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Future Challenges for Research and Teaching in Power Electronics

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Abstract

Power electronics is a key technology for modern societies and has reached a high level of development over the last decades. Accordingly, the question about future perspectives and challenges in research and teaching arises. Starting from a brief discussion of past performance improvements in main application areas, the potentials and limits of future advancements of power semiconductor technology and passive components, i.e. capacitors, magnetics, cooling systems, interconnections and packages / integration techniques are discussed. Subsequently, power converter topologies and control and modulation concepts are reviewed and main research targets are highlighted for each area. The second part of the presentation focuses on a paradigm shift from considering single converters to converter systems, i.e. cascaded converters or converter clusters, which is a typical situation found today in datacenters or More Electric Aircraft and will become widespread with the realization of the Smart Grid. Furthermore, the required extension of the analysis of power converters from switching frequency cycles to the whole life cycle is highlighted. Finally, resulting challenges for academic research and teaching which must be tackled in order to continue the highly dynamic development of the area of Power Electronics are identified.

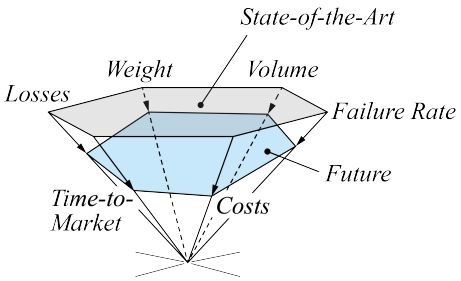

Fig. 1 State-of-the-art and future performance improvement of power electronic systems.

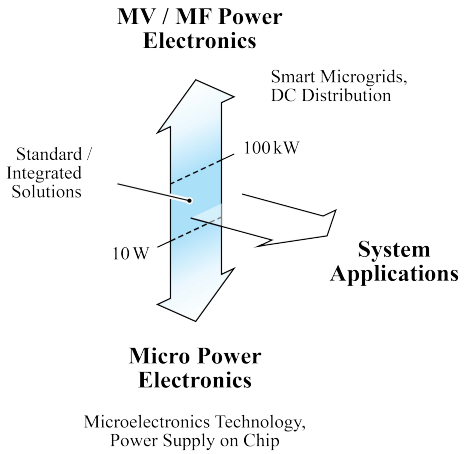

Fig. 2 Main future research directions in power electronics.

References

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