## Half-Day Workshop on Switchgear Protection and Technical Visit to Toshiba Transmission & Distribution System Asia

by Dr Siow Chun Lim and Ir. Ng Win Siau

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On 26th March 2019, the IEM Electrical Engineering Technical Division (EETD) have organised a technical visit cum workshop to Toshiba Transmission & Distribution System Asia (TTDA) at Toshiba Transmission & Distribution System Asia Sdn Bhd, Lot 22, Jalan Teknologi, Taman Sains Selangor 1, Kota Damansara. Around 40 participants first gathered at TTDA by 9:00am and were welcomed by Mr. Yamamoto from TTDA. This quickly proceed to a safety briefing advising participants on where are the emergency gathering points and some gentle reminders on the rules to be observed while visiting the manufacturing plant later. The emcee from TTDA then introduced the first speaker of the day, Mr. Ashishkumar who will be delivering a lecture on product reliability and safety. He started off his presentation by briefly introducing Toshiba which was established in 1875. The core purpose of TTDA is to be committed to the people and the future. He then introduced the analogy of tree as the power system at which the root represents the generation unit, the branch represents the transmission and distribution network while the leaves are the consumers. Mr. Ashish then highlighted the importance of standards as a common language among manufacturer and user to ease mutual understanding and selection of products via identification of several key parameters. Standards also rationalises the offer from manufacturer's point of view and promote transparent competition among manufacturers. He then introduced IEC62271: High-voltage switchgear and controlgear which covers generic standards, switching devices, switchgear installation and guidelines report. IEC 62271 defines the normal and special service conditions, ratings, design and construction, type and routine test, selection guide and other information such as transportation and storage. Type test is conducted to prove the testing and characteristic of the product whereas routine test is performed to reveal fault in material or construction of the product without impairing its reliability. Switchgear is a combination of electrical switching, protection, metering and management device which is used in 3 phase high power industrial, commercial and utility application. It can also be classified in terms of switching medium and insulating medium. The aforementioned medium is typically oil, air, gas such as $SF_6$, $N_2$, $CO_2$, fluoroketone and solid medium. According to Mr. Ashish, $SF_6$ has thrice the dielectric strength and twice the heat transfer ability of air, making it an excellent arc quenching medium. However, it is a greenhouse gas which has to be properly handled. Switchgear has gradually evolved from the traditional oil type to vacuum and of late, smart circuit breaker. Its main function is to isolate faulty equipment as well as dividing large network into subsections for reparatory works. Reliability evaluation is important to analyse the failure modes in distribution network. The risk to be evaluated

is the probability of occurrence of harm and severity of the harm. TTDA adopts the Design, Measure, Analyse, Improve and Control (DMAIC) approach to ensure quality control of the switchgear produced. The heart of switchgear is basically the circuit breaker. 70% of failures are due to mechanical reasons while 19% and 11% is due to faults in auxiliary and control circuit and due to electrical reasons respectively. Switchgear should be designed to be fail-safe instead of fail-proof and this is where the interlock feature is important to prevent unintended operation. The second speaker, Mr. Syazwan who replaced Mr. Abu Bakar gave a brief presentation on protection and control for smart grid. Smart grid requires the protection of smart switchgear which should be compliant with IEC 61850. In Malaysia, Tenaga Nasional Berhad (TNB) has recently invested sizably towards fully digitising and automating the national grid to maximise its efficiency and reliability.

Group photo of all participants at TTDA