Keynote speaker

Mr. Masayuki TOBITA, Vice President of TMEIC, Japan

Title

Contributions to Carbon Neutral through PEiE, Power Electronics in Everything

Abstract

The world is now moving towards Carbon Neutral. The power electronics technology contributes to Carbon Neutral by expanding renewables furthermore and by improving the energy use efficiency. The power electronics technology also contributes to Green Hydrogen production for replacing the fossil fuels and supports digital transformation for managing new energy circulation systems. The speech introduces some examples of such contributions.

The speech reminds the global goal, Carbon Neutral by 2050. As an example, the Japanese Prime Minister declared it and the government made the strategic plan. The plan includes development of the hydrogen power in addition to expanding renewables and batteries. The speech explains why power electronics is one of key technologies in the plan by introducing recent technology trend of industrial power electronics especially for the high capacity in MW range.

The first topic is the power electronics for the renewables and the energy storage systems, ESS. The speech introduces the key technologies for high power and high system efficiency for the industrial MW-range PV inverters. The speech also introduces the ESSs necessary for stabilizing the power grid by managing the power and energy from the renewables. The smart control systems are also introduced which integrates the renewables, the ESSs and the loads in the power grids. The speech also addresses the power electronics for the wind power generation. The wind power generation increases its power ratings in MW range and requires high-capacity power electronics.

The second topic tries to cover the energy transition, Green Hydrogen, and heating electrification. For these fields also, the power electronics technology is essential. Green Hydrogen is made with the electricity from the renewables. Quite large amount of hydrogen is necessary to replace the fossil fuels now used in the world. Then, very high DC current of kA is required in the electrolytic process for mass production of Green Hydrogen. The speech introduces such high current equipment. The fossil fuels widely used for heating processes. In industries, power electronics technologies of MW range can electrify some of heating processes. The speech goes back to Green Hydrogen, which, however, will be used in the rotating generator to stabilize the AC power network.

The third topic is the energy efficiency in industries. The motors consume more than half of the electricity in the world. The motor drive by inverters is well recognized for better system efficiency in low voltage applications. The speech notes that, for expanding the inverter drive to higher voltage applications, the inverter technology for several kV and higher is required. Then, such technology is introduced with the high voltage

motors.

The fourth topic is related to the digital transition. For achieving Carbon Neutral, the digitalization is the other essential technology to manage the new energy supply chain starting from renewables via Green Hydrogen to users. The digital transition is made of two elements, the vast information in data centers and the hardware made on Silicon wafers. The power electronics technology, UPS, is essential to supply the stable power to the data centers. The other type of power electronics, MPC, multiple purpose converter, reinforce power supply systems in the semiconductor device factories for maintaining the hardware supply chain.

In the summary, the speech remarks that the power electronics technology is now embedded almost in everything. Then, a concept “PEiE”, Power Electronics in Everything, will create new values by linking the power electronics in things. Through applications in various fields, PEiE firmly is believed to contribute to achieve Carbon Neutral.