

# Driving forward innovation

UNC Charlotte's EPIC center is ahead of the future in electric vehicles.



The college's interdisciplinary research center is working toward viable solutions for electric vehicle charging.

Almost everyone in North Carolina has noticed the signs that something big is happening in the energy industry. Solar farms are seemingly being built overnight, fleets of hybrid, plug-in hybrid and battery-electric vehicles have become common enough to attract the attention of state legislators - and are impacting the funding of our road system. Debates are taking place about the future of coal-generated power in the state versus massive new wind generation projects.

The Energy Production and Infrastructure Center at UNC Charlotte strives to be at the center of this energy economy transformation. EPIC is an interdisciplinary research center with a mission to facilitate a university-industry collaboration in engineering research and development with a focus on energy-related systems. The partnerships developed with EPIC produce technical scholarship through the efforts of associated faculty and students as well as implementable solutions and tangible outcomes developed by experienced professional engineering staff.

Behind the larger societal goal for cleaner energy is the development of new and innovative technology. The creativity of small companies, both startups and established businesses, is being counted on to solve this challenging problem. EPIC is a ready collaborator with new energy startups - especially those trying to connect to the Charlotte-based energy industry.

For example, brand new electric vehicle models will soon come pouring from car manufacturers. Many of these cars will have the ability to accept ultrafast rates of electric charge to solve the biggest challenge: how fast can 300 miles of driving range be acquired. With conventional cars, this takes nothing more than a quick, five-minute stop at a gas station. Many believe that achieving this same convenience for EVs is the key to achieving a universal transition from gasoline-powered cars to electrically powered ones.

With this transition comes a big question: where will all these new EV owners find a charging place that can sustain an ultrafast charge for their cars without grid modifications? The answer could be a new energy storage technology pioneered by ZapGo, Inc., an early-stage company that has partnered with EPIC. With headquarters in Oxford, England and offices in Charlotte, ZapGo came to EPIC for help getting their carbon-ion cells into a fully integrated system as a solution to getting ultrafast DC EV chargers onto the electric grid.

"ZapGo has engaged EPIC to deliver an independent evaluation of our C-ion high energy storage technology, as well as develop the concept and key components for an engineering

prototype of a large-format grid energy storage system using C-ion cells," Charles Resnick, ZapGo, Inc.'s president, says.

EPIC's C-ion Test and Development Laboratory was created for the purpose of assembling C-ion cells into larger component subsystems intended for large energy storage applications that can be used by electric utilities.

The fast charging stations needed for zero-emission battery EVs are generally not compatible with the electric utility infrastructure, so the development of a high-power energy storage system can help. Right now, the companies pursuing these systems see only one technology, and that is the same type of lithium-ion batteries found in EVs. But according to a study performed by Nicolas Sockeel, a post-doctoral researcher at EPIC, this isn't a viable option. Another type of technology is needed.

Jim Gafford, EPIC's assistant director for special projects, and Madhav Manjrekar, EPIC Assistant Director for Power Management, have forged a group of engineers and students to team with ZapGo's research labs and tackle the problem of building a prototype energy storage system to meet the need for ultrafast EV charging, without relying on costly and limited Li-Ion batteries.

"Evaluation capabilities, methodologies and results to date have been demonstrated to ZapGo clients and industrial partners, including Electrify America, LS Energy Solutions, Jabil, Duke Energy and ABB," Gafford says. Duke Energy has agreed to test the system at their Mount Holly Microgrid Innovation Research Center later this year.

EPIC continues to work on the design of the energy storage system. Blueprints of subassemblies filled with ZapGo C-Ion cells will be used by Jabil in Florida to manufacture the subassemblies. The fully tested subassemblies will be returned to the Charlotte-based manufacturing plant of LS Energy Solutions to perform the final system integration of the subassemblies into the grid-tied energy storage prototype, which will be sent to Duke Energy for evaluation.

The schedule is tight, but the team is in place to meet ZapGo customer commitments in the U.S. and Europe next year. Not a minute too soon, because in the next decade, cars that need the "zap and go" treatment will roll out of design studios and be headed for mass manufacturing.

EPIC is not only on time for our clients. We are ahead of the future.



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