times \mathbf{EF_{elec}} \right)$$

RE_p	:	Reference Emission in year *p*	[tCO_2/p]
$EC_{PJ,i,p}$	:	Electricity consumption at BTS i in project year *p*	[MWh/p]
EF_{elec}	:	Grid emission factor or diesel emission factor whichever smaller (on-grid) Diesel emission factor (off-grid)	[tCO_2/MWh]

$$\mathbf{EC_{PJ,i,p}} = \sum_{\mathbf{i}} \left(\mathbf{EC_{grid,i,p}} + \mathbf{EG_{diesel,i,p}} + \mathbf{EG_{solar,i,p}} \right)$$

$EC_{grid,i,p}$	:	Electricity consumption at BTS *i* in project year *p*（For off-grid: 0)	[MWh/p]
$EG_{diesel,i,p}$	:	Diesel electricity generation at BTS *i* in project year *p*	[MWh/p]
$EG_{solar,i,p}$	:	Solar power electricity generation at BTS *i* in project year *p*	[MWh/p]

Summary of the MRV methodology -2
(Project Emissions and Emission Reductions)

【Project Emissions】
The solar power generated and controlled by Tribrid system replace the grid power and diesel electric power generation.

$$\mathbf{PE_p} = \sum_{\mathbf{i}} \left(\mathbf{EC_{grid,i,p}} \times \mathbf{EF_{grid}} + \mathbf{EG_{diesel,i,p}} \times \mathbf{EF_{diesel}} \right)$$

PE_p	:	Project Emission in year *p*	[tCO_2/p]
$EC_{grid,i,p}$	:	Electricity consumption at BTS *i* in project year *p*（For off-grid: 0)	[MWh/p]
EF_{grid}	:	Grid emission factor	[tCO_2/MWh]
$EG_{diesel,i,p}$	:	Diesel electricity generation at BTS *i* in project year *p*	[MWh/p]
EF_{diesel}	:	Diesel emission factor	[tCO_2/MWh]

【Emission Reductions】
Emission reductions are calculated as the difference between Reference Emissions and Project Emissions.

$$\mathbf{ER_p} = \mathbf{RE_p} - \mathbf{PE_p}$$

Monitoring Parameters

items	Unit	Monitoring method	Monitoring frequency
Electricity from the grid (Grid connected area)	MWh	Invoices of the power company	Every month
Quantity of diesel electric power generation	MWh	Monitored data by measuring equipment	Continuously
Quantity of solar power generation	MWh	Monitored data by measuring equipment	Continuously

THANK YOU

Terima Kasih

ARIGATO

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