Low Voltage Electrical Installation

MODULE 2
Chapter 1: Supply System

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Module Description

- Expected Outcomes
  - Apply ethical principles and commit to professional ethics.

- Module Outline
  - 1.2 Power Generation
    - Outline of Power Generation, Transmission and Distribution
    - 3 main types of power station in Malaysia
    - Renewable Energy Power Plants
    - World Largest Solar Power Plant
    - Solar Power Plant in Malaysia
  - 1.3 Power Transmission

Module Description

- Module Outline (cont.)
  - 1.4 Power Distribution
    - Single phase and 3-phase (TNB Meter)
    - Simple Electricity Grids
    - Distribution Substation
    - Feeder Pillar

1.2 Power Generation

- **Outline of Power Generation, Transmission and Distribution**

❑ Before electricity reaches consumer's place, it has first to be generated, transmitted and distributed.

❑ Electricity is generated at power station and the voltage is raised to a specific level at the main substation before it is transmitted to the designated destination.

❑ For Malaysia case, consumer will receive the rated voltage level of 415V/230V at the distribution substation **[6].**

1.2 Power Generation

- **3 main types of power station in Malaysia**

❑ Hydro Power Station (E.g.: Kenyir, 400 MW)

- ❖ uses high pressure water from a dam as a prime movers to turn the turbine fans.

❑ Thermal Power Station (E.g.: Tanjung Bin, 2.1 GW)

- ❖ uses fuel, coal & gas to heat the water in the boiler and produce high pressure steam to turn the turbine fans.

❑ Gas Power Station (E.g.: Paka, 1.029 GW)

- ❖ uses high pressure gas that acts as the main source of energy to turn the turbine fans.

1.2 Power Generation

- **Renewable Energy Power Plants**

❑ Solar Power Plant

❑ Nuclear Power Plant

❑ Wind Power Plant

❑ Marine Power Plant

❑ Biomass Power Plant

World Largest Solar Power Plant

Kamuthi Solar Power Project

Location: Kamuthi, Tamil Nadu, India

Capacity: 648 GW, 2.5 million modules

Covered Area: 2,500 acres

Building Cost: $679 million

Date of Completion: 21st Sept. 2016

Solar Power Plant in Malaysia

8MW Kompleks Hijau Solar Farm
Location: Ayer Keroh, Malacca, Malaysia
Capacity: 8 MW, 29,092 modules
Covered Area: 17.7 acres
Building Cost: RM84 million ($19 million)
Date of Completion: Mid-Dec. 2014

1.3 Power Transmission

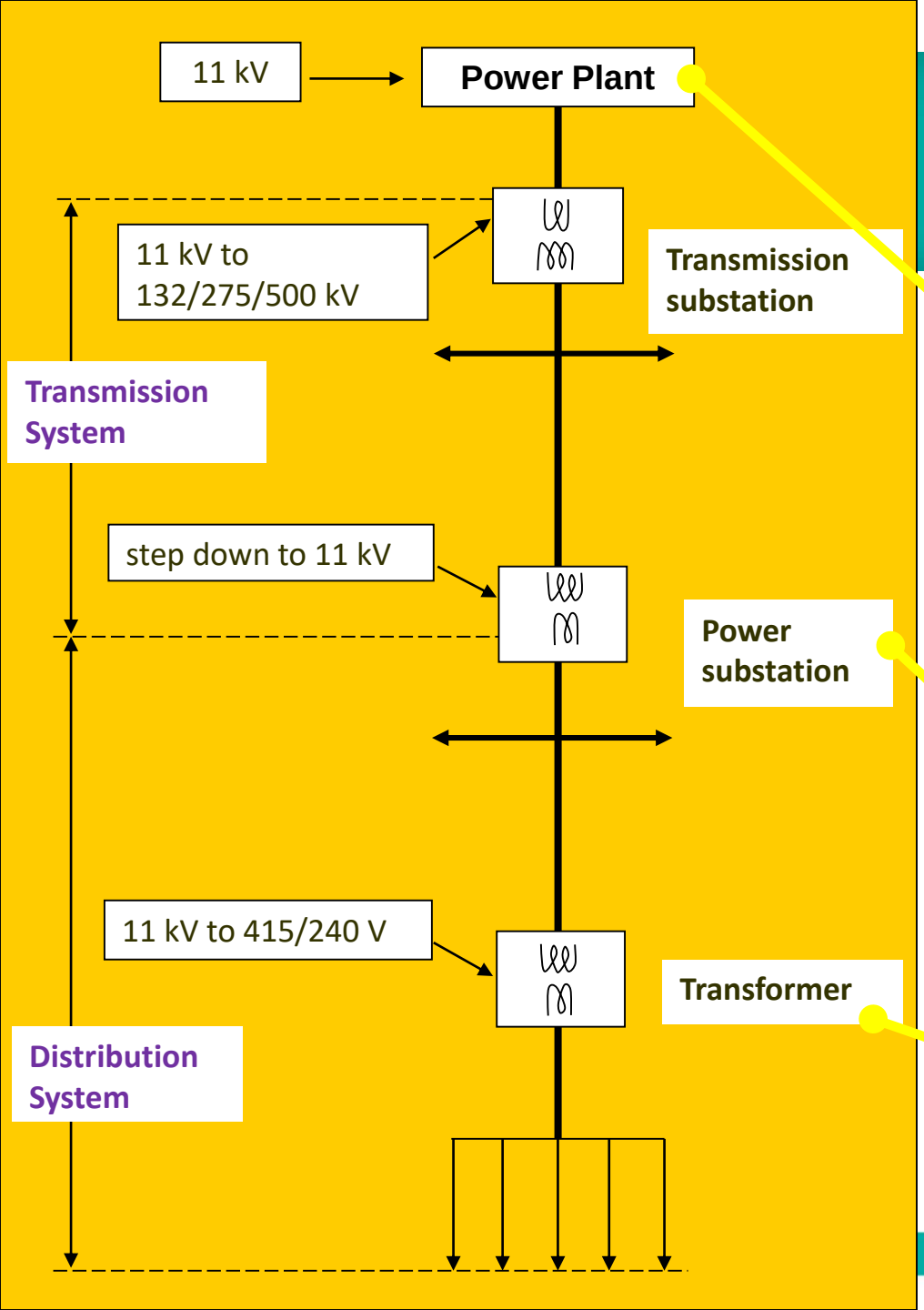
- It is a process of transmitting electricity from power station to main distribution substation.
- Generates 11KV and then raises via step-up transformer to 132KV/275KV/500KV
- The purpose of raising up the voltage is to reduce the transmission current. So, it is possible to;

❑ reduce heat loss (power loss)

❑ use smaller size cables

❑ minimize voltage drop in the cables

POWER GENERATION, TRANSMISSION & DISTRIBUTION




Source: [9]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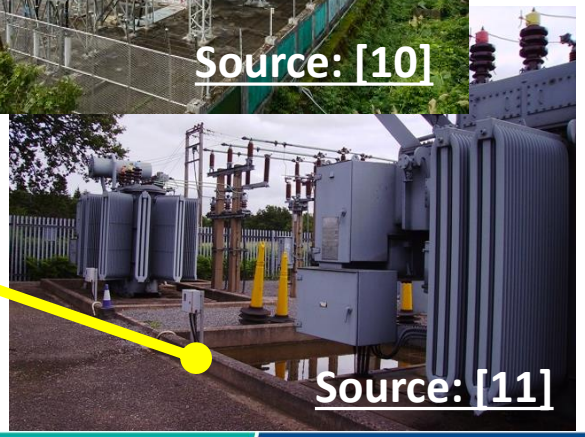

Source: [11]

1.4 Power Distribution

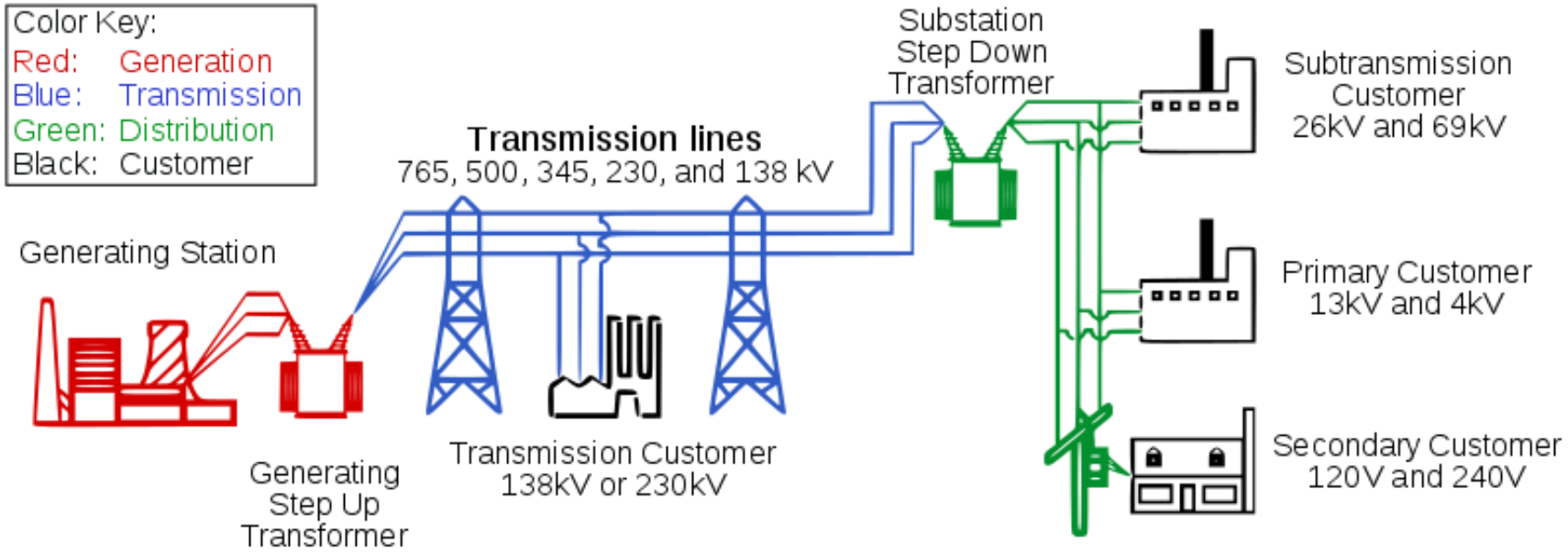
- Distributing electricity from main distribution substation to consumers.
- Stepping down the voltage from 500KV/275KV/132KV to 33KV/11KV using step down transformer.
- The actual voltage distributed to the consumers is stepped down to 415V/230V at substation.
- 415V is three phase voltage & 230V is single phase voltage.

Single phase & 3-phase (TNB meter)

Single phase (240 V)

Three phase (415 V)

Simple Electricity Grids



Source: Simple of electricity grids in North America [13]

Distribution Substation

Feeder Pillar

Source: [15]

References

6] Tenaga Nasional Berhad, *Electricity Supply Application Handbook*, 2011.

[7] Lorraine Chow (EcoWatch), https://www.ecowatch.com/worlds-largest-solar-plant-2011318629.html, 2016.

[8] Yingli Solar, *Success Story 8MW Kompleks Solar Hijau Farm*, http://d9no22y7yqre8.cloudfront.net/assets/uploads/projects/downloads/AseanCaseStudy_Malaysia%20Kompleks%20Hijau%20v08273015v3.0.pdf, 2014.

[9] Joe Mabel, *General Electric DC Generator*, https://commons.wikimedia.org/wiki/File:Georgetown_PowerPlant_Museum_GE_DC_Generator_01.jpg, 2009.

[10] Cephoto, Uwe Aranas, *Taipei, Taiwan: Electrical Sub-Station of Taiwan Power at Taipei Zoo South Station* https://commons.wikimedia.org/wiki/File:Taipei_Taiwan_Electrical-Substation-at-Taipei-Zoo-South-Station-01.jpg, 2015.

[11] David Neale, https://commons.wikimedia.org/wiki/File:Leebotwood_Primary_Substation_-_geograph.org.uk_-_198451.jpg, 2006.

[12] Farhan Ghazali, http://p3he.blogspot.my/2010/, 2010.

[13] United States Department of Energy, SVG version by User: J. Jmesserly, https://commons.wikimedia.org/wiki/File:Electricity_grid_simple-_North_America.svg, 2008.

[14] Aqeela Hamzah, *Distribution System*, Engineering, 2014.

[15] Autumn, http://autumn-internship.blogspot.my/2014/02/, 2014.

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