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# ICEM'2022 TUTORIAL

**TUTORIAL NAME:**

Modeling and Control of Medium Voltage Multiphase Generators for Wind Applications

**TUTORIAL PRESENTERS (Full Names, affiliations and e-mails)** *(Max 2)*:

Ioannis Tsoumas, Principal R&D Engineer, ABB System Drives, Switzerland, ioannis.tsoumas@ch.abb.com

**BIOS OF THE PRESENTERS (max 150 words each):**

Ioannis P. Tsoumas received the Dipl.-Eng. and Dr.-Eng. degrees in electrical and computer engineering from the University of Patras, Greece, in 2000 and 2007 respectively.
From 2008 to 2015 he was an R&D engineer in the field of low voltage high power motor drive systems technology at Siemens AG, Nuremberg, Germany. From 2015 to 2019 he was with ABB Corporate Research in Baden-Daettwil, Switzerland. In 2019 he joined the ABB System Drives in Turgi, Switzerland, where he is currently a Principal R&D Engineer. His work focuses on control and modulation concepts as well as on system-oriented optimization of medium voltage power electronic converters for offshore wind energy applications.
Dr. Tsoumas is a Senior Member of the IEEE. He has more than 50 publications in international scientific journals and conferences and holds several international patents in the field of electric drive systems.

**ABSTRACT (max 200 words):**

Multiphase medium voltage generators are increasingly employed in offshore wind parks in order to maximize the generated power per wind turbine and thus minimize the cost per MW of installed power. A characteristic example is the Dogger Bank wind farm, a future offshore wind farm at the North East coast of England. It will become the world's largest offshore wind farm with an installed capacity of 3.6 GW. Medium voltage multiphase generators with a rated power of 13-14 MW will be installed among others.

The control of such generators is more complicated than their conventional low voltage three-phase counterparts. Aim of the tutorial is to disseminate its fundamental concepts to the research scholars and the application engineers. Starting with an appropriate mathematical modelling of medium voltage multiphase electrical machines the classical and modern control concepts are going to be presented and analyzed in detail. Characteristic example of the former is the vector current control with carrier-based pulse width modulation, whereas optimized pulse patterns with model predictive pulse pattern control represent the newest and most advanced concept. The most important control challenges are also going to be discussed and some directions for future research on the topic are going to be provided.