The Advanced Transportation Energy Center is a sub-center of the FREEDM Systems Center that provides a solid base of engineering know-how, lab facilities, and an active network of industrial collaborators, for building on the automotive research capabilities of NC State. The key strengths of FREEDM in energy storage, power electronics, and vehicle systems are harnessed in ATEC to solve some of the challenges in bringing electric vehicles to market that satisfy consumer needs, provide tangible energy and environmental benefits, and also integrate seamlessly with the evolving electric infrastructure. As the public interest in electric vehicle technology grows and all the major automakers race to develop and roll out new plug in vehicles, the center is well positioned to make significant technical contributions to this evolving field. The synergies with FREEDM are strong, and its vision for a revolutionary new power grid helps provide a pathway for a future with significantly enhanced energy efficiency in personal transportation.

Rogelio Sullivan, managing director for the FREEDM Systems Center

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NSF GIVES POSITIVE REVIEW OF PROGRAMS AT FREEDM SITE VISIT

The center hosted nine reviewers from the National Science Foundation June 1-3 at the McKimmon Center for FREEDM’s third annual NSF site visit. This review was of particular importance because the site visit team would determine if the Engineering Research Center would receive funding for an additional five years. The center was initially funded in 2008 with $18.5 million over five years. The “critical review” received overall positive feedback from NSF, said Dr. Ewan Pritchard, director of industry collaboration and innovation for FREEDM. He said this year’s visit went even better than last year’s and that the center was complimented on the consistent improvement of all its programs.

The site visit consisted of presentations and updates on research, education and industry programs at FREEDM. Students also had opportunities to present posters about their research projects and network with NSF and industry members. The NSF reviewers also held private meetings with center students and industry members to discuss their activities and experiences with the center. The site visit culminated in a tour of the center lab facilities and technical demonstrations at the Keystone Science Center.

NSF did give FREEDM two specific instructions: implement a structured systems engineering process and increase the level of engagement with external organizations in the smart grid space. The center is “implementing a new process to bring systems engineering into all aspects of the center — such as our education programs,” said Pritchard. FREEDM management has been working to secure assistance for undertaking the systems engineering process and to provide appropriate training for all staff and students.

“The center is implementing a new process to bring systems engineering into all aspects of the center…” said Pritchard.
ABB GIFT CREATES $1.2 MILLION POWER ENGINEERING INITIATIVE AT NC STATE

Josh Lawrence wants to boost fuel economy of some of the largest plug-in hybrid vehicles on the road today – school buses.

Lawrence, a mechanical engineering graduate student at the FREEDM Systems Center, is among many researchers at FREEDM’s Advanced Transportation Energy Center (ATEC) working to improve fuel economy in plug-in electric and hybrid vehicles. ATEC is helping the automobile industry develop cleaner, more fuel-efficient versions of these vehicles—efforts researchers hope will lead to widespread adoption among motorists.

While pursuing his undergraduate degree in mechanical engineering at North Carolina State University, Lawrence participated in the co-op program. This unique program allows students to alternate between semesters spent in academia and in the workplace.

Lawrence rotated between his coursework and working in the transportation center at Advanced Energy, a non-profit on NC State’s Centennial Campus that helps utility, industrial and residential customers boost the returns on their energy investments. At Advanced Energy, Lawrence met Ewan Pritchard, then a doctoral student in mechanical engineering at NC State, who was identifying the source of losses found in post- mechanical engineering at NC State, who was identifying the source of losses found in educational programs and in the workplace.

While learning more about Pritchard’s research, Lawrence realized that demand for electric transportation would continue to increase. What’s more, he enjoyed the work, and he decided to pursue a career in electric transportation.

Lawrence’s own research centers around understanding Pritchard’s findings, validating those results in the lab, and optimizing the hybrid school bus drivetrain. Pritchard discovered that the torque converter in the school bus’s drivetrain and the electric motor lose energy — up to 30 percent.

“Understanding the problem and explaining it to others was an ‘aha’ moment,” Lawrence said.

In addition to working on the hybrid drivetrains, Lawrence is involved in the design of the electric vehicle tested at FREEDM. After he graduates in May 2012, he hopes to stay in the electric transportation industry by working in a national lab, a research center or in industry.

ABB’s North American headquarters has made a gift to the Department of Electrical and Computer Engineering to support power engineering research and education at North Carolina State University, home to the FREEDM Systems Center’s headquarters.

The $1.2 million initiative, which includes a $632,000 commitment over five years from ABB plus anticipated state and private matching funds, aims to strengthen the organizations’ cooperative research in electric power technologies and aid ABB’s recruiting of top engineering professionals. ABB is a FREEDM industry partner.

“Since becoming the first corporate tenants on Centennial Campus in 1991, ABB’s regional power products and power systems divisions have made their homes on campus. It’s a longstanding and welcome relationship,” said Dr. Louis Martin-Vega, dean of the College of Engineering. “A prime motivation of ABB in North America is to establish a greater presence in the U.S. We are very pleased that this new endowment will help grow our research relationship and help ABB develop its domestic capability.”

ABB’s gift will provide funding for an endowed professorship, a faculty support fund, scholarships and a lecture series, all focused on power engineering.

“It’s a very competitive environment for attracting and keeping top faculty and students,” said Dr. Daniel Stancil, head of the Department of Electrical and Computer Engineering. “This ability to offer professorships and scholarships will help bring the brightest minds in power engineering to NC State.”

ABB joined FREEDM as an industry partner after the center was formed in 2008, and FREEDM’s work in smart grid research is of particular interest to ABB.

The company is opening a Smart Grid Center of Excellence on Centennial Campus this year. The center will house 50 employees, a testing and development laboratory, and a demonstration center that will showcase ABB’s smart grid technologies and partnerships.

ABB Gift creates $1.2 million Power Engineering Initiative at NC State

Raleigh Conference plugs into Electric Vehicle movement

More than 800 visitors and exhibitors attended the 2011 Plug-In Conference and Exposition at the Raleigh Convention Center July 18-21.

Launched in 2008, the conference provides automotive manufacturers, electric utility companies, government agencies and other groups with the opportunity to collaborate on the future of electric vehicles and plans to support those vehicles with public policy, technology initiatives and infrastructure improvements.

The Advanced Transportation Energy Center (ATEC), an organization researching advancements for plug-in hybrid electric vehicles (PHEVs) and plug-in electric vehicles (PEVs) at the FREEDM Systems Center, was one of 50 exhibitors at the conference. FREEDM Principal Investigators Dr. Ewan Pritchard, Dr. Srdjan Lukic and FREEDM Managing Director Rogelio Sullivan were either moderators or speakers for sessions at the event.

The conference included multiple presentation sessions, a ride and drive event, a well-attended public night, and tours of ATEC and Advanced Energy. The tours provided conference attendees the opportunity to see some of the research that will help develop more advanced EVs for the future.

“Many students, professors and industry members stopped by the ATEC booth to find out more about ATEC research, such as improvements to battery packs and hybrid drive trains. Companies like Mitsubishi, Nissan and Chevrolet presented new models of electric vehicles and touted new features, including quick-charging capabilities, extended mileage, and luxury options customarily found in gas-powered cars. The Nissan Leaf, Mitsubishi i-MiEV, and an electric motorcycle from Siemens were displayed on the exhibit floor.”

Leading government officials, automotive executives, energy leaders, innovators and researchers met at the Raleigh Convention Center to discuss the future of electric transportation.

The FREEDM Systems Center welcomed members of the White House Council on Jobs and Competitiveness on June 13 for a meeting and tour of center facilities. The council is comprised of business leaders chosen by President Barack Obama to devise strategies for growing the economy, and includes breakout groups focused on energy, biotechnology, entrepreneurship and jobs training.

“The visit by the Council members was fantastic,” said Rogelio Sullivan, managing director of the FREEDM Center and Advanced Transportation Energy Center. “It gave us the opportunity to not only talk about the potential impact the center’s research and development can have in the future on energy and the environment, but it also gave us the chance to describe how the FREEDM education and outreach activities can help to develop a well-prepared workforce for the smart grid.”

“The energy group met on campus and discussed methods to improve energy infrastructure and consumer education on smart grid innovation,” officials at the meeting included U.S. Senator Kay Hagan, U.S. Secretary of Commerce Gary Locke; General Electric CEO Jeffery Immelt; NexEra Energy Inc. CEO Lewis Hay, NC State Chancellor Randy Woodson, Southwest Airlines President and CEO Gary Kelly, Comcast Corp. CEO Brian Roberts, and Kleiner, Perkins, Caufield & Byers Partner John Doerr.

“The President’s Council recognizes that energy is the frontier that will build this country back up,” said Dr. Ewan Pritchard, director of industry, innovation and collaboration at FREEDM. Some of the center’s industry partners also attended the meeting to discuss the role of smart grid technology in the marketplace. The event included a session in which local and national energy and smart grid executives spoke to Council members about the barriers to and opportunities for job growth in their sectors.

“Ester was pleased to participate in the President’s Council on Jobs and Competitiveness,” said Mark Monday, president of Ester Solutions, “and we are proud to partner with the FREEDM Center to develop innovative smart grid technologies that will result in energy efficiencies for both consumers and utilities.”

At the end of the day, the Council members met with President Obama at CREF, another council collaborator, to report their findings and share what they learned from the process.
INDUSTRY PARTNERS DONATE ELECTRIC VEHICLE CHARGING STATIONS

TE Connectivity donated the first electric vehicle charging station to be installed in the parking deck of the Keystone Science Center, home to the FREEDM Systems Center. Eaton donated the second charging station installed in the parking deck.

The parking deck can currently accommodate up to 10 charging stations.

TE Connectivity’s donation furthers FREEDM’s mission to study and refine current smart grid technology. The charger donated is a Clipper Creek “Level 2” system that is compatible with all new generation plug-in vehicles and is integrated into the FREEDM Green Energy Hub for energy monitoring and control.

“TE Connectivity’s commitment to supporting the globally evolving electric vehicle initiative will expand with collaborative efforts with organizations like the FREEDM Systems Center,” said Eric Freid, director of marketing for TE Connectivity. “The new charging unit will not only advance the center’s vision but is a working symbol of both organizations’ dedication to contribute to NC’s priority to promote the use of electric vehicle charging stations.”

The charging stations can be used to recharge vehicles in the Advanced Transportation Energy Center’s (ATEC) fleet of electric vehicles and is also available for use by visitors of the center. ATEC researchers work primarily on improving electric vehicle battery packs and control systems at the FREEDM facility.

“The FREEDM Systems Center’s goal in working with industry members is to bridge the gap between university research efforts and marketplace demands,” said Dr. Ewan Pritchard, director of industry, collaboration and innovation for FREEDM. “We will benefit greatly from TE Connectivity’s generous donation and look forward to building our relationship with them in the future.”