



**Asia-Pacific
Economic Cooperation**

2017/EWG/EGEEC/WKSP2/002

**Introduction to Heads of ASEAN Power
Utilities/Authorities and Project on Distribution
Transformer**

Submitted by: Malaysia



**Workshop on Reducing Losses in Power
Distribution Through Improved Efficiency of
Distribution Transformers**

**Jeju, Korea
28 March 2017**



**Asia-Pacific
Economic Cooperation**



**Reducing Losses in Power Distribution through Improved Efficiency of
Distribution Transformers (EWG 05 2015A)
First Project Steering Committee Meeting**

**Introduction to HAPUA &
Project on Distribution Transformer**

27 March 2017 | Jeju Island, Korea

Wan Khairuzzaman Wan Nordin

Tenaga Nasional Berhad, Malaysia

ORGANISERS:

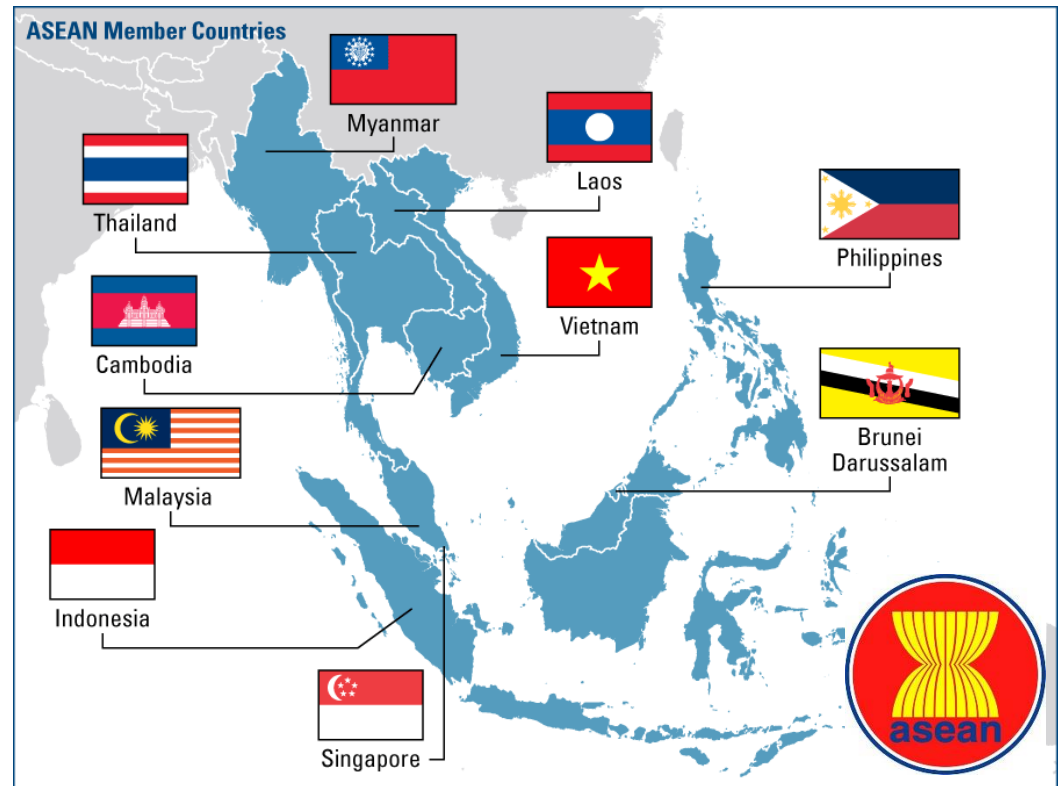


**International Copper
Association Southeast Asia
Copper Alliance**



About HAPUA

- Heads of ASEAN Power Utilities/Authorities (HAPUA)
- The MoU on new structure was signed in May 2004 by Department of Electrical Services of Brunei Darussalam, Electricité du Cambodge of Cambodia, PT PLN (Persero) of Indonesia, Electricité du Laos of Lao PDR, Tenaga Nasional Berhad of Malaysia, Department of Electric Power of Myanmar, National Power Corporation of Philippines, Singapore Power Limited of Singapore, Electricity Generating Authority of Thailand, and Electricity of Vietnam.



Objective of HAPUA

- To promote cooperation among its members to strengthen regional energy security through
 - interconnection development,
 - enhancing private sector participation,
 - encouraging standardization of equipment,
 - promoting joint project development,
 - cooperation in human resources, research & development,
 - and to enhance quality & reliability of electricity supply system.

HAPUA Working Group

- HAPUA Working Group No. 1 – Generation & Renewable Energy
- HAPUA Working Group No. 2 – Transmission / ASEAN Power Grid
- HAPUA Working Group No. 3 – Distribution and Power Reliability & Quality
- HAPUA Working Group No. 4 – Policy Studies & Commercial Development
- HAPUA Working Group No. 5 – Human Resources

HAPUA WG3 - Distribution and Power Reliability & Quality

- 3 Projects:
- Project 1 – Best Practices on Asset Management
- Project 2 – Guideline on Distributed Energy Resources (DER)
- Project 3 – Managing Distribution Network Reliability and Energy Efficiency

HAPUA WG3 Project 1 - Best Practices on Asset Management

OBJECTIVES:

1. To develop a guideline to assist HAPUA member countries to have equal understanding on what asset management is, its best practices and how to implement its program.
2. The main aim is to share a homogenous understanding of asset management, sharing the asset management best practices, tools and technologies.

HAPUA WG3 Project 1 - Best Practices on Asset Management

- Completed projects:
 - Best Practices on Asset Management - Maintenance of Primary Medium Voltage Equipment.
 - Asset Maintenance, Refurbishment and Replacement Practices in ASEAN utilities.
 - Life Cycle Cost Analysis (LCCA) model for distribution transformer.

HAPUA WG3 Project 1 - Best Practices on Asset Management

- Current Project 2017/2018
 - Common Failure Mode Effect & Analysis (FMEA) of Power and Distribution Transformers amongst HAPUA Member Countries
 - Guideline to Determine Health Index & Risk Index for Power and Distribution Transformers
 - Best Practice on Distribution Transformer Life Cycle Management from outside HAPUA

HAPUA WG3 Project 1 :

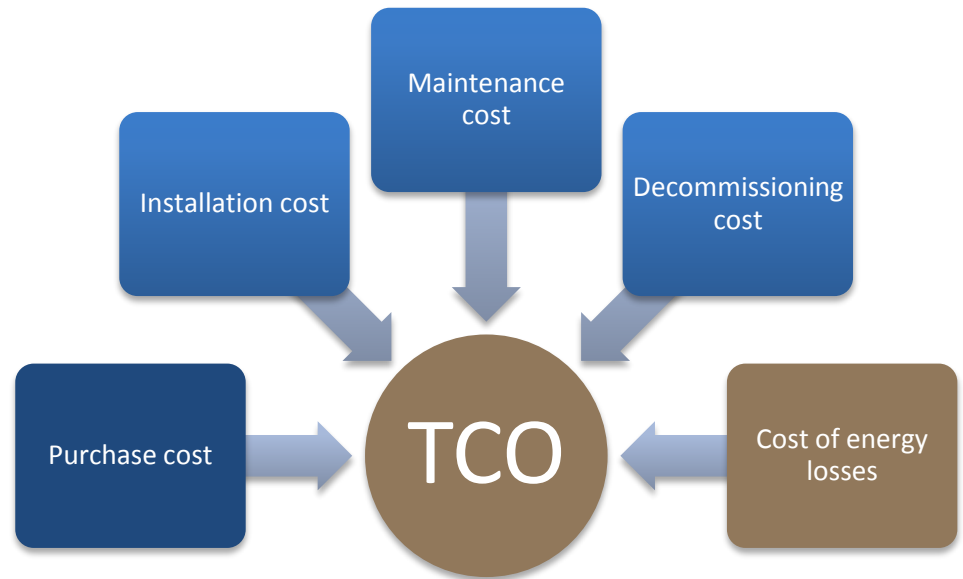
TCO Model for Distribution Transformer

- Close to 1 million transformers are installed across 11 ASEAN utilities according to the survey in Mar-May 2015
- About 30% contributor to the overall energy losses in a network
- At the time of purchase, the focus is often on the purchase cost instead of TCO, but TCO can be 2-3 times of the purchase cost

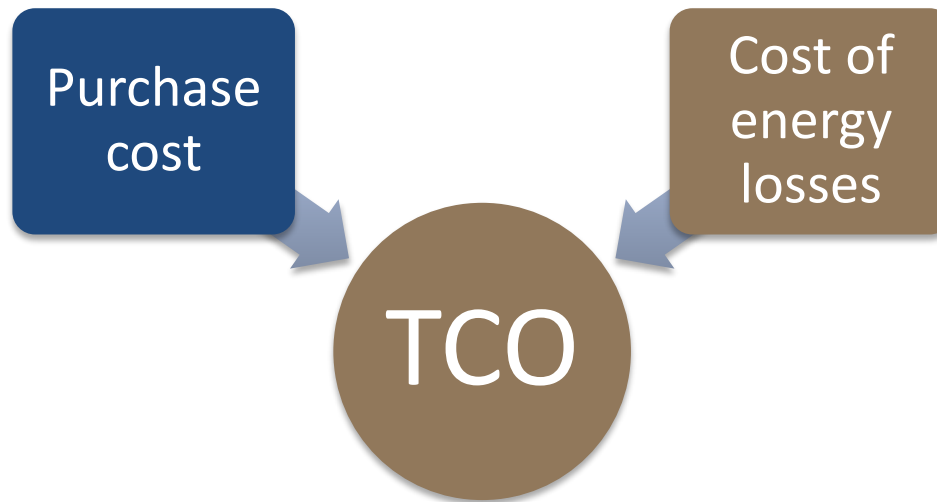


Total Cost of Ownership (TCO)

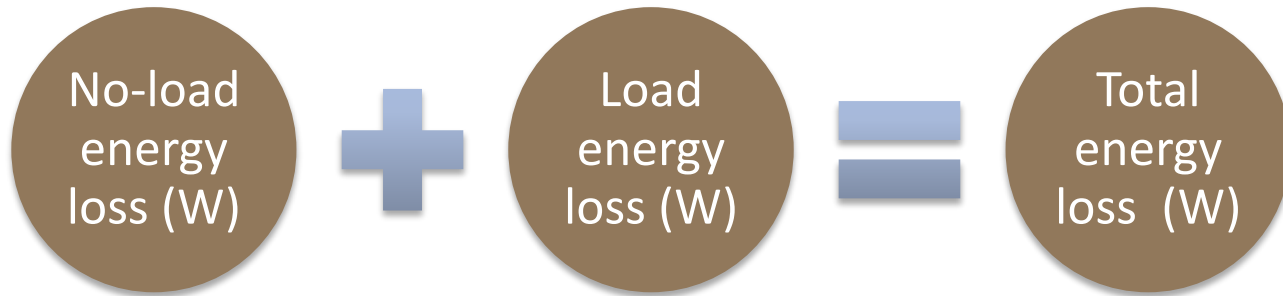
- TCO is also known as Life Cycle Cost (LCC)
- Sum of all the costs incurred during the life of a transformer
 - Purchase cost
 - Installation cost
 - Maintenance cost
 - Decommissioning cost
 - Cost of energy losses
- In practice, the following three are ignored due to not much variation from transformer to transformer:
 - Installation cost
 - Maintenance cost
 - Decommissioning cost



Two Key Components of TCO



Energy Loss: No-Load and Load Losses



Practical Application - Transformer Selection Based on TCO

CONCLUSION

- Lowest purchase cost doesn't mean lowest TCO
- High-efficiency transformer is higher in purchase cost by about 6%, but lower in TCO by 21%
- Transformer selection should be based on TCO



Thank You

WanKh@tnb.com.my

