



Professor
Fred C. Lee
Virginia tech, USA

Title: “Power Electronics Trends – a CPES’s perspective”

Abstract

This talk is attempted to capture some of the significant development events and trends in power electronics technologies over the past three, from a CPES’s perspective. It is evident that new devices and innovative materials will continue make significant en route to power electronics technologies and applications. Other drivers are equally important in shaping the future power electronics systems, such as

- Increasing electronic load demands for tighter regulations and dynamic responses;
- Increasing move from customized design to more standardized design;
- System architecture is moving from centralized to distributed;
- Circuit design is moving from discrete approach to integrated approach
- Increasing demand for energy efficiency, higher power density, lower cost and short cycle time.

The current design practices needs to be revisited to address these seemingly conflicting constraints. A paradigm shift in power electronics systems and design practice is eminent.

Biography of Professor Fred C. Lee

Fred C. Lee received his B.S. degree in electrical engineering from the National Cheng Kung University in Taiwan in 1968 and M.S. and Ph.D. degrees in electrical engineering from Duke University in 1972 and 1974, respectively. Dr. Lee is a University Distinguished Professor at Virginia and the Founder and Director of the Center for Power Electronics Systems (CPES), an engineering research center consisting of over 87 corporations. The Center's vision is "to provide leadership through global collaboration to create electric power processing systems of the highest value to society".

Dr. Lee holds 69 U.S. patents, and has published 240 journal articles and over 590 refereed technical papers. During his tenure at Virginia Tech, Dr. Lee has supervised to completion 71 PhD and 80 Master students. He served as President of the IEEE Power Electronics Society (1993-94) and is a recipient of William E. Newell Power Electronics Award in 1989, the Arthur E. Fury Award for Leadership and Innovation in 1998, the Ernst-Blickle Award for achievement in the field of power electronics in 2005, and the Distinguished Alumni Award from National Cheng Kung University in 2006.

Dr. Lee was Honorary Li Kwoh-Ting Chair Professor, National Cheng Kung University in 2011, honorary Sun Yuen Chuan Chair Professor, National Tsing Hua University, Taiwan in 2001, and is Honorary Professor at Zhejiang University (1990-), Shanghai Railroad Technology Institute (1991-), Shanghai University (1991-), Nanjing Aeronautical and Astronautic University (1993-), Tsinghua University (1997-), Huazhong University of Science and Technology (2000-), Harbin Institute of Technology (2002-), Beijing Jiao-Tong University (2004-), Shanghai Jiaotong University (2004-), Hefei Industry Technology University (2009-)

Dr. Lee is a member of the National Academy of Engineering (2011) and has served as President of the IEEE Power Electronics Society (1993-94). He has served as a member of the Board of Directors for Zytex (1987-1997), Artesyn (1997-2004) and Virginia Tech Intellectual Properties (2007-2009), and Chairman of the Board for VPT (1993-2009). He currently serves on the Board of Directors for Delta Power Electronics and the Delta Environment and Education Foundation



Professor
Frede Blaabjerg
Aalborg, university,
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Title: Design for Reliability of Power Electronic Systems

Abstract

Advances in power electronics enable efficient and flexible processing of electric power in the application of renewable energy sources, electric vehicles, adjustable-speed drives, etc. More and more efforts are devoted to having better power electronic systems in terms of reliability to ensure high availability, long lifetime, sufficient robustness and low maintenance cost. However, the reliability predictions are still dominantly according to outdated models and terms, such as MIL-HDBK-217H handbook models, mean-time-to-failure (MTTF), and mean-time-between-failures (MTBF). In this presentation, a collection of methodologies based on physics-of-failure (PoF) approach and mission profile analysis are presented to perform reliability-oriented design of power electronic systems. The corresponding design procedures and reliability prediction models are provided. Further on, a case study on 10 MW wind power converters is discussed with emphasis on the reliability critical components IGBTs and DC-link capacitors. Different aspects of improving the reliability of the power converters are mapped.

Finally, the challenges and opportunities to achieve more reliable power electronic systems are addressed.

Biography of Professor Frede Blaabjerg (S'86-M'88-SM'97-F'03)

He was employed at ABB-Scandia, Randers, from 1987-1988. During 1988-1992 he was a PhD. student at Aalborg University, Denmark, became Assistant Professor in 1992, Associate Professor in 1996 and full professor in power electronics and drives in 1998 the same place. He has been part-time research programme leader at Research Center Risoe in wind turbines. In the period of 2006-2010 he was the dean of the faculty of Engineering, Science and Medicine the same place and became visiting professor at Zhejiang University, China in 2009.

His research areas are in power electronics and its applications like wind turbines, PV systems and adjustable speed drives. Since 2006 he has been Editor in Chief of the IEEE Transactions on Power Electronics as well as he was Distinguished lecturer for the IEEE Power Electronics Society from 2005 to 2007. It is followed up as Distinguished lecturer for the IEEE Industry Applications Society from 2010 to 2011.

He received the 1995 Angelos Award for his contribution in modulation technique and the Annual Teacher prize at Aalborg University, also 1995. In 1998 he received the Outstanding Young Power Electronics Engineer Award from the IEEE Power Electronics Society.

He has received twelve IEEE Prize paper awards and another prize paper award at PELINCEC Poland 2005. He received the IEEE Power Electronics Society Distinguished Service Award in 2009 as well as the EPE-PEMC 2010 Council award.