Future Power

NOVEL CONTROL, INTEGRATION AND ENERGY EFFICIENT SOLUTIONS FOR A RESILIENT AND RELIABLE POWER GRID

Our world today is on the cusp of a new age of hyperconnectivity in which devices, buildings and systems will all be networked. Among the most exciting opportunities will take place in the energy sector, with cars, aircraft, houses and buildings storing and using electricity and linked to clean sources of power. Just as new technology ushered in a digital wave that replaced legacy analog systems, a new era of hardware, systems and controls is needed to transform today's grid and realize this vision. Case Western Reserve University provides world-class expertise in controls, power engineering, energy storage and data analytics, to develop transformational solutions for modernizing the grid and improving building energy efficiency.

Strengths

- Expertise in distribution system modeling, protection schemes, analysis and control
- Campus grid with multiple renewable energy sources
- Leading researchers in complementary areas of data analysis and energy storage
- Pioneering advancements in device development and systems integration
- Developing forecasting tool and models for energy markets
- Experience transitioning solutions to the marketplace

Opportunities

- Demand response and load management
- Cyber and physical security systems and software
- Agent-based communication
- Forecasting and modeling
- Advanced relay protection
- Advanced control
- Distributed energy resources
- Sensors and data analytics
- Next-gen building energy management tools

Benefits

- Sensor systems and data analytics for self-detection, selfdiagnosis and autonomous control
- Grid integration of hyper-connected, intelligent and distributed resources
- Widespread adoption of new technologies into existing systems and infrastructure

For more information on grid modernization and building energy efficiency research at CWRU, visit energy.case.edu, or contact Kim Fleddermann, business development and commercialization manager, at **216.368.0889** or **kim.fleddermann@case.edu**.

LASE WESTERN RESERVE N I V E R S I T Y think beyond the possible



CURRENT RESEARCH PROJECTS

TECHNICAL LEAD

Grid	Integ	ration
unu		

Management of Loads, Considering Needs of Energy Use and Efficiency, End Users, Building Operators and Utilities	Kenneth Loparo
Beneficial Integration of Energy Storage and Load Management with Solar Generation	Marija Prica
Microgrids which Integrate Buildings, Renewable Generation, Energy Storage and Backup Generators	Mingguo Hong, Kenneth Loparo
Secure Outsourcing and Distributed Computing for System Security and Data Privacy	Pan Li
Electricity Market Simulation to Enable Informed Decisions	Vincenzo Liberatore Mingguo Hong
Smart Sensors	
Harvesting Vibrational Energy to Power Maintenance-Free Ambient Environment Monitoring	Philip Feng
Indoor Sensors Tracking Temperature, Humidity, Illumination, Power, and Room Occupancy	Soumyajit Mandal
Building Energy Signature Analytics	
Sophisticated Data Analytics to Map a Building's Energy Signature	Alexis Abramson Roger French
Analyzing Historical Energy Use Data to Reveal Patterns, Develop Cross-Correlation Maps	Roger French

Modeling and Assessment the Effects of Hazards on Structural and Infrastructure Systems

CWRU as a living lab for grid and energy management integration

CWRU is transforming campus into a living laboratory to develop and test next generation grid solutions and propel legacy buildings into the 21st century. We have connected two legacy buildings to renewable energy to demonstrate energy management techniques applied to non-utility participants. This research will establish essential technologies, software and systems to achieve resilient, reliable, efficient, secure and cost-effective energy solutions.



GREAT LAKES ENERGY INSTITUTE

Yue Li