

# FY 2010 ANNUAL REPORT

CENTER FOR ADVANCED  
ENERGY STUDIES



*The Center for Advanced Energy Studies is a research partnership between Boise State University, Idaho National Laboratory, Idaho State University and University of Idaho.*

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## STATE OF IDAHO FY 2010 ANNUAL REPORT



Dear colleagues,

The future for energy research and development is bright at the Center for Advanced Energy Studies and its partner institutions - Boise State University, Idaho National Laboratory, Idaho State University, and University of Idaho.

All continue to build their collective research portfolios through CAES. Our collaboration is paying off not only for the partners, but for the state of Idaho and the nation.

In FY 2010, CAES:

- Competed for and won approximately \$ 8.2 million in new research, equipment, and other funding
- Attracted 418 students to Idaho's flagship nuclear engineering and science programs and added three new faculty members/researchers (three more are in the works)
- Built a new industrial partnership in bioenergy from solid wastes
- Filled its advanced materials, imaging, and visualization laboratories with state-of-the-art equipment.

Thank you for continued support of CAES and be assured that we will continue to develop and grow CAES for the state of Idaho and the nation.

A handwritten signature in black ink that reads "Harold S. Blackman". The signature is written in a cursive style with a long horizontal flourish at the end.

Harold Blackman  
CAES Director

## FY 2010 PERFORMANCE

CAES provided a substantial return on investment for Idaho in FY 2010.

The state invested \$1.6 million to support faculty and staff at the three Idaho universities to conduct research, educate the next generation of energy professional, and collaborate through CAES. (The state is providing the same level of support in FY 2011.)

In return, CAES researchers won approximately \$8.2 million in research, infrastructure, and other funding through competitive processes. CAES also is measuring how much of that money was expended during the FY 2010 fiscal year. To date, CAES and its partners have expended more than \$1.5 million.

This metric CAES' reflects the direct economic impact research portfolio is having on the Idaho economy.

## FY 2010 FUNDING

### RESEARCH AND DEVELOPMENT

<p><b>ATR-NSUF Measurement of Actinide Neutronic Transmutation Rates</b> Nuclear Science and Engineering</p>	\$225,000
<p><b>ATR-NSUF: Online Flux Monitors for ATR-C</b> Nuclear Science and Engineering</p>	\$225,000
<p><b>CWI Sodium Metal</b> Nuclear Science and Engineering</p>	\$113,908
<p><b>Development and Testing of an Open-Loop Oscillator for Small Reactivity Worth Samples</b> Nuclear Science and Engineering</p>	\$597,252
<p><b>Fuel Performance Experiments on the Atomistic Level, Studying Fuel through Engineering Single Crystal UO<sub>2</sub></b> Nuclear Science and Engineering</p>	\$1,300,000
<p><b>INL Process and LCA Model Review</b> Nuclear Science and Engineering</p>	\$11,614
<p><b>Studies of Deteriorated Heat Transfer in Prismatic Cores Stemming from Irradiation-Induced Geometry Distortion</b> Nuclear Science and Engineering</p>	\$1,287,921

<p><b>Chalcogenide Glass Radiation Sensor; Materials Development and Design and Device Testing</b> Advanced Materials</p>	\$973,532
<p><b>Characterization of Nuclear Graphite</b> Advanced Materials</p>	\$21,387
<p><b>Fabrication of Advanced ODS Alloys Using Field Assisted Sintering</b> Advanced Materials</p>	\$70,000
<p><b>Method for Measuring Lattice Strain and Rotation</b> Advanced Materials</p>	\$55,000
<p><b>Small Sample Testing</b> Advanced Materials</p>	\$72,615
<p><b>TRISO-Coated Fuel Durability Under Extreme Conditions</b> Advanced Materials</p>	\$155,636
<p><b>Battelle Hybrid DEM-FE Model</b> Carbon Management</p>	\$195,924
<p><b>Carbon Dioxide Mineralization Potential of Host Rocks in Deep Saline Aquifers</b> Carbon Management</p>	\$721,000

<b>Economic Impact of Small Modular Reactors</b> Energy Policy	\$61,000
<b>Fuel Cycle Performance Metrics</b> Energy Policy	\$21,170
<b>Up-front Financing Options for Energy Efficiency for Small Businesses</b> Energy Policy	\$13,000

**INFRASTRUCTURE**

<b>Acquisition of an SEM for Microstructural and Chemical Analysis of Nuclear Materials</b> Boise State University	\$260,000
<b>Infrastructure Improvement for Nuclear Engineering and Health Physics Laboratory Instrumentation</b> Idaho State University	\$87,072
<b>Minor Reactor Upgrade</b> Idaho State University	\$145,107
<b>Enhanced Experimental and Computational Capabilities to Support Nuclear Energy R&amp;D</b> University of Idaho	\$250,000



**SCHOLARSHIPS/FELLOWSHIPS**

<b>FY 2010 NEUP Scholarships</b> BSU, ISU, UI	\$45,000
<b>NASA Fellowship</b> Boise State University	\$15,000
<b>Nuclear Regulatory Agency Scholarship</b> Idaho State University	\$178,672
<b>Nuclear Regulatory Agency Scholarship</b> Idaho State University	\$172,150

**OTHER**

<b>DOE Program Administration FY 2010</b> Idaho National Laboratory	\$1,800,000
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## CAES 2010 REPORT CARD

GOAL	GRADE	COMMENTS
<b>Recognized Excellence in Energy Research</b>	<b>A</b>	Competitive research awarded to date has met and exceeded expectations, including 68 publications. However, the CAES partners must develop and execute sound strategy that grows research volume and industrial partnerships.
<b>Sustainability</b>	<b>B</b>	CAES needs to decide on the business model it will pursue for the long term. Long-term state support also is being pursued. The required level of long-term support from the state and INL need to be defined and commitments established.
<b>Human Capital</b>	<b>B</b>	CAES leadership and affiliate staff is comprised of a strong group of recognized professionals. CAES also bolstered its modeling capabilities with the addition of a globally recognized expert (INL fellow) to its team. In addition, both the undergraduate and graduate nuclear engineering programs have seen substantial growth.
<b>Infrastructure</b>	<b>A</b>	CAES is establishing competitive capabilities, particularly in imaging, materials and modeling and simulation, with the help of congressional appropriations and INL contributions. The CAES virtual campus model leverages equipment at university campuses and the building now houses state-of-the art AV equipment that enables distance learning and video conferencing.
<b>Safety and Operations</b>	<b>B+</b>	CAES has developed its first generation processes and they have proven effective for a small number of projects to date. Additional proof-of-process is needed for a larger number of projects, especially for the planning and execution of university-owned projects. A more mature version of the CAES operating envelope that includes radiological work is being developed.

## INVESTING IN RESEARCH

CAES provided \$1.2 million in INL-funded seed money to researchers for exploratory projects in FY 2010.

This program fosters collaboration between INL scientists and university faculty. Together, they can pursue cutting-edge research and create new capabilities that will help CAES not only help develop sustainable R&D programs but also find solutions to the nation's energy issues.

This program has benefited CAES, its partners, and the state significantly. A CAES/Idaho State University project on precision nanoparticles led to the signing of a \$3.1 million cooperative research and development agreement (CRADA) with a private company based in Idaho Falls.

Research projects funded by this seed money cover topics such as bioenergy, advanced wind turbines, and materials science.

In FY 2010, CAES funded more than 50 Idaho university researchers and students through this program.

## INVESTING IN CAPABILITIES

CAES has continued to build research and development capabilities that support its five primary mission areas - nuclear science and engineering, advanced materials, carbon management, bioenergy, and energy policy – and distinguish it from other research institutions

The labs at CAES are filled with state-of-the-art equipment that enables it to be competitive in open competition. Nearly \$10 million in new equipment has been added in the last year.

Key capabilities:

- The CAES imaging suites houses a Local Electrode Atom Probe (LEAP) as well as other high-end microscopy equipment. There are only a small number of atom probes in the world.
- CAES is the only facility in Montana, Idaho, Utah, and Wyoming with a Computer Assisted Virtual Environment or CAVE. The CAVE creates interactive simulations in which researchers can examine designs, data, or environments.

## INVESTING IN IDAHO

CAES continues to deliver on its commitment to Idaho. The center has forged strong relationships with state and regional partners to foster knowledge and find energy solutions.

In FY 2010, CAES:

- Developed a new partnership with the city of Meridian and others in the area of solid waste bio-energy
- Continued working with Utah State University to create a Center for Advanced Radioactive Materials through a National Science Foundation program.
- Supported the state's Office of Energy Resources and the governor's Strategic Energy Alliance
- Participated on the Idaho Technology Council R&D Committee
- Co-developed a statewide symposium to showcase Idaho technology and industry
- Collected and analyzed data from a Blackhawk Vertical Axis Wind Turbine, which was invented and developed in Idaho
- Supported more than 30 Idaho university students through CAES-based research projects
- Supported seven faculty members at Idaho universities by paying half of their salaries.
- Awarded 10 scholarships to college and university students interested in pursuing energy-related careers.

## UPCOMING CHALLENGES

With ongoing support from the state of Idaho, Idaho National Laboratory, and the U.S. Department of Energy, CAES will continue to contribute to the nation's energy security.

However, CAES faces major challenges in coming years, particularly in the areas of lab space and researchers. The labs at CAES are filled with equipment and that support the center's current research portfolio. However, available space and equipment is inadequate if the CAES research portfolio is to be sustained and grow. The Idaho universities must bolster their on-campus research facilities or another CAES facility is needed.

The same is true with the number of university-based researchers working with CAES. Our researchers have been successful in competing for and winning research and other funding. If CAES is to continue to be competitive in the long term, the number of university-based researchers needs to increase.

The CAES partners are confident that when Idaho's investment reaches \$3 million a year for university faculty, the center will achieve sustainable growth that benefits both the Idaho universities and the state economy.

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