IEC 60364-8-1 Energy Efficiency – Part 2

by Dr Siow Chun Lim

Dr Siow Chun Lim is currently the Secretary/Treasurer in Electrical Engineering Technical Division (EETD).

After the break, Mr. Philip resumed the session by presenting the overview of IEC standards on energy efficiency. Optimising the energy performance of a building requires addressing passive and active solutions. Passive energy efficiency refers to the natural processes that contribute to the comfort and efficiency of a building. Some passive elements include building site and orientation with respect to natural light, building envelope including materials used and natural ventilation for instance free cooling. Passive elements are commonly a one-time only investment with limited upgrade potential beyond building envelope renovation and require low relative maintenance cost. Active energy efficiency refers to the adaptive systems that contribute to energy usage and cost to drive occupant comfort, processes and other operations.

Such systems include HVAC and lighting systems, HBES, BMS, Power and Energy Managing Systems, renewable energy systems, microgrid control systems and distributed energy resources. IEC 60364-8-1 covers the design phase of low voltage installations with energy efficiency while ISO 50001 covers the operation phase of energy management systems and requirements with guidance for uses. The objectives of IEC 60364-8-2 are to state on the role of end-user, promote active Energy Management, integrate dispersed local power sources and consider local storage of energy. Its scope is limited to installations which produce and consume electrical energy i.e. prosumer for both new and existing installations.

Prosumer's installation is conceptualized as having a set of coordinated electrical equipment with the function of supply (connection to grid, PV panels, local generator and storage units), distribution (wiring systems and distribution panels) and consumption (motors, heating system, lighting and lifts)). From the architectural perspective, a prosumer installation may be individual installation (with one single electrical installation and a set of local power supplies and storage unit) or collective of several installations (with one common set of local power supply and storage unit with local energy shared between installations) or shared of several installations (some equipped with local power supplies and/or storage units and local energy can be shared between installations).

The operating modes of prosumer installation includes direct feeding mode (installation is connected to public grid and the public network supplies the installation), reverse feeding mode (installation is connected to public grid and the installation supplies the public network) and islanding mode (installation is disconnected from the public grid and loads are supplied from local power sources/storage units. The speaker also introduced the Electrical Energy Management System (EEMS) which controls the connection to the Smart Grid by monitoring and controlling the local electrical energy production and consumption.

Brief introduction to IEC 61557-12 (Power Metering and Monitoring Devices) which was referred to by the IEC 60364-8-1 standards was done next. The purpose of this standard is to assist designers in selecting the right device for any electricity cost-management application. Such devices also come in different performance class. Next, IEC 62974-1 specifies the requirement for monitoring and measuring systems used for data collection, gathering and analysis which include energy servers, energy data loggers, data gateways and I/O data concentrators. The importance of ISO 50001 (Energy management systems) was also emphasized as it defines a process of continual improvement of energy-related performance.

The final section of his presentation was dedicated to IEC 60364-8-1. IEC 60364-8-1 refers to residential buildings, commercial buildings, industrial buildings and infrastructure and is only applicable for the electrical distribution of the energy supply within a building. The energy efficiency of the electricity transmission/power generation as well as the useful use of equipment in the electrical system is beyond the scope of this standard. Mr. Philip highlighted an interesting dilemma when it comes to defining energy efficiency for a building as unlike the manufacturing sector which yields products as output, the output of a building is usually service to the occupants which is not easily quantifiable or measurable. Hence the ratio of output over input cannot be used and a system approach is adopted to optimize the efficiency of electrical energy usage.

This system approach is based on the principles of minimizing energy losses, using energy when the cost is lower and maintaining the performance. The first principle can be obeyed by optimizing the wiring losses within the installation and the Barycenter method. Wiring losses can be optimized by carefully considering the voltage drop, cross-sectional areas of conductors, power factor correction and reduction of harmonic effects. The second principle works by grouping circuits into meshes and optimizing the use of electricity by using energy efficiency management system. Last but not least, to maintain the building performance, the life cycle methodology can be adopted. This particular standard also provides a comprehensive method to assess the energy efficiency of an electrical installation based on the level of implementation of the energy efficiency measures at several stages which include initial installation, energy management, performance maintenance, power monitoring and bonus.

The session ended with a presentation of token to the speaker