



GRAPES

GRid-connected Advanced Power Electronic Systems

GRAPES Mission

<https://grapes.uark.edu>

The mission of this center is to accelerate the adoption and insertion of power electronics into the electric grid in order to improve system stability, flexibility, robustness, and economy. We expect to accomplish that mission by focusing on the following main objectives:

- To develop new technologies for advanced power electronic systems in the areas supporting grid connected distributed energy resources, power steering and routing devices, and intelligent load-side devices
- To develop the software and tools for controlling embedded- and grid-connected power electronics to benefit the grid as well as controlled loads
- To educate engineers who understand the power electronic technologies important to the member companies

GRAPES is partially funded by the Industry/University Cooperative Research Center program of the National Science Foundation, while industry members fund the bulk of our research. Our work with industry focuses on improving power electronics technology and integrating it with the needs of industry and of the power grid as a whole.

Research will concentrate on design, development, evaluation, control, and standardization of grid-connected power electronic equipment on both the supply and load side of power systems. Relevant research areas include:

- Power systems, especially off-grid systems such as in transportation systems (ships, planes, trains, automobiles)
- Power electronics devices, characterization, modeling
- Simulation methods and environments for multidisciplinary dynamic systems

GRAPES Sample Projects

- **SiC-Based Direct Power Electronics Interface for Battery Energy Storage System into Medium Voltage Distribution System (13.8 kV)**
- **Coordinated optimal Voltage Regulation for the Next-Generation Distribution Grids with Extremely High Penetration of PV Generation**
- **Distributed Energy Resources: A Distributed Autonomous Control Concept and Architecture for Microgrids**
- **High Voltage Encapsulations and Their Applications in Power Modules**

An NSF Industry/University Cooperative Research Center



GRAPES “Graduation Project”

13.8-kV Unbalanced Current Static Compensator: An EPRI tailored collaboration project with Southern Company and Arkansas Electric Cooperative Corp.



UNIVERSITY OF
ARKANSAS

College of Engineering
*National Center for
Reliable Electric Power Transmission*

National Center for Reliable Electric Power Transmission (NCREPT): established for the purpose of investigating solid-state solutions for the electric power grid including protection devices and FACTS as well as energy storage and distributed generation applications.

<https://ncrept.uark.edu>

- Highest Power Test Facility on any U.S. University Campus
- Internationally Recognized, Award Winning Research (3 R&D Awards)
- Supports 3 Centers of Excellence
- 70 feet of Wall-Mounted 480 V/1200 A ac Busway
- 70 feet of Wall-Mounted 1500 V/1500 A dc Busway
- Server/IT Room Dedicated for Cyber Security Research Equipment
- 120 Ton Chiller
- 400 Sq. Ft. SCIF/Secure Room

State impacts of this techno-ecosystem include:

- R&D funding over \$100 million in last 10 years
- Spin-out companies (5)
- Founding, nurturing & advising of businesses
- Unique technical service provider to companies that lower costs
- Provider of specialized talent to industry
- Cooperative R&D with industry (over 50 companies)
- Patents & copyrights