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

KDDI Corporation
Company Profile

Strength in Mobile + Fixed Networks & Global Capability

**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
Electric Power Consumption in KDDI

KDDI Electric Power Consumption

Year 2011 Breakdown

- Power Consumption: 2,320 bWh
  - BTS (58.4%)
  - NC-DC (40.2%)
  - Office (1.4%)

〜Electric Power Consumption is increasing〜
98.6%: facilities
58.4%: BTS

“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

Average 24% Down

Climate data for Jakarta

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average low °C (°F)</td>
<td>24.2 (75.6)</td>
<td>24.3 (75.7)</td>
<td>25.2 (77.4)</td>
<td>25.1 (77.2)</td>
<td>25.4 (77.7)</td>
<td>24.8 (76.6)</td>
<td>25.1 (77.2)</td>
<td>24.9 (76.8)</td>
<td>25.5 (77.9)</td>
<td>25.5 (77.9)</td>
<td>24.9 (76.8)</td>
<td>24.9 (76.8)</td>
<td>24.98 (76.97)</td>
</tr>
<tr>
<td>Rainfall mm (inches)</td>
<td>402 (15.89)</td>
<td>284 (11.18)</td>
<td>219 (8.62)</td>
<td>131 (5.16)</td>
<td>113 (4.45)</td>
<td>90 (3.54)</td>
<td>58 (2.28)</td>
<td>61 (2.4)</td>
<td>64 (2.52)</td>
<td>101 (3.98)</td>
<td>128 (5.04)</td>
<td>204 (8.05)</td>
<td>1.855 (73.03)</td>
</tr>
<tr>
<td>Avg. rainy days</td>
<td>19</td>
<td>17</td>
<td>16</td>
<td>11</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>14</td>
<td>130</td>
</tr>
<tr>
<td>Mean daily sunshine hours (h)</td>
<td>6.1</td>
<td>6.4</td>
<td>7.7</td>
<td>8.5</td>
<td>8.4</td>
<td>8.5</td>
<td>9.1</td>
<td>9.5</td>
<td>9.7</td>
<td>9</td>
<td>7.7</td>
<td>7.1</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Tokyo Mean daily sunshine hours (h): 6 5 6 7 6 4 3 5 5 4 5 5 5.1

Source #1: World Meteorological Organization Climate-Data.org for mean temperatures and precipitation
Source #2: climatemps.com for rain days, sunshine and humidity, Danish Meteorological Institute (sun and relative humidity)
2016 | 2017 | 2018  
---|---|---  
Jan. - May: Pre-Check  
May: Report to Japan Government  
Jun.: Order for Implementation  
Jun. - Sep.: Procurement  
Jul. - Nov.: Site Preparation  
Oct. - May: Installation  
Upon the completion of Installation(*): Monitoring, Verification, Optimization  
* Requires the inspection by Japan Government.

© Copyright 2014 KDDI Corporation. All rights reserved.
Potential of Business Expansion

Indonesia Market
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).

【Current】
- Power company
- Diesel generator (e.g. 5kW)
- Rectifier (e.g. 2kW)
- Storage Battery (e.g. 7.5kWh)
- BTS (e.g. 750W)

【After】
- Power company
- Diesel generator (e.g. 5kW)
- Rectifier (e.g. 2kW)
- PV (e.g. 1.5kW)
- Storage Battery (e.g. 7.5kWh)
- BTS (e.g. 750W)
### 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 0.8tCO₂/MWh (figure for small-scale CDM methodology AMS-I.A.).

\[
RE_p = \sum_i (EC_{PJ,i,p} \times EF_{elec})
\]

- **\(RE_p\)**: Reference Emission in year \(p\) [tCO₂/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) [tCO₂/MWh]

\[
EC_{PJ,i,p} = \sum_i (EC_{grid,i,p} + EG_{diesel,i,p} + EG_{solar,i,p})
\]

- **\(EC_{grid,i,p}\)**: 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.

\[
PE_p = \sum_i \left( EC_{\text{grid},i,p} \times EF_{\text{grid}} + EG_{\text{diesel},i,p} \times EF_{\text{diesel}} \right)
\]

<table>
<thead>
<tr>
<th>PE(_p)</th>
<th>Project Emission in year (p)</th>
<th>[tCO(_2)/p]</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC(_{\text{grid},i,p})</td>
<td>Electricity consumption at BTS (i) in project year (p) (For off-grid: 0)</td>
<td>[MWh/p]</td>
</tr>
<tr>
<td>EF(_{\text{grid}})</td>
<td>Grid emission factor</td>
<td>[tCO(_2)/MWh]</td>
</tr>
<tr>
<td>EG(_{\text{diesel},i,p})</td>
<td>Diesel electricity generation at BTS (i) in project year (p)</td>
<td>[MWh/p]</td>
</tr>
<tr>
<td>EF(_{\text{diesel}})</td>
<td>Diesel emission factor</td>
<td>[tCO(_2)/MWh]</td>
</tr>
</tbody>
</table>

**[Emission Reductions]**
Emission reductions are calculated as the difference between Reference Emissions and Project Emissions.

\[
ER_p = RE_p - PE_p
\]
Monitoring Parameters

<table>
<thead>
<tr>
<th>items</th>
<th>Unit</th>
<th>Monitoring method</th>
<th>Monitoring frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity from the grid (Grid connected area)</td>
<td>MWh</td>
<td>Invoices of the power company</td>
<td>Every month</td>
</tr>
<tr>
<td>Quantity of diesel electric power generation</td>
<td>MWh</td>
<td>Monitored data by measuring equipment</td>
<td>Continuously</td>
</tr>
<tr>
<td>Quantity of solar power generation</td>
<td>MWh</td>
<td>Monitored data by measuring equipment</td>
<td>Continuously</td>
</tr>
</tbody>
</table>
THANK YOU
Terima Kasih
ARIGATO

Designing The Future

KDDI