

Special Issue: A look at where we've been and where we're going

Over the last 11-plus years, the Center for Advanced Energy Studies (CAES) has gone from concept to concrete. Although based out of the CAES facility in Idaho Falls, CAES reaches beyond those walls and is located anywhere partner collaboration takes place.

As fields of research and specialties change, and as priorities shift to stay current with the needs of customers and potential customers, organizations need to change. As we look forward to the year ahead, looking back gives us an opportunity to take stock of how far we've

come, lessons learned and goals brought into focus.

Here, in words and pictures, is a brief history of CAES.

CAES announced as an initiative by new prime contractor Battelle Energy Alliance who will manage Idaho National Laboratory (INL) for the U.S. Department of Energy

"This center will bring academia into the life of the laboratory ... and provide students and professors access to the laboratory's unique capabilities." – DOE news release

2005

Ground broken on 55,000-square-foot building at 995 University Boulevard, Idaho Falls, including eight laboratories and 154 office spaces



2007

CAES building dedication
CAES begins hosting the annual My Amazing Future event, one of many ongoing efforts to encourage student interest in STEM fields
CAES building is certified LEED Gold, only the third LEED gold building in Idaho

2009

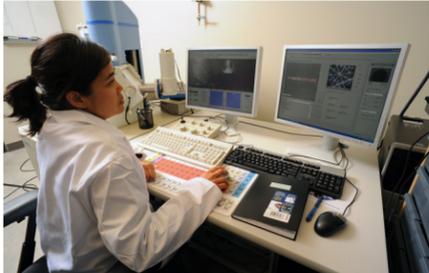
2008



Idaho lawmakers appropriate \$1.6M for CAES

2010

CAES begins operating the CAVE and Microscopy and Characterization Suite (MaCS) as user facilities



2011

CAES Energy Efficiency Research Institute (CEERI) established by gubernatorial proclamation
Computer-Assisted Virtual Environment (CAVE) and Local Electrode Atom Probe (LEAP) added
CAES Energy Policy Institute hosts first Energy Policy Research Conference

2012

Governor announces new Idaho Global Entrepreneurial Mission (IGEM) to foster industry collaboration with CAES universities
DOE-sponsored Industry Assessment Center established at Boise State University

CAES refines core strategy to focus on industry, talent and initiatives

2013



2014



University of Wyoming joins CAES, becomes the first university member outside of Idaho

CAES Industry Advisory Board established with board members from eight companies

Idaho Department of Commerce, INL and CAES establish the Autonomous Systems Center of Excellence (ASCE)

First Temporal Analysis of Products (TAP) reactor installed in CAES

DOE announces effort to build Regional Clean Energy Innovation Partnerships, based partly on the CAES collaboration model

New mobile-responsive CAES website launched

PBS NOVA films footage in CAES for documentary on advanced reactors

2015

2016

CAES receives external funding for advanced visualization projects in the Applied Visualization Laboratory. Dr. James Money named new Applied Visualization Lead

Second TAP reactor installed, making CAES home to two of only three in the United States. Research led by Dr. Rebecca Fushimi receives money from DOE Advanced Manufacturing Office to establish a user portal

2016 RESEARCH HIGHLIGHTS

In 2016 CAES increased its work with industry and performed exciting research in many areas including bioenergy, resource extraction, food processing and semiconductor manufacturing. Engagement from Idaho National Laboratory and the four CAES universities – Boise State University (BSU), Idaho State University (ISU), University of Idaho (UI) and University of Wyoming (UW) – took on a variety of forms, reflecting the imagination and expertise of researchers in a truly collaborative environment.

CAES partners INL and UI are assisting Avista, which operates natural gas, hydroelectric, coal and wood-waste combustion power plants in five western states, with energy-saving analysis at two of its sites. They are also working with Avista and the Northwest Food Processors Association (NWFPA) on a proposal for selecting technologies that offer the greatest potential for

saving significant amounts of energy and water at food processing plants, and possibly developing a template to be used at other NWFPA member facilities.

In June, the U.S. Department of Energy announced a CAES project involving INL, UW's Carbon Management Institute and the U.S. Geological Survey to develop new methodologies to analyze trace elements in high-salinity brines. The object is to determine if rare earth elements and critical materials can be found in quantities that might lessen the United States' dependence on foreign sources.

CAES researcher, Dr. Haiming Wen from ISU, received a \$500,000 NEUP grant to improve the strength and irradiation resistance of metals used in nuclear reactors. Wen and three ISU graduate students have been developing nanostructures that could improve the performance of materials conventionally used in building

reactors. INL scientists and engineers are helping with neutron irradiation testing.

BSU students collaborated with researchers at INL to develop a program that allows visualization of scientific datasets using augmented reality (AR) through the Unity game engine. With AR, a user interacts and explores a 3-D model through a mobile device. One visualization was created to show density distribution in a graphite billet. Graphite billets have extensive individual data sets that are pooled to determine distinct trends in material properties. Another visualization involved electric vehicle charging patterns in the Pacific Northwest's I-5 corridor. The augmented environment promotes natural human interaction, providing understanding of data that are difficult to achieve with traditional static figures.



Mike Hagood,
CAES Acting Director

Hagood named CAES Acting Director

As it prepares for 2017, CAES says goodbye to its director, Dr. Steven Aumeier, who was selected in November to develop and lead new INL initiatives for nuclear energy applications. CAES deputy director of Program Development Mike Hagood will serve as acting CAES director while a nationwide search for a new director takes place. In his program development role, Hagood

has been responsible for establishing research and development programs for the laboratory, including those associated with clean energy generation and integration,

sustainable transportation, advanced manufacturing and materials, and environmental stewardship. During his more than 30-year career, Hagood has worked extensively in the energy and environmental fields, including working for several years in Europe, the Middle East and Far East. Hagood also supports the laboratory in developing regional energy-related programs and partnerships. He has testified before the U.S. House committees on Science, Space and Technology and Natural Resources on the development of unconventional fossil energy resources. He holds bachelor's and master's degrees in geology and is a registered geologist and hydrogeologist in the state of Washington.

A permanent CAES director is expected to be named by March 2017.

Bring on the New Year

With the end of 2016 approaching, the Center for Advanced Energy studies can look back upon a year of transition and growth. The fiscal year, which ended Sept. 30, showed movement toward larger, sustainable initiatives that aligned closely with strategic goals. To build on those goals CAES brought on several new strategic hires:

- Bob Borrelli (UI), *assistant professor, nuclear engineering*
- Richard Christensen (UI), *professor, nuclear engineering*

- Michael Haney (UI), *assistant professor, computer science*
- Leslie Kerby (ISU), *assistant professor, nuclear engineering & health physics*
- James Money (INL), *applied visualization lead*
- Haiming Wen (ISU), *research assistant professor, nuclear engineering & health physics*

About CAES

The Center for Advanced Energy Studies (CAES), a consortium of Idaho National Laboratory, Boise State University, Idaho State University, University of Idaho, and University of Wyoming, is a public/private research center that provides research capabilities, energy-related educational opportunities and industry assistance to fuel economic growth.

CAES by the Numbers

(October 2015 - September 2016)

79

students from the CAES partner universities interned at Idaho National Laboratory

2734

visitors experienced the CAES Computer-Assisted Virtual Environment (CAVE)

200+

CAES presentations, publications, and proceedings

92

events hosted in the CAES Idaho Falls facility

39

CAES meetings and workshops hosted by CAES affiliates

Have comments, questions or suggestions for future newsletter topics?
Contact Julie Ulrich, julie.ulrich@inl.gov, 208-526-1572.

CAESENERGY.ORG

CAES
Center for Advanced
Energy Studies