

## **Abstract**

The energy paradigms in many countries (e.g., Germany and Denmark) have experienced a significant change from fossil-based resources to clean renewables (e.g., wind turbines and photovoltaics) in the past few decades. The scenario of highly penetrated renewables is going to be further enhanced. Denmark expects to be 100 percent fossil-free by 2050. Consequently, it is required that the production, distribution and use of the energy should be as technologically efficient as possible and incentives to save energy at the end-user should also be strengthened. In order to realize the transition smoothly and effectively, energy conversion systems, currently based on power electronics technology, will again play an essential role in this energy paradigm shift. Using highly efficient power electronics in power generation, power transmission/distribution and end-user application, together with advanced control solutions, can pave the way for renewable energies. In light of this, the most common renewable energies (wind and photovoltaic) and some emerging ones such as wave and tidal energies, which by means of power electronics are changing character as a major part in the electricity generation, are discussed. Issues like technology development, implementation, power converter technologies, control of the systems, and synchronization are addressed. Special focuses are paid on the future trends in power electronics for those systems like how to lower the cost of energy and to develop emerging power devices and better reliability tool.