

CAES , U.S. Dairy Industry Teaming on “Greening”

By Kortny Rolston, CAES Communications

The Center for Advanced Energy Studies is teaming with the U.S. dairy industry to turn cow manure into energy and reduce greenhouse gas emissions at the nation’s 90,000 dairy farms.

CAES recently signed a memorandum of understanding with the Innovation Center for U.S. Dairy to help develop sustainable farm practices, better manure management techniques and improve methods for turning waste into energy.

“CAES has the research capabilities and expertise to help meet the dairy industry’s sustainability goals,” said Jerry Bingold, director of the Innovation Center.

The industry’s first goal is to reduce the greenhouse gas emissions related to milk production by 25 percent by 2020. It plans to do that primarily by increasing the use of anaerobic digestion at dairies across the country. The industry wants to have 1,800 digesters in place by 2020.

The benefits of anaerobic digestion (a process in which microorganisms break down biodegradable material so it can be converted into energy or fuel) are numerous.

Using anaerobic digestion can turn dairy waste, which many farmers must now either spread on fields or pay to dispose of, into a source of energy. With this process, manure can be converted into a biogas or biofuel that power a farm’s operation or be sold to utilities to produce electricity.

“Anaerobic digestion is a win-win for dairy farms,” said Melinda Hamilton, who leads CAES’ bioenergy research initiative. “These digesters can turn the millions of pounds of manure that cows produce into a form of renewable energy, which also reduces greenhouse gas emissions.”

But while some dairy farms are using anaerobic digesters on site, the upfront costs to build the systems can be high and operating them, selling and transporting a biofuel or biogas is complex.

Also, there must be enough waste to make operating a digester economically feasible.

“There are some challenges with anaerobic digesters and making them affordable enough to operate – especially for smaller dairy producers,” Hamilton said.

One of the options CAES and the Innovation Center are exploring is the concept of community digesters for areas with a concentration of smaller dairies – such as Twin Falls.

With community digesters, farms in an area can ship their waste to a single operation instead of having to purchase one. It would also ensure there is enough waste to feed the digester.

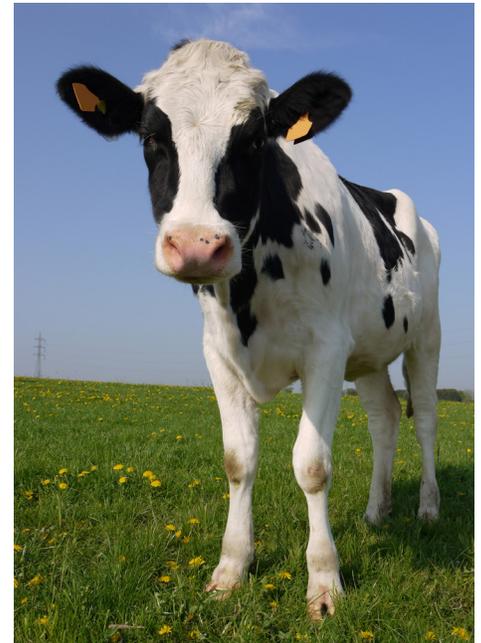
The Twin Falls/Magic Valley area is a good location to pilot the concept because there is not only a high concentration of dairies but there also is a natural gas pipeline that runs nearby.

“One of the issues with renewable energy is how to get the power that is produced to the grid,” Hamilton said. “You have to transport it there somehow. Having access to a resource like a pipeline would help solve that problem.”

CAES also is researching mixing others feedstocks with dairy manure so the waste produced during the anaerobic digestion process can be transformed into a useful product.

One idea is to feed it to algae that can make lipids, which can then be used to create biofuels.

“We would be turning another waste



stream into something useful,” Hamilton said.

The dairy industry believes anaerobic digestion is a technology that could help it meet its greenhouse gas reduction goal. Already, some major dairy operations are using the technology.

According to the Innovation Center, 1,200 cows at Blue Spruce Farm in Vermont supply enough electricity for 4,000 nearby homes and businesses.

The center says that if a digester were running at 2,600 dairy farms across the country, the energy generated would equal that of nearly 9,000 wind turbines and could power the entire state of Hawaii.

“We think the time is right to invest in this kind of technology,” Bingold said.



Researchers Attend CAES Summer Schools

By Kortny Rolston, CAES Communications

Scientists and engineers from industry, academia and national labs headed back to school this summer to learn how to use two new cutting-edge research tools at the Center for Advanced Energy Studies.

More than 30 students attended the CAES-sponsored courses, one of which focused on 3D visualization using the center's computer-assisted virtual environment (CAVE) and other on materials characterization and analysis using a focused ion beam and a local electrode atom probe in CAES' new Microscopy and Characterization Suite (MaCS).

This is the first year CAES has offered the summer courses.

"Both of these capabilities have come on line in the last year and we wanted to give researchers the opportunity to access these unique pieces of equipment," said Oren Hester, CAES deputy director. "We operate the CAVE and MaCS as user facilities so scientists and engineers from the CAES partner institutions as well as academia and industry can use them to solve their problems."

The three-day courses were designed to be hands on - participants brought their own samples to run in the focused ion beam and atom probe and their own data to view in the CAVE.

This enticed Linda Tedrow, a University of Idaho technician who processes light

detection and ranging data (LiDAR), to enroll in the immersive visualization course and bring a LiDAR image of Moscow Mountain to view in 3D.

As the image loaded onto a wall of 3D screens in the CAES visualization laboratory, Tedrow was awed. It was the first time she had seen the image on something larger than a standard computer screen.

The detailed view convinced her that the researchers she works with need to embrace advanced visualization technology.

"When you look at it like this, the data all starts to make sense," said Tedrow. "Until now, the only visual I've had is when I look up a location with Google maps to see what it is I'm working on. This gives you a much clearer and insightful perspective."

Hester said exposing researchers to CAES and its capabilities was one of the goals for the courses.

"We want people to better understand how these tools can advance their research, facilitate collaboration between the participants and with CAES, and make the equipment and tools readily available to researchers" he said.

Dustin Ellis, a materials researcher for General Electric, enrolled in the atom probe tomography course after hearing about it from his boss. Much of his work requires the use of an atom probe to examine samples of nickel-based super

alloys they are developing for jet engines and other applications.

"Atom probes are one of the few technologies that we can use to look at the grain boundaries of these samples so we can better understand how and why they crack," Ellis said. "That will allow us to design more durable materials that withstand the stress. There is no room for error with these materials."

Ellis had been sending his samples to atom probe labs for examination, but hopes to do it himself in the future, which is another reason he attended the CAES course.

Researchers – even those outside the CAES partner institutions – can become qualified to run the atom probe, focused ion beam and other equipment in MaCS.

"The idea of being able to run my own samples, collect the data and analyzing them is very appealing," Ellis said. "I don't know of any other place with this equipment that will let me do that. It's very unique."

Hester said CAES plans to offer summer courses again next year.

"The feedback we got from participants was very positive," he said. "We're already thinking about topics for next year."

CAES Distributes \$10,000 in Scholarships

By Kortny Rolston, CAES Communications

Eight Idaho National Laboratory interns are returning to school this fall with scholarship money to help pay for tuition, fees and other educational expenses.

Seven students received \$1,000 awards and one received \$3,000 through a scholarship program offered by the Center for Advanced Energy Studies (CAES).

The winners were announced August 10 during the INL intern poster session held at CAES.

This is the fourth year CAES has awarded scholarships to interns. It started the program to help fulfill its mission of increasing the number of students entering the energy field.

Since 2008, CAES has given out \$42,000 in scholarships.

“Our goal is to influence young people to pursue careers in energy-related fields, whether it’s in energy policy or nuclear engineering,” said Oren Hester, CAES deputy director. “CAES is proud of the role it plays in helping students fulfill their dreams.”

Recipients were selected based on the work they completed during their internships and on a brief essay describing their career interests and the energy challenges the nation and world face.

This year’s \$3,000 scholarship winner is Ellen Roybal, an ecological economics major at Rensselaer Polytechnic Institute.

This year’s \$1,000 scholarship winners are:

- McKay Graybill, a computer science major at Boise State University
- Brandi Grover, a general studies major at Idaho State University
- Sabrina Ireland, a nuclear engineering major at Oregon State University
- Timothy Kremer, a chemical engineering major at Ohio State University
- Callan McGriff, a civil engineering major at University of Idaho
- Jessica Paul, a nuclear engineering major at University of Florida
- Dane Sterbenz, a nuclear engineering major at Idaho State University

Intern Discovered Career Path at INL

By Kortny Rolston, CAES Communications

Throughout high school and most of college, Ellen Roybal planned to become a teacher.

By the end of her junior year at the College of Idaho, the economics and political science major was well on her way. She had completed nearly all of the education classes required to teach and even landed an internship at Idaho National Laboratory through a program for soon-to-be teachers.

“For years, that’s all I wanted to do,” she said.

Then she interned at INL.

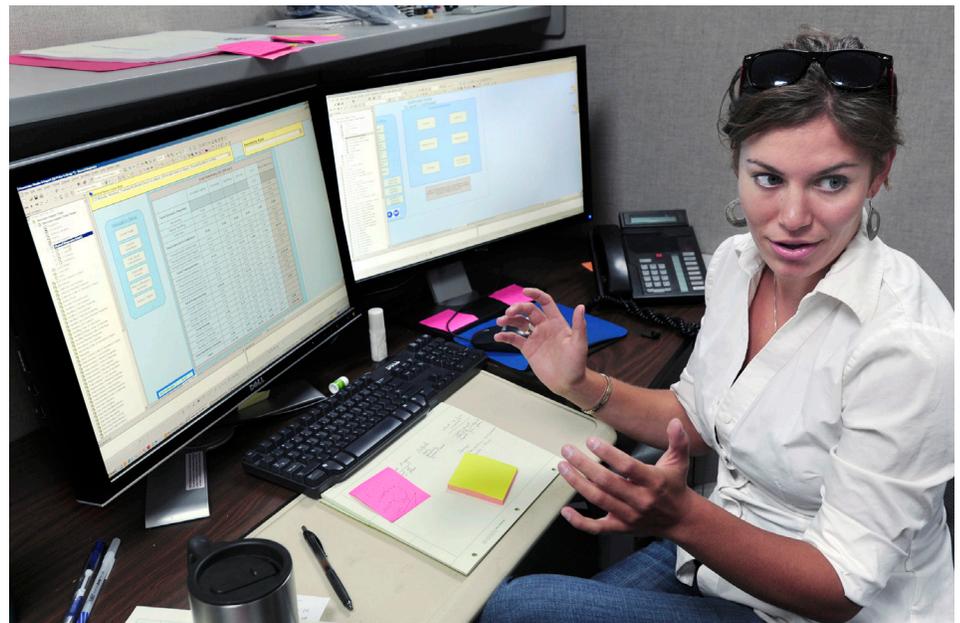
While working on a biomass cost/benefit simulation project with mentor, Jacob Jacobson, Roybal became interested in energy policy and renewable energy.

When she returned to school that fall, she took an ecological economics course and was hooked.

“I loved it,” she said. “It was just so interesting to me.”

Roybal is now earning her master’s degree earned in ecological economics at Rensselaer Polytechnic Institute in New York.

The Idaho Falls native has returned to INL every summer to work with Jacob-



son on a computer model that evaluates the costs and logistics of a biofuel supply system.

“If someone wants to harvest a certain crop in a specific area and get it to a refinery, this program will help,” she said. “The computer model shows what it is going to cost to get there.”

Once she completes her PhD, Roybal plans to continue working with renew-

able energy - one reason she was selected to receive a \$3,000 scholarship from the Center for Advanced Energy Studies. (CAES provides a \$3,000 scholarship and seven \$1,000 scholarships to INL interns who plan to work in the energy field.)

“Every year I’ve learned more about what I want to do in my career,” Roybal said of her internships at INL.



Research Project Taking on Transmission Line Siting

By Kortny Rolston, CAES Communications

When it comes to siting a transmission line, using GIS mapping technology to draw a route that avoids geographical obstacles like a national park or river is fairly simple.

Getting the public to buy into a proposed route, however, is much harder. That's why Center for Advanced Energy Studies (CAES) researchers are creating a new software program that merges public opinion about transmission lines with GIS technology.

Known as LineSiter, the program's goal is to reduce public friction over new transmission lines and the amount of time it takes for new routes to be approved and built.

"Siting a transmission line can be a long, arduous and expensive process," said David Solan, a Boise State University researcher who leads the CAES Energy Policy Institute. "It now takes eight to 10 years to site and build a transmission line. We think this program will be a very

useful tool and will save utilities – and ultimately ratepayers – time and money."

Solan and Daniel P. Ames, a CAES researcher from Idaho State University who specializes in GIS technology, started working on the project two years ago. (It is being funded through a CAES program that provides seed money for innovative research projects.)

Solan and his team at the Energy Policy Institute have spent much of that time developing questions and surveying 600-plus people in southern Idaho about their views on transmission lines and where they should be located.

It is that information, he says, which sets the LineSiter program apart.

While there are GIS programs that compute the least expensive route based on the actual costs of navigating terrain, LineSiter is the first to account for both cost and social attitudes.

In addition, the CAES program is based on real social data, which Solan believes

is the first of its kind collected for such a project.

"As far as I know, we're the only team building a program like this using actual data based on surveys and how people responded," he said.

LineSiter is based on a free and open source geographic information system programming library called DotSpatial that was developed at ISU with the help of international volunteers.

Ames and his team have been working on the algorithms and framework necessary to incorporate the survey results. They will spend the next year refining the open-source LineSiter program, which evaluates spatial and social data and then run calculations to determine a route.

"It basically identifies areas as hot and cold and then finds the safest areas in which to build a line," Solan said.

Solan has wanted to create a program like LineSiter since working for a Con-

gressional energy committee during the early 2000s.

It was there that he first he saw how controversial energy projects can be. He watched public opposition kill several transmission projects, including one in which a developer had spent millions siting

He concluded the public's views need to be incorporated into a project at the beginning, not after a proposed route has been identified.

"Once a project reaches a certain point, you can't go back and fix it. It costs too much money," Solan said. "You are better off addressing it on the front end rather than be delayed."

He believes LineSiter can help engineering firms and utilities do that.

"This is a great way to complement the engineering and technical studies to

develop possible paths," he said. Of course, the developer still needs strong outreach to engage specific communities to get the project done."

Once the open-source LineSiter program is complete, the public will have access to it.

Solan and Ames believe it will become a useful tool for utilities, especially those in the intermountain West whose residents may harbor similar views as those his team surveyed. (Utilities in other regions

would be able to use the survey questions to gather their own social data.)

In the West alone, there are more than 30 high priority lines that need to be constructed to meet demand, and government mandates for renewable energy.

"Would it work in Maryland? We don't know," Solan said. "But we think it would work in Colorado, Montana and Wyoming. We think it is pretty transferable to anywhere in the intermountain West."

For More Information

Go to www.linesiter.com or visit the CAES Energy Policy Institute at <http://epi.boisestate.edu/>.

University of Idaho professor recognized by magazine

By Kortny Rolston, CAES Communications

Kevin Van Den Wymelenberg, an assistant professor at University of Idaho, was one of 40 Treasure Valley professionals under the age of 40 recognized recently by the Idaho Business Review. Van Den Wymelenberg, an architect, directs UI's Integrated Design Lab in

Boise and is part of the CAES Energy Efficiency Research Initiative (CEERI). Van Den Wymelenberg's research focuses on energy efficiency. His design team has worked on more than 200 projects to improve energy efficiency in buildings.

The magazine's 2011 "Accomplished Under 40" were nominated and chosen by a panel of their peers. The 10-member selection panel evaluated nominees on their professional accomplishments, leadership skills, community involvement and long-term goals.



CAES Professors Land Nuclear Energy Research Projects

By Kortny Rolston, CAES Communications

The U.S. Department of Energy has awarded Idaho's three research universities more than \$3.1 million to conduct nuclear energy research.

Idaho State University won two awards and University of Idaho received one of the 51 projects DOE funded this year through its Nuclear Energy University Program (NEUP). Also, researchers from UI and Boise State University are collaborators on winning projects led by researchers at other schools.

Idaho State University received:

- \$800,000 for a project titled "Plasmonically Cloaked and Metamaterial Neutron Scintillators." The principal investigator is Eric Burgett, an ISU professor affiliated with Idaho National Laboratory and CAES. The project focuses on developing advanced radiation detectors.
- \$1,199,990 for a project titled "In-Pile Instrumentation Multi-Parameter System Utilizing Photonic Fibers and Nanovision." Burgett is the principal investigator for the project, which involves measuring fuel inside nuclear reactors. Michael Lineberry, an ISU professor and CAES researcher is a collaborator on the project.

University of Idaho received:

- \$400,000 for a project titled "Innovative Elution Processes for Recovering

Uranium from Seawater." The principal investigator is Chien Wai, a UI professor associated with CAES. The project is focused on researching methods to recover uranium from seawater.

- \$175,000 for its work on a project titled "Developing the User Experience for a Next Generation Nuclear Fuel Cycle Simulator," led by the University of Wisconsin-Madison. Robert Hiromoto, a UI professor and CAES researcher, is collaborating on the project.
- \$299,912 for its work on a project titled "Cavity Cooling System with

Air Development of Advanced High Uranium," led by the University of Wisconsin-Madison. Akira Tokuhiko, a UI professor and CAES researcher, is collaborating on the project.

Boise State University received:

- \$377,232 for its work on a project titled "Development of Advanced High Uranium Density Fuels for Light Water Reactors," led by the University of Wisconsin-Madison. Darryl Butt, a BSU researcher and CAES associate director, is collaborating on the project.



CAES team to lead solar energy siting project

By Kortny Rolston, CAES Communications

The U.S. Department of Energy has awarded a CAES research team \$2.8 million to build a software tool to help developers identify locations for large-scale solar energy farms.

The project is part of the federal Sunshot Initiative, which seeks to increase the use of solar energy by making

utility-scale solar systems more economical. One of the barriers is finding a site that can accommodate hundreds of solar array panels.

"Siting is a huge issue for energy projects and solar is no different," said David Solan, director of the CAES Energy Policy Institute and the lead researcher

on the project. "There's a real need for a tool like this."

Solan and his team will evaluate environmental, land use, public opinion and other factors to build the software tool. It will be similar to Linesiter, a transmission line siting program the team is already building.

Q&A with Bill Rogers

By Kortny Rolston, CAES Communications

In May, J.W. "Bill" Rogers, Jr. took over as director of the Center for Advanced Energy Studies, a research and education partnership between Boise State University, Idaho National Laboratory, Idaho State University and University of Idaho.

Rogers has been at INL since 2005. Before moving to CAES, he managed the lab's Energy and Environment Science & Technology Directorate.

Though he has only been at CAES for a few months, Rogers is no stranger to the center or the research partnership model. He helped develop the concept for CAES while working on the bid team for Battelle Energy Alliance, which operates INL for the U.S. Department of Energy.

Rogers also served as director of the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL), a national scientific user facility at Pacific Northwest National Laboratory (PNNL) and worked with a National Science Foundation industry/university research cooperative at the University of Washington.

What are you looking forward to most about working at CAES?

One of things I am looking forward to is developing close ties with our university partners. I used to be in academia and there are pieces of it that I still really miss like working with students. I am working with University of Idaho to become an affiliate professor of chemical engineering and want to do the same at the other two universities so I can work with graduate students on their research.



I'm also looking forward to fully maturing our research initiatives developing more collaborations with industry.

What are your goals for CAES?

CAES has been very successful and I want to keep building on that. In fact, CAES is the only center of its kind that has been successful within the DOE complex.

I think CAES plays an important role within the state. It's a way for the universities, industry and government agencies in the state to work with INL and have full and transparent access to this multibillion dollar national asset. This isn't always easy to do and my goal is to make that access easier.

What is the biggest challenge facing CAES?

One of our biggest challenges is getting our legal foundation in place. We've been operating under a memorandum of agreement that was put in place a few years ago. We need to become a formal, legal entity and all of the CAES partners are working on what that will be.

Another challenge is making sure that CAES is financially sustainable. To do that, I think we need to work with industry and form research partnerships. That was a key part of the research center I worked with at the University of Washington.

What do you like best about working at CAES?

I like the research atmosphere here, the participation from all the partner institutions and the large cohort of students who work in the building. It's fun having them here and their presence really conveys that CAES is a research and education partnership.

Be our friend

We recently launched a Facebook page to help keep our friends and fans updated on what's happening at CAES. Check it out at www.facebook.com/CenterforAdvancedEnergyStudies and become our friend.

To submit story ideas or other information for upcoming CAES newsletters, please send an e-mail to Kortny.Rolston@inl.gov.