HIGH POWER DENSITY & HIGH EFFICIENCY LEVEL 2 ELECTRIC VEHICLE CHARGER

SUMMARY

This project will increase the adoption and penetration of green electrified transportation systems.

DESCRIPTION

From generation to consumption, approximately fifty percent of the generated electricity in the United States travels through power electronics. It is predicted that this figure will rise to 80 percent by the year 2030, highlighting the significant need to increase the efficiency while decreasing the cost of electrical energy conversion. Recent advancements in silicon carbide and gallium nitride materials have provided a key component to increasing efficiency but they have not been fully utilized.

The goal of this project is to research a new topology for level two on-board electric vehicle chargers that utilizes wide band gap semiconductors. Reducing the volume and weight while simultaneously increasing efficiency of the charger is absolutely key for on-board transportation applications. Leveraging a new topology and new wide bandgap devices will allow for state of the art decreases in volume and weight and increase in efficiency.

MILESTONES

1. Develop simulation

2. Build prototype 50kW converter system for EV Traction applications

3. Complete testing and characterization of converter

ABOUT OUR TEAM

Nathan Weise, PI
Assistant Professor, Marquette University
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Nathan Weise will lead research for the project, with the help of two graduate students who will be responsible for simulation, fabrication of the prototype, and experimental validation, with four undergraduate students providing support.

BEYOND BOUNDARIES

The first theme this proposal will contribute to is the pursuit of academic excellence for human well-being. The contribution of the research will be a state-of-the-art power electronic converter in its class. The development of efficient and power dense electric energy converters decreases required energy generation from fossil fuel-based sources. The experimental results of this converter will thrust Marquette University into the spotlight for energy conversion. The second theme that this proposal will contribute to is research in action. The research will allow the principal investigator to contribute to this theme by creating an innovative solution for power dense converters in transportation applications. Finally, the work contained in this proposal will allow graduate students and undergraduate students to work on a project that is state of the art in power electronic research and directly contribute to outcomes that have significant societal impacts.

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Community Impact