

CENTER FOR RESEARCH IN ENERGY AND ENVIRONMENT (CREE)

101 Engineering Research Laboratory Jonathan Kimball (Director)

The mission of the Center for Research in Energy and the Environment (CREE) is to support research in the broad field of energy—including traditional and alternative energy sources, energy storage, and energy delivery and usage—as well as research in biological, chemical, and physical systems involving emerging contaminants in natural and engineered systems. CREE brings together researchers from across the campus—including faculty in all three colleges: the College of Engineering and Computing, the College of Arts, Sciences, and Education, and the Kummer College of Innovation, Entrepreneurship, and Economic Development—to address the multi-faceted challenges of maintaining energy security while mitigating human impact on the environment.

Recent projects include a study of nano-engineered catalysts for producing syngas; 3D printing of battery components; extreme fast charging of electric vehicles; phytoforensics for emerging contaminant and nanoparticle tracking; biomarker discovery and monitoring; the development of regulatory directives pertaining to emissions of jet engines along with the standardize testing methods for these directives; and innovative approaches to obtain critical minerals needed for alternative energy. CREE research is supported by a wide range of industry sources as well as federal agencies such as the National Science Foundation, National Institutes of Health, Department of Education, Department of Transportation, Nuclear Regulatory Commission, and the Environmental Protection Agency.

CREE laboratories support advanced research with chemical analysis instruments including high performance liquid chromatography (HPLC), HPLC-mass spectrometry (HPLC-MS), gas chromatography (GC) and GC-mass spectrometry (GC-MS), inductively coupled plasma-optical emission spectrometer (ICP-OES) and inductively coupled plasma mass spectrometry (ICP-MS), plus a variety of instruments used for sample preparation. CREE also includes the Center of Excellence for Aerospace Particulate Emissions Research, funded by NASA, FAA, the Department of Defense, and the EPA, with novel instruments such as the LII (Laser Induced Incandescence), MSSPLUS (Laser Induced Photoacoustic) to measure non-volatile mass, the DMS 500 and AVL APC to measure size and particle concentration and the CAI 600 for measuring certain gas species. These instruments are tailored to measuring and analyzing airborne particulates. Finally, CREE supports the unique Solar Village and EcoVillage living laboratories. The Solar Village comprises four houses with a shared energy management system to form a microgrid, whereas the EcoVillage has two houses each with their own energy management system. Each house has a solar array and was built with environmentally-friendly construction materials. The living laboratories also provide testbeds for EV charging and multiple battery technologies.