

A glimpse into power converters for modern wind turbines

Date: Wed. 4th Dec.

Time: 1:10 pm

Location: Building 59, Room 2016

Speaker:

Dr. Hamza Chaal

Systems engineer with Siemens
Keele, UK.

Abstract:

In this talk we are going to look at the modern direct drive wind turbines, and in particular Siemens Gamesa offshore product portfolio. We will touch on the levelized cost of energy (LCoE) and how innovation and industrialization of wind turbines contribute to lowering it persistently over the years. We will review the basic principle for controlling variable speed wind turbines then focus on the power converter system. Furthermore, we will review the two-level back-to-back topology of three phase power converters, the modular concept and the critical power switch component used to realize them, namely the IGBT; why IGBT and how to control IGBT voltage source inverters. Then light will be shed on the power converter requirements on both the generator bridge and the grid-side bridge, and the methods and tools used to circumvent the design, development and commercial challenges. Finally, a case study showcasing the development cycle of the “Inertial Response” feature will be presented.

Bio:

Hamza Chaal is currently a power electronics and systems engineer with Siemens Gamesa Renewable Energy in the R&D converter competence centre in Keele, UK. He has more than eight years experience in the wind power industry sector driving technology forward. His knowledge and experience cover software engineering, control system modelling and implementation, frequency converter power electronics up to the multi megawatt range.

He took part in the development of many Siemens flagship wind turbines including the first direct drive platform SWT-3.0-101 and subsequent offshore SWT-6.0-154 from requirements capture, design and implementation through to commissioning. He is the author of numerous patents, journal and conference papers and recipient of various academic and industrial awards.

He is an IEEE senior member and a registered Chartered Engineer with the UK Engineering Council. He provides services to the community as a STEM ambassador and is a technical reviewer for several journals (e.g. IEEE tran. on Power Electronics, and IEEE tran. on Industrial Electronics). He received the Control Engineering Degree from Annaba University, Algeria in 2002 and the Master's Degree in Automatic Control Systems from Université Paul Sabatier, Toulouse, France in 2003. In 2005 he joined the Systems Engineering Dept. at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia, as a Lecturer-B where he taught linear and digital control systems labs. In September, 2007 he joined the Graduate School of Information, Production and Systems, Waseda University, Kitakyushu, Japan for research work in the area of power electronics control supported by MEXT (Japanese Government).

From 2008 to 2011, he was with the Engineering Dept. at Northumbria University, Newcastle, UK as a full time PhD student supported by EPSRC (UK Government).