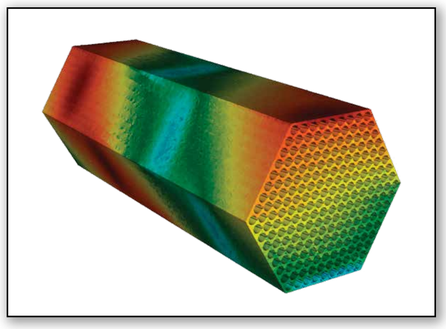
ENERGY SCIENCE at National User Facilities

Global energy challenges require multiple solutions. The National User Facilities provide state-of-the-art capabilities to advance energy research.

Argonne Leadership Computing Facility



Safer, Greener Renewable Energy

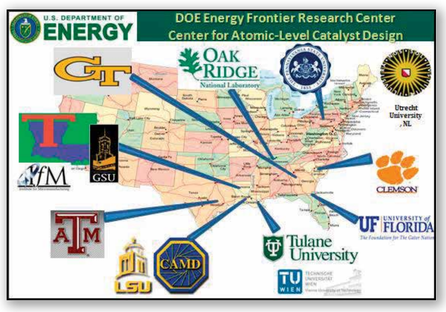
The United States is committed to new technologies that will enhance the use of safe, clean nuclear energy as an economical power source to meet growing global energy demands. Researchers are using the ALCF computing resources to refine advanced reactor designs that will efficiently recycle spent nuclear fuel and extract the full energy potential from it.

Spallation Neutron Source

Abundant New Energy Sources

Neutron studies of materials under high pressure, or other extreme conditions, are leading to discoveries of potential new energy sources. At SNS, such studies have revealed the structure of gas molecules that could produce energy, as well as sequester the carbon dioxide that forms in the process. This research promises great advancements in energy production and reduction of global warming from use of common materials.

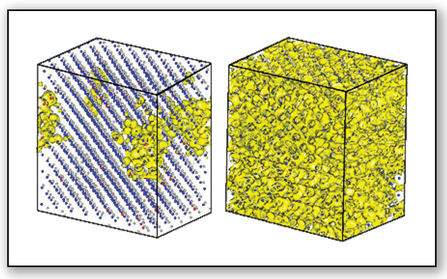
Center for Advanced Microstructures and Devices



Developing New Energy Technologies

Researchers from across the southeastern region of the U.S. are using CAMD's tools to develop new means of producing and storing energy, ranging from renewable resources such as solar and biomass, to developing improved means to store energy in both electrical and chemical forms. LSU's DOE Energy Frontier Research Center – an international collaboration – is working to develop atomic-level catalysts by design.

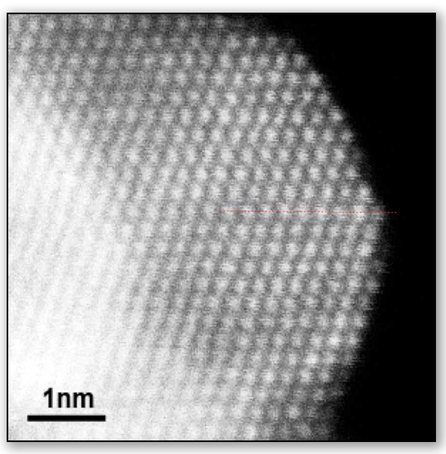
National Energy Research Scientific Computing Center



Nanoscale Solar Materials

Scientists are using NERSC to help develop new photovoltaic and "fuel from sunlight" technologies based on advanced nano-scale materials. Through the simulation of the optical and energetic properties of the materials, computation streamlines the process of development. Such carbon-neutral technologies promise solutions to our nation's energy and environmental challenges.

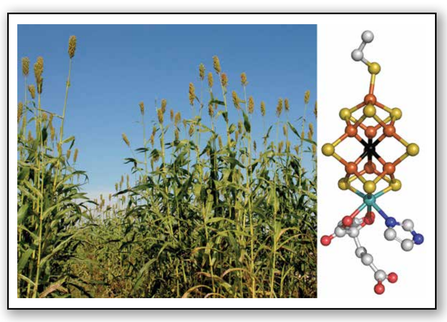
Center for Functional Nanomaterials



A Cheap Alternative to All-Platinum Catalysts

BNL scientists are working to reduce the cost of expensive catalysts such as platinum (Pt) by replacing the bulk of it with a cheaper material, and reserving Pt for the surface. The scientists have used the advanced transmission electron-microscopy facility of the CFN to characterize, at the atomic level, the structure of core-shell Pd-Pt nanoparticles and to determine the optimum thickness of the Pt layer. They have found that even a catalyst that uses a single layer of platinum has high reactivity. This result may enhance the practicality of fuel-cell vehicles and be applicable to other catalysts.

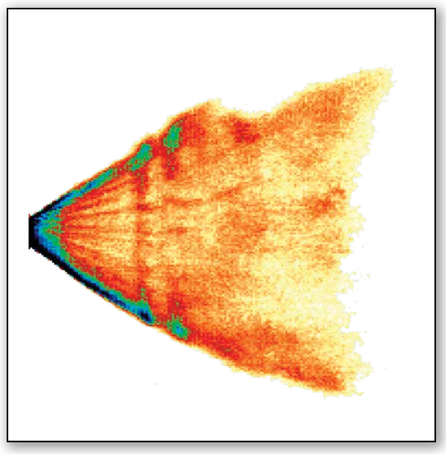
Stanford Synchrotron Radiation Lightsource



Mimicking Nature's Energy

If we could make plant food from nitrogen the way nature does, we would have a much greener method for manufacturing fertilizer — a process that currently requires such high temperatures and pressures that it consumes about 1.5 percent of the world's energy. Scientists at SSRL are working to mimic nature's gentle version of the reaction with the long-term goal of developing a lower-energy process for making fertilizers.

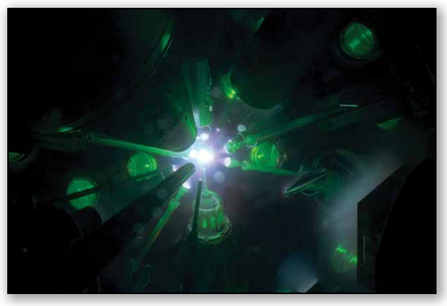
Cornell High Energy Synchrotron Source



More Efficient Automobile Engines

Ultrafast x-ray detectors are being developed at Cornell that allow Department of Energy scientist Jin Wang and Cornell professor Sol Gruner to use x-ray radiography to capture transient images of gasoline spray produced by an automobile fuel injector. Engineers use these images – taken in millionths of a second – to make automobiles more fuel-efficient.

Omega Laser Facility



Inertial Confinement Fusion

The LLE Omega Facility is one of the principal participants in the national inertial confinement fusion program. One of LLE's major achievements is the compression of heavy hydrogen to a pressure of 150 billion atmospheres at a temperature 25 million degrees – comparable to the conditions at the core of our sun. This research may one day lead to a safe, inexhaustible and economically competitive form of energy.

NATIONAL USER FACILITY ORGANIZATION