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Title: Growth Power Electronics Technology to Realize the Carbon Neutral Society

Abstract

In June 2025, the European Commission, together with the COP30 Presidency, Brazil, and the IEA, hosted the first High-Level Energy Transition Dialogue in Brussels. The event focused on accelerating the global shift away from fossil fuels in preparation for COP30 in November. A key highlight was affirming again the global goals made at COP28: to triple renewable energy capacity and double energy efficiency by 2030. These ambitious goals underscore the urgency of deploying innovative clean energy solutions. This presentation focuses on Power Electronics technology, highlighting its essential role in every solution aimed at reaching that goal.

TMEIC continues to develop power electronics technology under the concept of “PEiE: Power Electronics in Everything.” This presentation introduces the latest development activities aimed at realizing a carbon-neutral society, showing topics applied in large-scale industries.

The first topic is high-capacity Power Electronics technology for expanding Renewable Energy. Renewable Energy is going to become the main player in electric power generation, replacing fossil-fueled generation. Energy Storage System will also play important roles in the future energy network. Power Electronics technology provides grid-forming functions for renewable energy and energy storage systems. Power Electronics also contributes to power transmission

from remote Renewable Energy.

The second topic relates to Green Hydrogen. In fossil fuel driven sectors where electrification is difficult, switching to clean fuels, including Green Hydrogen, is essential. The mass production of Green Hydrogen requires high-capacity Power Electronics technology compatible with future power networks. This presentation introduces recent applications of Power Electronics in development projects in Japan.

The third topic moves to digital networks for information and communication. The digital networks will play a key role in dynamically managing and operating the future energy networks. Today, another major trend is the rise of AI, which requires large data centers. This presentation reminds that these digital networks require large scale secure electric power supply. Power Electronics technology provides the necessary power supply solutions.

The final topic introduces the Power Electronics technologies applied to industrial sectors. For achieving Carbon Neutral Society, conventional electrification solutions are often inadequate for large-scale industries. High-capacity Power Electronics technology enables electrification of facilities rated at tens of MW. The high-capacity Power Electronics also improves energy efficiency by optimally managing MW-rated systems.