

2011 - 2012

National Guide to **State Energy Research Centers**



STATE & LOCAL

ENERGY

REPORT

ASERTTI

Energy Research Centers Abound, Driving Technology Transfer Opportunities

With energy research, development, demonstration, and deployment (RDD&D) work underway within so many different organizations today, grasping the full, expansive technological knowledge base at work within the U.S. is a challenge. The State and Local Energy Report is proud to present the National Guide to State Energy Research Centers--a first-of-its-kind compilation of more than 130 energy research centers that operate throughout the country, under the auspices of state and local governments, private organizations, and institutions of higher education.

Even the best innovations from our nation's energy research and technology laboratories and centers need a path across the entrepreneur's "valley of death" in order to reach commercial scale. The gap between emerging technologies and their successful large-scale deployment continues to be one of the most critical barriers to instilling a shift in energy use by consumers and businesses.

Transfer of new technologies from the lab to the market often requires a collaboration of researchers, states, and industry to identify the most promising pathways and facilitate successful market delivery. State Energy Offices and their State Energy Research Institutions and Centers are key to ensuring these new technologies move from the lab to initial market deployment where the private sector can adopt and adapt the best ideas, and investors can share the risks and rewards with entrepreneurs. Thanks to the efforts of these state institutions and their private partners, the technology transfer landscape is beginning to open up for innovation and commercialization.

The nation's research laboratories develop an amazing array of good prototypes for all kinds of applications in every facet of energy production, distribution, and consumption. For example, since 2001, the Department of Energy has funded efforts grounded in regional approaches to expanding deployment of distributed generation (defined as combined heat and power, waste heat recovery, and district energy systems) via the Regional Clean Energy Application Centers. Although technology for district energy may work equally well in Wisconsin as in Massachusetts, the policy and regulatory environment tends to vary widely from state to state and between public utility service territories. Using a region-

ally centered approach to work out actual site development details avoids a one-size-fits-all approach, which has led to successful deployment, as illustrated in Case Study #1 in LaCrosse, Wisconsin.

"I would say the technology transfer process is a two-way street between industry, like our association, and university-based research centers, like the Midwest Regional Clean Energy Application Center," noted Robert Thornton, president of the International District Energy Association, in describing the collaboration between his trade association and the research center in holding workshops on the developments in distributed generation technology and policy.

With research, development, demonstration, and deployment (RDD&D) work under way in so many federal and state agencies, as well as at dozens of state-based research sites, keeping track of the knowledge base becomes a major content management challenge.

The federal government has made significant progress in supporting technology information exchange and collaboration by relying on a state-based expert, Washington State University's Energy Extension Program, to answer questions about energy efficiency and renewable energy programs nationwide. Case Study #3 highlights the role of the clearinghouse in increasing the value of federal technology investments and resources by sharing them with stakeholders throughout the United States.

Finally, even the best ideas to come out of our energy research centers need a path across the entrepreneur's "valley of death" to reach the customer as a service provided on a viable commercial scale. The federal government has an active small business investment program housed within the National Science Foundation. That seed money can help a great idea become a salable idea, but almost never without significant local assistance from a state-based demonstration and deployment effort.

Increasingly, multiple partners are leveraging each other's investments, even across state lines, in jump-starting early demonstration projects for the most promising ideas. For example, Case Study #2 showcases the Utility Accountant—an inexpensive new device to dissect your building's utility bill to help target efficiency and

conservation measures. The device is on its way from the laboratory at the Desert Research Institute in Reno, with early support from both California and Nevada, to an industrial test bed in Nuremberg, Germany this fall.

Over the past decade, individual state energy offices and state technology institutions have been collaborating with increasing frequency to hasten deployment of clean energy technologies. The Association of State Energy Research and Technology Transfer Institutions (ASERTTI), the National Association of State Energy Officials (NASEO), and the U. S. Department of Energy are at the forefront of these state-based efforts.

ASERTTI's mission is to increase the effectiveness of energy research efforts in contribution to economic growth, environmental quality, and energy security by facilitating collaboration across state, federal, university, and private sector partners. ASERTTI members share technical and operational expertise and develop research programs focused on local energy issues with

national application. The State Technologies Advancement Collaborative (STAC) program was established by NASEO, ASERTTI, and the U.S. Department of Energy in 2005 to offer a collaborative funding process for RDD&D projects across a diverse array of technologies using an innovative project selection process to accelerate energy market transformation. Two of the case studies examined in the Guide feature members of ASERTTI, the University of Illinois-Chicago's Energy Research Center and Washington State University's Energy Extension Program.

To learn more about ASERTTI, visit:
<http://www.asertti.org/>.

To learn more about the State and Local Energy Report, visit:
<http://www.stateenergyreport.com/>.

Courtesy: University of Illinois at Chicago



The U.S. Department of Energy's Midwest Clean Energy Application Center at the University of Illinois at Chicago's Energy Resources Center provided technical assistance to Gundersen Lutheran Health Systems to determine the initial feasibility of the landfill gas combined heat and power plant being installed on the health system's campus in Onalaska, Wisconsin.

Center for Advanced Vehicle Technologies (CAVT)

University of Alabama
 Director: K. Clark Midkiff
<http://cavt.eng.ua.edu>

CAVT is committed to fostering efficient, safe, economical, durable, comfortable, and environmentally friendly vehicles. The main areas of research and development of CAVT are powertrains, energy storage, materials and manufacturing, and electronics. CAVT provides research that addresses vehicular industry challenges, meets transportation needs and addresses the environment and fuel efficiency.



Center for Green Manufacturing (CGM)

University of Alabama
 Director: Robin D. Rogers
<http://bama.ua.edu/~cgm>

Through the development of new technologies, CGM research aims to prevent pollution and reduce the use of hazardous substances during the design, manufacture, and application of chemical products. CGM is working on novel chemistry strategies to support the growing green market and social pressure to develop green sustainable technologies.

Auburn University Research

Auburn University
 Director: John Mason
<http://auburn.edu/research>

Auburn focuses on research in biofuel production, silicone solar panels, and advanced laser diagnostics. Researchers are currently developing an inexpensive solar panel that uses the same techniques plants use to harvest and convert energy. Auburn researchers are also using 3D imaging to help develop safer, faster, fuel-efficient aircraft.



Courtesy: University of Arizona



Alaska Center for Energy and Power (ACEP)

University of Alaska, Fairbanks
 Director: Gwen Holdmann
<http://www.uaf.edu/acep>

ACEP is dedicated to applied energy research. With abundant fossil and renewable energy resources and its geographic location, Alaska is an optimal location for researching and developing technologies for cold climates and remote locations. Current research specializes on reducing the cost of geothermal exploration for low and moderate temperature sites.

Water and Environmental Research Center (WERC)

University of Alaska Fairbanks
 Director: Bill Schnabel
<http://ine.uaf.edu/werc>

Scientists at WERC are conducting research to better understand the role of the arctic and subarctic in the global system through a scientific and engineering focus related to water resources and environmental quality. Research includes: microbiology; oceanography; environmental, civil, and arctic engineering; hydrology; limnology; and hydraulics.

Petroleum Development Laboratory (PDL)

University of Alaska Fairbanks
 Director: Shirish L. Patil
<http://ine.uaf.edu/pdl>

PDL's mission is to develop technologies that remove, improve, manage, and commercialize Alaska's oil and gas resources. The PDL Fluid Properties Laboratory is actively participating in research that measures vapor-liquid, physical properties of crude oil/natural gas systems, formation volume factors, and phase compositions.

Cold Climate Housing Research Center (CCHRC)

University of Alaska Fairbanks
 Director: Jack Hébert
<http://www.cchrc.org>

CCHRC researches energy-efficient and cost-effective building technologies for people living in polar climates. Current research concentrates on hybrid micro-energy to resolve how a combination of renewable energy sources can power the energy needs of Alaskans on a year-round basis. CCHRC is expanding research to biomass, geothermal heat pumps, and gas/wood-fueled heat and power technologies.



Center for Bio-Inspired Solar Fuel Production (BISfuel)

Arizona State University
 Director: Devens Gust
solarfuel.clas.asu.edu

BISfuel uses the principles behind photosynthesis to create a design for solar-powered production fuels, such as hydrogen, using water-splitting techniques. BISfuel uses the blueprint of photosynthesis to aid in creating practical and cost-effective technology for converting sunlight into useful fossil fuels.

Sustainable Energy Solutions (SES)

Northern Arizona University
 Director: Tom Acker
<http://ses.cefn.s.nau.edu>

The center's area of excellence consists of research and development in the engineering design of renewable and clean energies, mainly in wind, solar, hybrid renewable systems, renewable fuels, energy sources, and energy efficiency. A current project is the Arizona Synthetic Fuels Project, which aims to capture and recycle carbon dioxide from the atmosphere while harnessing renewable electricity to produce a carbon-neutral fuel that is compatible with our existing gasoline infrastructure.

Laboratory for Algae Research and Biotechnology (LARB)

Arizona State University
 Directors: Qiang Hu and Milton R. Sommerfeld
<http://larb.asu.edu>

LARB researches micro algae for renewable energy production, environmental bioremediation, human nutraceuticals, and pharmaceuticals. LARB's advances in algae-based biofuel may provide green fuel, pollution control, food, and fertilizer. LARB's innovative indoor/outdoor photobioreactors provide the most efficient and cost-effective culture system. LARB is also using strains of algae to identify toxins in water.

SRC/SEMATECH Engineering Research Center (ERC) for Environmentally Benign Semiconductor Manufacturing

University of Arizona
 Director: Karen McClure
<http://erc.arizona.edu>

ERC focuses on innovative scientific and technological research for environmentally sound semiconductor manufacturing. Through the development of novel solutions, designs, and education, ERC aims to demonstrate the positive impact semiconductor manufacturing has on the environment.



Quantum Energy and Sustainable Solar Technology (QESST)

Arizona State University
 Director: Chris Honsberg
<http://www.qesst.org>

QESST improves and increases solar energy and solar electric power use. Research on integrating materials and devices into high-performance, affordable photovoltaic devices, quantum mechanics, and systems will generate new solar cell technologies to support the increase of photovoltaic devices in large-scale manufacturing, which will enable the photovoltaic industry to rapidly reach terra-watt levels of production.



Arizona Research Institute for Solar Energy (AzRISE)

University of Arizona
 Director: Joseph H. Simmons
<http://azrise.org>

AzRISE specializes in improving conversion efficiency, reducing cost, and increasing reliability in photovoltaics, energy storage, and smart grid technologies. Currently, AzRISE is working on ways to use smart metering in households to reduce electricity consumption during times of low solar production to ensure the home can run off the amount of electricity produced by solar panels.

The Center for Bioenergy & Photosynthesis

Arizona State University
 Director: Thomas A. Moore
<http://bioenergy.asu.edu>

Through multidisciplinary scientific research this center aims to use biologically based artificial systems to address the sustainable energy needs of society. The center emphasizes solar energy conversion, bioenergy transformation, and photosynthesis methods.

Center for Interface Science: Solar Electric Materials (CISSEM)

University of Arizona
 Director: Neal R. Armstrong
<http://www.solarinterface.org>

CISSEM concentrates on exploring technological advances in thin-film photovoltaic (PV) energy conversion at a molecular level, with a narrow concentration on regions called "interfaces" that occur at nanometer length scales when different materials interact. CISSEM examines the chemical interactions of interfaces to further understand and improve efficiency, lifetime, and manufacturability of thin-film PVs.



Grid-Connected Advanced Power Electronics Systems (GRAPES)

University of Arkansas
 Director: Dr. Alan Mantooth
<http://www.grapes.uark.edu>

GRAPES concentrates on the design, development, assessment, and effectiveness of grid-connected power electronics on both the supply and shipment side of power systems. Research areas include transportation power systems, power electronic devices, characterization, modeling, and simulation methods and environments for multidisciplinary dynamic systems.

EPSCoR Center for Plant-Powered Production (P3)

Arkansas State University
 Director: Carole L. Cramer, Ph.D.
<http://www.arkp3center.org>

P3 provides research in plant-based enzyme and plant-made pharmaceutical production to develop new medicines, new sources for enzymes, biofuels, health-promoting phytochemicals, and other industrial compounds. Other strengths include plant molecular cell biology and biochemistry with agricultural, food-, and health-related applications. Their goal is to create new compounds to meet diverse markets.



National Center for Reliable Electric Power Transmission (NCREPT)

University of Arkansas
 Director: Dr. Alan. Mantooth
<http://ncrept.eleg.uark.edu>

NCREPT develops prototypes for advanced solid-state protection devices and energy storage electronic systems. Objectives are to develop prototypes of advanced power electronics systems for the power grid; to develop advanced packaging solutions for high-current, high-voltage power semiconductor devices; and to establish a premium test facility for advanced power electronic circuit and package designs for distribution-level voltages (15 kV-class) and high currents (300 A).

Vertically-Integrated Center for Transformative Energy Research (VICTER)

University of Arkansas
 Director: Dr. Alan Mantooth
<http://victor.uark.edu>

VICTER's primary research is focused on solar electric-based materials, devices, and technologies. In addition to the creation of solar cells, the center develops innovative photovoltaic materials to help meet the challenges of packaging solar cells, as well as creating cost effective solar panels and exploring the next generation solar inverter technologies.

UC Davis Center for Water-Energy Efficiency (CWEE)

University of California, Davis
 Director: Frank Loge, Ph.D.
<http://cwec.ucdavis.edu>

CWEE uses research and increased public awareness for water-related net energy efficiency. The center also advocates education on water energy efficiency via market access to affect changes in public policy on a local, regional, state, and national level. Current research is the conversion of wastewater biosolids into biodegradable plastic.

Arkansas Center for Energy, Natural Resources and Environmental Studies (ACENRES)

Arkansas Tech University
 Director: Dr. Jason Patton, P.G.
<http://www.atu.edu/ces>

The long-range goal of this center's research is to develop new, more economically viable molecular systems that mimic photosynthesis as well as measure the size distribution of epitaxial-grown Quantum Dot (QD) layers for the use of solar cell applications.

Center for Energy Efficient Materials (CEEM)

University of California, Santa Barbara
 Director: John Bowers
<http://ceem.ucsb.edu>

CEEM designs new materials and devices that control the interaction between light, electricity and heat at the nano scale to achieve sustainable energy efficiency on a commercial level through research and development in photovoltaics, thermoelectric, and solid-state lighting. CEEM focuses on the development of organic materials used to make low-cost, thin-film, plastic solar cells.

Energy Frontier Research Center (EFRC): Center For Gas Separations Relevant to Clean Air Technologies

University of California, Berkeley
 Director: Berend Smit
<http://www.cchem.berkeley.edu/co2efrc>

EFRC develops methods to understand the relationship between material structures and efficiency to create materials with the ultimate molecular properties for carbon capture and sequestration. Researchers at EFRC focus on reducing the energy costs associated with the separation of carbon dioxide by cutting the parasitic energy of carbon capture by half.



Energy Biosciences Institute (EBI)

University of California, Berkeley
 Director: Chris Somerville
<http://www.energybiosciencesinstitute.org>

EBI has recently received a 10-year, \$500 million award from BP to develop a sustainable plant-based fuel. The institute is comprised of more than 70 programs with over 300 scientists and students. Areas of research include feedstock development, biomass depolymerization, biofuels production, and fossil fuel bioprocessing.

Public Interest Energy Research Program (PIER)

The California Energy Commission
 Chair of California Energy Commission:
 Robert B. Weisenmiller, Ph.D
<http://www.energy.ca.gov/research/index.html>

The Energy Commission created the Public Interest Energy Research (PIER) program to focus on research, development and demonstration (RD&D) as an effort to promote research in energy efficiency, renewable energy, advanced electricity technologies, energy-related environmental protection and transportation technologies that are market oriented to reach the California electricity market. PIER collaborates with businesses, utilities, energy companies, public advocacy groups, and scientists at California's universities and national laboratories. In the last ten years PIER has invested over \$700 million to energy technologies that provide environmental and economic benefits to California's ratepayers.

Light-Material Interactions in Energy Conversion Research Center (LMI-EFRC)

California Institute of Technology
 Director: Harry Atwater
<http://www.lmi.caltech.edu>

LMI-EFRC concentrates on solar energy conversion by examining the properties of PV and photochemical energy conversion. LMI-EFRC has made advances in PV energy conversion and fuel synthesis from sunlight through research proving that the flow of light in materials can be harnessed to precisely guide optical energy to nano-structured absorbers.

Stanford Linear Accelerator Center (SLAC)

Stanford University
 Director: Persis Drell
<http://slac.stanford.edu>

SLAC's energy lab is the Center for Sustainable Energy through Catalysis (SUNCAT). SUNCAT focuses on creating cheaper and more efficient catalysts for alternative energy. Scientists at SLAC and the Technical University of Denmark have engineered an inexpensive and plentiful alternative to the platinum catalyst and combined it with a light-absorbing electrode producing hydrogen fuel from sunlight and water.

Molecularly Engineered Energy Materials (MEEM)

University of California, Los Angeles
 Director: Vidvuds Ozolins
<http://ismen.seas.ucla.edu>

MEEM focuses on creating new materials for high-efficiency organic solar cells, supercapacitors, and efficient greenhouse gas capture systems through inexpensive custom-designed molecular structural designs. MEEM's new nanoscale materials that efficiently generate, transport and store energy and mass are able to surpass 10 percent efficiencies for organic solar cells.

Center for Energy Science and Technology Advanced Research (CESTAR)

University of California, Los Angeles
 Director: Mohamed Abdou
<http://www.cestar.ucla.edu>

CESTAR promotes energy-related research conducted at UCLA to provide collaborative expertise, equipment sharing, information exchange, and energy research seminars. Currently the four major areas CESTAR is helping to develop are fusion energy, hydrogen, materials for energy applications, and energy conversion/conservation.



UCLA Smart Grid Energy Research Center (SMERC)

University of California, Los Angeles
 Director: Dr. Rajit Gadh
<http://smartgrid.ucla.edu>

SMERC performs research and innovation on advanced wireless communications to develop the next generation of the electric utility grid. SMERC is working on wireless/communications and sense-and-control to enable the Smart Electric Grid of the Future to provide optimum integration of renewable energy sources and electric vehicles, greater efficiency, flexible electricity pricing, and consumer participation.



Center on Nanostructuring for Efficient Energy Conversion (CNEEC)

Stanford University
 Director: Fritz Prinz and Stacey Bent
<http://cneec.stanford.edu>

CNEEC specializes in the development of high-efficient, cost-effective technologies that produce and store large amounts of energy to meet the world's growing demand through increased efficiency of energy conversion devices and storage systems by manipulating materials at the nanometer scale. Other areas of research include the study of charge transport, light absorption, and reaction thermodynamics and kinetics.

Center for Energy Nanoscience (CEN)

University of Southern California

Director: P. Daniel Dapkus

<http://www.cen-efrc.org>

CEN focuses on the improvement of solar cells and light-emitting diodes (LEDs) through the study of semiconductor nanotechnology and organic molecular design. CEN's research with LEDs involves using organic and inorganic nanostructures to generate higher levels of brightness with less use of electricity.



EECL

Colorado Center for Biorefining and Biofuels (C2B2)

University of Colorado, Boulder

Director: Alan Weimer

<http://www.c2b2web.org>

C2B2 specializes in biorefining and biofuel approaches that focus on the integration of renewable sources of materials and energy for future commercialization. C2B2 works in growth of sustainable crops and cropping systems for biofuel production, as well as translational science approaches that impact the conversion of new, cost-effective technologies in the marketplace.

Center for the Advanced Control of Energy and Power Systems (ACEPS)

Colorado School of Mines

Director: Marcelo Godoy Simão

<http://aceps.mines.edu>

ACEPS focuses on various intelligent control systems for power systems. Current research efforts involve developing novel electrical models and advanced distributed resources. Through testing of multiple types of advanced distributed resources, this research will determine the impacts of multiple distributive resources such as photovoltaic, wind, fuel cell, microturbine, and engine, on the electrical power system.

Renewable Energy Materials Research Science and Engineering Center (REMRSEC)

Colorado School of Mines

Director: Dr. Craig Taylor

<http://remrsec.mines.edu>

REMRSEC, with participation of researchers at the National Renewable Energy Laboratory, is focused on improving transformative materials to advance renewable energy technology. Research includes next-generation photovoltaics; advanced membrane technologies, essential to conversion, utilization, and storage of energy; and energy storage of hydrogen or methane.



Engines & Energy Conversion Lab (EECL)

Colorado State University

Director: Dr. Bryan Willson

<http://www.eecl.colostate.edu>

With a mission to create innovative energy solutions, the EECL is a leading global research force in advanced biofuels, engines and engine controls, smart grid technology, and energy for development. The Smart Grid Research Trust at EECL has developed systems to manage and transmit abundant, affordable, clean, efficient, and reliable power while optimizing grid performance.



Center for Clean Energy Engineering (C2E2)

University of Connecticut

Director: Prabhakar Singh

<http://www.energy.uconn.edu>

C2E2 researchers are involved in fundamental and applied research in clean and efficient energy systems, from energy conversion of fuels to power management. Currently researchers are exploring high temperature mechanical/structural interaction of new and existing solid oxide fuel cell materials in order to see how they behave in real conditions and how they may be applied.



Renewable and Sustainable Energy Institute (RASEI)

University of Colorado, Boulder

Director: Michael Knotek, Ph.D.

<http://rasei.colorado.edu>

RASEI researches, develops, and produces industry-wide energy at a lower cost, higher efficiency and reduced amount of greenhouse gas emissions. Last March RASEI received 10 plug-in hybrid electric vehicles donated by Toyota to gather data on performance, charging patterns, and electric utility/customer interactions to provide solutions that save energy and natural resources.



EECL

Center for Energy Frontier Research in Extreme Environments (EFree)

Carnegie Institute of Washington
 Director: Ho-kwang (Dave) Mao
<https://efree.gli.ciw.edu>

EFree focuses research on creating new materials that can withstand extreme pressure and temperature conditions to meet the global need for abundant, clean, and economical energy. These materials include new classes of superconductors, superhard materials, high-energy density and hydrogen storage materials, new ferroelectrics and magnetic systems, and materials that resist chemical changes under extreme conditions.

Solar Power Program (SPP)

University of Delaware
 Director: Allen Barnett
<http://www.solar.udel.edu>

SPP research activities include advanced-concept solar cells, including quantum dot and quantum well solar cells, InGaN solar cells, ultra high-efficiency solar cell concepts, high efficiency silicon solar cells, solar cells using unconventional materials, hybrid PV/hydrogen systems, and PV and solar hydrogen systems. Researchers hope to generate the majority of U.S. electricity through PV technology.



Center for Fuel Cell Research (CFCR)

University of Delaware
 Director: Dr. Ajay K. Prasad
<http://www.cfcf.udel.edu>

The CFCR conducts research on fuel cell and hydrogen infrastructure science and technology. They aim to improve the performance and durability of fuel cell technology while enabling commercialization with technology transfer to industry. The CFCR has developed several transit buses that get more efficient gas mileage and are quieter, at reduced cost.

Delaware Biotechnology Institute (DBI)

University of Delaware
 Director: Kelvin H. Lee
<http://www.dbi.udel.edu>

DBI works to promote research and technology transfer for biotechnology applications and support innovative discoveries that benefit the environment, agriculture, and health through cutting-edge research. Researchers are involved in projects such as the study of plants for biofuels and the study of biogeochemical interactions with soil, water, and plants in the Earth's surface atmosphere.

The Center for Carbon-free Power Integration (CCPI)

University of Delaware
 Director: Willett Kempton
<http://www.carbonfree.udel.edu>

CCPI conducts research on offshore and coastal wind power, ocean currents, geostrophic winds, transmission planning, and storage to support large-scale carbon-free power systems, primarily in large-scale generation facilities. CCPI researchers have developed a set of interacting technologies to manage the flow of power in and out of an electric-drive vehicle-to-grid (V2G) device.

Institute of Energy Conversion (IEC)

University of Delaware
 Director: Robert W. Birkmire
<http://www.udel.edu/iec>

IEC is focused on hands-on research in engineering studies and analysis of film deposition and processing of thin-film PV solar cells and other photonic devices. IEC's fully integrated research process facilitates the correlation of the properties of finished devices with their production, all in the same lab.

Catalysis Center for Energy Innovation (CCEI)

University of Delaware
 Director: Dion Vlachos
<http://www.cfcf.udel.edu>

CCEI seeks to develop catalytic technologies for sustainable energy applications through a spectrum of processes envisioned in a future biorefinery. New technologies include novel pyrolysis for biomass degradation, selective catalytic transformation of biomass derivatives, and novel fuel cells. CCEI is also working on degradations of waste through pyrolysis technology, and technologies to upgrade bio-oil.

Applied Research Center (ARC)

Florida International University
 Director: John R. Proni, Ph.D.
<http://www.arc.fiu.edu>

ARC specializes in technology development in biomass conversion to fuels and power, algal fuels, and deployment of renewable energy systems. Their water division focuses on issues such as water treatment and its purification processes, energy-efficient water cleanup, surface water and groundwater pollution characterization, hydrology and hydrogeology, contaminant fate and transport, and sampling and analysis.

Advanced Materials Processing and Analysis Center (AMPAC)

University of Central Florida
 Director: Dr. Sudipta Seal
<http://ampac.research.ucf.edu>

Researchers at AMPAC pursue collaborative work and research on material science and engineering. The goal of the center is to enhance the scientific understanding, industrial development, and economic growth of several applications including energy, microelectronics, nanotechnology, life sciences, optics, aerospace, and bioengineering.

Center for Advanced Power Systems (CAPS)

Florida State University
 Director, Dr. Steiner J. Dale
<http://www.caps.fsu.edu>

CAPS is dedicated on developing power distribution high-level systems for advanced transportation power systems and components. This center strives to address long range advanced system power issues through infrastructure, advanced modeling, simulation capabilities, and novel materials, components, and command & control research and development.

Florida Solar Energy Center (FSEC)

University of Central Florida
 Director: James M. Fenton, Ph.D.
<http://www.fsec.ucf.edu>

FSEC conducts research and tests on solar systems and many other new and innovative energy solutions. Their numerous projects include zero energy homes, energy-efficient schools, photocatalytic paint formulations, high temperature/low relative humidity membrane fuel production, and the testing and certification of PV components and systems.

Energy & Sustainability Center (ESC)

Florida State University
 Director: Dr. Anjaneyulu Krothapalli
<http://esc.fsu.edu/homePage.html>

This center works to create energy systems that are sustainable, cost effective, and emit less carbon dioxide and greenhouse gases. Researchers at the center have constructed an Off-Grid Zero Emissions Building entirely powered by solar cells. The building serves as an energy-efficient mold for alternative energy technologies in both residential and commercial settings.

Nanoscience Technology Center (NSTC)

University of Central Florida
 Director: Dr. Sudipta Seal
<http://www.nanoscience.ucf.edu>

Through the use of interdisciplinary research, NSTC hopes to promote the study and application of biomaterials, energy, optics, and other research areas. Research projects at NSTC involve the study of spectroscopy and the optoelectronic imaging of materials at the nanoparticle level such as conjugated polymers, nanoparticles, and nanoparticle hybrids.

**Future Fuels Institute (FFI)**

Florida State University
 Director: Dr. Chang Samuel Hsu
<http://www.research.fsu.edu/ffi>

FFI focuses on the development of renewable fuels through essential research, technology, and applied knowledge. FFI is looking to promote technology for efficient production and use of second- and third-generation biofuels derived from pyrolysis oils, algae oils, and green fuels. The knowledge gained from research at FFI will help advance fuel-generation-based technology.

Southeast National Marine Renewable Energy Center (SNMREC)

Florida Atlantic University
 Director: Susan Skemp
<http://snmrec.fau.edu>

By implementing a full-scale, at-sea testing facility, researchers at SNMREC are able to develop innovative testing infrastructures and protocols for components as well as complete generating systems. Additionally, through technological research, development, and testing, this center focuses on renewable resources research as well as novel environmental monitoring systems.



Clean Energy Research Center (CERC)

University of South Florida
 Director: Elias (Lee) Stefanakos, Ph.D.
<http://cerc.eng.usf.edu>

CERC specializes in the development of environmentally clean energy sources and systems that meet the needs of power and energy producers and the transportation sector. Projects at CERC include the development of photocatalytic technology for detoxification and disinfection of water and indoor air, and the development of a 20,000 watt solar/electric charging station for electric vehicles.

The Florida Institute for Sustainable Energy (FISE)

University of Florida
 Director: Dr. David Norton
<http://www.energy.ufl.edu>

FISE develops energy-efficient methods and technologies for homes, transportation, and industry. This institute houses several labs, including the Prototype Development & Demonstration Laboratory and a Biofuel Pilot Plant that works to accelerate commercialization of energy technologies and processes. Current research at FISE focuses on developing advanced nuclear fuel designs.

USF Nanotechnology Research and Education Center (NREC)

University of South Florida
 Director: Ashok Kumar, Ph.D.
<http://www.nnrc.usf.edu>

Research at NREC has contributed significant scientific and technological developments on powerful miniaturized electronic and optical systems, on new alternative energy sources and materials, novel drug delivery schemes, new medical and environmental technologies, and other novel nanotechnical initiatives.

Florida Energy Systems Consortium (FESC)

University of Florida
 Director: Dr. Tim Anderson
<http://www.floridaenergy.ufl.edu>

FESC develops innovative energy systems that lead to alternative energy strategies, improved energy efficiencies, and enhanced economic development. Current research at FESC looks to develop Florida's biomass resources, which makes up seven percent of the U.S. biomass resources. FESC provides a crucial location for developments in biomass conversion.

Center for Organic Photonics and Electronics (COPE)

Georgia Institute of Technology
 Director: Bernard Kippelen
<http://www.cope.gatech.edu>

COPE develops flexible organic photonic and electronic materials and devices. Through material processing and device engineering, researchers at COPE look to identify unusual chemical and physical trends in organic-based materials.

University Center of Excellence for Photovoltaics (UCEP)

Georgia Institute of Technology
 Director: Dr. Ajeet Rohatgi
<http://www.ece.gatech.edu/research/UCEP>

UCEP focuses on the development of the science and technology of advanced PV devices and the production of cost-effective, record high-efficient solar cells. Current researchers at UCEP are using recent novel solar cell concepts to construct large-area cells on relatively low-quality thin crystalline-silicon layers in order to reduce the cost of silicon solar cells.

Brook Byers Institute for Sustainable Systems (BBISS)

Georgia Institute of Technology
 Director: John Crittenden
<http://www.sustainable.gatech.edu>

BBISS focuses on engineering water and power infrastructures that prove to be more efficient than current systems and help reduce the risk of supply- or demand-driven system failures. By compiling databases and architecture, BBISS will be able to assess sustainability and resilience of infrastructures in various scenarios. BBISS looks to help solve problems with climate change, water scarcity, and urbanization.

Renewable Energy and Engines Laboratory

Georgia Southern University
 Director: Dr. Valentin Soloiu
<http://cost.georgiasouthern.edu/meteet/engine/index.html>

This center develops biofuel combustion chemistry, modeling, and biofuel engine performance, and produces novel, systematic, and analytical tools to quantify excess emissions. Currently, researchers are looking for a way to pretreat crude bio-oil and to help reduce the amount of free fatty acids during the treatment process.

Hawai'i Natural Energy Institute (HNEI)

University of Hawai'i at Manoa

Director: Richard E. Rocheleau

<http://www.hnei.hawaii.edu>

HNEI works on development of energy, food, minerals, and other resource technologies. The institute carries out basic research, manages research centers and laboratories in Hawaii, and explores the social, environmental, and economic impact of energy-related activities. Currently the center is researching sewage sludge for the production of charcoal.



Center for Advanced Energy Studies (CAES)

Idaho State University

Director: J. W. Rogers, Jr., Ph.D.

<http://www.uidaho.edu/idahofalls/caes>

CAES concentrates on addressing Idaho's energy-related challenges through nuclear science and engineering solutions. Researchers specialize in advanced materials, carbon management, bioenergy, energy policy, modeling and simulating, emerging research, and energy efficiency. Additionally, CAES research projects include closing the fuel cycle, studying reactor concepts, and correctly increasing the consumption of locally abundant coal and alternative hydrocarbon resources.



Argonne-Northwestern Solar Energy Research (ANSER) Center

Northwestern University

Director: Michael R. Wasielewski

<http://www.ansercenter.org>

By designing and synthesizing new nanoscale architecture, ANSER hopes to develop new materials that will produce efficient technologies for solar fuels and electricity production. Researchers are currently using carbon nanotubes to make solar cells affordable.

Argonne National Laboratory

University of Chicago

Director: Eric D. Isaacs, Ph.D.

<http://www.anl.gov>

Argonne applies research, science, and engineering to deliver innovative technologies and solutions in the fields of energy storage, alternative energy and efficiency, nuclear energy, biological and environmental systems, and national security. Currently the lab is working on developing an energy storage system that enables and enhances electric powered vehicles.



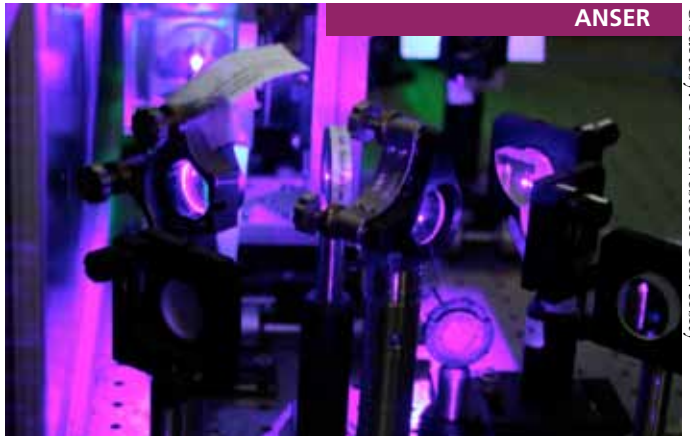
The Energy Resources Center (ERC)

University of Illinois at Chicago

Director: John J. Cuttica

<http://www.erc.uic.edu>

Through consultation and services, the ERC provides tangible solutions to energy and environmental problems. The interdisciplinary staff covers all sectors of energy issues, which include energy management assessments, economic modeling, analysis of policy and regulatory initiatives, and public outreach and education.



University of Illinois at Chicago's Energy Resource Center

Leveraging Expertise to Accelerate Distributed Generation

“The first \$2 million we spent on conservation measures such as retrofitting pumps and fans has resulted in \$1.2 million per year in savings,” stated Jeff Thompson, MD and CEO of Gundersen Lutheran Health Systems, a physician-led, nonprofit health care provider based in LaCrosse, Wisconsin, that serves patients in 19 counties.

But Gundersen Lutheran has not stopped at conservation measures alone. By 2007, with its energy bills rising by \$350,000 per year, the health system launched an aggressive power generation program called Envision.

This fall, it will open a facility that uses waste biogas from a nearby LaCrosse County landfill to generate electricity and heat on the health system's Onalaska campus. The health system has already been successful with an earlier cogeneration plant when it collaborated with a local firm, City Brewery, to burn waste biogas to generate electricity. But this new project, for capturing landfill gas that was previously flared off, is even larger.

“LaCrosse County will pipe the biogas, which is made up of about 50 percent methane, about one and a half miles from the county's landfill to Gundersen's Onalaska campus so that the heat can be captured for use in the buildings. The electricity that is generated will be sent to the power grid to offset electrical use at the campus,” explained Cliff Haefke, program manager for Distributed Energy at the Energy Resources Center of the University of Illinois at Chicago. “Gundersen's goal is 100 percent energy independence by 2014.”

Under the U.S. Department of Energy (DOE) Clean Energy Application Center program, Haefke's team in Chicago helped Gundersen Lutheran staff in Wisconsin evaluate the potential for electrical and thermal generation, including financing options and utility implications.

The Energy Resources Center's roots date back almost four decades. In 1973, in the midst of a national oil crisis, the university's Board of Trustees established the Energy Resources Center with a mandate “to conduct studies in the fields of energy and the environment and to provide industry, utilities, government agencies, and the public with assistance, information, and advice on new technologies, public policy, and professional development training.”

From its very beginning, the Center was an unusual academic unit, structured as a “fast response” team of experts capable of quickly extending technical expertise, advice, and professional assistance to the state's industrial, residential, and commercial sectors.

Today, the Energy Resources Center has a staff of more than 16 employees and is located on the University of Illinois at Chicago campus. The Center is staffed by hands-on professional engineers, economists, architects, computer science specialists, educators, and public policy analysts. Many staff hold advanced degrees and certifications in their fields of expertise. The Center's applied research is grouped into four core capabilities for its clients: bioenergy and climate, distributed generation, energy efficiency, and utilities management.

Over its first two decades, the Center steadily built a long list of happy clients and a reservoir of staff expertise and skills, often drawing on the university's other academic units, such as the College of Education, the School of Public Health, and the departments of civil engineering, chemical engineering, economics, and geography.

In 1998, the DOE announced an ambitious goal to double the combined heat and power capacity, from the existing 46 Gigawatts to 92 Gigawatts in 2010. In addition, DOE aimed to broaden the initiatives that had been known up to that time as the “Combined Heat and Power” regional application centers to the more inclusive “Clean Energy” term as a name. On a parallel track, the City of Chicago's 2001 Energy Plan established a goal of using combined heat and power systems to generate 1.5 billion kilowatt-hours of electricity annually by 2010.

“The US DOE Midwest Center Energy Application Center was the first Clean Energy Regional Application Center established by the DOE and Oak Ridge National Lab back in 2001,” noted Haefke. “The DOE designated the Midwest Center as a pilot center over a multi-year period here in Chicago at our Energy Resources Center, together with the Gas Technology Institute nearby in Des Plaines.”

Unfortunately, natural gas price spikes in the early 2000's caused some hesitancy among potential sites to shift to natural gas as a primary fuel.

Meanwhile, based on the case studies and deployment templates for combined heat and power that the Center in Chicago developed by 2003, the DOE awarded funding to seven additional sites to create a national network of RDD&D for distributed generation.

The DOE defined distributed generation as cogeneration and small power production, which can include the following components: combined heat and power, waste heat recovery, and district energy. Combined heat and power, also known as cogeneration, is the concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy. Waste heat recovery is the capture of waste heat that an industrial site or pipeline compressor station is already emitting, in order to turn it into clean and renewable electricity, recycled thermal energy, or mechanical energy. District energy refers to generating any combination of electricity, steam, heating, or cooling at a central plant and then distributing that energy to a network of nearby buildings.

“Even with uneasiness about fuel prices, we got up to 82 Gigawatts installed by 2010,” noted Haefke.

The Clean Energy Regional Application Center focuses on three core activities to spur uptake in distributed generation: education and outreach, policy support, and technical assistance.

“In outreach, we learned early on that it is better to target a market sector, say farmers or hospitals,” continued Haefke.

“Each sector will have its own issues. So a meeting specific to farmers is more helpful than a meeting without a critical mass in any given sector.”

“We believe that, although technology advances are important to the long term success of CHP,” noted Haefke on the Center's approach to policy support, “the most significant and immediate barriers to more rapid deployment of CHP are state and local policy issues and available financing mechanisms.”

Haefke's team researches questions such as: In what ways are utility rate structures confusing or unfavorable to distributed generation? How would a site secure long-term contracts to sell excess energy at reasonable rates? Do combined heat and power or waste heat recovery qualify for renewable energy portfolio standards in the potential site's home state? Are the local utility's standby rates applicable to and profitable for the installer?

“We are technology neutral, when we give technical assistance to clients,” explained Haefke. “We try to link a site owner to qualified engineering firms and will assist them in writing requests for proposals to attract the best bid for the work to improve that owner's site, as we did for Gundersen Lutheran this year.”

John Cuttica, Director of the University of Illinois at Chicago's Energy Resources Center, is serving as the Vice Chair and Treasurer of ASERTTI's 2011 Executive Committee. ASERTTI promotes and facilitates energy RDD&D communication, cooperation, coordination and collaboration among its members and with other public and private organizations.

Gas Technology Institute (GTI)

ASERTTI

Director: Daniel LeFevers
<http://www.gastechnology.org>

GTI is a not-for-profit Research and Development (R&D) organization and for 70 years has been a leader in the development and deployment of technology solutions. GTI provides economic value to the energy industry and its customers. To date, GTI programs have resulted in nearly 500 products, 750 licenses, and more than 1,200 associated patents.



Center for Advanced Bioenergy Research (CABER)

University of Illinois at Urbana-Champaign
 Director: Hans Blaschek
<http://bioenergy.illinois.edu>

CABER supports the advancement of biofuel and chemical development as well as the efficient use of biorenewable resources. The center is a leader in the growth and development of bioenergy research and strives to create new jobs and economic opportunities for agricultural producers and for the processing businesses.

Micro and Nanotechnology Laboratory (MNTL)

University of Illinois

Director: Rashid Bashir
<http://mntl.illinois.edu/about.htm>

Through multidisciplinary research, MNTL focuses on advanced research in photonics, microelectronics, biotechnology and nanotechnology. Specifically, the nanobiosystems thrust centers around developing, nanofabricating, and implanting materials, technologies, and devices in cells for the study of cellular biochemistry.



The Center of Advanced Materials for the Purification of Water with Systems (WaterCAMPWS)

University of Illinois at Urbana-Champaign
 Director: Mark A. Shannon
<http://www.watercampws.illinois.edu>

Through shared research, education, and policy initiatives, WaterCAMPWS focuses on improving and increasing global water supplies. WaterCAMPWS's solar thermal desalination research effort involves reducing the amount of lost energy for seawater desalination, reducing liquid emissions and other residuals for inland seawater, and desalinating water by cooling a thermal electric solar-powered generator.

Center for Research in Environmental Sciences (CRES)

Indiana University

Director: Dr. Keith Clay
<http://www.indiana.edu/~cres1/index.shtml>

CRES promotes research and development of joint investigations across disciplines that address issues such as climate change, renewable energy resources, adequate water resources, environmental quality, and natural disasters forecasting. Their research on microbial biodiversity and plant-soil-microbe interactions has applied value in developing sustainable biofuel production of switchgrass and other native grassland species.

The Discovery Park Energy Center

Purdue University

Director: Maureen McCann
<http://www.purdue.edu/discoverypark/energy>

The center creates energy-based solutions through new discoveries and technological developments, and provides an informational hub for the energy research community. Current research investigates wind power research and education to limit the operational and policy restrictions of new technologies. The center is studying wind-turbine technologies that offer benefits over conventional designs.

Center for Sustainable Energy at Notre Dame (cSEND)

University of Notre Dame

Director: Joan F. Brennecke
<http://energy.nd.edu>

cSEND focuses on technological developments of sustainable energies and systems, constructive energy options, influencing energy policies, and providing information on affordable and sustainable energy. cSEND's solar research group focuses on the engineering of new materials at the nano scale to successfully detain solar radiation through light-harvesting structures, and on highly efficient catalytic methods for fuel conversion.

Center for Direct Catalytic Conversion of Biomass to Biofuels (C3Bio)

Purdue University

Director: Maureen McCann
<http://c3bio.org>

C3Bio develops new technologies for utilization of advanced liquid transportation fuels to increase energy. The research concentrates on carbon efficiencies of biofuel production through the design of both the physical and chemical alteration developments and new biomass.

Richard G. Lugar Center for Renewable Energy

Indiana University-Purdue University
Director: Dr. Alan Jones
<http://www.lugarenergycenter.iupui.edu>

This center is a leader in renewable energy research, specifically in renewable hydrogen generation and its applications. Research also focuses on the development of fuel cell technology and of bio-fuel production through partnerships with federal agencies, state governments, and related industries. Current research focuses on genetically modified yeast for ethanol production.

Center for Research in Energy and the Environment (CREE)

Indiana University
Director: J. C. Randolph
<http://www.indiana.edu/~cree>

CREE focuses on advancing new uses of fossil fuels and nuclear power; developing alternative and renewable energy resources; extracting, refining, and processing fossil fuels; and understanding the science and applications of the carbon cycle and carbon sequestration. Current exploration builds on widespread research to study the carbon sequestration ability of geological layers in southern Indiana.

Center for Sustainable Environmental Technologies (CSET)

Iowa State University
Director: Robert C. Brown
<http://www.cset.iastate.edu>

Researchers at this center are involved in fundamental and applied research of biomass and fossil fuels and the development of thermochemical technologies for fuel, chemical, and power production. Researchers are working on a set of programs that convert cellulosic biomass into fuels and chemicals by using a mixture of thermochemical and biological designs.

Center for Biorenewable Chemicals (CBiRC)

Iowa State University
Director: Brent Shanks
<http://www.cbirc.iastate.edu>

CBiRC focuses on the production of biorenewable chemicals and technologies via biological and chemical catalysis systems. Through research and education, CBiRC hopes to transform the petroleum-based industrial chemical production industry into a renewable resource-based one. The main research strategy for achieving this goal is to develop an array of chemicals from renewable carbon sources.

Iowa Energy Center

Iowa State University
Director: Kevin Nordmeyer
<http://www.energy.iastate.edu>

This center provides Iowa residents and businesses with accurate, usable information on renewable energy such as wind, solar, and biomass. It also provides information that supports projects to help Iowa industries and businesses run efficiently so they can be more productive and profitable.

The Ames Laboratory

Iowa State University
Director: Alex. H. King
<http://www.ameslab.gov>

Researchers at Ames hope to turn their discoveries into less expensive, more efficient technologies that yield faster, safer, and better solutions to energy-related issues. For the last several years, Ames has been working on developing a room-temperature, solid hydrogen fuel that is stable when combined with other materials. By developing a storage intermediate with an equivalent energy density to that of hydrogen when in liquid form, researchers hope to create a possible fuel for vehicles.

Center for Sustainable Energy

Kansas State University
Directors: Mary E. Rezac & Ron Madl
<http://sustainable-energy.ksu.edu>

Through research and education, this center develops sustainable, renewable, less polluting energy sources and fuel-carrying systems, which include efficient conversion of liquid fuels to hydrogen and the conversion of biomass to fuels. Research includes developing techniques and systems to store hydrogen or natural gas in a high energy-density state for automotive purposes.

Center for Environmentally Beneficial Catalysis (CEBC)

University of Kansas
Director: Bala Subramaniam
<https://www.cebc.ku.edu>

The mission of CEBC is to develop and promote the availability of economically and environmentally efficient technologies in the chemical and energy industries via catalytic science and reaction engineering.



Conn Center for Renewable Energy Research

University of Louisville
 Director: Mahendra Sunkara
<http://conncenter.org>

The Conn Center provides research in renewable energy and encourages the development of technologies and practices that increase energy efficiency. The goal of the Conn Center is to meet the demand of the nation's homegrown energy source while reducing consumption and dependence on foreign oil. Current research involves cost-effective, zero-energy building technologies and smart materials.

Center for Applied Energy Research (CAER)

University of Kentucky
 Director: Rodney Andrews
<http://www.caer.uky.edu>

The center focuses on performing basic and applied research that improves the environment and contributes to the design of energy, coal, and other environmental technologies. Currently, CAER is working on developing an algae-based system that helps diminish carbon dioxide emissions from coal-fired power plants.

Energy Institute

University of Louisiana, Lafayette
 Director: Dr. Ali Ghalambor
<http://energy.louisiana.edu>

The Energy Institute provides research related to coal, energy, and the environmental industries. Other goals are to develop renewable energy technologies, including biomass and biofuels, electrochemical power sources, capacitors, batteries, and solar energy technologies. The institute is researching coal bed natural gas recovery and carbon dioxide sequestration in the unexploited coal beds of central Louisiana.



PHaSE

Courtesy: University of Massachusetts, Amherst

Nanostructures for Electrical Energy Storage (NEES)

University of Maryland
 Director: Gary W. Rubloff
<http://www.efrc.umd.edu>

NEES' Energy Frontiers Research Center is studying nanostructures in order to provide research to develop more efficient and higher functioning batteries. The group is engaged in designing structures at the scale of tens to hundreds of nanometers to optimize conduction, diffusion, and storage of electrical energy.



University of Maryland Energy Research Center (UMERC)

University of Maryland
 Director: Eric D. Wachsman, Ph.D.
<http://www.umerc.umd.edu>

UMERC is a broad-based research center dedicated to studying and developing energy-efficient and environmentally sustainable technologies and practices. UMEREC also educates the public on matters of energy efficiency and sustainability, and the global impact of energy policy and practices. Additionally, they are engaged in promoting policies that encourage sustainability and energy efficiency.

Eni-MIT Solar Frontiers Center

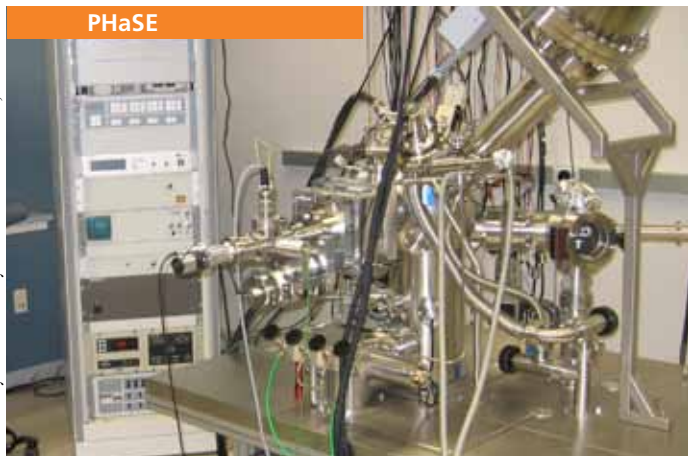
Massachusetts Institute of Technology
 Director: Clifton G. Fonstad
<http://sfc.mit.edu/default.htm>

This center's research projects include developing low-cost nanostructured PV devices at room temperature over large areas, fabricating solvent-free polymer-inorganic thin films in order to create prototypes of efficient and environmentally stable PVs, and developing a concentrated solar power system that yields a higher return on investment compared with conventional solar power plants.

Electrochemical Energy Lab (EEL)

Massachusetts Institute of Technology
 Director: Shao-Horn
<http://web.mit.edu/eel>

The Electrochemical Energy Lab focuses on electrochemical energy conversion and storage—specifically, fundamental research on materials and catalysts that convert and store energy; novel lithium storage materials; and catalysts for electro-conversion of small molecules from one form to another.



Polymer-Based Materials for Harvesting Solar Energy (PHaSE)

University of Massachusetts, Amherst
 Directors: Thomas P. Russell and Paul M. Lahti
<http://www.cns.umass.edu/efrc>

PHaSE research focuses on organic PV strategies, specifically biomimetic and biological materials for energy, proton transport materials for fuel cells, and PV application materials.

Northeastern University Center for Renewable Energy Technology (NUCRET)

Northeastern University
 Director: Sanjeev Mukerjee
<http://www.northeastern.edu/nucret>

NUCRET is a leader in the advancement of clean energy conversion and storage science and technology. The center is developing technology that transforms inedible bio-oil into a hydrocarbon fuel with a chemical structure comparable to petroleum-based kerosene. Researchers hope that the development of this technology will create an alternative diesel fuel.

Wind Energy Center (WEC)

University of Massachusetts, Amherst
 Director: James F. Manwell
<http://www.umass.edu/windenergy>

WEC focuses on wind energy education, academic research, and policy. Research at the center studies wind turbine aerodynamics, blade element-momentum modeling, flow analysis, and computational fluid dynamics code development. By developing floating offshore wind turbines and actively controlled smart rotors, researchers at WEC are able to study aero-elastic design codes, active load control, and blade stability.

Fueling the Future Center for Chemical Innovation

University of Massachusetts, Amherst
 Director: S. Thayumanavan
<http://www.chem.umass.edu/masscrest/fuelingthefuture>

This center aims to develop novel organic charge-conducting materials with tunable transport properties for renewable energy applications. The center also concentrates research initiatives on organic materials for enhanced charge transport, proton conveyance for innovative fuel cell membranes, and electron transport for high efficient organic PV designs.



Solid-State Solar-Thermal Energy Conversion Center (S3TEC)

Massachusetts Institute of Technology
 Director: Gang Chen
<http://s3tec.mit.edu>

S3TEC develops cost-effective manufacturing processes for energy conversion materials, devices, and systems. Through fundamental science and research, this center constructs solid-state, solar-thermal-to-electric energy conversion technologies. Research is conducted on a variety of designs, including transport modeling, electron spectroscopy on thermoelectric materials, and prototype development, to study solar thermoelectric generation.

Center for Hierarchical Manufacturing (CHM)

University of Massachusetts, Amherst
 Director: James J. Watkins
<http://chm.psc.umass.edu>

CHM focuses on developing precise, cost-efficient, nanotechnology-enabled devices for electronics, energy conversion, resource conservation, and human health. Research efforts focus on roll-to-roll processing of flexible electronics and high technology devices on the nanoscale. Devices include solar cells, cell phone displays, batteries, and sensors.

The WPI Fuel Cell Center (FCC)

Worcester Polytechnic Institute
 Director: Ravindra Datta
<http://www.wpi.edu/academics/che/FCC>

The center fosters technological advances in fuel cells, fuel reformers, and related devices. Currently it performs research in modeling, development of higher temperature and carbon monoxide tolerant proton-exchange membrane fuel cells, catalytic reformer design, nonpyrophoric reforming and water-gas shift catalysts, preferential carbon monoxide oxidation catalysts, low-temperature shift catalysts, palladium and other inorganic membranes, and molten-carbonate fuel cells.

Transportation Energy Center (TEC)

University of Michigan
 Director: Johannes Schwank
<http://www.engin.umich.edu/research/tec>

The TEC researches hydrogen fuel cell technology. The center is also developing high performance synthetic fuels, as well as advanced chemical energy conversion and storage concepts. Their goal is to push the national energy economy toward independence from fossil fuels.

Center for Solar and Thermal Energy Conversion (CSTEC)

University of Michigan
 Director: Peter F. Green
<http://cstec.engin.umich.edu>

Through collaborative nanoscale research, synthesis, processing, computations, and measurements of ultrafast processes, CSTEC looks to develop energy conversion mechanisms in PV and thermoelectric devices, as well as fabricate inorganic, organic, and hybrid materials that possess low-dimensional nanostructures.

Clean Energy Research Center (CERC)

Oakland University
 Director: Amy Butler
<http://www.oakland.edu/cerc>

CERC conducts fundamental research that will help deliver energy efficiency solutions, innovative new clean energy jobs, and provide significant natural resource, environmental, and economic technologies. Research includes energy-efficient buildings, solar, combined heat and power, biomass, and wind energy.

National Biofuels Energy Laboratory (NBEL)

Michigan State University
 Director: K. Y. Simon Ng
<http://www.eng.wayne.edu/page.php?id=4765>

NBEL's objective is to develop a widespread understanding of composition property performance relationships for biofuels. Their research covers all aspects of next-generation biodiesel development, specifically on performance, cold flow, and stability properties. Faculty members are currently studying the effect of biodiesel design and chemistry on exhaust emissions of vehicles and stationary equipment using biodiesel fuels.

Oakland University Clean Energy Research Center (CERC)

Oakland University
 Director: Amy Butler
<http://www.oakland.edu/cerc>

Clean Energy Research Center (CERC) integrates scientists and engineers to conduct applied research and promote private sector investments to reach a 40% energy reduction in industrial, commercial and institutional buildings in the Southeast Michigan tri-county area. CERC aims to dramatically improve energy efficiency, new technology and new clean energy jobs by 2020. Projects at CERC focus on energy efficiency buildings, solar, combined heat and power (CHP), biomass and wind energy.



Courtesy: Mississippi State University



Center for Compact and Efficient Fluid Power (CCEFP)

University of Minnesota
 Director: Kim Stelson
<http://ccefp.org>

CCEFP's goal is to streamline hydraulic and pneumatic technologies into effective sources of energy transmission. It also aims to educate students, users, and the general public about the efficiency of fluid power technology.

Institute for Renewable Energy and the Environment (IREE)

University of Minnesota
 Director: Dick Hemmingsen
<http://environment.umn.edu/iree>

IREE's goal is to find promising renewable energy technologies. Projects include bioenergy and bioproducts with an emphasis on algae; catalysis and feedstocks; solar energy and PV; improved energy production for large wind turbines; geothermal carbon sequestration; and hydrogen storage and production. IREE's affiliate, the Center for Biorefining, focuses on bioenergy, biochemicals, and biomaterials.

Center for Biorefining

University of Minnesota
 Director: Dr. Paul L. Chen
<http://biorefining.cfans.umn.edu>

Affiliated with the IREE, the Center for Biorefining focuses on bioenergy, biochemicals, and biomaterials. It encourages collaboration between researchers and outside investigators, assists industries in the transfer of technology, and promotes the development of rural areas.

Materials Research Science and Engineering Center (MRSEC)

University of Minnesota
 Director: Timothy P. Lodge
<http://www.mrsec.umn.edu>

MRSEC's goal is to make future technology possible through research in biomedicine, renewable energy, and information technology. Notably, MRSEC is developing a new architecture for efficient solar cells through the use of engineered composition gradients of the organic semiconductor active materials. Supported by over 35 companies, the MRSEC also collaborates with research labs in Asia and Europe.



Energy Institute of Mississippi State University - Institute for Clean Energy Technology (ICET)

Mississippi State University
 Director: Dr. Glenn Steele
<http://www.icet.msstate.edu>

ICET consists of four disciplines: diagnostic and sensing technologies, engineering scale testing, environmental impact of energy production and use, and nuclear and defense measurement technologies. One noteworthy IEP project is centered on repurposing wastes originating from Cold War defense activities. IEP focuses on aqueous chemistry and operations necessary for converting the waste into nonleachable glass and cement forms.



Energy Institute of Mississippi State University - Southeast Clean Energy Application Center (CEAC)

Mississippi State University
 Directors: Pedro Mago and Steve Kalland
<http://www.southeastcleanenergy.org>

One of the CEAC's applications, combined heat and power, provides on-site electrical generation using the heat from equipment to provide cooling and/or heating for the building. The center identifies and promotes the use of feasible technologies and systems that can increase efficiencies, reduce operating costs, and reduce loads on the utility electrical grid.



Energy Institute of Mississippi State University - Sustainable Energy Research Center (SERC)

Mississippi State University
 Director: Dr. Glenn Steele
<http://www.icet.msstate.edu>

Focusing on the southeastern United States, SERC's mission is to foster the creation of sustainable energy industries. Currently, its main subjects of bioenergy research are fuels, economics and policy, and feedstocks.



Courtesy: Mississippi State University

Energy Research and Development Center

Missouri University of Science and Technology
 Director: Mariesa L. Crow
<http://energy.mst.edu>

The Energy Research and Development Center strives to educate students as well as solve energy-related issues. The center is known for the renewable energy demonstration project, a grid inter-tie hybrid wind/PV system with a 10 KW turbine on a 120-foot tower, and six solar panes producing 2 kilowatt of energy. The project aims to show how renewable energy can reduce the state's energy bills.

Photosynthetic Antenna Research Center (PARC)

Washington University in St. Louis
 Director: Robert E. Blankenship
<http://parc.wustl.edu>

Supported by the U.S. Department of Energy, PARC is dedicated to establishing the scientific basis for clean, inexpensive energy. Its foundation is solar and photosynthetic energy, and its goal is to create and enhance light-harvesting systems through a combination of university-based and private research.

International Center for Advanced Renewable Energy and Sustainability (I-CARES)

Washington University in St. Louis

Director: Himadri B. Pakrasi

<http://icares.wustl.edu>

I-CARES' mission is to encourage collaborative, renewable-energy research on a global scale. It focuses on biofuels, alternative energy, environmental systems, and the St. Louis area's coal resources to develop solutions for global energy issues.

Zero Emission Research and Technology Center (ZERT)

Montana State University

Director: Dr. Lee Spangler

<http://www.montana.edu/zert>

ZERT is a partnership with the U.S. Department of Energy determined to alleviate fossil fuel-created greenhouse gases through geologic carbon dioxide storage. Using advanced computer models, its research aims to study the viability, safety, and security of underground carbon dioxide retention.

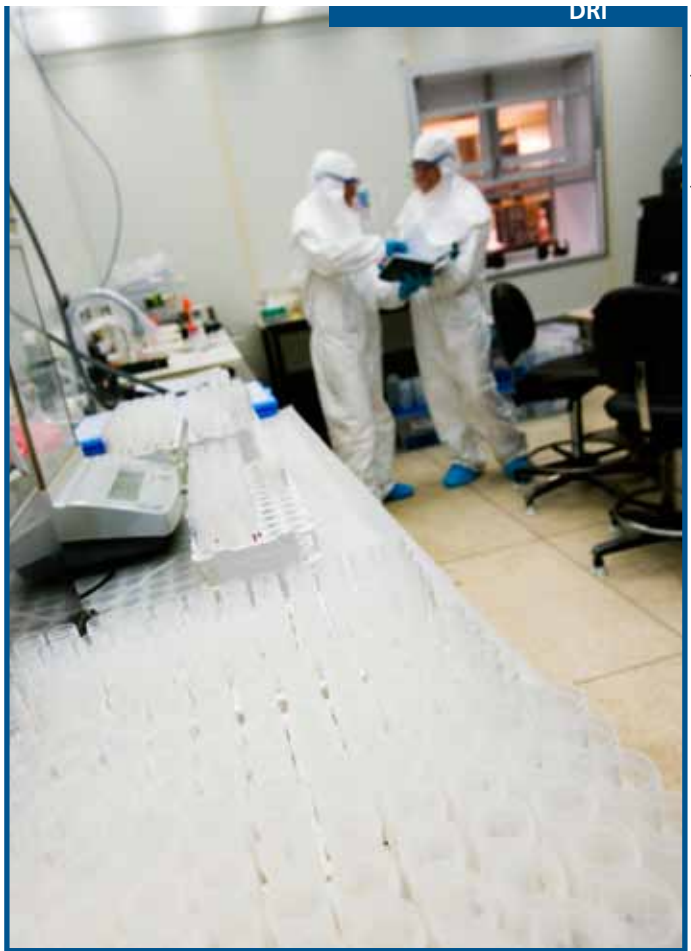
High Temperature Electrochemistry Center (HiTec)

Montana State University

Director: Dr. Lee Spangler

<http://www.montana.edu/hitec>

Funded by the U.S. Department of Energy, HiTEC's goal is to create new energy technologies through the study of high-temperature electromechanical systems. Researchers examine electroceramic materials and solid oxide fuel cells in order to determine the limits and advantages of these technologies.



DRI

Courtesy: University of Nevada, Reno

Energy Research Institute

Montana State University

Director: Dr. Lee Spangler

<http://www.montana.edu/energy>

The Energy Research Institute studies four areas: fuel cell research, focused on making viable solid oxide fuel cells; carbon sequestration research; wind research, enabling future wind-generated electricity; and biofuel research, or replacing fossil fuels with cleaner, more-efficient biofuels.

The Nebraska Center for Energy Sciences Research (NCSR)

Nebraska Public Power District and the University of Nebraska-Lincoln

Director: Dr. Jerry L. Hudgins (Interim)

<http://ncsr.unl.edu>

The NCSR conducts basic and applied research on renewable energy sources, energy efficiency, and energy conservation. It conducts energy research that produces new technologies, processes, and systems to provide new or significantly enhanced renewable energy sources. Research ranges from electrical energy storage, secure grid technologies, batteries, and fuel cells to wind turbines.



DRI

Courtesy: University of Nevada, Reno

Desert Research Institute, University of Nevada, Reno

Granular Energy Data Enables Action

The food service sector has the highest energy intensity of all commercial sectors. Fast food proprietors operate on thin margins and have a hard time identifying inefficient appliances and activities, calculating the cost-benefit of appliance repair or replacement, or managing peak demand costs, which can be up to 50% of the electric bill.

“For a typical restaurant, saving \$500 is the same as selling 2,000 more burgers,” summarized Hampden Kuhns, CEO of LoadIQ, a new startup in Reno, Nevada. “You can save energy today, but increasing sales takes time.”

Imagine if the monthly utility bill for your home or business were as easy to decode as your itemized phone bill. Entrepreneurial scientists at the Desert Research Institute (DRI) have invented a reliable and inexpensive energy-management software that determines how energy is used in buildings, and itemizes energy bills in real time to help ratepayers reduce costs.

Monthly utility bills report electric and natural gas consumption and cost as lump sums. These aggregated totals leave a consumer in the dark about how the actual operating cost of any particular appliance impacts the overall energy load and cost.

Informing consumers in detail about the costs of their home’s appliances can produce significant and enduring savings. Research shows the load savings is between 6.5% in a recent Canadian study and 18% in a recent Japanese study.

“We lower the cost of end use metering by using signal processing rather than branch circuit metering. The hardware and installation cost savings can be a fraction of monitoring each load individually,” noted Kuhns. “What started as two guys not taking salary has now grown to adding paid staff.”

Kuhns and Morien Roberts, both of the DRI at the University of Nevada, Reno, co-invented a software and hardware package, the Utility Accountant, that takes only 15 minutes to install in a typical home or small business.

The Desert Research Institute generates \$50 million in total annual revenue with more than 500 employees and two main campuses in Reno and Las Vegas, Nevada.

With a PhD in civil engineering from Carnegie Mellon University, Kuhns had worked on air quality monitoring at DRI’s Division of Atmospheric Sciences. This research built algorithms to profile sources of air pollution and models for the receptors used to detect these sources. The results allowed researchers to deconstruct the pollution in an air sample by apportioning the sources to different kinds of smoke or particulate.

“Does the air contain 10% cigarette smoke or 10% broiled hamburger smoke?” offered Kuhns as an example. Kuhn and his fellow researchers at DRI came to realize the same algorithm techniques to sample air could be adapted to sample the composition of energy demands within electricity or natural gas flows.

The Utility Accountant is an energy management device that measures electricity and natural gas entering a building. It does so non-intrusively by analyzing only the aggregate building load measured at the AC mains, rather than requiring a connection to each appliance. A patented advanced load monitoring algorithm creates detailed tables when major appliances turn on or off to show how the incoming utilities are consumed by individual appliances within the building. A building owner accesses the data from the device via a Web page through a secure

networked computer requiring no additional specialized software other than a Web browser.

“The value we offer is reducing the hardware cost to get an itemized energy bill,” continued Kuhns, “because we use a signal processor instead of expensive instrumentation.”

In 2006, the team filed a patent application with the help of the UNR/DRI Technology Transfer Office. In 2007, Kuhns and his colleagues founded a university startup company to commercialize the Utility Accountant load disaggregation system. They secured initial research and development support from the Nevada Institute for Renewable Energy Commercialization, California Energy Commission, and DOE.

The Utility Accountant patent was published in 2009, just as the company landed a Phase I grant of \$100,000 from the National Science Foundation’s Small Business Innovation Research program. This funding allowed them to conduct a test of the Utility Accountant in three Reno homes, where utility bills were typically \$150 per month. Initially, Kuhns reported, they thought they would target the residential consumer market.

The tests proved that their device worked quite well for very different kinds of homes and consumer lifestyles. The system can detect electricity usage ranging from 25 watt lightbulbs to a 1.4 kilowatt oven. During home trials, the Utility Accountant information allowed the user to distinguish different power demands for items such as a dishwasher, an oven used to broil, an oven used to bake, garage lights, a central vacuum, and a clothes iron.

But the high degree of variance among appliance use between homes—and even within a home over the course of a week—would lead to a much heavier customer service component for their fledgling business than they were ready or able to deliver.

Homes have relatively low energy bills, with uses driven by lifestyle choices. However, fast food restaurants that might spend between \$3,000 and \$4,500 per month on utilities display very routinized use patterns.

“It’s a tough sell into a home, but quick serve restaurants will be profit driven,” recalled Kuhns. “This process has been a crash course in business development for us.”

In 2011, the new company adopted the name LoadIQ and landed a Phase II grant of \$500,000 from the National Science Foundation’s Small Business Innovation Research program, turning to commercial and industrial applications as a test market.

“This funding helped us create a beta product to install in restaurants in Reno in a December 2011 timeframe and to hire talented staff,” explained Kuhns.

Meanwhile, the energy industry was beginning to take notice of the little startup, which is currently seeking \$2 million in investment capital, leveraged by the \$500,000 in grant funds.

“In June 2011, we met the Siemens Technology Business Group, who had just acquired a load monitoring firm. Siemens gave us a grant to run a pilot next year at an industrial testbed for Siemens in Nuremberg, Germany,” said Kuhns.

In early fall 2011, LoadIQ received yet another award. The Cleantech Open, the world’s largest cleantech accelerator, announced that LoadIQ’s business plan is the regional finalist in the energy efficiency category and will represent the California region at the national competition in November. ■



The Center for Energy Research (CER)

University of Nevada, Las Vegas
 Director: Robert F. Boehm
<http://www.cer.unlv.edu/cer>

The center is focused on solar energy utilization schemes; arid regions energy systems (dry cooling considerations); advanced cooling concepts (refrigeration systems that do not use CFCs); and nuclear waste issues. The center serves as a generator and catalyst for ideas, a stimulus for interdisciplinary cooperation, and a facilitator for commercialization.

Renewable Energy Center

University of Nevada, Reno
 Director: Dr. Manoranjan Misra
<http://www.unr.edu/energy>

The center coordinates programs for competitive research in the renewable energy field. The university has conducted renewable energy research for more than 10 years, including geothermal, biomass, hydrogen energy, and solar. Currently, researchers are dedicated to solving the challenges of hydrogen storage, utilization, and safety.



Desert Research Institute (DRI)

University of Nevada, Reno
 Director: Terry Surles
<http://www.dri.edu>

DRI conducts basic and applied research on global climate change, water quality and availability, air quality, sustainability of desert lands, life in extreme environments, and renewable energy technologies—specifically, electricity, hydrogen, and algae. DRI's Systems Microbial Ecology Lab seeks to enhance the technical knowledge and development of algal-biomass production systems.



UNLV CER

Courtesy: University of Nevada, Las Vegas

Center for Clean and Renewable Energy Research

University of New Hampshire
 Director: Debra Williams
<http://www.unh.edu/chemical-engineering/care.html>

The center was established to improve organizational cohesion and enhance public recognition of chemical engineering. For decades, it has been involved in teaching courses in energy and environment-related areas. Current projects include biodiesel production from microalgae, use of waste oils for biodiesel and fuel cell studies, and novel enzymes for cellulosic ethanol.

Center for Ocean Renewable Energy (CORE)

University of New Hampshire
 Director: Ken Baldwin
<http://www.unh.edu/core>

CORE provides research, technology development, education, and outreach for hydrokinetic systems, including tidal, wave, ocean current, and offshore wind energy. CORE is an interdisciplinary center for research, development, and evaluation for ocean renewable energy systems, and a training center for the next generation of engineers, scientists, and policy makers.

Combustion Energy Frontier Research Center (CEFRC)

Princeton University
 Director: Chung K. Law
<http://www.princeton.edu/cefrc>

The CEFRC was established to address the pressing issues of energy sustainability, energy security, and climate change. The center focuses on the combustion of fossil and alternative fuels to produce heat and power, and concentrates on finding chemical reactions for alcohol fuels, biodiesel, and foundation fuels.

Rutgers Energy Institute (REI)

Rutgers University
 Director: Paul Falkowski
<http://rei.rutgers.edu>

The center integrates basic research with real-world applications to advance energy technologies in a variety of areas: biofuels, solar and wind energy, efficient energy use, and carbon capture and sequestration. Rutgers Energy Institute integrates science, engineering, economics, and policy, putting it at the forefront of alternative energy research.

The New York Battery and Energy Storage Technology Consortium (NY-BEST™)

New York State Energy Research Development Authority (NYSERDA)

Director: Bill Acker
<http://ny-best.org>

Funded by the New York State Energy Research Development Authority (NYSERDA), NY-BEST is a collaboration between academic, industrial and government partners to research, test and commercialize battery and energy storage technology. University centers funded by NY-BEST, working on General Electric research projects, include Alfred University, Columbia University, Clarkson University and Stony Brook University. Areas of research range from electrochemical modeling and measurements to development of glass seals and ceramics, as well as X-ray scattering techniques.



Center for Sustainable Energy Systems (CSES)

Clarkson University
 Director: Dr. Kenneth Visser
<http://www.clarkson.edu/cses>

The center provides a vehicle to bring energy researchers together and generates new concepts for innovative, sustainable, collaborative projects at local, national, and international levels. CSES focuses on fuel cell and hydrogen fuel research.



The Center for Sustainable & Renewable Energy (CSRE)

State University of New York
 Director: Cornelius B. Murphy, Jr.
<http://www.esf.edu/energycenter>

Through innovative research and investigation efforts, The Center for Sustainable & Renewable Energy has an ongoing interest in sustainable, energy-efficient solutions, such as wind power, biomass feedstocks, the production of biohydrogen, fuel cell functions, biomass combined heat and power, PVs, and carbon sequestration methods.



David R. Atkinson Center for a Sustainable Future (ACSF)

Cornell University
 Director: Frank DiSalvo
<http://www.sustainablefuture.cornell.edu>

ACSF aims to develop technologies in the form of hybrid cells, improved semiconductor materials, and aquatic micro-algae for biofuel production. Researchers are currently working on creating a high-value enzyme, as well as creating a precise method to monitor algal culturing to increase the output of the enzyme.

Center for Advanced Energy Systems (CAES)

Rutgers University
 Director: Dr. Michael R. Muller
<http://caes.rutgers.edu>

The center is dedicated to the creation of new technologies and practices in the field of energy systems, as well as education and outreach to promote awareness on a state and national level. Researchers at CAES are currently working on the reduction of greenhouse gas emissions from power plants by analyzing the PJM power pool with the U.S. Environmental Protection Agency's eGrid software.

Energy Materials Center at Cornell (EMC2)

Cornell University
 Director: Hector D. Abruña
<http://www.emc2.cornell.edu>

EMC2 focuses on understanding and developing the science of active materials and their interfaces to help incorporate new materials into advanced energy technology solutions. Researchers are currently investigating ways to create nanohybrid systems for structural materials in fuel cells and other electrochemical devices.

Advanced Energy Research & Technology Center (AERTC)

Stony Brook University
 Director: Jim Smith
<http://www.aertc.org>

AERTC focuses on developing technologies to produce clean energies, renewable resources, and nanotechnology applications for novel sources of energy. Researchers are studying materials that can harness the sun's energy for the efficient production of hydrogen fuel through solar water splitting, as well as improving efficiency in light-driven water-splitting mechanisms.

Center for Sustainable Mobility (CSM)

Rochester Institute of Technology
 Director: Dr. Thomas A. Trabold
<http://www.rit.edu/gis/research-centers/csm>

This center is a leader in transportation energy technology research and development. Researchers study the impact of various alternative fuel and propulsion technologies on transportation systems. By examining emerging fuel technologies and their applications, researchers are able to predict requirements for sustainable future transportation systems and infrastructure.



Energy and Environmental Technology Application Center (E2TAC)

Albany State University
 Director: Pradeep Haldar
<http://www.e2tac.org>

E2TAC seeks to advance research and education on advanced energy and environmental applications through microelectronics and nanotechnology. E2TAC is also at the forefront of energy-related issues such as smart grid energy efficiency, thermoelectric, power electronics, sensors and superconductors, and advanced PVs. E2TAC researchers are currently working to develop new power electronic devices.

Re-Defining Photovoltaic Efficiency Through Molecule Scale Control

Columbia University
 Director: James Yardley
<http://www.cise.columbia.edu/efrc>

This center focuses on organic and hybrid PV systems through fundamental research of the molecule-scale control process. By developing nanostructured materials with the potential for extracting several electrical charges from a single absorption event, researchers are able to create novel solar cell devices that are well beyond the current efficiency limit.

Building Energy and Environmental Systems Laboratory (BEESL)

Syracuse University
 Director: Edward Bogucz
<http://beesl.syr.edu>

BEESL advances groundbreaking technologies for indoor environmental quality, energy efficiency buildings, air conditioning and refrigeration manufacturing, and power generation and distribution. Areas of research include hydrothermal performance of materials for built environmental systems; coupled heat, air, moisture and pollutant simulation; air cleaning technology, intelligent built environmental systems, material emissions and indoor air quality.



Northeastern Center for Chemical Energy Storage (NECCES)

Binghamton University & Stony Brook University
 Director: M. Stanley Whittingham
<http://necces.chem.sunysb.edu>

NECCES seeks to develop new characterization and theoretical tools to identify and design novel battery systems and key atomic-scale processes, which govern electrode function in rechargeable batteries. Researchers focus on developing characterization tools and methodologies with increased spatial, energy, and temporal resolution in order to gain full understanding of various properties of materials and systems.

Center for the Environmental Implications of NanoTechnology (CEINT)

Duke University
 Director: Mark Wiesner, Ph.D.
<http://ceint.duke.edu>

The center performs research on the behavior of nanoscale materials on complex ecosystems. Efforts involve all aspects of nanomaterial transport, exposure, and ecosystem impacts. Research includes environmental toxicology and ecosystem biology, biogeochemistry of manufactured and natural nanomaterials, and nanomaterial chemistry and fabrication.

The NanoPower Research Labs (NPRL)

Rochester Institute of Technology
 Director: Paul Stiebitz
<http://www.rit.edu/gis/research-centers/nanopower>

NPRL is dedicated to the development of new materials and devices for power generation, energy conversion, and storage devices for microelectronic components and micro-electromechanical systems. Their research on nanostructures and III-V materials in high-concentration PV systems have revealed that III-V-based PVs can result in direct reduction in cost per watt.

UNC Energy Frontier Research Center (UNC EFRC): Solar Fuels and Next Generation Photovoltaics

University of North Carolina
 Director: Thomas J. Meyer
<http://www.efrc.unc.edu>

The center provides basic research on storable solar fuel energy conversion. Research initiatives utilize a comprehensive, multidisciplinary approach across a broad range of disciplines in engineering, chemistry, physics, and materials science. Solar Fuels is currently involved in research that captures sunlight and uses it to drive solar fuel reactions or PV devices.

Center for Energy Research & Technology (CERT)

North Carolina A&T State University
 Director: Dr. Harmohindar Singh
<http://cert.ncat.edu>

CERT's multidisciplinary research efforts focus on reducing energy and water consumption, and promoting sustainable energy design practices. The center is currently focused on creating an energy efficient, environmentally responsible society by promoting and developing carbon dioxide emissions reduction, energy independence, and net-zero energy and sustainable design practices.

Advanced Energy Corporation

N.C. Utilities Commission

Director: Dr. Robert Koger, President and Executive Director
<http://www.advancedenergy.org>

Founded by the N.C. Utilities Commission, the Advanced Energy Corporation researches and implements new technologies for distributed generation, load management, conservation and energy efficiency. Advanced Energy Corporation focuses on energy efficiency for commercial and industrial markets, electric motors and drives, plug-in transportation and applied building science. Advanced Energy is a non-profit corporation governed by a Board of Directors appointed by the governor of North Carolina and the member utilities.

North Carolina Solar Center

North Carolina State University

Director: Steve Kalland
<http://www.ncsc.ncsu.edu>

Researchers at the North Carolina Solar Center focus on developing renewable energy technologies for residential and industrial purposes through programs to educate the public, share research and technical expertise, guide industry's energy decisions, and shape government policy. The Database of State Incentives for Renewables & Efficiency (DSIRE) is an ongoing project at the center.

Mechanical and Aerospace Engineering Department

North Carolina State University

Director: Richard D. Gould
<http://www.mae.ncsu.edu>

One of the most prominent departments of its type in the nation, strengths include thermal sciences, particularly thermal fluids, fluid mechanics, and combustion; mechanical sciences, including manufacturing mechanics, structural dynamics, materials, and controls; and the aerospace sciences, particularly aerodynamics, aircraft design, hypersonics, propulsion, flight research using UAVs, and computational fluid dynamics.

Energy & Environmental Research Center (EERC)

University of North Dakota

Director: Dr. Gerald H. Groenewold
<http://www.undeerc.org>

The center develops cleaner, more efficient energy and environmental technologies to provide practical, cost-effective solutions for clean coal technologies, carbon dioxide sequestration, energy and water sustainability, hydrogen technologies, air toxics and fine particulates, mercury measurement and control, alternative fuels, wind energy, biomass, water management, global climate change, waste utilization, and contaminant cleanup.

Ohio Center for Industrial Energy Efficiency (OCIEE)

Energy Industries of Ohio (EIO) and The Ohio Energy Resources Division (OERD)

Director: Robert M. Purgert (EIO)
<http://www.energyinohio.com>

EIO's mission is to develop, demonstrate, and incubate technologies that will improve the competitiveness of Ohio industry through increased energy efficiency, reduced operating costs and improved environmental performance. EIO develops partnerships between public and private institutions, as well as colleges and universities. This center will integrate state and federal programs for industrial companies to more efficiently and cost effectively receive services.

Center for Energy, Sustainability, and the Environment (CESE)

Ohio State University

Director: Kevin M. Passino
<http://iee.osu.edu/partnerships/affiliated-osu.cfm>

CESE specializes in fundamental research and technological innovations in efficient energy infrastructure systems, such as power grids, transportation networks, clean energies, economical solar energy, nuclear energy fusion, and carbon sequestration.



Wright Center for Photovoltaics Innovation and Commercialization (PVIC)

University of Toledo

Director: Robert W. Collins, Ph.D.
<http://pvic.org>

PVIC focuses on technological advances of second- and third-generation PV materials and devices tendered for applications in clean electricity generation, as well as the manufacture of low-cost PV systems. Research at PVIC consists of thin-film modeling, nanotech PV, PV optics, optical coatings, thermoelectric materials, solar energy conversion, and advanced photonic materials.

Tulsa Alternative Energy Institute

University of Tulsa

Director: Daniel Crunkleton
<http://orgs.utulsa.edu/altenergy>

Through multidisciplinary research, the Tulsa Alternative Energy Institute advances research in next-generation energy solutions. Research at the institute is currently divided into two areas: fuels and biofuels. Researchers are currently working to produce traditional transportation fuels from photosynthetic algae.

Northwest National Marine Renewable Energy Center (NNMREC)

Oregon State University and University of Washington
 Director (OSU): Dr. Belinda Batten
 Co-director (UW): Dr. Phil Malte
<http://depts.washington.edu/nnmrec>

NNMREC is a U.S. Department of Energy-funded partnership between OSU and UW to study renewable energy harnessed by the ocean. Tidal energy issues have been allocated to UW and wave energy issues to OSU. Both universities share responsibilities to collaborate on outreach activities, information dissemination, and improved reliability of devices.

Wallace Energy Systems & Renewables Facility (WESRF)

Oregon State University
 Directors: Annette von Jouanne and Ted Brekken
<http://cecs.oregonstate.edu/wesrf>

WESRF specializes in several areas, including research into novel, direct-drive wave energy generators, and developing novel motors, generators, adjustable speed drives, power electronics, power supplies, industrial process equipment, and power systems and renewables.

Center for Microtechnology-based Energy and Chemical Systems (MECS)

Oregon State University
 Director: Richard B. Peterson
<http://cbec.oregonstate.edu/research/mecs.html>

MECS researchers specialize in the fields of micro bioreactors, microscale unit operations, and micro biosensors. MECS focuses on expanding its expertise and research in order to develop microelectro mechanical systems that can be applied to the center's focus areas of biomaterials, bioprocessing, environmental processes, microtechnology-based energy and chemical systems, and microelectronic processing.

Solar Energy Center (SEC)

University of Oregon
 Director: Frank Vignola
<http://solarenergycenter.uoregon.edu>

SEC focuses on the design and operation of solar energy technologies for heating water, heating and cooling buildings, and generating electricity. In addition, SEC research includes projects that test PV cell and system technologies; develop and enhance a regional solar radiation database; and aid in appropriate design and operation of solar systems.

Center of Electric Power Engineering (CEPE)

Drexel University
 Director: Chika Nwankpa
<http://power.ecc.drexel.edu>

Research efforts at CEPE focus on the generation, transmission, distribution, use, and conservation of electric power, as well as advanced concepts for electric power generation. Researchers at CEPE are currently developing solar PV systems as a means of reducing peak demand requirements through the energy displacement and peak load-saving capabilities of the PV system.

Energy Research Center (ERC)

Lehigh University
 Director: Edward K. Levy
<http://www.lehigh.edu/~inenr>

The Energy Research Center is a multidisciplinary research group with an emphasis on energy conversion and power generation. The center covers such issues as stack emissions, electric-generating plants, fossil fuels, electric power generation, energy conservation, and renewable resources.

The Penn Center for Energy Innovation (PENNERGY)

University of Pennsylvania
 Directors: Cherie R. Kagan and Andrew Jackson
<http://www.energy.upenn.edu>

PENNERGY unites researchers to create innovative solutions and technologies for the development of new alternative energy sources. PENNERGY's research focuses on solar energy conversion, nanostructured solar cells, hybrid solar cells, plasmonics, catalysis for energy applications, and fuel cell research.

The Energy Systems Engineering Institute (ESEI)

Lehigh University
 Director: Martha Dodge
<http://www.lehigh.edu/~inesei>

ESEI conducts research in areas related to energy supply and consumption, structural engineering, surfaces sciences, materials characterization, environmental remediation, and clean coal technologies. Researchers at ESEI are looking to efficiently convert biomass into chemicals and fuels, with a focus on converting wood residues into fuels with similar chemical structures as gasoline.

Penn State Institutes of Energy and the Environment (PSIEE) - Hydrogen Energy Research Center

Pennsylvania State University
 Director: Dr. Bruce E. Logan
<http://www.engr.psu.edu/h2e>

Researchers are involved in biohydrogen production using modified microbial fuel cells. This research thrust involves generating hydrogen gas at high yields from bacteria. By using ordinary wastewater as fuel, the system has enabled hydrogen to be produced at 4 times the amount as that typically generated by fermentation alone.

Renewable Energy Research Lab (College of Engineering)

Temple University
 Director: Svetlana Neretina
<http://vader.eng.temple.edu/research/labs/rel>

The team at the Renewable Energy Research Lab is developing exotic growth modes that are used for thin films and nanostructured materials. The materials will be built into the designs of solar cells to determine if the superior properties translate into improved solar cell performance.

Penn State Institutes of Energy and the Environment (PSIEE) - Indoor Environment Center (IEC)

Pennsylvania State University
 Director: William P. Bahnfleth, Ph.D., P.E.
<http://www.engr.psu.edu/iec>

IEC conducts interdisciplinary research on indoor air quality, aerobiological engineering, illumination, and acoustics within a sustainable design context to create indoor environments that are healthier, safer, more comfortable, and energy efficient. For example, lighting and mechanical systems researchers identify toplighting strategies that minimize energy use in lighting and HVAC systems.

Center for Lignocellulose Structure and Formation (CLSF)

Pennsylvania State University
 Director: Daniel Cosgrove
<http://www.lignocellulose.org>

By conducting collaborative research on biopolymer lignocellulose structures, CLSF hopes to develop improved methods of converting biomass into transportation fuels. Specifically, researchers study cellulose synthesis and fibril formation as well as plant cell walls in order to create novel cellulosic biomaterials with diverse economic applications.

Penn State Institutes of Energy and the Environment (PSIEE) - Biomass Energy Center

Pennsylvania State University
 Director: Tom L. Richard
<http://www.bioenergy.psu.edu>

The Biomass Energy Center addresses the complete value chain of biomass energy systems through collaborative research and outreach. Through the biodiesel and bio-oils research thrust, researchers focus on exploring and developing strategies for optimal energy usage to increase profitability and cash flow of agricultural production and food-processing enterprises.

 **Center for Energy**

University of Pittsburgh
 Director: Don Shields
<http://www.energy.pitt.edu>

Current research looks at optimizing the impact of hydrokinetic energy extraction, which extracts kinetic, rather than potential, energy from rivers and transforms it into electrical energy. Pitt researchers are computationally and experimentally studying flow behavior to maximize possible energy extraction, while minimizing the environmental impact on the river's ecosystem.

NSF Industry/University Cooperative Research Center (I/UCRC) for Fuel Cells

University of South Carolina
 Director: John W. Van Zee, Ph.D.
<http://www.che.sc.edu/centers/PEMFC/index.html>

The Center for Fuel Cells focuses on fuel cell design, hydrogen storage, new catalysts and materials for hydrogen production and fuel cell electrodes, and motor design and power conditioning. In addition to advancing industrial and commercial use of fuel cells, the center also trains the next generation of fuel cell engineers.

The NanoCenter

University of South Carolina
 Director: Tom Vogt
<http://www.nano.sc.edu>

The catalysis nanoscience research area at the NanoCenter studies the relationships among synthesis procedures, catalyst nanostructures, and catalyst performance for environmental, chemical and energy applications. Additionally, researchers have developed innovative approaches to research polymer nanocomposites through synthesizing custom-made layered materials with surface chemical groups well-matched with target polymers.

Center for Bioenergy Research and Development (CBERD)

South Dakota School of Mines & Technology

Director: Dr. Duane Abata

<http://bioenergynow.org>

CBERD researchers focus on commercializing biofuels and bioproducts through innovative technologies. CBERD hopes to augment our petroleum-based economy with renewable energy, chemicals, and biomaterials. Researchers are working on improving biorefinery economics and the environmental impacts of bioenergy production by identifying and developing commercially viable co-products at any point in the bioprocess.



Bio Energy Science Center (BESC)

University of Tennessee

Director: Paul Gilna

<http://bioenergycenter.org>

BESC researchers are studying ways to decompose the cellular walls of switchgrass and poplar to form biofuel, including studying enzymes and microbes that will break down the plant structure. BESC hopes to modify the genome of the biomass to form a more populous, easily broken down feedstock that will mature easily.

Center for Environmental Biotechnology (CEB)

University of Tennessee

Director: Gary S. Saylor

<http://www.ceb.utk.edu>

Through environmental biotechnology expertise, this center fosters multidisciplinary research directed toward emerging environmental and societal needs. CEB's research combines modern molecular biological analysis throughout a spectrum of science and engineering research projects dealing with fundamentally complex environmental problems.

The Center for Nanophotonics

Texas Tech

Director: Hongxing Jiang

<http://www2.ecc.ttu.edu/nanophotonics>

The center focuses on the manipulation of photons-electrons in nanoscale materials, nanoscale material synthesis, and device fabrication. It investigates the mechanisms of optical transitions, light-emitting diode emission, and lasing in nitride materials, understanding fundamental optical transitions and dynamic processes, and improving the quality of materials and the optimization of optoelectronic devices.

Energy & Environmental Systems Institute (EESI)

Rice University

Director: Walter G. Chapman, Ph.D.

<http://eesi.rice.edu>

With experts in diverse disciplines, EESI aims to facilitate the development of technological solutions within the energy and environmental fields, and promote interdisciplinary research and education. EESI's nanophotonics research focuses on enhancing the absorptive capacity of solar panels, extending their longevity, and developing more efficient solar power generators.



Wind Science and Engineering Research Center (WiSE)

Texas Tech

Director: John Schroeder, Ph.D.

<http://www.depts.ttu.edu/weweb>

Through comprehensive and interdisciplinary research, WiSE develops information in wind science and engineering. Specifically, WiSE focuses on the detrimental effects of wind, such as windstorm disaster mitigation; testing of utility-scale wind turbines; wind-driven water treatment and desalination systems; and developing industry partnerships.



Center for Petroleum & Geosystems Engineering (CPGE)

University of Texas at Austin

Director: Gary A. Pope

<http://www.cpge.utexas.edu>

CPGE develops research in petroleum and geosystem engineering, and provides a method for technology transfer. Research in subsurface environmental engineering is directed toward the characterization and remediation of contaminated aquifers. Projects range from investigation of the transport of chemicals and microbes in permeable media to pilot field tests of several technologies.



Energy Institute

University of Texas at Austin
 Director: Raymond L. Orbach
<http://www.energy.utexas.edu>

Researchers at the Energy Institute are currently working on decreasing the net cost of carbon sequestration and storage (CSS) from coal-fired power plants as well as suspending carbon dioxide in extracted brine. The project indicates a reduction in CSS cost such that it could compete in a market environment without subsidies or a price on carbon.

The Advanced Research Initiative for Sustainable Energy (ARISE)

Texas A&M University
 Director: Hong-Cai Zhou
<http://arise.tamu.edu>

ARISE aims to discover new concepts and materials for hydrogen production and storage; electrodes and membranes of fuel cells; efficient conversion of biofuels; and economic production of solar energy. It strives to help find solutions to the increasing consumption of petroleum deposits and escalating air pollution issues.



Center for Frontiers of Subsurface Energy Security (CFSES)

University of Texas at Austin
 Director: Gary Pope
<http://www.utcfeses.org>

CFSES integrates its research on subsurface phenomena within various disciplines through the use of fundamental and hands-on methodologies. It focuses on the behavior of carbon dioxide and other by-products of energy production, and studies the complexity of fluids in geologic media to predict the long-term behavior of subsurface energy by-product storage.

Center for Electrochemical Systems and Hydrogen Research (CESHR)

Texas A&M University
 Director: Manuel Soriaga
<http://www.science.tamu.edu/research/centers>

Through its solid knowledge of electrochemical techniques and surface spectroscopic methods, CESHR develops innovative proton-exchange-membrane fuel cells for aerospace and military applications—specifically, converting and storing renewable energy-based technologies by understanding the atomic-level processes at the electrode-solution interface.



Center for Electromechanics (CEM)

University of Texas at Austin
 Director: Dr. Robert Hebner
<http://www.utexas.edu/research/cem>

This center is a world leader in the study, design, and fabrication of advanced electrical power generation and distribution systems for sporadic and nonstop applications. Researchers have recently developed an active suspension technology that decreases wear and tear on military vehicles, and helped in the development of fuel efficiency ship technology.

Center for Space Exploration Technology Research (cSETR)

University of Texas at El Paso
 Director: Ahsan R. Choudhuri, Ph.D.
<http://research.utep.edu/csetr>

The Center for Space Exploration Technology Research specializes in energy propulsion and energy engineering research. Specialized research works to improve combustion, efficiency, and high heat stability on thermal barrier coatings for more effective heat tolerance and improved turbine efficiency.

Texas Engineering Experiment Station (TEES)

Texas A&M University
 Director: David W. Hollingsworth
<http://tees.tamu.edu>

TEES researchers focusing on energy efficiency developed a web-based tool to test the energy efficiency of new houses before construction, helping to improve energy efficiency of new homes by 65 percent. Research on energy infrastructure developed technology that monitors and prevents electric power outages, saving Texans millions of dollars annually.

Center for Environmental Resource Management (CERM)

University of Texas at El Paso
 Director: William L. Hargrove, Ph.D.
www.cerm.utep.edu

CERM focuses on rapidly developing innovative science and technologies in the fields of renewable energy to achieve sustainable solutions to environmental issues. Through the solar PV canopy system project, this center has installed a 175 kilowatts solar PV system that produces about 302,000 kilowatt-hours per year and works at 82 percent efficiency.



Center for Nano- and Molecular Science and Technology (CNM)

University of Texas at Austin
 Director: Xiaoyang Zhu
<http://www.nano.utexas.edu>

The goal of CNM is to guide groundbreaking, targeted research initiatives and programs in nanoscience and nanotechnology. Through their knowledge and collaborative research methods, researchers at CNM study innovative chemical and physical processes of solar energy conversion as well as electric vehicle energy usage and storage in batteries.

Center for Energy and Environmental Resources (CEER)

University of Texas at Austin
 Director: Dr. David T. Allen
<http://www.utexas.edu/research/ccer>

The specific goal of this center is to provide fundamental research in air quality, greenhouse gas emissions, atmospheric chemistry, meteorology, and the efficient and economical use of energy in Texas. They hope to ensure a cleaner environment by developing technologies that minimize waste and conserve natural resources.

Institute for Clean and Secure Energy (ICSE)

University of Utah
 Director: Philip J. Smith
<http://www.ices.utah.edu>

The main focus of ICSE is to develop high-temperature fuel-utilization processes for energy generation. Through interdisciplinary research on energy, combustion, and high-temperature fuel-utilization processes, ICSE enables the development of predictive tools, which are repeatedly linked with applied systems and industrial applications.



cSETR

Courtesy: University of Texas at El Paso



Center for Smart Power Grids (SPG)

George Mason University
 Director: Dr. Alex Brodsky
<http://spg.gmu.edu>

SPG intends to make the smart grid more centralized, efficient, and consumer interactive. Focus areas include recovery from energy supply disruptions, near-real-time energy market pricing and peak power consumption scheduling, enhancement of the electric grid framework to withstand natural and human-induced disasters, and smart grid security.



WSU - EEP

Courtesy: Washington State University

Virginia Coastal Energy Research Consortium (VCERC)

Old Dominion University
 Director: Dr. Patrick Hatcher
<http://www.vcerc.org>

Through multidisciplinary research collaborations, the Virginia Coastal Energy Research Consortium aims to develop and implement renewable energy resources, such as algal biomass, wind, and wave energy. Research from this center will help create jobs, encourage investments, lower fuel prices, and facilitate development of clean energy sources.

Center for Catalytic Hydrocarbon Functionalization (CCHF)

University of Virginia
 Director: T. Brent Gunnoe
<http://artsandsciences.virginia.edu/cchf>

CCHF enables crucial advancements in the design and development of next generation catalysts for selective, low temperature, hydrocarbon functionalization. The center also specializes in solar energy and materials conversion from biomass to compact liquid fuels, used in the development of large-scale renewable energy resources.

Extension Energy Program of Washington State University

Energy Information Center Expertise

Since 1990, the Extension Energy Program of Washington State University has fielded nearly a quarter million inquiries on all things energy. All assistance is given free of charge to the program's customers. Originally housed within the state energy office, the Energy Library has been under university administration since 1997 as an integral part of the university's Extension Energy Program.

Initially, the program got into the energy information business by developing energy-related technical assistance and information for customers of the Bonneville Power Administration and Western Area Power Administration. This early partnership between the university's cooperative extension services and local public utilities has led to a robust suite of programs with a national client base.

"We currently have three active information centers in-house, including the Recovery Act Clearinghouse, EERE [Energy Efficiency and Renewable Energy] Information Center, and the clearinghouse for the Western Area Power Administration," noted Sheila Riggs, assistant director of the program communications in its Legislative and Administrative Division.

The program's staff of approximately 100 people includes on-site energy specialists, engineers, research librarians, energy efficiency software developers, and customer service staff, who work out of the university's Olympia, Spokane, and other satellite offices. The program is a self-supported department within the university, operating as a consulting firm with a nationwide client base.

"The WSU Energy Program has several advantages in providing cost-effective information services to a client such as the federal government," explained Jacob Fey, Director of the WSU Extension Energy Program. "For example, information center staff and projects are embedded within a larger organization, which adds to both their knowledge and credibility with clients."

Based on the program's success in managing the call center for major utilities, the DOE approached the university about consolidating the numerous separate, independent information and technical assistance clearinghouses. These federal-level resources contained valuable efficiency and renewable energy products and services, but were hard to locate for those who needed the information.

The new service created the EERE Information Center, where information from 95 websites with 7,500 pages would become coherent and accessible, while remaining up to date.

The EERE Information Center organizes an extensive portfolio of resources to assist citizens, businesses, federal facilities, tribes, utilities, manufacturing plants, schools and universities, local governments, and others in improving energy efficiency and the use of renewable energy.

Since its launch in January 2004, the EERE Information Center has fielded more than 128,000 inquiries from all 50 states and the U.S. territories. The program's private sector information technology partner for migration to the content management system has been Maryland-based Energy Enterprise Solutions.

In addition, center staff are involved with other real-world RDD&D carried out by the program, adding to staff knowledge and credibility with clients. In addition, the program has reached economies of scale as the EERE Information Center's operation, infrastructure, and expertise are shared with other call centers and energy-related projects and material resources. This critical mass lowers the costs over providing the EERE as a stand-alone center.

The university's track record led it to become the headquarters for the Northwest Clean Energy Application Center in 2004, as the original pilot at the Energy Research Center of the University of Illinois at Chicago expanded to seven other regional sites. The Northwest five-state center promotes combined heat and power, waste heat recovery, and other clean energy technologies and practices useful for industrial and commercial facilities.

With the rollout of ARRA in early 2009, the DOE faced a particularly difficult challenge. How could the agency clearly communicate the hundreds of grant opportunities to thousands of potential applicants while managing the inevitable flow of questions and exchanges of information in a coherent fashion?

In February 2009, the Secretary of Energy's Office approached the university's Extension Energy Program about establishing and operating a new information clearinghouse devoted solely to the Recovery Act.

By April 2009—just five weeks after the program agreed to take on this effort—the service was up and running, orchestrated by Dr. Lee Link and a team of nearly two dozen people, including the Maryland-based information technology partner,

The Recovery Act Clearinghouse serves all 50 states and U.S. territories. It has fielded 30,000 inquiries to date by email and phone from state and local governments, large and small businesses, tribes, federal agencies and facilities, professional and trade associations, schools and universities, Congress, citizens, consumers, and homeowners.

This success has led to additional work for the Secretary of Energy in providing training webinars for grant recipients and reviewers, and making over 500 outbound calls to assist award recipients and DOE reviewers.

"WSU's centralized call center was a force-multiplier for us, allowing us to communicate with thousands of customers in a quick and effective manner, with the highest marks of customer satisfaction," explained Jaime Carlson, adviser for Recovery Act Implementation at the DOE.

Secretary of Energy Steven Chu honored Dr. Link with a Secretary's Appreciation Award in 2010 to underscore the critical role that the Extension Energy Program is playing in supporting the nation's economic recovery.

Beyond providing unique clearinghouse services to clients, the Extension Energy Program offers a diverse suite of services for hire, partnering with funders, research collaborators, and contractors. These services run the gamut from code compliance support and technical writing, to industrial plant energy assessments and energy efficiency software development. The program's partners have included organizations as diverse as the Northwest Food Processors Association, Boeing, and Microsoft.

"For example, in 2009–2010 we delivered \$1.7 million in incentives to 44 Washington industries for energy efficiency projects projected to save \$1.5 million each year," noted Fey about the program's ongoing effectiveness within the state industrial sector.

Jake Fey, the Director of the WSU Extension Energy Program, is serving as the Chair of ASERTTI's 2011 Executive Committee. ASERTTI promotes and facilitates energy RDD&D communication, cooperation, coordination and collaboration among its members and with other public and private organizations.



Institute for Energy and Environmental Research (IEER)

James Madison University
 Director: Kenneth Newbold
<http://www.jmu.edu/ieer>

IEER initiatives support solutions within energy and environmental science by implementing innovative alternative energy solutions. The Valley 25x'25 initiative at IEER is devoted to helping the Shenandoah Valley achieve its goal of 25 percent renewable energy use before the year 2025.

Thomas Jefferson National Accelerator Facility

Southeastern Universities Research Association
 Director: Hugh E. Montgomery
<https://www.jlab.org>

This lab specializes in nuclear energy research. By using its innovative particle accelerator, the facility leads the field in fundamental nuclear matter discoveries. Additionally, this facility applies its advanced knowledge to serve its communities and the nation through education and public outreach.

Washington State University Extension Energy Program

Washington State University
 Director: Jacob C. Fey
<http://www.energy.wsu.edu>

The Extension Energy Program looks to advance the environmental energy services, products, education, and information on combined heat and power, district energy, and waste energy recovery technologies—specifically, by providing technical expertise on alternative fuel vehicles, cost-effective bioenergy technologies, hydrogen cells, fuel cells, and solar PV energy systems.

W Institute of Advanced Materials & Technology (i-AMT)

University of Washington
 Director: Alex Jen
<http://depts.washington.edu/iamt>

i-AMT aims to solve problems of energy generation through technological development in biotechnology, new energy sources, and nanotechnology. The energy research effort at i-AMT focuses on the production, transport, and storage of energy in batteries, fuel cells, biofuels, and supercapacitors.

Power and Energy Systems Analysis Lab

University of Washington
 Directors: Daniel Kirschen, Mohamed El-Sharkawi, Rich Christie, Miguel Ortega-Vazquez
<http://wp.ee.washington.edu/energy-group>

The Power and Energy Systems Analysis Lab focuses on building a smart grid that will increase the amount of energy produced from renewable sources at an affordable cost while maintaining a reliable electricity supply. Research is founded on the belief that a smart grid is necessary to successfully reduce the use of fossil fuels.



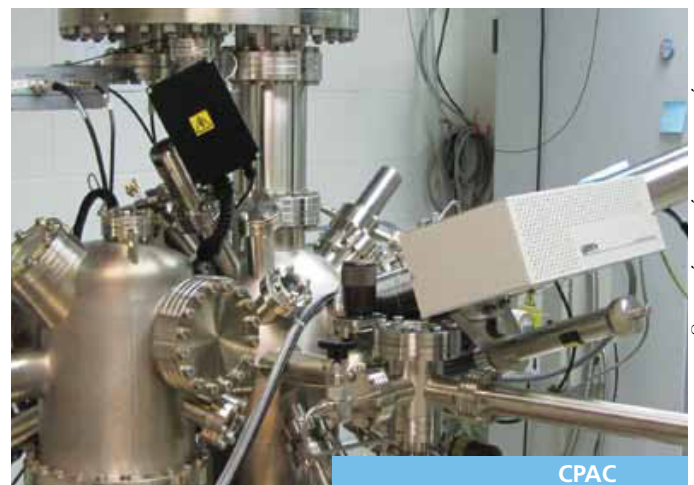
CPAC

Courtesy: University of Wyoming

Advance Energy Initiative (AEI)

West Virginia University
 Director: Joseph Kozuch
http://energyresearch.wvu.edu/about_aci

AEI works to achieve energy independence and to transition to more sustainable energy forms. Research projects focus on carbon capture and geologic storage, high-efficiency engine and vehicle technology, fuels production, clean power generation and distribution, utilization of coal for clean fuels and chemicals, biomass conversion and utilization, and sustainable use of water in energy production.



CPAC

Courtesy: University of Wyoming



Center for Sustainability & the Global Environment (SAGE)

University of Wisconsin
Director: Dr. Carol Barford
<http://www.sage.wisc.edu>

SAGE researchers study the influence of natural resources on technologies, human health and security, and changes in the global environment. Through research and development, SAGE is able to contribute to the scientific and policy discourse on energy, including measuring carbon neutrality of biofuel systems, quantifying carbon sequestration, and developing farm-based bioenergy infrastructures.

Great Lakes Bioenergy Research Center (GLBRC)

University of Wisconsin-Madison,
with Michigan State University as major partner
Director: Timothy Donohue
<http://www.glbrc.org>

The primary focus of GLBRC is to incorporate novel technologies into bioenergy research, specifically the conversion of cellulosic biomass to ethanol and other advanced biofuels. Currently, researchers are working on converting plant-derived sugars into bioenergy compounds and developing strategies to more easily degrade cell walls.

Energy Center of Wisconsin

Director: Susan Stratton
<http://www.ecw.org>

The center delivers objective research, analysis and education on energy issues. Research is conducted in bioenergy (opportunity fuels, residues, byproducts and crops), energy efficiency and building efficiency. A yearlong study identified both behavioral and technical savings opportunities by monitoring household electrical devices, their energy use, and related consumer behaviors.

SEL Solar Energy Lab (SEL)

University of Wisconsin
Director: Sanford A. Klein
<http://sel.me.wisc.edu>

SEL emphasizes the application of engineering concepts to energy problems, including solar heating, PVs, desiccant and absorption cooling, and HVAC and air quality. SEL is an innovator of energy simulation methods, developing software such as TRYNYSYS and FCHART to aid the energy industry in development and design.

Wisconsin Bioenergy Initiative (WBI)

University of Wisconsin
Director: Gary Radloff
<http://www.wbi.wisc.edu>

WBI focuses its research on bioenergy technologies. Researchers study biological and thermochemical conversions, biomass production, and improved plants. One of their findings is a treatment that aids the breakdown of cellulose in plants in order to have efficient access to the sugars needed to convert it to biofuel.

Wind Energy Research Center (WERC)

University of Wyoming
Director: Jonathan Naughton
<http://www.uwyo.edu/werc>

WERC is a world-renowned center in wind energy-related research and education for the continued development of technology and the ability to transmit. WERC provides experimental and computational capabilities, as well as intellectual resources to carry out internationally unique research that aids in enhancing energy security while reducing energy-related environmental impact.



Center for Photoconversion and Catalysis (CPAC)

University of Wyoming
Director: Bruce Parkinson
<http://www.uwyo.edu/ser/centers-of-excellence/photoconversion-catalysis.html>

By emphasizing electrical and chemical conversions of light in novel energy forms, CPAC seeks to advance energy production efficiency and find new ways to generate energy. Research at the center focuses on the conversion of sunlight to stored energy, fuel cell technology advancement, and the production of photogenerated fuels.

Carbon Management Institute (CMI)

University of Wyoming
Director: Ron Surdam
<http://www.uwyo.edu/cmi>

CMI engages in research and development of carbon capture and storage technologies. Researchers are involved in capturing and separating carbon dioxide from emission sources and storing it safely and permanently in geologic reservoirs deep below the earth's surface. CMI currently leads Phase I of the Wyoming Carbon Underground Storage Project.

Advanced Electronics

- 23 Advanced Energy Research & Technology Center (AERTC)
- 10 Advanced Materials Processing and Analysis Center (AMPAC)
- 26 Center for Electric Power Engineering (CEPE)
- 23 Center for Advanced Energy Systems (CAES)
- 4 Center for Advanced Vehicle Technologies (CAVT)
- 8 Center for Clean Energy Engineering (C2E2)
- 17 Center for Hierarchical Manufacturing (CHM)
- 6 Grid-Connected Advanced Power Electronics Systems (GRAPES)
- 32 The Institute of Advanced Materials and Technology (i-AMT)
- 6 National Center for Reliable Electric Power Transmission (NCREPT)
- 24 Northeastern Center for Chemical Energy Storage (NECCES)
- 5 SRC/SEMATECH Engineering Research Center for Environmentally Benign Semiconductor Manufacturing
- 7 Stanford Linear Accelerator Center (SLAC)

Algae

- 5 Laboratory for Algae Research and Biotechnology (LARB)

Alternative Energy

- 23 Center for Sustainable Energy Systems (CSSES)
- 22 Rutgers Energy Institute (REI)
- 25 Tulsa Institute of Alternative Energy

Bioenergy

- 28 Bio Energy Science Center (BESC)
- 27 Biomass Energy Center
- 9 Catalysis Center for Energy Innovation (CCEI)
- 14 Center for Advanced Bioenergy Research (CABER)
- 5 The Center for Bioenergy & Photosynthesis
- 28 Center for Bioenergy Research and Development (CBERD)
- 19 Center for Biorefining
- 33 Energy Center of Wisconsin
- 12 Energy Resources Center (ERC)
- 33 Great Lakes Bioenergy Research Center (GLBRC)
- 19 The Sustainable Energy Research Center (SERC)
- 33 Wisconsin Bioenergy Initiative (WBI)

Biofuels

- 15 Ames Laboratory
- 10 Applied Research Center (ARC)
- 14 Center for Direct Catalytic Conversion of Biomass to Biofuels (C3Bio)
- 27 Center for Lignocellulose Structure and Formation (CLSF)
- 14 Center for Research in Environmental Sciences (CRES)
- 8 Colorado Center for Biorefining and Biofuels (C2B2)
- 7 Energy Biosciences Institute (EBI)
- 6 EPSCoR Center for Plant-Powered Production (P3)
- 10 Future Fuels Institute (FFI)
- 18 National Biofuels Energy Laboratory (NBEL)

Biorenewable Research

- 4 Center for Green Manufacturing (CGM)

Carbon Capture

- 33 Carbon Management Institute (CMI)
- 6 Energy Frontier Research Center (EFRC)
Center for Gas Separations Relevant to Clean Air Technologies

Cold Climate Research

- 4 Alaska Center for Energy and Power (ACEP)
- 4 Cold Climate Housing Research Center (CCHRC)

Energy Conversion

- 7 Center for Energy Science and Technology Advanced Research (CESTAR)
- 28 Center for Petroleum & Geosystems Engineering (CPGE)
- 33 Center for Photoconversion and Catalysis (CPAC)
- 7 Center on Nanostructuring for Efficient Energy Conversion (CNEEC)
- 22 Combustion Energy Frontier Research Center (CEFRCC)
- 16 Electrochemical Energy Lab (EEL)
- 8 Engines & Energy Conversion Lab (EECL)
- 9 Institute of Energy Conversion (IEC)

Energy Efficiency Research

- 32 Advance Energy Initiative (AEI)
- 25 Advanced Energy Corporation
- 12 Argonne National Laboratory
- 22 The Center for Energy Research (CER)
- 25 The Center for Energy, Sustainability, and the Environment (CESE)
- 29 Center for Frontiers of Subsurface Energy Security (CFSES)
- 29 Center for Space Exploration Technology Research (cSETR)
- 14 The Discovery Park Energy Center
- 29 Energy Institute, The University of Texas at Austin

Energy Efficiency Research continued

- 26 Energy Research Center (ERC) at Lehigh University
- 23 The New York Battery and Energy Storage Technology Consortium (NY-BEST™)
- 25 North Carolina State University - Mechanical and Aerospace Engineering Department
- 18 Oakland University Clean Energy Research Center (CERC)
- 25 Ohio Center for Industrial Energy Efficiency (OCIEE)
- 29 Texas Engineering Experiment Station (TEES)

Energy Efficient Materials

- 12 Center for Advanced Energy Studies (CAES)
- 6 Center for Energy Efficient Materials (CEEM)
- 23 Energy Materials Center at Cornell (EMC2)
- 11 The Florida Institute for Sustainable Energy (FISE)
- 26 The Penn Center for Energy Innovation (PENNERGY)

Environmental Research

- 6 Arkansas Center for Energy, Natural Resources and Environmental Studies (ACENRES)
- 11 Brook Byers Institute for Sustainable Systems (BBISS)
- 9 The Center for Carbon-free Power Integration (CCPI)
- 22 Center for Clean and Renewable Energy Research
- 30 Center for Energy and Environmental Resources (CEER)
- 9 Center for Energy Frontier Research in Extreme Environments (EFRee)
- 29 Center for Environmental Resource Management (CERM)
- 26 Center for Microtechnology-Based Energy and Chemical Systems (MECS)
- 33 Center for Sustainability & the Global Environment (SAGE)
- 9 Delaware Biotechnology Institute (DBI)
- 25 Energy & Environmental Research Center (EERC)
- 28 Energy & Environmental Systems Institute (EESI)
- 20 Energy Research Institute, Montana State University
- 27 Indoor Environment Center
- 30 The Institute for Clean and Secure Energy (ICSE)
- 32 The Institute for Energy and Environmental Research (IEER)
- 15 Iowa Energy Center
- 4 Water and Environmental Research Center (WERC)

Environmental Research, Environmental Technology

- 24 Center for Energy Research & Technology (CERT)
- 23 Center for Sustainable Mobility (CSM)

Environmental Technologies

- 24 Building Energy and Environmental Systems Laboratory (BEESL)
- 16 Center for Applied Energy Research (CAER)
- 28 Center for Environmental Biotechnology (CEB)
- 15 Center for Environmentally Beneficial Catalysis (CEBC)
- 30 The Center for Nano- and Molecular Science and Technology (CNM)
- 15 Center for Research in Energy and the Environment (CREE)
- 14 Center for Sustainable Energy at Notre Dame (cSEND)
- 15 Center for Sustainable Environmental Technologies (CSET)
- 18 Clean Energy Research Center (CERC)
- 10 Energy & Sustainability Center (ESC)
- 26 The Energy Systems Engineering Institute (ESEI)
- 24 Energy and Environmental Technology Application Center (E2TAC)
- 19 Institute for Clean Energy Technology (ICET)
- 19 Southeast Clean Energy Application Center (CEAC)
- 16 University of Maryland Energy Research Center (UMERC)
- 30 Virginia Coastal Energy Research Consortium (VCERC)
- 26 Wallace Energy Systems & Renewables Facility (WESRF)

Fuel Cell Research

- 9 Center for Fuel Cell Research (CFCR)
- 17 Fueling the Future Center for Chemical Innovation
- 20 High Temperature Electrochemistry Center (HiTec)
- 27 Hydrogen Energy Research Center
- 27 NSF Industry/University Cooperative Research Center (I/UCRC) for Fuel Cells
- 18 Transportation Energy Center (TEC)
- 17 The WPI Fuel Cell Center (FCC)
- 20 Zero Emission Research and Technology Center (ZERT)

Nanotechnology Research

- 24 Center for the Environmental Implications of NanoTechnology (CEINT)
- 28 The Center for Nanophotonics
- 14 Micro and Nanotechnology Laboratory (MNTL)
- 27 NanoCenter at the University of South Carolina
- 24 The NanoPower Research Labs (NPRL)
- 10 Nanoscience Technology Center (NSTC)
- 11 Nanotechnology Research and Education Center (NREC)

Nuclear Energy

- 32 Thomas Jefferson National Accelerator Facility

Petroleum Research

- 4 Petroleum Development Laboratory (PDL)

Power Electronics

- 10 Center for Advanced Power Systems (CAPS)
- 29 Center for Electromechanics (CEM)
- 11 Center for Organic Photonics and Electronics (COPE)
- 8 Center for the Advanced Control of Energy and Power Systems (ACEPS)
- 16 Nanostructures for Electrical Energy Storage (NEES)
- 32 Power and Energy Systems Analysis Lab

Power Technologies

- 14 Gas Technology Institute (GTI)

Renewable Energy

- 29 The Advanced Research Initiative for Sustainable Energy (ARISE)
- 4 Auburn University Research
- 15 Center for Biorenewable Chemicals (CBIRC)
- 30 Center for Catalytic Hydrocarbon Functionalization (CCHF)
- 29 Center for Electrochemical Systems and Hydrogen Research (CESHR)
- 27 Center for Energy
- 15 Center for Sustainable Energy
- 23 The Center for Sustainable & Renewable Energy (CSRE)
- 11 Clean Energy Research Center (CERC)
- 16 Conn Center for Renewable Energy Research
- 23 David R. Atkinson Center for a Sustainable Future (ACSF)
- 22 Desert Research Institute (DRI)
- 16 Energy Institute, The University of Louisiana at Lafayette
- 19 Energy Research & Development Center
- 11 Florida Energy Systems Consortium (FESC)
- 11 Georgia Southern University's Renewable Energy and Engines Laboratory
- 12 Hawai'i Natural Energy Institute (HNEI)
- 18 Institute For Renewable Energy and the Environment (IREE)
- 20 International Center for Advanced Renewable Energy and Sustainability (I-CARES)
- 19 Materials Research Science and Engineering Center (MRSEC)
- 7 Molecularly Engineered Energy Materials (MEEM)
- 20 The Nebraska Center for Energy Sciences Research (NCESR)
- 17 Northeastern University Center for Renewable Energy Technology (NUCRET)
- 26 Northwest National Marine Renewable Energy Center (NNMREC)
- 7 Public Interest Energy Research Program (PIER)
- 8 Renewable and Sustainable Energy Institute (RASEI)
- 22 Renewable Energy Center at The University of Nevada, Reno
- 8 Renewable Energy Materials Research Science and Engineering Center (REMRSEC)
- 27 Renewable Energy Research Lab (College of Engineering)
- 15 Richard G. Lugar Center for Renewable Energy

Renewable Energy continued

- 5 Sustainable Energy Solutions (SES)
- 32 Washington State University Extension Energy Program

Smart Grid

- 30 Center for Smart Power Grids (SPG)
- 7 UCLA Smart Grid Energy Research Center (SMERC)

Solar

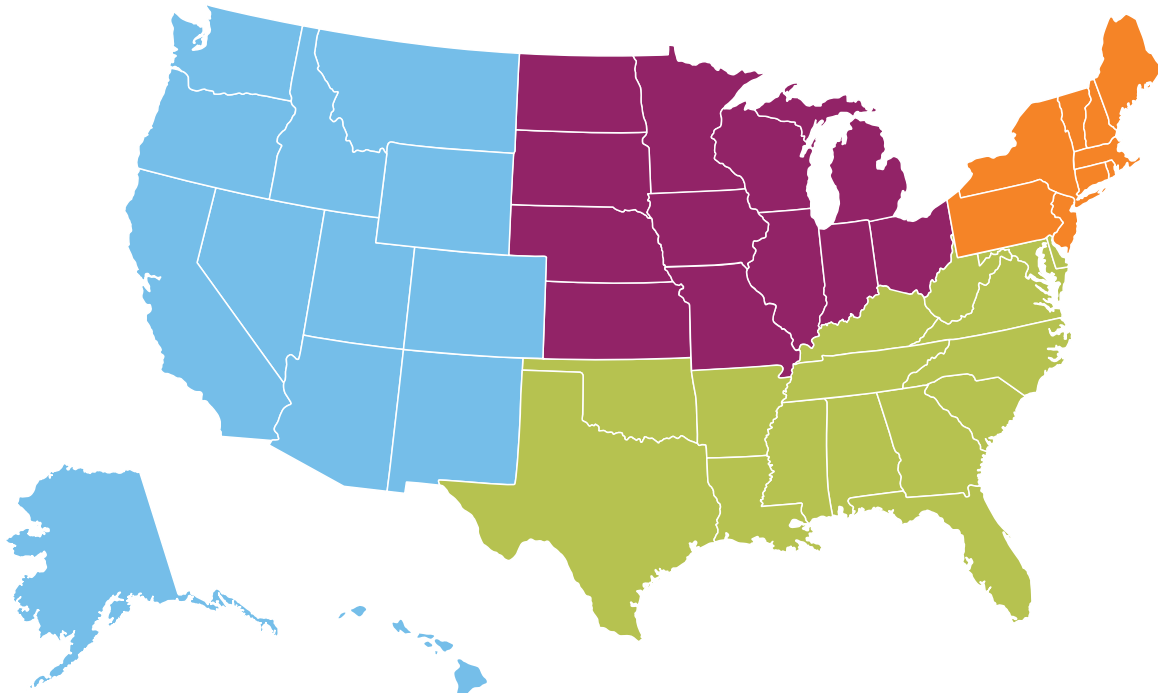
- 12 Argonne-Northwestern Solar Energy Research (ANSER) Center
- 5 Arizona Research Institute for Solar Energy (AzRISE)
- 5 Center for Bio-Inspired Solar Fuel Production (BISfuel)
- 8 Center for Energy Nanoscience (CEN)
- 5 Center for Interface Science: Solar Electric Materials (CISSEM)
- 18 Center for Solar and Thermal Energy Conversion (CSTEC)
- 16 Eni-MIT Solar Frontiers Center
- 10 Florida Solar Energy Center (FSEC)
- 7 Light-Material Interactions in Energy Conversion (LMI-EFRC)
- 25 North Carolina Solar Center
- 19 Photosynthetic Antenna Research Center (PARC)
- 17 Polymer-Based Materials for Harvesting Solar Energy (PHaSE)
- 5 Quantum Energy and Sustainable Solar Technology (QESST)
- 24 Re-Defining Photovoltaic Efficiency Through Molecule Scale Control
- 26 Solar Energy Center (SEC)
- 33 Solar Energy Lab (SEL)
- 9 Solar Power Program (SPP)
- 17 Solid-State Solar-Thermal Energy Conversion Center (S3TEC)
- 24 UNC Energy Frontier Research Center (UNC EFRC): Solar Fuels and Next Generation Photovoltaics
- 11 University Center of Excellence for Photovoltaics (UCEP)
- 6 Vertically-Integrated Center for Transformative Energy Research (VICTER)
- 25 Wright Center for Photovoltaics Innovation and Commercialization (PVIC)

Water Efficiency

- 18 Center for Compact and Efficient Fluid Power (CCEFP)
- 22 Center for Ocean Renewable Energy (CORE)
- 14 The Center of Advanced Materials for the Purification of Water with Systems (WaterCAMPWS)
- 10 Southeast National Marine Renewable Energy Center (SNMREC)
- 6 UC Davis Center for Water-Energy Efficiency (CWEE)

Wind Technology

- 17 Wind Energy Center (WEC)
- 33 Wind Energy Research Center (WERC)
- 28 Wind Science and Engineering Research Center (WiSE)



The **National Guide to State Energy Research Centers** is published jointly by State & Local Energy Report and the Association of State Energy Research & Technology Transfer Institutions (ASERTTI).

ASERTTI

ASERTTI's mission is to increase the effectiveness of energy research efforts in contribution to economic growth, environmental quality, and energy security.

ASERTTI believes everyone benefits when knowledge, expertise and experience are shared, unproductive duplication is avoided and widespread application is facilitated.

For more information on ASERTTI, go to www.asertti.org.



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