MISSION

The Center for Clean Energy Engineering (C2E2) at the University of Connecticut will be recognized for world class education and training of scientists and engineers; research and innovation in transforming science to systems; and enabling industries to develop cost-effective and efficient fuel cells and other advanced energy systems. C2E2 will utilize these strengths for timely implementation of a global sustainable energy economy.

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Faculty and students. C2E2 conducts research, training, and outreach activities to advance our understanding of clean and efficient energy systems, processes, and devices, and to enhance the real world applicability of research. Collaborations ensure the relevancy and commercial integration of C2E2’s technical advancements. These professional collaborations involve educational, governmental, and industrial partners in developing new and improved solutions in the areas of advanced functional and structural materials synthesis and characterization; high temperature materials and coatings; electrocatalysis and membranes; and catalytic, computational simulation, and control electronic, and renewable energy systems.

From Ideas to Implementation

C2E2 collaborates with educational, governmental, and industrial partners to help individuals with foundational knowledge and skills pertaining to energy technology and policy. The center offers students and researchers unique opportunities to participate in integrated, hands-on opportunities under the mentorship of leading energy faculty and industry experts. C2E2’s educational scope embraces students and educators at the K-12 level, undergraduate and graduate students, and faculty and industry professionals.

Partnerships

C2E2 collaborates with educational, governmental, and industrial partners in developing and commercializing clean and reliable energy technologies. These professional collaborations ensure the relevancy and commercial integration of C2E2’s technical advancements while enhancing the real-world applicability of research opportunities for faculty and students.

Research and Innovation

C2E2 conducts fundamental and applied research through programs sponsored by federal and state government agencies and industrial partners. Research efforts serve to develop both scientific knowledge and innovative engineering solutions in the areas of advanced functional and structural materials synthesis and characterization; high temperature materials and coatings; electrocatalysis and membranes; and catalytic, computational simulation, and control electronic, and renewable energy systems.

Education and Workforce Development

As a portal for energy research at the University of Connecticut, C2E2 is dedicated to providing students with foundational knowledge and skills pertaining to energy technology and policy. The center offers students and researchers unique opportunities to participate in integrated, hands-on opportunities under the mentorship of leading energy faculty and industry experts. C2E2’s educational scope embraces students and educators at the K-12 level, undergraduate and graduate students, and faculty and industry professionals.

Laboratory Capabilities

C2E2 resides in a one-of-a-kind dedicated research facility totaling more than 22,000 square feet of laboratory space that houses state-of-the-art equipment and experimental faculty. Among the center’s many capabilities are material synthesis and characterization tools that allow for advanced functional material development (heterogeneous catalysis, electrodes, surface coatings, structural materials); material surface and interface characterization; structural analysis; and solid, liquid, and gas phase chemical analysis. The facility also possesses capabilities for electrochemical device fabrication, cell and stack component assembly, and mechanical and electrochemical testing and diagnostics of a wide range of fuel cells, stacks and systems which operate at either low or high temperatures. Test facilities provide for long-term stability and durability assessment in an environment complete with on-site hydrogen generation and gas detection and safety shut-off features. In addition to university faculty and research staff, the center is well positioned to provide analytical services to external clients for product development, education and training purposes.

Clean & Efficient Energy Systems

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Renewable Energy and Resources

C2E2 also pursues innovative technologies for solar photocatalysis, solar thermal, and clean water technologies. Specific research initiatives include: titanium dioxide nanoparticle and support structures to enhance sensitized solar cells; novel membranes for use in sustainable wastewater treatment, desalination and power generation; and soil and microbial contaminant description and utilization.

Laboratory Capabilities

The Center for Clean Energy Engineering, formerly the Connecticut Global Fuel Cell Center, was established in 2001 under sponsorship from the Connecticut Clean Energy Fund. Since 2009, C2E2 has added eight new faculty members under the state’s Sustainable Energy projects and received over $70 million in research awards. In addition to the 15 faculty currently active in center activities, Research programs and students at the graduate and undergraduate levels are supported by collaborations with industry, state agencies, and federal agencies. In addition to ongoing research, the center organizes numerous workshops and technical conferences (over 200 activities since 2009) in an effort to spark early interest in energy education and career opportunities. These activities are supported by the Center for Clean Energy Engineering to lead the development of efficient energy systems for a global sustainable energy economy.

Clean Energy Engineering Center for faculty and students.

Energy Initiative

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HIGHLIGHTS AND ACHIEVEMENTS

C2E2 leverages UConn’s expertise in advanced combustion systems research to develop clean and efficient techniques for the utilization of various fuels, from biomass-derived fuels to coal and petroleum. Research initiatives encompass techniques for chemical conversion of fuels, methods for improving the quality of emissions, and methods for improving the efficiency of existing conversion technologies.

Energy Storage and Power Management

C2E2 investigates both electrochemical and chemical energy storage, with emphasis on small grid applications. Advanced power electronics and controls are being designed for distributed generation with connectivity from multiple power sources. Other efforts target the development of novel energy storage methods for grid stabilization.

Fuels and Fuel Processing

C2E2 is pioneering new, more efficient ways to use fuels derived from hydrogen and renewable sources. Researchers investigate new pathways for the conversion of fuels derived from biomass, coal, and petroleum, and the use of hydrogen as a fuel for transportation and other applications. Research in this area focuses on enhancing hydrogen production, catalytic chemistry and synthesis, and thermal integration for fuel reforming, improving waste heat recovery and reducing greenhouse gas emissions, qualification, thermochemical, and hybrid cycles.

Renewable Energy and Resources

C2E2 also pursues innovative technologies for solar photocatalysis, solar thermal, and clean water technologies. Specific research initiatives include: titanium dioxide nanoparticle and support structures to enhance sensitized solar cells; novel membranes for use in sustainable wastewater treatment, desalination and power generation; and soil and microbial contaminant description and utilization.

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