

Marquette University: Professor awarded \$5 million Department of Energy grant for advanced electric drivetrain

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MILWAUKEE — Dr. Ayman El-Refaie, Werner Endowed Chair in Secure/Sustainable Energy and professor of electrical and computer engineering on the Opus College of Engineering at Marquette University, has received a \$5 million grant from the Department of Energy in support of his project to develop the next generation of electric-drive drivetrains.

The grant was awarded to Marquette, as the lead institution. Partner institutions include Virginia Polytechnic Institute and State University, General Motors, Niron Magnetics and the National Renewable Energy Laboratory. The goal of the project team will be to develop an electric drivetrain that meets or exceeds the DOE's system level targets of cost and energy efficiency, while maintaining a higher targeted direct current (DC) voltage value.

“Our research team is appreciative of the Department of Energy for its funding support in this project,” El-Refaie said. “The developed technologies will have a broad impact on the development of electric vehicles in terms of sustainability, cost and size reduction of electric. These advances will also be able to be leveraged for synergistic areas such as renewable energy and industrial applications. This opportunity would not have been possible without the Werner endowment, which enabled establishing a state-of-the art lab and a world-class research team of postdoctoral fellows and graduate research assistants.”

The three-year project, “Low-Cost Rare-Earth Free Electric Drivetrain Enabled by

Novel Permanent Magnets, Inverter, Integrated Design and Advanced Thermal Management,” will utilize novel iron nitride permanent magnets to develop a novel rare-earth-free traction motor. A low-cost inverter and tight integration concepts will also be developed, which will be enabled by multiple technologies, ranging from device selection to integrated design approaches.

“This grant is very exciting for Dr. El-Refaie and his research team as they pursue significant advances for sustainability,” said Dr. Kristina Ropella, Opus Dean of the Opus College of Engineering. “We are extremely proud to have this work representing Marquette University and the Opus College of Engineering, as its effects could be far-reaching in the advancement of renewable energy sources.”

The Department of Energy announced the availability of up to \$133 million in grants to accelerate advanced vehicles technology research to support research that will lead to more affordable, efficient, and secure transportation energy. Marquette is the only university to receive one of two \$5 million awards in the area of developing low cost electric traction drive systems that use no heavy rare Earth materials. The awards are funded through the Office of Energy Efficiency and Renewable Energy.