Why energy efficient distribution transformers?
Our presenters today

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Energy targets - SDG 7

- Universal access to affordable, reliable and modern energy services
- Increased share of renewable energy in the energy mix
- Improvement in energy efficiency


Impact dimensions of energy

Energy as an enabler for sustainable development

Technology
Access to new technologies

Education
Online learning, Lighting

Health
New healthcare technology, clean cooking

Communication
New communication tools

Employment
New businesses creating employment opportunities

Environment
Safeguarding biodiversity and the environment

Sustainable development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

WCED (1987)

Figure 1 – Impact of access to modern energy services on sustainable development

Challenges in Africa

Energy efficiency and reliability

Energy efficiency
Losses have a cost
- Direct, energy generated and not consumed
- Indirect, less electricity available

Also reliability

Unreliable power
- Power interruptions
- Loss of economic activity
- Increased maintenance costs
- Re-investment in new equipment

Challenges
- Electrification
- Energy access
- Reliability
- Affordability

Expanding access to electricity
Strengthening T&D infrastructure
Harnessing technological developments
Based on U4E 2020 Country Saving Assessments, the reduction potential range in electricity consumption, monetary savings and GHG emissions mitigation in all 5 regions in Africa alone from a market transformation to more Energy Efficient Distribution Transformers is very significant by 2030.
Energy efficiency and transformers

Central generation

Distributed generation

End consumers

Houses

Industries

Businesses

High Voltage

Medium Voltage

Low Voltage

Railways

Industries

Typical transformer efficiencies ranging from 97 to over 99%

5% approx. of total electricity is lost in transformer losses

Non-stop operation over its 25 to 40 years or longer service life
Distribution Transformer - at glance

Transformer materials, manufacturing process and technology make the difference

Reliability and life expectancy

Design:
- Hot spot temperature rise
- Short circuit calculations and validation

Material quality
Manufacturing process control
Testing
Operation and maintenance

Technology and Supply Capacity are available for Africa
Towards energy efficient distribution transformers

Transformer losses

No Load Loss

Load Loss

Total ownership cost

Initial cost (price)

Cost

Cost of losses

++ Losses --

MEPS
Minimum energy performance standards

Simple approach
Secure a minimum efficiency

MEPS define minimum efficiency levels
Based upon the economics of the local market and what type of transformers can be made available
Set the bar under which no products can be sold, and represent the foundation from which to ensure the success of any energy efficient-transformers transition strategy

TCO
Refining/advancing in the cost optimization and benefits

Total Cost of Ownership = Initial Cost (price) + Operational Cost (losses) + Other costs (Maintenance Cost Downtime...etc)
A case example: Savings from energy efficiency

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rating</strong></td>
<td>1000 kVA</td>
<td>1000 kVA</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Design 1</td>
<td>Design 2</td>
</tr>
<tr>
<td><strong>Cost of energy</strong></td>
<td>0.1$/kWh</td>
<td>0.1$/kWh</td>
</tr>
<tr>
<td><strong>Discount Rate</strong></td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Period</strong></td>
<td>25 years</td>
<td>25 years</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>12,346.3$/kW</td>
<td>12,346.3$/kW</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Varies with load</td>
<td>Varies with load</td>
</tr>
<tr>
<td><strong>NLL</strong></td>
<td>0.693kW</td>
<td>1.05kW</td>
</tr>
<tr>
<td><strong>LL</strong></td>
<td>7.6kW</td>
<td>8.5kW</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>35,000</td>
<td>31,000</td>
</tr>
</tbody>
</table>

Savings: 1 x 1000 kVA Transformer
- 5100 kWh / year
- 4000 USD total cost

http://tcocalculator.abb.com
Why energy efficient distribution transformers?

An investment in lower energy costs and reliability
- Lowering the total costs
- Reduce energy losses
- Increased reliability, associated to materials, manufacturing processes, technology

Towards adoption of energy efficient distribution transformers
- Starting with the adoption of MEPS
- Following with the application of the TCO concept

Benefits in Africa
- **Electricity savings**: 2.2 TWh/year
- **CO2 emissions savings**: 1.9 Mton/year
- **Financial savings**, yearly
  - 160MUSD Electricity saved
  - 160MUSD Avoided power generation