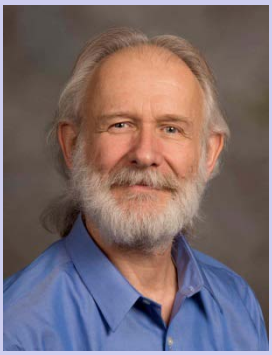
Application of Silicon Carbide (SiC) Power Devices: some opportunities, challenges and potential solutions



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报告简介：

After a decade of premonition, it is becoming increasingly clear that the future human energy needs will be dominantly provided by electricity provided by renewable and distributed generation and delivered over electronic power “pipelines”. Moreover, modern electronic power distribution systems built for airplanes, ships, road and off-road vehicles, data-centers, industrial processes, and buildings, often comprise hundreds of electronic power converters, which is already challenging our basic understanding about how power systems are designed and operated. In order not only to cope with the trend, but to guide it instead, it is essential to develop innovative electronic power system architectures, new control concepts for the solid-state power substations, and methods that allow improved system integration and assessment of dynamic interactions.

The presentation will start with a brief overview of the organization of CPES and its research activities. Then it will review the state-of-the-art and summarize CPES experiences in evaluating the use of SiC devices in dc-dc, ac-dc (single- and three-phase) and dc-ac power converters, as well as in three-phase motor drives, for transportation and higher power applications, ranging from kilowatts to megawatts. It will be shown that SiC devices can provide tangible improvements to existing applications so that their adoption will be mostly determined by the *converter* cost tradeoff. On the other hand, SiC opens two previously unachievable sorts of applications: power converters where power semiconductor devices operate at high-temperatures (> 200 ºC), and high-power conversion in the megawatt range with switching frequencies in tens of kilohertz, where the SiC adoption will be mostly governed by the *system* cost tradeoffs. The presentation will conclude with a vision for a scalable, hierarchical, future ac and dc electronic energy systems, which achieves dynamic decoupling of generation, distribution, and consumption by using bidirectional solid-state power substations as energy control centers.

Dushan Boroyevich教授简介：

Dushan Boroyevich is the director of CPES. Center for Power Electronics Systems (CPES), IEEE Fellow, Member of US National Academy of Engineering. He is the president of the IEEE Power Electronics Society (PELS) for 2011-12. He is the recipient of IEEE William E. Newell Power Electronics Technical Field Award.

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