

HIGH VOLTAGE ECONOMY: Q&A WITH DR. ALAN MANTOOTH, UNIVERSITY OF ARKANSAS

By AMP Staff

A resilient, robust and reliable power supply is vital to our nation's quality of life and to our national security. In fact, the U.S. government classifies the electric power grid as critical infrastructure, and we'll rely on it even more as electric vehicles take on a greater role in moving goods and people.

Helping to enhance and protect the nation's electric grid is Dr. Alan Mantooth of the University of Arkansas, a Distinguished Professor in the Electrical Engineering Department. He serves as director of the National Center for Reliable Electric Power Transmission (NCREPT), which he helped found in 2005. His research relates to advanced electronics. His contributions to the state's economy due to collaborative research have been estimated at more than \$1 billion, and he currently oversees more than \$30 million in active research projects.



Dr. Alan Mantooth

AMP: Your focus is on advanced electronics, but can you be more specific?

Dr. Mantooth: My team and I design tools, models, circuits, controls and cybersecurity software for advanced power electronics. The primary applications include space, electrified transportation (planes, trains, automobiles, heavy equipment) and electric power grid modernization, but power electronics are EVERYWHERE. Look around the room. Power electronics is in lighting, computing, consumer electronics, hand tools, household appliances, cars, trucks, bulldozers, airplanes, the electric power grid... and that's just the ones you see daily. Power electronics is in manufacturing, medical instrumentation; the list is endless. So, what we are doing impacts every American, every day.

AMP: Tell us a little bit about the Na-

tional Center for Reliable Electric Power Transmission (NCREPT).

Dr. Mantooth: NCREPT is a very high-power test facility: 6 MW, which is the equivalent power used by more than 1,000 homes simultaneously. We use this facility to test and evaluate the power electronics that we prototype for grid and transportation applications. It is also home to our cybersecurity testbed, or cyber range. This ensures that everything we do is focused on working in rugged, real-world, settings.

AMP: You are the executive director for a research center called GRAPES. What is GRAPES?

Dr. Mantooth: GRAPES is an acronym for GRid-connected Advanced Power Electronic Systems and is a National Science Foundation Center of Excellence. It

is the center of our work that focuses on electric power grid modernization.

AMP: Why is the work being done at GRAPES so vital to our nation's security?

Dr. Mantooth: Our existence as an independent, first-world nation literally depends on generating reliable power. Creating an electric power grid that can withstand cyberattack, violent weather, and aging effects is the mission of our research. Our work is focused on creating the very best power electronic equipment coupled with leading cybersecurity.

AMP: Securing the power grid is essential, but your team is well-regarded for creating electrical components that can withstand extreme conditions. How is your research benefiting, say, electric vehicles?

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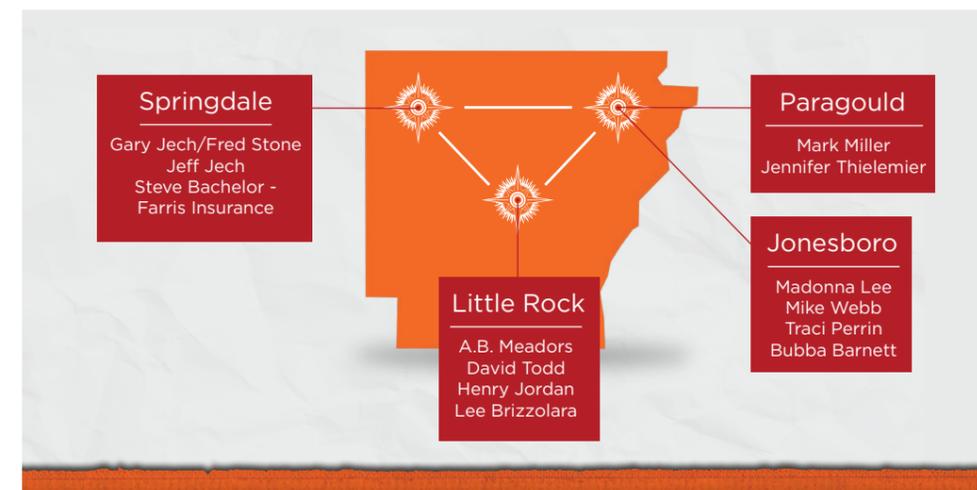
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Dr. Mantooth: Our group derives its reputation from extreme environment electronics. This includes the circuit design, the materials and the electronic packaging that can withstand very high temperatures and yet continue to operate reliably for years and years. This includes electronics for driving electric motors and for charging the batteries of electric vehicles. Our partners include Ford, GM, Toyota, Boeing, BAE Systems, Caterpillar, John Deere, and Karma Automotive, to name a few.

AMP: What is needed to turn research into commercial impacts? What challenges or friction points exist that make this more challenging?

Dr. Mantooth: In a word, commitment. A substantial amount of solid research is done in our group alone and also across the UA campus. If there are committed individuals to the cause of building a business from many of these efforts, then there will be commercial impact. The biggest challenge is finding entrepreneurial-minded folks who will commit to what it takes to build a business. Likewise, if a company licenses UA technology, there has to be a commitment to make that technology work, which often needs to involve the inventors at some level. A great example of this is our work with the electric cooperatives in Arkansas, and I expect you will hear more news about commercial efforts on that front in the near future.

The next big challenge is truly having an incubation system that will understand that it takes more than cutting-edge technology to build a business. You often hear this from businesspeople, but the problem is that other parts of the startup incubation system need to embrace it. This includes university licensing, recognition and support for



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entrepreneurial faculty and their students (policies, procedures), state government, facilities, mentoring and networking beyond the borders of Arkansas. Of course, the resulting companies must go where they can get funding to grow and access to capital is an area our ecosystem needs a sense of urgency to address.

AMP: What do you want the Arkansas business community and public officials to know about your research and how it's making a difference?

Dr. Mantooth: First and foremost, they should take immense pride in the fact that we have built a top five program in advanced power electronics in the U.S., and top 10 in the world. This was no small feat, and we did it over a 15-year period. Some have said that Arkansas isn't likely to be a leader in

building electric vehicles or rockets due to the capital requirements, but we are absolutely a leader in building the technologies that enable these advances.

Lastly, this field is growing and evolving rapidly, and it is important to realize that we will need continued support to push innovations out the door and into the industry. We have the people. We have many of the tools. We have the vision. And we know how to realize that vision. I would invite them to visit us and see our vision of the future.

The Arkansas Research Alliance Academy of Scholars and Fellow is a community of strategic research leaders who strive to maximize the value of discovery and progress in the state. Learn more at ARAlliance.org. Dr. Mantooth will present at ARA Project Scope in March. ■