Feasibility Studies with the Aim of Developing a Bilateral Offset Credit Mechanism FY2011

Studies for Project Development and Organization

Program organization research of Green House Gas emission reduction through pilot project of energy efficient Distribution Transformer introduction in Vietnam, Indonesia and South Africa.

New Energy and Industrial Technology Development Organization (NEDO)
Hitachi Metals, Ltd.
Overview

Implemented pilot project of installing Amorphous Distribution Transformer (AMDT) as energy efficient DT and proposed standard of energy efficient DT to VN. And FS in ID and SA are to enhance the credibility and to ensure the adaptability of Bilateral Offset Credit Mechanism (BOCM) in this scheme.

Study Item

1) Measured actual Load Factor (LF) of AMDT at several sites in VN and make a plan to install it suitably.
2) Improved MRV methodology of AMDT (add load-loss as parameter, not no-load loss only).
3) Proposed LCC as economical assessment when they install energy efficiency DT.
4) Proposed new standard of energy efficient DT to VN.
5) Expand this scheme to ID and SA to enhance the credibility and to ensure the adaptability of BOCM.

Expected Emission Reduction

1) 12,800 t-CO2/yr: At first year, if EVN-Ho Chi Minh City (EVNHCNM) and EVNHANOI installs AMDT to all new installation and replacement.
2) 47,000 t-CO2/yr: At first year, if EVN expand this scheme to whole country.
3) 280,000 t-CO2/yr: 10 years later, if EVNHCNM and EVNHANOI installs AMDT to all new installation and replacement.
4) 1,300,000 t-CO2: Cumulative total. If EVNHCNM and EVNHANOI installs AMDT to all new installation and replacement in 10 years.
Two types of losses are generated by transformer.

<table>
<thead>
<tr>
<th>Loss</th>
<th>Location</th>
<th>Main cause</th>
<th>Feature</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-load Loss [Iron Loss]</td>
<td>Magnetic Core</td>
<td>Magnetic reluctance</td>
<td>Constant, independent of the load</td>
<td>- Magnetic Material, - Core structure, - Thin strip</td>
</tr>
<tr>
<td>Load Loss [Copper Loss]</td>
<td>Copper Wire</td>
<td>Electric resistance</td>
<td>Proportional to the square of the load current</td>
<td>- Al \rightarrow Cu, - Shorten the wire, - Thin insulation</td>
</tr>
</tbody>
</table>

The loss of transformer depends on LF. To know actual LF is important to calculate the loss of transformer.
Calculating CO₂ Emission Reduction in Vietnam

Calculating CO₂ Emission Reduction through standard comparison

- **Load Loss**
  - (Annual CO₂ tons per unit, 3-phase 400 kVA).
  - No Load Loss

<table>
<thead>
<tr>
<th>Load Loss</th>
<th>No-Load Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>1.63 t-CO₂/yr</td>
</tr>
<tr>
<td>900</td>
<td>1.29 t-CO₂/yr</td>
</tr>
<tr>
<td>1,000</td>
<td></td>
</tr>
</tbody>
</table>

Load Factor: 30 %*

- **EVEN-HANOI regulation**
- **EVEN-HCMC regulation**
- **China S15 (Amorphous)**

RMS Load Factor: 35.7 %**

(Except blackout and un-measured period.)

* We measured RMS LF at 8 sites in Vietnam and average RMS LF is 30.7%. So, we use 30% for CO₂ emission reduction calculation.

** One of example of measured RMS LF in Hanoi. There is over-load period, and it’s not good in terms of DT’s life time and reliability. And RMS LF becomes lower than 35.7%, if DT is installed appropriately.

*** Emission factor : 0.576kg-CO₂/kWh
F/S for Bilateral Offset Credit Mechanism

Category: Power Distribution

To accelerate energy saving of Distribution-Network in VN

1) Proposed energy efficient DT standard to VN.
2) Proposed LCC as economical assessment when they install energy efficiency DT.
3) Calculated CO₂ emission reduction, when VN install AMDT as major transformer.

Expand this scheme to ID and SA

1) Enhance the credibility and ensure the adaptability of Bilateral Offset Credit Mechanism in this scheme.
2) Advance localization of AMDT and evaluate the AMDT spec.
   Hitachi Metals can support them in launching of AMDT lines, especially making core.
3) Calculated GHG emission reduction potential.
4) Enhance domestic industry and expand their export biz.