

FREEDMA

SYSTEMS CENTER

Ken Dulaney
Director of Industry and Innovation



What is FREEDM?

Future
Renewable
Electric
Energy
Delivery and
Management
Systems
Center



The FREEDM vision is to create the Energy Internet that allows renewable generation, energy storage, and various loads to be added and controlled seamlessly at the distribution level of the power system.

- Adaptable to allow new technologies to plug and play
- Distributes communications and control

Full



Associate



Affiliate



Research Pillars

WBG Power Electronics

WBG Devices

SSTs

MV Power Electronics

Low-Voltage High-Performance Power Converters

Electric Transportation

Electric Machines and Drives

Fast Chargers

Wireless Power Transfer

Automotive & Aerospace Power Electronics

Modern Power Systems

FREEDM Distribution System

Distributed Grid Intelligence

System Controls Stability and Cybersecurity

Economic Modeling & Market Mechanisms

Renewable Energy Systems

Distributed Energy Resources

Microgrids

Solar PV & Wind Systems

Renewable Integration into Grid

12 kVAC → 120 VAC Output +
380 VDC Bus

Capabilities

Control customer voltage

Control power factor

Eliminate customer side harmonics

Low voltage ride through

Current limiting

Disconnect/reconnect

Monitor energy usage

Demand side management



GRIDBRIDGE



- Open Source Microgrid Controller
- NC Storage Study
- DC Circuit Breakers
- Medium Voltage Modular Fast Charger
- High Power Inverter
- Decentralization and Electrification
Optimization for Ireland

freedm.ncsu.edu/annual-report

Quote from Director's Letter

The common thread that weaves our research together is Electrification: the conversion of our industrial processes, vehicles, and building systems to cleaner, decarbonized electricity. Power converters, improved controls, and greater levels of renewable energy resources make the grid cleaner. High power EV charging, efficient EV inverters, and improved motor designs contribute to transportation electrification. All these technology developments are enabled through applications of wide bandgap devices.



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