International Copper Association Southeast Asia
Copper Alliance

Promotion of Low Loss Distribution Transformers

Education Campaign for the Non-Utility Market in ASEAN

Rationale

The importance of the non-utility market for distribution transformers is growing in ASEAN, with an estimated 30% market share in many countries.

Typically, non-utility players have limited awareness of efficiency, and instead focus on the initial purchase cost. As DTs have an average lifetime of 30 years, this results in significant electricity and economic losses.

Most standards measure the energy efficiency of DTs at 50% load. In reality, the load varies throughout the day, and the performance of DTs varies accordingly.

The IEC TS 60076-20 offers a better way of measuring the losses of a DT according to real conditions of utilization, by including load and no-load losses.

The Total Cost of Ownership Cost (TCO) Tool

In 2016, ICA supported HAPUA in the development of a Total Cost of Ownership (TCO) model which allows to understand the total cost (purchase, operation and maintenance) of a DT over its life cycle. Because low loss DTs are more efficient, their TCO cost is much lower than less efficient, cheaper DTs.

HAPUA Working Group 3
Project 1
Best Practices on Asset Management

Life Cycle Cost Assessment (LCCA) of Transformers

TRANSFORMER TCO CALCULATOR

Description	Units	Enter Data Below for Alternative Transformers						
		Option - T1	Option -T2	Option -T3	Option-T4	Option-T5	Option-T6	Option-T7
Part A: User Inputs		Use the cells below to input your data (Manufacturer, Model and kVA rating) are for your transformer type reference.						
Manufacturer/Make		Brand A	Brand B	Brand C	Brand D	Brand E	Brand F	Brand G
Model		A123	B124	C456	E123	F456	G124	H143
kVA rating		700kVA	700kVA	700kVA	700kVA	700kVA	700kVA	700kVA
Discount Rate (Example: 10)	%	22.00%	11.00%	10.00%	20.00%	7.00%	8.00%	5.00%
Electricity Cost / kWh (Example: 2.35THB / kWh) Currency Selector	MYR/kWh	0.750	0.075	0.075	0.040	0.040	1.000	2.000
Lifespan of transformer (Example: 20 years)	Years	10	20	10	15	25	12	10
Transformer Loading (Example: 50)	%	65.00%	60.00%	70.00%	70.00%	60.00%	50.00%	40.00%
No-load losses (Example: 250 W)	W	1647.00	1647.00	1018.00	2400.00	2200.00	250.00	100.00
Load Losses (Example: 1550 W)	W	9507.00	9507.00	6769.00	13568.00	2500.00	1550.00	1000.00
Purchase price of transformer (Example: 156700 THB)	MYR	10194	10194	10845	12250	13000	160000	11000
Part B: Calculated Results		Below are the computed results based on your data inputs above						
Value of factor A		25775	5232	4037	1638	4083	66016	135285
Value of factor B		10890	1883	1978	803	1470	16504	21646
TOTAL COST OF OWNERSHIP (TCO)	MYR	156178	36717	28345	27074	25659	202085	46174

NOTES

Troubleshooting:

In case you can't get the acceptable results from this calculator, please check for the following issues:

- Did you input the numbers in the correct units? For example, ensure that electricity rate figure is per kWh and transformer losses are in W. And also, transformer loading is a whole number (50 and not 0.5).
- Did you enter the discount rate in terms of percentage (i.e., 10 and not 0.1)? [Also, don't enter the symbol %; this will appear automatically once you enter a number.]

Applicable currencies

USD/kWh	=	USD
IDR/kWh	=	IDR
MYR/kWh	=	MYR
PHP/kWh	=	PHP
THB/kWh	=	THB
VND/kWh	=	VND
SGD/kWh	=	SGD

Opportunity

Distribution utilities in ASEAN could become an agent of change, since they hold a strategic position vis-à-vis non-utility users (when purchasing a DT, these users must submit the technical specifications to the distribution utility for approval) and manufacturers (utilities are important clients for them). This presents a unique opportunity to educate non-utility users on life cycle management, and manufacturers on best testing methods.

Background

In 2016, with funding from APEC, ICA conducted a study on the potential for savings from the adoption of low loss DTs in APEC and ASEAN. HAPUA members acted as project steering committee. Under the leadership of IIEC, regional workshops were organized and led to formulating strategic recommendations, including:

- Adoption of IEC 60076 as national testing standards
- Development and adoption of MEPS to regulate the non-utility market
- Conduct of education campaigns for non-utility players with the support of distribution utilities

The Project

It is proposed to educate non-utility users about the advantages of adopting a life-cycle perspective for the selection and management of DTs, and encourage manufacturers to use the IEC TS 60076-20 for the testing the performance of their DTs

Approach

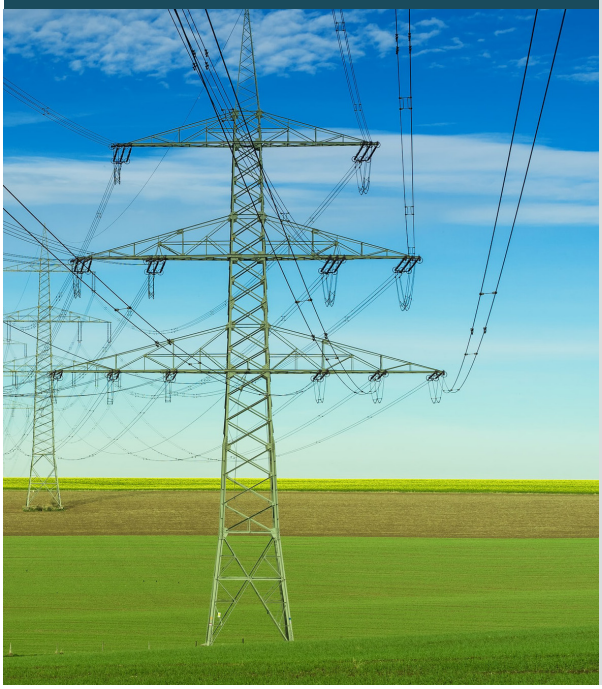
Through their direct interactions with users and manufacturers, distribution utilities will play a key role in sharing best practices with these non-utility players

Proposed Roles

HAPUA: Project Steering Committee

Distribution utilities: members of the Technical Working Group (TWG): design education campaign strategy and action plan

ICA: project management and technical support; provide financial support



Project Milestones

- **M1** Form TWG with HAPUA members
- **M2** Conduct stakeholders mapping and analysis study
- **M3** Review TCO tool developed in 2016, identify improvements
- **M4** Develop education campaign strategy (TWG workshops, ICA technical support)
- **M5** Develop education tools (user-friendly version of the TCO tool, videos, leaflets, etc.)
- **M6** Develop education action plan
- **M7** Implement education plan

Project Outline

M1

1. Form Technical Working Group (TWG) – kick-off meeting

Workplan, roles, deliverables approved

- ICA develops TORs
- HAPUA members nominate members
- ICA organizes kick-off meeting

M1-4

2. Conduct stakeholders mapping and analysis study

Understanding of non-utility market trend and decision-making processes

- ICA conducts study
- HAPUA members support (including interviews with procurement officers)

M2-3

3. Review of TCO tool

TORs for the improvement of the TCO tool approved

- Through online review meetings of the TWG
- Coordination by ICA

M4-6

4. Design of the education campaign strategy

Understanding of non-utility market trend and decision-making processes

- Through online meetings of the TWG - Coordination by ICA

Consultation with non-utility players

- By ICA, with support from TWG

Education campaign strategy and plan - final

- Review of feedback by TWG – online or physical TWG meeting

M6-8

5. Develop education tools

Define list of education tools

- Through online meetings of the TWG - Coordination by ICA

Develop education tools

- By ICA with support from consultants – PR company

M6-8

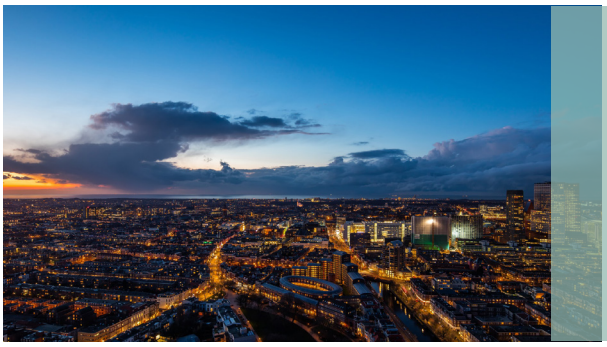
6. Develop education action plan

Education action plan

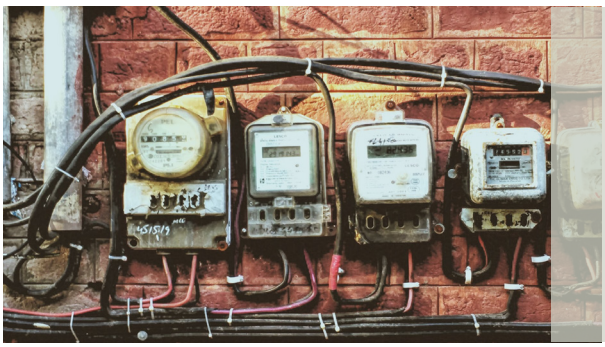
- Through online/physical meetings of the TWG - Coordination by ICA

Benefits

- Overall for the country: reduced electricity losses, reduced GHG emissions



- ASEAN electric distribution utilities: reduced system losses and active contribution to government's energy security objectives and GHG emission reductions targets



- Non-utility players: reduced electricity losses, reduced electricity bills

- Local transformers manufacturers: higher demand for low loss transformers (higher profitability, push for technology upgrades)

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