MARQUETTE UNIVERSITY

Departmental Colloquium
Electrical and Computer Engineering

Energy Conversion for a Sustainable Future
Revived Role of Power and Energy

Tuesday, October 24, 2023
2:00 pm – 3:00 pm
Olin 202

Reception to follow in Olin 204
3:00 pm – 3:30 pm

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ABSTRACT: Energy sustainability is arguably one of the most critical challenges for a sustainable future. With predictions showing future scarcity and/or higher degree of extraction difficulty of traditional sources of energy for example coal, oil and natural gas, the shift to sustainable clean sources of energy is a must. Another key reason is the increasing detrimental impact of using fossil fuels. Over the last few decades, there has been a serious effort to replace mechanical and hydraulic systems with electrical systems. This effort also includes replacing fixed-speed and old electrical drives with higher performance variable-speed drives. This is mainly due to the higher reliability, efficiency and robustness of electrical systems. This trend of "more electric" systems could be seen across a wide range of applications. These include traction, aerospace, actuation, mining, oil and gas, and industrial applications as examples. This push for electrification posed a lot of challenges to develop electrical systems that meet the demanding requirements of the various applications including harsh environments, high power density, high efficiency and fault tolerance in safety-critical applications. At the heart of the electrification effort is the development of advanced electrical machines and drives. This presentation will provide an overview of the various applications where electrification is taking place. The presentation will focus on electrical machines and drives that have been developed or are currently under development. The presentation will also cover some general trends in electrical machines and potential areas of research.

BIOGRAPHY: Ayman M. EL-Refaie received the B.S and M.S degrees in electrical power engineering from Cairo University, Giza, Egypt, in 1995 and 1998, respectively, and the M.S. and Ph.D. degrees in electrical engineering from the University of Wisconsin-Madison, Madison, WI, USA, in 2002 and 2005, respectively. Between 2005 and 2016, he was a Principal Engineer and a Project Leader with the Electrical Machines and Drives Laboratory, General Electric Global Research Center. Since 2017, he has been the Werner Endowed Chair for energy sustainability with Marquette University, Milwaukee, WI, USA. He has more than 160 journal and conference publications. He has 48 issued US patents. At GE, he worked on several projects that involve the development of advanced electrical machines for various applications including aerospace, traction, wind, and water desalination. His research interests include electrical machines and drives. Dr. EL-Refaie was the Chair for the IEEE IAS Transportation Systems committee and an Associate Editor for the Electric Machines committee. He was a Technical Program Chair for the IEEE 2011 Energy Conversion Conference and Exposition. He was the General Chair for 2014 IEEE Energy Conversion Congress and Exposition and 2015 IEEE Energy Conversion Congress and Exposition steering committee chair. He was the General Chair for 2019| International Electric Machines & Drives Conference. He is the Past Chair for the IEEE IAS Industrial Power Conversion Systems Department. Dr. EL-Refaie is the President Elect of the IEEE Industry Applications Society, and he is a Fellow of the IEEE.