TEXAS A&M UNIVERSITY

Electric Power and Power Electronics Institute

WEEKLY SEMINAR SERIES – SPRING 2016
Wednesday, March 2nd, 2016, 3:00 – 4:00 p.m., WEB 236C

NEXT GENERATION POWER ELECTRONICS FOR IMPORTANT APPLICATIONS

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Abstract
Power electronics is everywhere in our daily lives, with applications ranging from renewable energy and data centers to portable and biomedical electronics. These applications all require power electronics to offer high performance, small physical size, high reliability, and low cost. Traditionally, it has been preferable to implement power electronics with topologies that have low component count and simple controls. However, these designs require substantial energy storage and bulky passive components, and are reaching their fundamental limits with decreasing marginal performance gains. Moreover, they do not leverage the dramatic advances that have been made in semiconductor materials and integrated circuits. With the advent of wide-bandgap semiconductor materials, and the exciting opportunities offered by emerging high-impact applications, sophisticated and modularized power conversion architectures are becoming extremely attractive.
This talk will present three novel power electronics architectures developed for three important applications, including an electrolytic-free LED driver that promises substantially longer lifetime, a solar micro-inverter that delivers significantly higher efficiency, and a telecom power converter that realizes ultra-high power density. These three architectures extend the fundamental performance boundary of power electronics from three different perspectives, and are enlightening the path to much more sophisticated and modularized power electronics that will benefit a wide range of applications.

Biography
Minjie Chen received the B.S. degree from Tsinghua University in 2009, and the S.M., E.E., and Ph.D. degrees from MIT in 2012, 2014 and 2015, respectively. He is currently a postdoctoral research associate in the MIT Research Laboratory of Electronics. His primary research interests are in the design of high performance power electronics for emerging and important applications, including renewable energy, LED lighting, grid-interface power supplies, and miniaturized power management systems. He is the recipient of the MIT E.E. Landsman Fellowship with a focus on power electronics, and a co-winner of an IEEE ECCE best student demonstration award.