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Keynote speaker

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Title

Power Electronics Technology to Realize the Carbon-Neutral Society

Abstract

This summer, many regions around the world have experienced record-breaking heat. The UN attributes these unprecedented temperatures to long-term global warming amplified by the El Niño phenomenon. The UN stresses the need to accelerate efforts toward carbon neutrality through measures such as renewable energy expansion and the transition to clean energy. These technologies are essential for reducing emissions and improving resilience to extreme weather.

TMEIC continues to advance power electronics technology under the concept of “PEiE: Power Electronics in Everything.” This presentation introduces our latest development activities toward a carbon-neutral society, focusing on applications for large-scale industries.

The first topic is high-capacity power electronics for expanding renewable energy. Renewable energy is expected to become a primary source of electricity generation, replacing fossil-fuel-based generation. Energy storage systems will also play important roles in future energy networks. Power electronics enables grid-forming functions in renewable energy and energy storage systems and facilitates power transmission from remote renewable energy resources.

The second topic addresses green hydrogen. In fossil-fuel-dependent and hard-to-electrify sectors, switching to clean fuels, including green hydrogen, is essential. Large-scale green hydrogen production requires high-capacity power electronics compatible with future power networks. This presentation introduces recent power-electronics applications in development projects in Japan.

The third topic addresses digital networks for information and communication. Digital networks will play a

key role in the dynamic management and operation of future energy networks. Today, another major trend is the rapid growth of AI, which requires large data centers with high and variable power consumption. This presentation highlights the need for secure large-scale power supply and power consumption leveling to support digital networks. Power electronics provides the necessary solutions.

The final topic introduces power electronics technologies for industrial applications. To achieve a carbon-neutral society, conventional electrification solutions are often inadequate for large-scale industries. High-capacity power electronics enables the electrification of facilities rated at tens of MW and improves energy efficiency through optimal management of MW-scale systems.