
Why energy efficient distribution transformers?

Our presenters today

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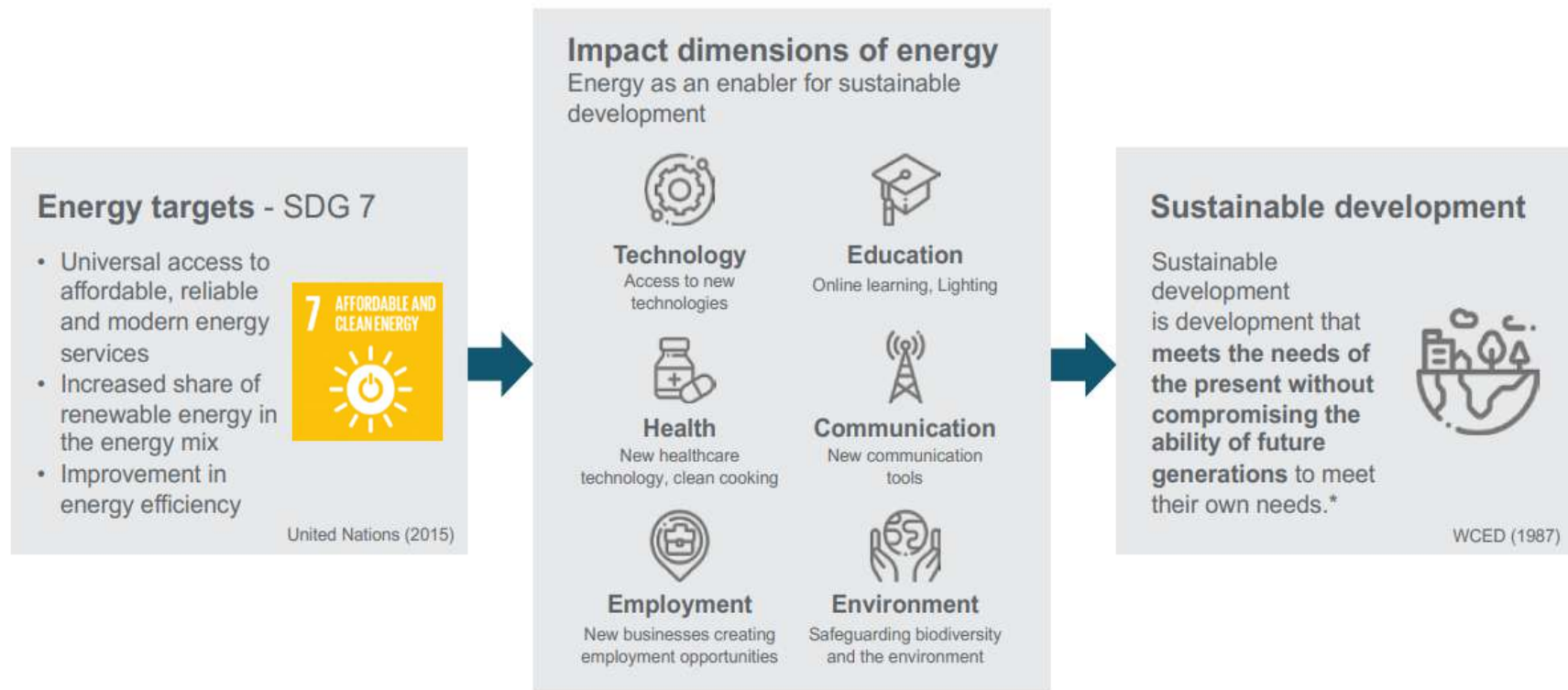
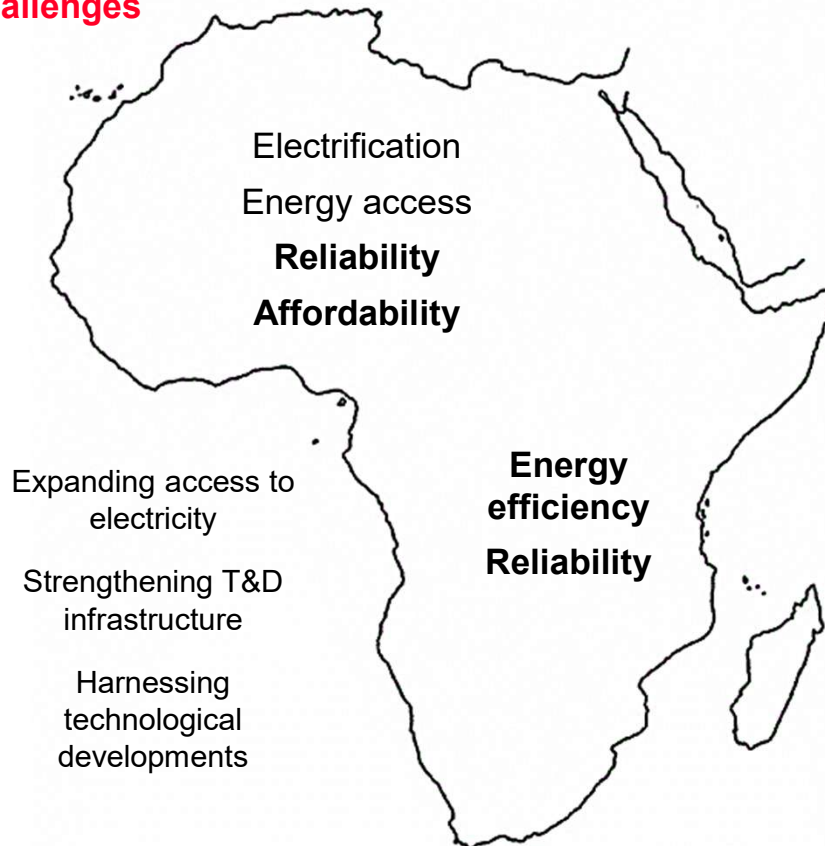


Figure 1 – Impact of access to modern energy services on sustainable development

Challenges



Energy efficiency and reliability

Energy efficiency

Losses have a cost

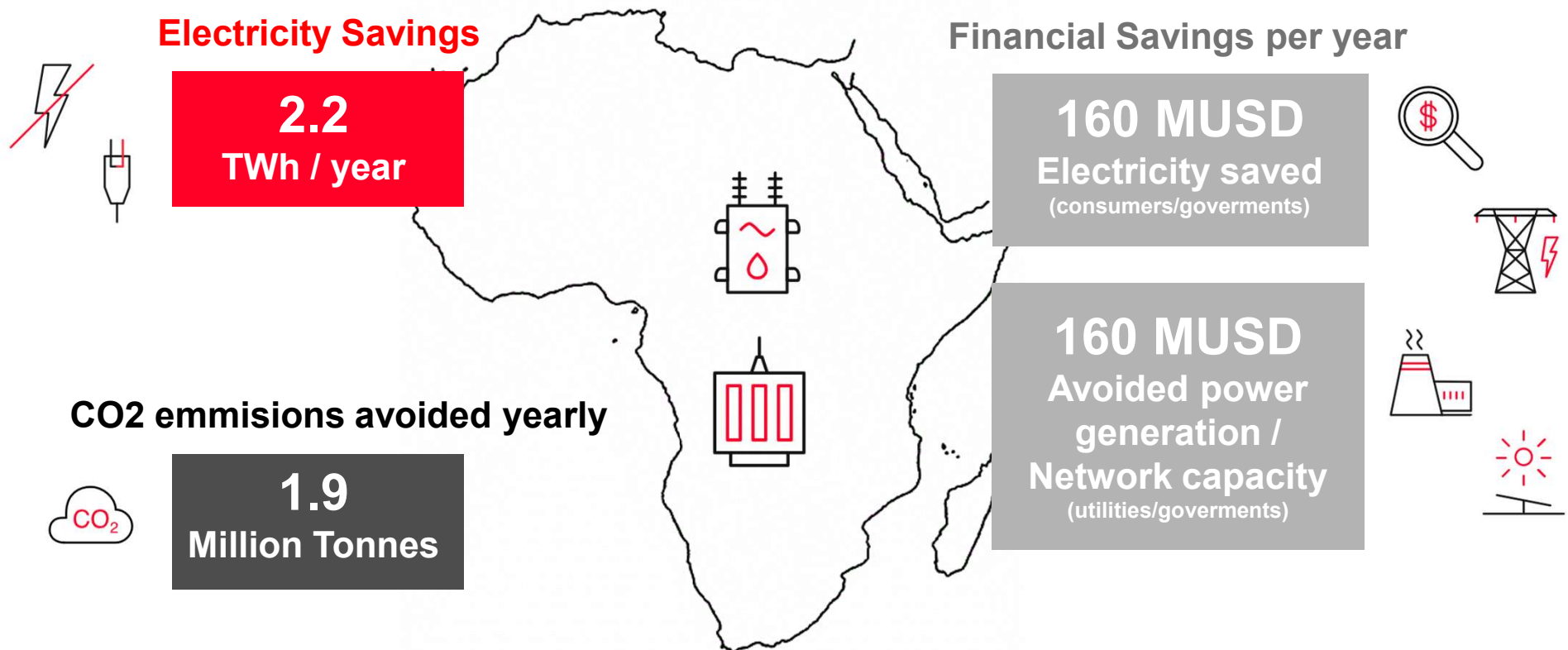
- Direct, energy generated and not consumed
- Indirect, less electricity available

Also reliability

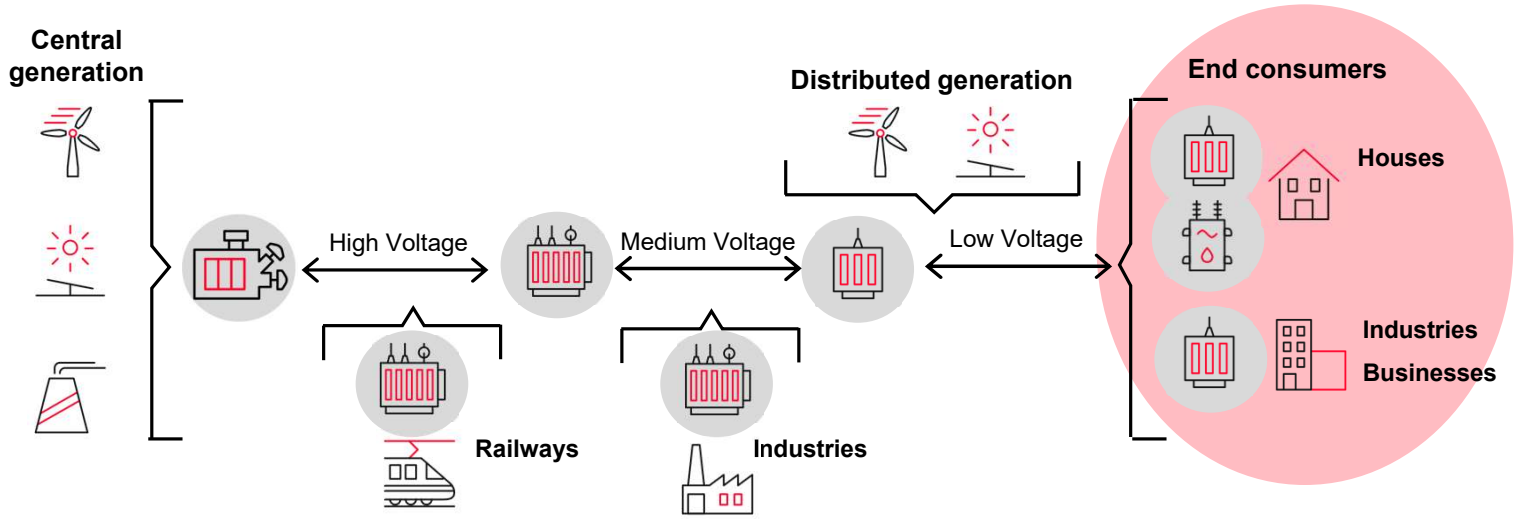
Unreliable power

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

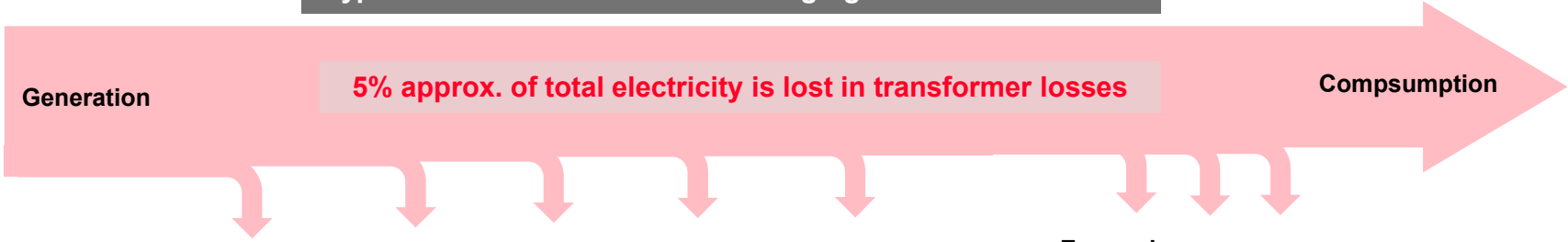
Africa: Impact of Energy Efficient distribution transformers



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

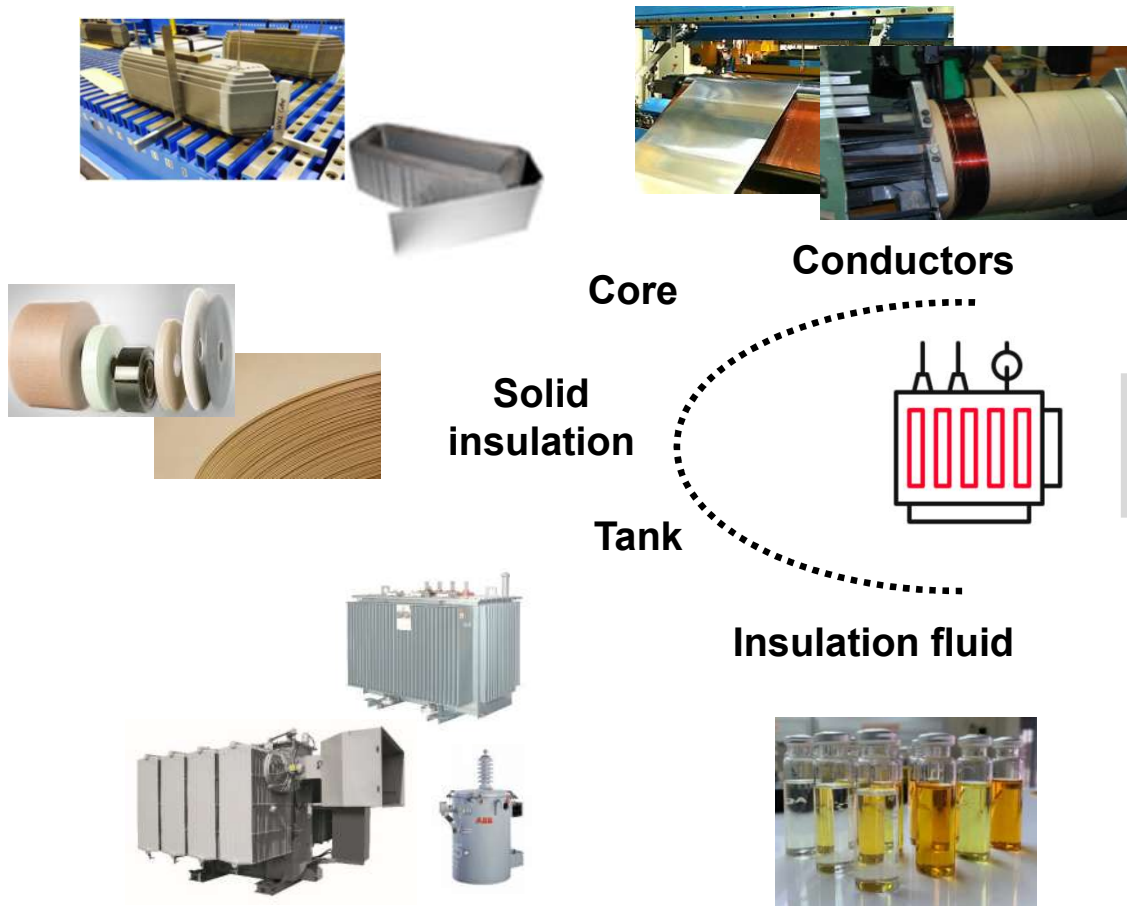


Typical transformer efficiencies ranging from 97 to over 99%



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

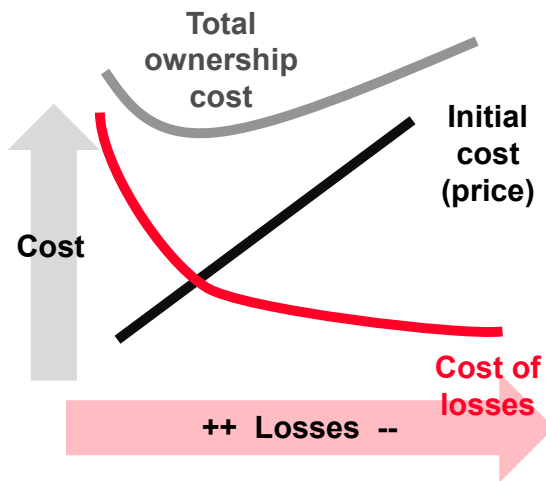
Manufacturing process control

Testing

Operation and maintenance

Technology and Supply Capacity are available for Africa

Transformer 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

$$TCO = I + O + M + D + R$$

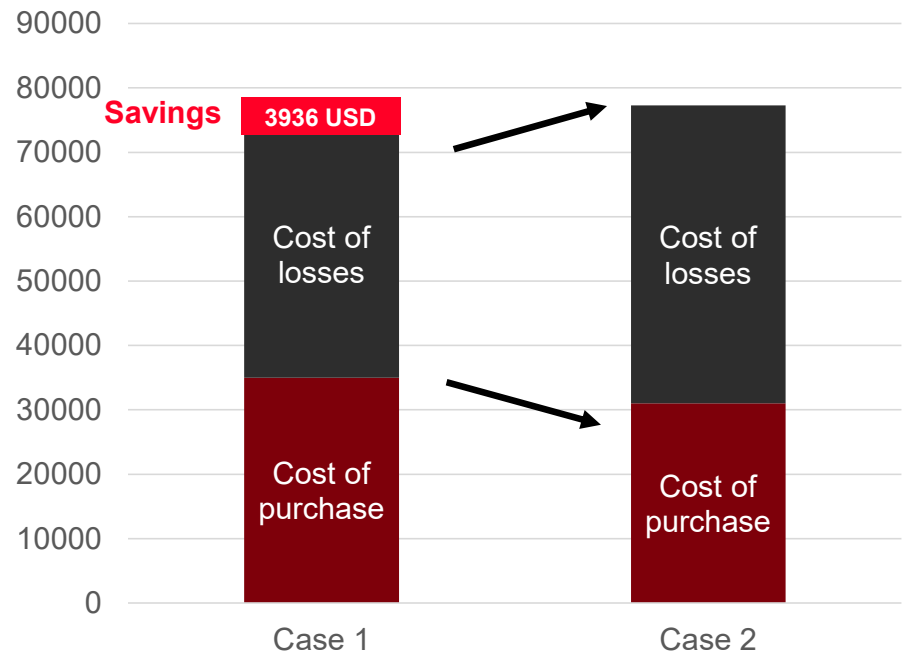
$$\text{Total Cost of Ownership} = \text{Initial Cost (price)} + \text{Operational Cost (losses)} + \text{Other costs (Maintenance Cost Downtime...etc)}$$

A case example: Savings from energy efficiency

Rating	1000 kVA Design 1	1000 kVA Design 2
Cost of energy	0.1\$/kWh	0.1\$/kWh
Discount Rate	5%	5%
Period	25 years	25 years
A	12,346.3\$/kW	12,346.3\$/kW
B	Varies with load	Varies with load
NLL	0.693kW	1.05kW
LL	7.6kW	8.5kW
Price	35,000	31,000

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

Savings from Energy Efficiency



Transformer energy efficiency

Total Cost of Ownership calculator

<http://tcocalculator.abb.com>

Settings

Currency

Use of Watts or Kilowatts in inputs

 Watts Kilowatts

Standard

 IEC/EN IEEE

Loss capitalization factors (A and B)

Transformer A & B factors known

 Yes No

Initial electricity price (1st year)

 EUR/kWh

A-factor:

Annual increase of energy price



B-factor:

Interest rate (for the investment)



Operating hours per year

 Hours

Service life



Average load during lifetime



A-factor: 0.00 EUR/W B-factor: 0.00 EUR/W

Why **energy efficient** distribution transformers?

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An investment in lower energy costs and reliability

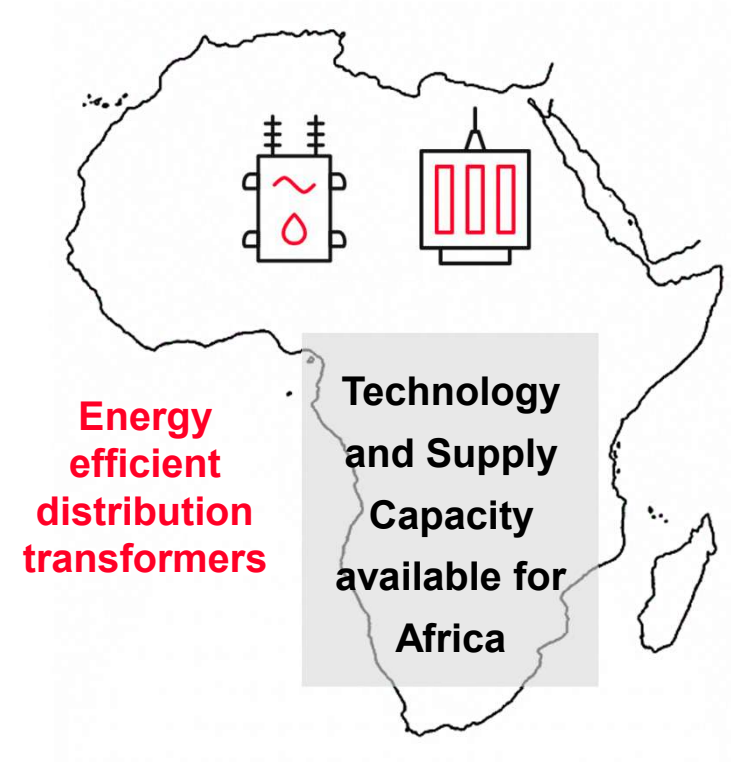
- Lowering the total costs
- Reduce energy losses
- Increased reliability, associated to materials, manufacturing processes, technology

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



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