



Po-tai Cheng received his Ph.D. degree from the University of Wisconsin-Madison, Madison, WI, USA. He is currently a Professor with the Department of Electrical Engineering, National Tsing Hua University, Hsinchu, Taiwan. His research interests include high-power converters in industry and smart grid applications.

He received IAS Transactions Prize Paper Award in 2009 and IAS Industrial Power Converter Committee paper award in 2012 and 2014. He is the chairperson of the Industrial Power Conversion Systems Department (2016-2017), and a member-at-large of the Executive Board (2014-2015, 2018-2019) of IEEE-IAS. He also serves as a Distinguished Lecturer of IEEE PELS for 2014-2017, and an associate editor of IEEE Transactions on Power Electronics. He is elevated to IEEE Fellow in 2018.

He has been involved the following activities:

- Executive Board Member, IEEE Industry Applications Society, 2018-2019, 2014-2015
- Chair, Industrial Power Conversion Systems Department, IEEE-IAS, 2016-2017
- Associate Editor, IEEE Transactions on Industry Applications, 2007-2016.
- Associate Editor, IEEE Transactions on Power Electronics, 2005-present.
- Member, International Steering Committee, Energy Conversion Congress and Exposition (ECCE), 2012-2013, 2016-2017
- Member, International Steering Committee, International Conference on Electric Machines and Systems (ICEMS), 2016-present
- Tutorial chair, IEEE Energy Conversion Congress and Exposition (ECCE), 2018, Portland, OR, USA.
- Publicity Chair, IEEE Energy Conversion Congress and Exposition (ECCE), 2013, Denver, CO, USA.
- Technical Program co-Chair, IEEE Energy Conversion Congress and Exposition (ECCE), 2012, Raleigh, NC, USA.
- International Steering Committee co-Chair, IEEE International Symposium on Power Electronics for Distributed Generation Systems (PEDG), 2012, Aalborg, Denmark.
- Vice Technical Program Chair, IEEE Energy Conversion Congress and Exposition (ECCE), 2009-2011

Contact email: ptcheng@ieee.org

Lecture Topics

Total of four topics are proposed. All four topics alone are suitable for 40-60 minutes seminars. Depending on the need of the event organizer, Topic 1 can be integrated with other topics and become tutorial/workshop material, and tailor-made to suit the need of industrial or academic audience.

1. PWM and controls technique of AC/DC Converters/Inverters

This lecture first introduces the basics of AC Pulse Width Modulation, from the old harmonic elimination, to the industry-standard Space Vector PWM. Detailed discussions of SVPWM, like its zero vector placement, DC bus voltage utilization, will be presented for better understanding its features. Afterwards, the basic closed-loop controls, like the current control and voltage control, are presented. The integration of the closed-loop controls and the PWM modulators will also be explained. Finally, practical examples, like active power filter, or field-oriented motor drives, will be given to illustrate how these basic technologies are utilized in the industries.

2. Powering Critical Loads: State-of-the-Art Based on Taiwan Experience

High tech industries, like semiconductor foundries, display panel manufacturers, etc. play a critical role in the economy of Taiwan. These facilities have many automatic equipment and processes, any interruption of electric power results in unscheduled shut-downs and incurs severe financial losses. This presentation will explain how various power electronics technologies are utilized to maintain the power quality and the reliability in these facilities, including dynamic voltage restorers (DVRs), solid state transfer switches (STSs), and uninterruptible power supplies (UPSs). Basics of these technologies will be introduced, and then advanced research development based on field experiences will be presented and verified by test results.

3. Low Voltage Ride-through of renewable energy converters

With more and more distributed energy resources (DERs) being connected to the grid through interface converters, the utility grid operator impose more low voltage ride through (LVRT) requirement on large scale PVs and wind power equipment. Reactive current injection (RCI) is often required as part of LVRT in order to support grid voltages. This presentation will cover the basics of operating the grid interface converter under unbalanced grid voltages. and how the reactive current injection can be accomplished by various methods. A novel technique proposed by the speaker's research group will also be presented. This proposed technique combines the positive and negative sequence reactive current for precise control of the peak converter current. The purpose is to reduce risk of over-loading or even damaging the power transistors while meeting the low voltage ride-through requirement. Its operation principle and control method are explained and analyzed.

4. Medium Voltage Power Electronics in the Smart Grid Applications

Medium voltage applications of power electronics have gained significant momentum in recent years as the demand of high capacity of power conversion soars, like utility-grade renewables and energy storages, smart grid infrastructures, and etc. to tackle the challenges of carbon reduction. Taiwan's power electronics industries explore these opportunities by integrating their low voltage converter products into medium voltage high power conversion systems. This presentation will share the experience of the collaboration between our academic research laboratory and the corporate research of industries as they evolve from component suppliers to system solution providers.