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U.S. DEPARTMENT OF  
**ENERGY** | Energy Efficiency &  
Renewable Energy

# *Amped Up!*

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**EFFICIENCY**

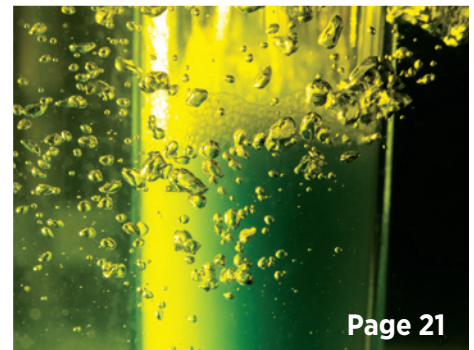
*Saving America Time, Money and Energy*





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## A Message from Dave



Dear EERE Family,

This edition highlights the latest and most exciting work going on in the Office of Energy Efficiency and Renewable Energy (EERE), with a special emphasis on efficiency. As our Deputy Assistant Secretary for Energy Efficiency Kathleen Hogan always reminds us, the cheapest clean energy is the energy you *don't* use.

One of the most impactful activities we have in efficiency is our Appliance and Equipment Standards Program within our Building Technologies Office. In 2013, President Obama set an ambitious goal in his Climate Action Plan for EERE to reduce U.S. greenhouse gas emissions by 3 billion metric tons by 2030 through energy efficiency standards. This truly bold goal is equivalent to removing 632 million cars from America's roads for a whole year.

With the finalization of 40 new or updated efficiency standards so far during this administration, we are now more than three-fourths of the way to this target. We have already achieved a reduction of an estimated 2.3 billion metric tons toward our 3 billion metric ton goal. This is an amazing accomplishment, made possible by the tremendous leadership and hard work of our appliance standards team. By 2030, standards issued since 2009 will save consumers \$540 billion on their utility bills. While we still have extensive work to do in 2016 to achieve the president's goal, I'm very confident in our team's ability to get the job done.

This is just one of many of outstanding results EERE is achieving in the efficiency space.

Our research and development initiatives have solidified the United States as a global leader of light-emitting diodes (LED) innovation, with costs dropping 90% since 2008 as a result of our industry partnerships. Installations of LED bulbs increased exponentially in the United States from 400,000 in 2009 to 78 million in 2014. We are also on the forefront of a major shift toward high-efficiency, low-global-warming potential technologies, working with industry partners, like Honeywell where we are working to commercialize more efficient refrigerants for supermarkets.

Our market adoption work has seen enormous efficiency gains in upgrading the energy performance of federal facilities through the expertise of our Federal Energy Management Program (FEMP). In this issue, FEMP Director Tim Unruh highlights how his office has led the federal government in attaining bold sustainability goals.

You will also find an overview of some of our Advanced Manufacturing Office's (AMO) exciting new activities focused on making our manufacturing sector more efficient. This includes our new efforts in smart manufacturing from a new member of Team EERE, Sudarsan Rachuri, one of the nation's leaders in this exciting new field. *Amped Up!* also profiles AMO's new High Performance Computing for Manufacturing initiative and much more.

We still have a long way to go before we can declare success on fully meeting our national clean energy and efficiency goals. But given the results we see each day at EERE, I am as optimistic as ever about our path ahead.

Enjoy the read!

*Dave*

Amped Up is a bimonthly newsletter on the latest developments within EERE and is brought to you by EERE's Communications Office; do not cite or release without prior approval. If you have any suggestions or comments about what you would like to see in this newsletter, please contact [eeAmpedUp@ee.doe.gov](mailto:eeAmpedUp@ee.doe.gov).



# Appliance Standards: Saving Consumers Energy and Money



With warmer weather on the way, air conditioners will soon be set to full blast. That typically would blow out most people’s energy bills, but now more and more Americans are saving energy and money thanks in large part to efficiency standards developed by EERE’s [Appliance and Equipment Standards Program](#).

Today’s air conditioners use 50% less energy than they did in 1990, contributing to the average American household saving around \$320 per year on energy bills.

The standards program is saving consumers \$63 billion a year while avoiding carbon dioxide

emissions equivalent to nearly 50 million automobiles. The program tests, sets, and helps enforce minimum efficiency levels on more than 60 U.S. products that are mandated by Congress and benefit American households.

These products cover more than 90% of home energy use, 60% of commercial building energy use, and 30% of industry energy use. They include items such as light bulbs, kitchen appliances, laundry equipment, and heating and cooling systems. By setting and reviewing standards every six years, the program is helping to improve the most popular products used at home and at work.

“This program gets consumers value without sacrificing performance,” said John Cymbalsky, program manager for the Appliance and Equipment Standards Program. “By removing inefficient appliances from the market, it not only saves energy but also improves innovation from the manufacturers by focusing research and development on making products more efficient with more consumer-friendly features and similar performance.”

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*New refrigerators use a quarter of the energy they used in 1973 and offer 20% more storage capacity for half the price.*

Since 1990, innovation has increased efficiency in a number of common household appliances:

- **Washing machines** – 70% less energy
- **Dishwashers** – more than 40% less energy
- **Furnaces** – roughly 10% less energy.

The standards program worked with the Federal Trade Commission to make it easier for consumers to identify highly efficient products by creating yellow [EnergyGuide labels](#) for those appliances. It also provides technical support and product verification testing to the Environmental Protection Agency’s [ENERGY STAR®](#) program.

While more efficient products may cost a little more upfront, they save money over time through lower energy bills. And, as more people upgrade to new appliances, they can expect to save nearly \$460 annually by 2030.

## SUPPORTING THE CLIMATE ACTION PLAN

The standards program is a pillar of President Obama’s [Climate Action Plan](#), announced in 2013 to combat climate change. Since that time, EERE has finalized standards for 21 products, including a record-breaking rule for commercial air conditioners and furnaces in December 2015. These new standards are expected to save businesses \$167 billion on their utility bills and reduce carbon pollution





by 885 million metric tons—more than any other standard issued to date.

With these standards in place, EERE is now more than three-fourths of the way to achieving the Climate Action Plan’s carbon reduction goal of 3 billion metric tons by 2030—equivalent to nearly half of the carbon pollution from the entire U.S. energy sector for one year.

### MORE THAN JUST STANDARDS

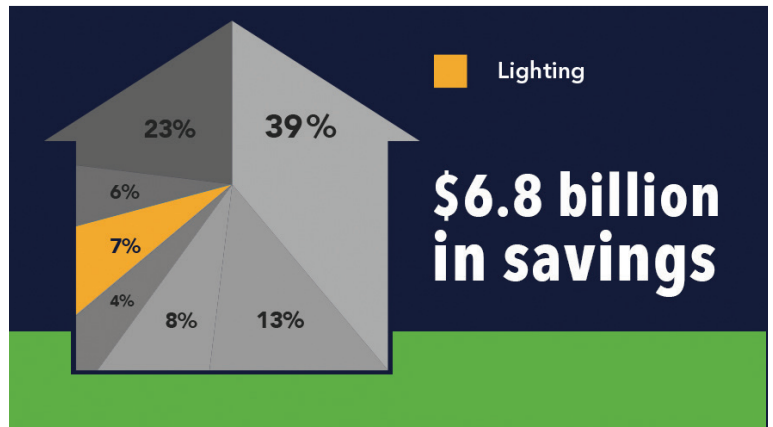
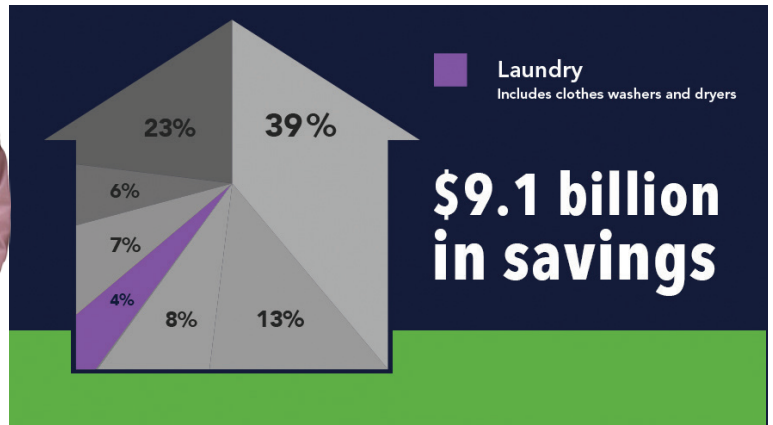
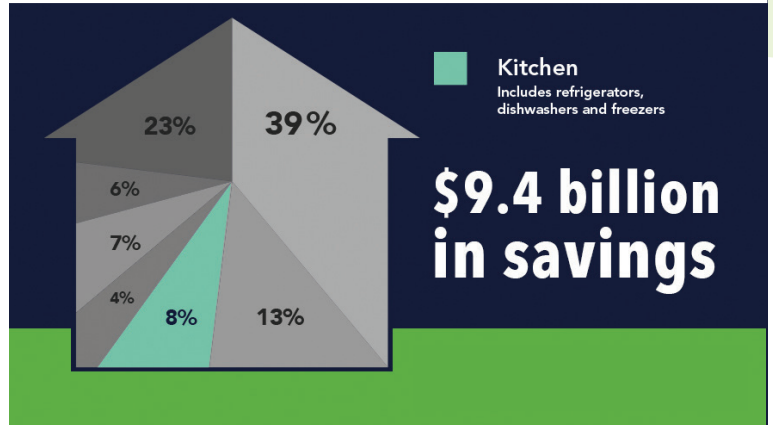
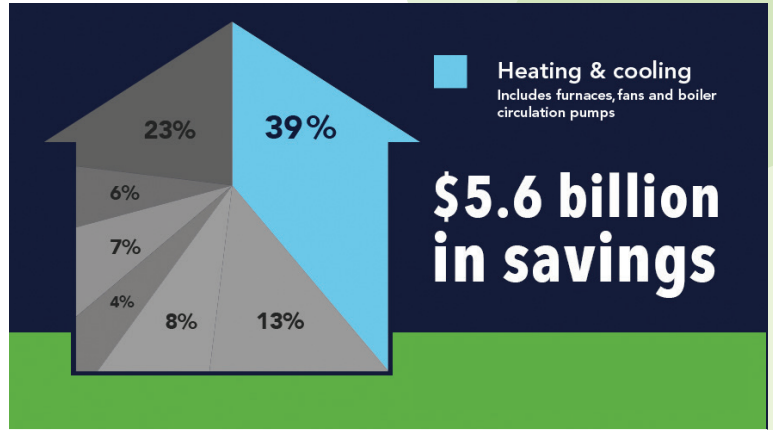
Authorized by Congress in 1975, the Appliance and Equipment Standards Program works with manufacturers and other stakeholders to set and periodically update all standards and test procedures. Developing a new test procedure can take up to three years to complete and is an important tool in creating a level playing field for all manufacturers, and to keep the industry honest – protecting the consumer from inefficient products.

The standards program, in conjunction with Energy Department General Counsel, also actively enforces each standard to ensure compliance. Manufacturers, including importers and private labelers must test, rate, and certify their products prior to distribution for commerce in the United States and are subject to fines for not meeting compliance.

“It means quality and it means value,” said Cymbalsky. “We are making sure that the American consumers who are buying these products are getting what they expect.”

“At the end of the day, this program is saving real people, real money without compromising what people expect to get out of their appliances.”

- John Cymbalsky



## Ready, Set, Swap Better Buildings Plans Energy Audit Sequel

Bring together business leaders keen to find deeper energy cost savings, sprinkle in a friendly competition, and what do you get? The first [Better Buildings Challenge SWAP](#), where Hilton Worldwide and Whole Foods Markets traded energy management teams to uncover energy savings in each other's buildings in San Francisco, California.

The teams walked-through two very different buildings—Hilton San Francisco Union Square, a 1.8-million-square-foot hotel, and Whole Foods Ocean Avenue, a 25,600-square-foot grocery store—and covered everything from lighting, HVAC, and energy management systems to customer and employee engagement.

The outcome? Hilton and Whole Foods identified new technologies and processes that should lead to big energy cost savings. They also found a way to engage their employees—and

thousands of others—through a reality-style series of web videos dubbed Season 1 that tracked the energy audit and progress of the teams. The webisodes proved that collaboration can lead to solutions across industry sectors, saving energy and improving bottom lines.

“By and large, solutions that are used by one organization can be used broadly throughout the market,” said Maria Vargas, director of the Better Buildings Challenge. “The SWAP was about unearthing and understanding those truths, and finding partners to work with to make it engaging. The episodes on the partners and their findings move things out of a very technical discussion into a company-wide, organization-wide management objective. And that’s where it’s important to get energy efficiency in play.”

The Better Buildings Initiative stems from President Obama’s 2011 push to

cut building energy costs by 20% or more. Today, more than 285 partners are working with EERE to achieve 20% portfolio-wide energy savings over the next decade. Across the country, private and public sector organizations have shared progress on more than 32,000 properties as well as the strategies they are using to achieve their savings.

One of the ways these partners share best practices is through the online Better Buildings Solutions Center. It offers energy savings resources including showcase projects for a variety of building types and sizes, along with implementation models (or partner playbooks), case studies, guides, and technical reports to optimize building energy efficiency. It also allows users to easily find information based on topics relevant to them by location, technology, organizational barrier, sector, and more.



“The episodes on the partners and their findings moves things out of a very technical discussion into a company-wide, organization-wide management objective. And that’s where it’s important to get energy efficiency in play.”

- Maria Vargas





*Better Buildings Director Maria Vargas talks efficiency with Hilton Worldwide and Whole Foods' energy management teams.*

With the solutions center a cornerstone of Better Buildings' work, key questions for the team involved how to motivate partners and connect organizations to the center. Better Buildings saw companies taking steps such as offering opportunities where outside organizations could see what they were doing to improve efficiencies. Against this backdrop, the team chewed over a bunch of ideas and the SWAP got its start.

One of the most important lessons from the SWAP is that sharing solutions face-to-face is a highly effective way for companies to learn from one another, even if they have vastly different operations and facilities. For instance, the Whole Foods team sug-

gested that the hospitality giant request hotel guests' permission for staff to turn down thermostats when rooms are unoccupied. The Hilton team recommended lighting fixes that could net up to 50% energy savings at Whole Foods' Ocean Avenue store.

Hilton has already started implementing recommendations from Whole Foods including LED lighting upgrades, door gasket replacements, and a phase-out of less efficient appliances within refrigerated containers. Whole Foods is exploring simple lighting fixes, refrigeration savings through doors on cases, and heat recovery improvements that could yield energy savings at its Ocean Avenue store. Plans for

the next SWAP are underway and will be announced at the Better Buildings Summit, May 9-11 in Washington, D.C.

The Better Buildings team was exploring a host of options for the next SWAP. They include focusing on teams from one industrial sector, focusing on a particular city, or an energy audit team exchange involving federal facilities.

Stay tuned!

## BETTER BUILDINGS SUMMIT AROUND THE CORNER

The [2016 Better Buildings Summit](#) will be held May 9-11 in Washington, D.C., bringing together hundreds of energy professionals from private and public sector organizations to share best practices and explore ways to cut energy intensity in their buildings portfolio-wide by 20% over the next 10 years.

The event will feature 250 speakers presenting on topics such as financing, organizational strategies, high impact technologies, and data-driven decision making at sessions throughout the summit.



*Team Hilton inspects Whole Foods Market's roof fan*

## New Tool to Track States' Energy Efficiency Savings



*Amy Royden-Bloom,  
State Energy Program Manager*

The [State Energy Program](#) (SEP) competitive awards are spurring progress across more than 30 states in building retrofits, wastewater treatment improvements, alternative financing, and other areas. Some of these projects support multi-state collaborations advancing regional or national solutions. One example is the National Energy Efficiency Registry (NEER), a nationwide, web-based platform that will allow states to transparently track energy efficiency data.

Currently, there is not a nationwide system in place for tracking energy efficiency projects. Businesses, for example, can calculate changes in energy use over time, but are rarely able to attribute savings to specific upgrades. NEER would give states this opportunity—and the ability to aggregate energy efficiency program results—by standardizing project outcomes and how they are tracked.

“This registry has the potential to catalyze even more energy efficiency savings by standardizing the process by which energy efficiency is measured and makes the process transparent, thus increasing the confidence in the amount of energy savings achieved by those measures,” said Amy Royden-Bloom, SEP manager.

Through an \$800,000 SEP competitive funding award, Tennessee is collaborating with state energy offices in Georgia, Michigan, Minnesota, Oregon, and Pennsylvania to develop a framework that maps out how NEER would be used and what information it would capture. The Climate Registry (which [uses a similar format](#) to capture carbon data) and the National Association of State Energy Officials are supporting the effort by drafting the initial operating rules and facilitating stakeholder engagement. States are currently developing a steering committee and recruiting stakeholders to eventually help finalize the framework and processes.

“This project involves a wide spectrum of organizations,” said Royden-Bloom. “Six states, the association representing all state and territorial energy offices, and The Climate Registry are working to improve energy efficiency accounting so that energy efficiency is better valued in the market.”

After the policies and protocols are complete, a software developer would then create the NEER tool, which is expected to be available for states to use by 2018. Once up and running, the registry will help lower administrative costs associated with state energy efficiency programs, streamline energy efficiency project evaluation, measurement and verification processes, avoid double counting of energy savings, and create greater transparency of energy efficiency programs and impacts.

The SEP is part of EERE’s [Weatherization and Intergovernmental Program Office](#). It provides funding to all U.S. state and territory energy offices to help them develop plans and deploy energy efficient technologies.





# FEMP Provides Energy Leadership to Nation and Beyond

The [Federal Energy Management Program](#) (FEMP) is helping more than 50 federal government agencies—together the nation's largest energy consumer—meet aggressive clean energy and sustainability goals, and tremendous progress is being made:

- Building energy use is 45% less than 40 years ago
- Eight percent of building-related energy comes from renewable resources
- Carbon emissions are 17% lower than in 2008 in support of the Climate Action Plan.

With an eye on the agencies' 2025 goals, FEMP is fielding initiatives on renewable procurement, third-party financing, and improving the expertise of the federal workforce. The following initiatives are excellent models that other government and private sector entities can use to increase their efficiency.

## MEASURING POTENTIAL OF RENEWABLE ENERGY TECHNOLOGIES

Federal agencies can approach their 30% by 2025 renewable energy targets by using FEMP's [Renewable Energy Optimization](#) (REopt) tool to examine their inventories of real property. It calculates energy use and cost at each site, and obtains and interprets local renewable energy resource information to identify and prioritize cost-effective sites.

## TRAINING THE FEDERAL WORKFORCE

FEMP offers state-of-the-art, accredited online and in-person [training](#) to foster and maintain a high-performance workforce to construct, operate, and maintain facilities. Many of these courses are available to the public at no cost, with topics ranging from renewable energy technologies to contracting and financing for projects.

## MAKING PERFORMANCE CONTRACTING BUSINESS AS USUAL

Under the Presidential Performance Contracting Challenge, the federal government has awarded more than \$2.5 billion in [performance contracts](#). These allow federal agencies to procure energy savings and facility improvements with no upfront capital costs or special appropriations from Congress. In conjunction with [Lawrence Berkeley National Laboratory](#), FEMP also recently created [eProject Builder](#) (ePB), a cutting-edge tool that standardizes the collection, calculation, and reporting of performance contract data.

## GREENING DATA CENTERS

In order to reduce data center energy use, FEMP spearheaded the [Better Buildings Data Center Challenge and Accelerator](#) to engage federal agencies, national laboratories, and the private sector to improve data center efficiency 20% to 40% by applying cost-effective energy efficiency measures and strategies.

As the federal government continues to lead by example, FEMP will continue to offer innovative and progressive programs in energy and sustainability management and provide best practices and solutions to our nation and beyond. Additional information on these initiatives can be found on [energy.gov](#).

-Dr. Timothy Unruh, director, Federal Energy Management Program





## Rachuri To Head Up New Smart Manufacturing Institute

With the creation of the new Smart Manufacturing Institute on the horizon, the [Advanced Manufacturing Office](#) (AMO) is bringing world-class talent in to the lead the way.

Sudarsan Rachuri, an industrial engineer whose background spans academia and 20 years at the National Institute for Standards and Technology (NIST), will oversee the new smart manufacturing facility that calls for up to \$70 million in federal investment along with private funding. It's one of the cornerstones of EERE's efforts to accelerate innovation and U.S. competitiveness in manufacturing.

"Institutes like this help develop the technologies crucial to compressing America's manufacturing innovation cycle and address cross-cutting challenges in advanced manufacturing," said Rachuri, AMO's new federal program officer.

Smart technologies such as advanced sensors, controls, platforms, and modeling can help U.S. manufacturers capture, share, and process data in real-time. This leads to improved processes, equipment reliability, and higher productivity gains at a reduced cost. More efficient processes also mean less waste and fewer greenhouse gas emissions. The Smart Manufacturing Institute will support research and development efforts in these areas to reduce deployment costs for smart technologies by as much as 50%, in addition to helping train the next generation workforce on these advancements.

"Working with public and private sector partners on advanced sensing and instrumentation; process monitoring, control, and optimization; and advanced hardware and software platforms will help businesses across the spectrum, including small- and medium-sized manufacturing enterprises," Rachuri said.



*Sudarsan Rachuri -  
AMO's new federal program officer*

By furthering smart manufacturing technologies with broad applications, the institute will also support the administration's effort to double U.S. energy efficiency by 2030. It will be the third EERE-funded institute and is part of President Obama's [National Network for Manufacturing Innovation](#) (NNMI). The president envisions an initial network of up to 15 institutes that would grow to 45 over 10 years.

Each institute is a private-public partnership that serves as a regional hub, bridging the gap between applied research and product development by bringing together federal agencies, companies, universities, and other institutions to invest in key technology areas that encourage investment and production in the United States.

Through the [Clean Energy Manufacturing Initiative](#), the EERE has already established two innovation institutes in the areas of power electronics and advanced composites. It has also established two new high-impact manufacturing demonstration facilities with the national laboratories that are focused on additive manufacturing and high-performance computing power.



## Super Computing Shrinks Production Time for U.S. Industry

With five of the top 12 high-performance computing systems in the world, EERE is harnessing the power of the national laboratories to address the nation's manufacturing challenges.

The [Advanced Manufacturing Office](#) recently announced \$3 million in second-round funding for select U.S. companies to participate in its [High Performance Computing for Manufacturing](#) (HPC4Mfg) Initiative. The project enables private sector companies to use high-performance computing resources at the Energy Department's national labs. Ten projects started in February as manufacturers began using the labs' modeling and simulation technology to reduce production costs and shorten technology-to-market duration.

Led by [Lawrence Livermore National Laboratory](#) (LLNL) in partnership with the [Oak Ridge](#) and [Lawrence Berkeley national laboratories](#), HPC4Mfg got its start last year with four

“seedling” projects. One of those included Soraa Incorporated, a California-based company that lacked the computational capability to accurately model its proprietary crystal growth process for manufacture of gallium nitride wafers. By partnering with LLNL, Soraa gained access to supercomputing capability for development of a model combining computational fluid dynamics and chemistry to predict crystal growth rates and production yields.

“Each experiment costs tens of thousands of dollars and takes at least a week, involving 10 people to run,” said Soraa's Rajeev Pakalapati, senior director of GaN Operations. “They are extremely expensive and time-consuming experiments.”

According to Pakalapati, this work can shave significant development time by eliminating years of trial-and-error experimentation from future scale-up activities. An accurate crystal growth model should cut

a three-year process development time to half a year in future scale-up.

Soraa's GaN wafer technology will enable a range of new devices from LED bulbs to power switching devices that have a lower energy consumption and a longer life, thus reducing electronic waste, lowering the carbon footprint, and benefiting the American consumer.

“We are thrilled with the response from the U.S. manufacturing industry,” said LLNL Mathematician Peg Folta, the director of the HPC4Mfg program. “This program lowers the barrier of entry for U.S. manufacturers to adopt high-performance computing.”

The HPC4Mfg Initiative is a key piece of EERE's [Clean Energy Manufacturing Initiative](#) to put high-performance computing at the national labs to work on modeling, simulating, and analyzing cutting-edge industrial products and processes. Fifteen projects are currently underway with funding totaling nearly \$4.5 million.

## Small Business Vouchers Pave Way for U.S. Start-Ups

American small businesses now have a fighting chance to make a big impact in clean energy. Through EERE’s [Small Business Vouchers](#) (SBV) pilot, 33 small businesses are gaining access to outstanding resources at nine national laboratories to help move their innovative ideas and technologies closer to the marketplace.

Skysun LLC, a start-up from Bay Village, Ohio, is one of 12 companies using national lab capabilities for the first time. It’s working with [Sandia National Laboratories](#) to perform systems modeling on its prototype for a ganged heliostat—an array of movable mirrors controlled by a single device used to reflect sunlight in a fixed direction.

“The SBV pilot will let us collaborate with Sandia’s world-renowned solar researchers,” said Skysun President Jim Clair.

“That would normally be beyond the reach of a start-up like us. This teamwork



Zack Baize, Allegheny Science & Technology contractor lead supporting SBV pilot

will dramatically accelerate our technology’s acceptance and deployment into the marketplace.”

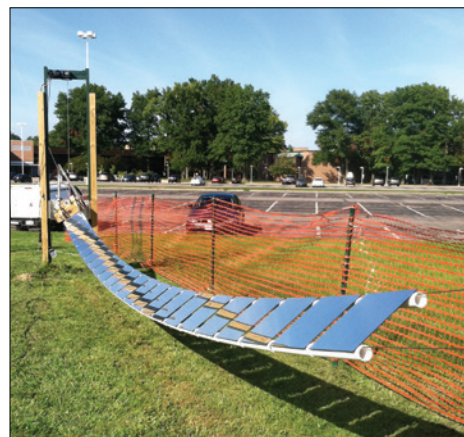
According to the Small Business Administration, small businesses like Skysun produce more than 15 times as many patents per employee as larger firms. The SBV pilot taps into this market by giving American companies access to capabilities found only at the Energy Department’s national laboratories.

“Small businesses are really the backbone of our innovation ecosystem,” said Zack Baize, senior energy policy analyst. “That’s really where these cutting-edge innovations come from. If we don’t engage with the small business community, then we’re really leaving a lot on the table.”

The \$20 million SBV pilot is part of EERE’s National Laboratory Impact Initiative, which aims to accelerate the commercialization of national lab research. SBV awarded its first round of selections in March to 33 small businesses. Voucher funding, ranging from \$50,000 to \$300,000, provides lab access to advance clean energy innovations in transportation, renewable power, and energy efficiency.

“The labs have unique and specific capabilities that are, at times, difficult for the private sector to access,” said Baize. “The more problems our labs can help solve, the better.”

A second round of vouchers is now available for American small businesses. Applications and additional resources can be found at [sbv.org](#).



Skysun LLC’s ganged heliostat prototype. Photo/Skysun LLC.

### LAB-CORPS LAUNCHES SECOND COHORT

Fourteen teams from Energy Department labs with innovations in advanced manufacturing, vehicles, and geothermal and nuclear energy joined the ranks of the EERE’s [Lab-Corps](#) initiative to learn how to successfully transition their discoveries into the marketplace. Managed by the [National Renewable Energy Laboratory](#) (NREL), the program launched the second cohort of teams in March on the heels of a successful pilot last fall. Lab-Corps aims to accelerate the transfer of clean energy technologies from the labs to the marketplace by training and empowering national lab researchers to successfully transition their discoveries into high-impact, real world technologies in the private sector. When they graduate on May 5, the 14 teams will join their colleagues from the first round of training in the growing Lab-Corps alumni network.



## Victor Kane Lays Out Lab Impact Initiative Goals

*Victor Kane brings to the job of director of the Lab Impact Initiative hands-on experience helping business and entrepreneurs achieve commercialization.*

*His background includes an engineering-related turn at multinational giant General Electric, a business development/partnership role at solar cell start-up Suniva, and five years at EERE's SunShot Initiative, where he expanded the SunShot incubator program.*

*In an interview with the Amped Up! team, Kane discussed steps he will take to shift the culture at the national labs and build new roads to commercialization.*



### What is the Lab Impact Initiative?

In 2013, we launched the National Lab Impact Initiative to enhance the industrial impact of the national labs in the clean energy sector. The initiative helps American businesses meet their own ambitious targets around renewable energy and energy efficiency by building a more commercially aware and entrepreneurial culture throughout the lab network.

Our three overarching goals are: to increase and enhance relationships between the labs and the private sector, increase and streamline access to our world-class national lab capabilities to enable more businesses and entrepreneurs to take advantage of these resources and expertise, and demonstrate the value of lab-developed science and technology.

### What steps are you are taking to boost collaboration between the national labs and America's top innovators?

We have launched a number of exciting new initiatives, including these innovative pilot programs:

- **Small Business Vouchers (SBV) Program** - provides American small businesses with funding, technical assistance, and access to the lab's state-of-the-art facilities and renowned technical experts.
- **Lab-Corps Program** - empowers lab researchers and scientists with the tools, resources, and relationships necessary to commercialize their innovations.
- **Technologist-in-Residence (TIR) Program** - fosters long-term, lab-industry partnerships by pairing senior lab technical staff with counterparts from large U.S. manufacturing companies to conduct collaborative research. TIR is run by the Clean Energy Manufacturing Initiative and funded by EERE's Advanced Manufacturing Office (AMO).
- **Cyclotron Road** - provides entrepreneurs with seed research funding, lab space, and access to lab resources to help them refine and translate their innovative ideas into commercial products. Cyclotron Road is funded by AMO.

### What are your goals in 2016?

The Lab Impact Summit on May 4 at the National Renewable Energy Laboratory, and continuing to build on the successful Lab-Corps and SBV pilots. At the Lab Impact Summit, we will host 200 representatives from industry, including many that have not worked with the labs before. We'll discuss the successes the labs have been able to generate for other companies, and how companies can work with the labs in the future. During 2016, we also hope to announce follow-on rounds to all the Lab Impact pilots. Stay tuned for more announcements!

## EERE Day Targets MIT's Sweet Spot

EERE Assistant Secretary Dave Danielson engaged with students at the Massachusetts Institute of Technology (MIT) recently to promote the technology innovation accomplishments and new entrepreneurial culture of the Energy Department and its national laboratories. He also encouraged the students to join the vital work of helping the United States transition to a clean energy economy.

In presentations to students, researchers, and faculty members on March 17, Danielson and a group of top EERE program officials outlined the wide array of cutting-edge research and development efforts the organization leads to break down technology and market barriers and develop and deploy emerging clean energy solutions.

EERE leaders told the MIT community that new programs are bearing fruit—including an initiative designed to strengthen collaboration among the Energy Department, its labs, and America's top innovators—creating an entrepreneurial culture focusing on commercialization.

Danielson discussed the critical need for innovation to address the world's clean energy and climate change challenges. He told the students that energy had to be reinvented, and explained that the aggressive climate and energy goals set by the administration demonstrate confidence in the work done at EERE that will continue for years to come.

The visit to the prestigious university in Cambridge, Massachusetts, recognized for fostering tech entrepreneurs and business start-ups, is part of a continued drive to recruit the nation's best and brightest to bring their talents to EERE, an organization at the center of the global clean energy economy.

In his presentation, Danielson hailed EERE as one of the largest enterprises in the world dedicated to renewable energy and efficiency, with nearly \$2 billion invested annually in innovation to solve big energy challenges. The MIT graduate also pointed out the strong alumni ties of Energy Department leadership, including Energy Secretary Ernest Moniz. Danielson, who founded the MIT Energy Club as a student, told the crowd he hoped the students would keep up the tradition.

Other MIT alums on hand for the EERE event were: Mark Johnson, director of the Advanced Manufacturing Office; Patrick Phelan, program manager for emerging technologies in the Building Technologies Office; Johanna Wolfson, director of the Technology-to-Market Program; Brian Walker, senior fellow at the Clean Energy Manufacturing Initiative; and Joyce Yang, former director of the Lab Impact Initiative.



Assistant Secretary Dave Danielson (second from left) shares panel at EERE Day at MIT with Joyce Yang, Johanna Wolfson, Brian Walker, and MIT students.



# Creating a Clean Tech Pipeline of Talent

The Energy Department's [Cleantech University Prize](#) (Cleantech UP) paves the way for entrepreneurs, students and researchers across the nation to jump on the clean energy technology bandwagon – inspiring the next generation workforce of innovators with competitive funding for business development and training.

Cleantech UP builds on the success of EERE's National Clean Energy Business Plan Competition, started in 2011, which saw a slew of student clean energy teams launch businesses and bring new and nascent technologies to market. That competition exposed entrepreneurs to business principles, customer engagement and best practices – drawing more than 1,000 teams – and resulting in more than 70 ventures, 120 new jobs, and \$60 million in follow-on funding.

“The power of our collegiate competitions is that they support technology transfer from universities into legitimate companies,” said Jennifer Garson, director of the Cleantech UP. “Our companies are applying business acumen to real physical products, taking them beyond the lab into marketplace with technologies that consumers can use.”

Announced last summer, the new and expanded Cleantech Up competition calls for eight institutions to host regional, collegiate challenges that award cash prizes. The contests culminate with a final championship in June, growing the nation's pipeline of student clean energy entrepreneurs. Through this expanded avenue, cleantech companies are attracting and retaining top talent. In fact, every year of the competition, Forbes has recognized Cleantech UP competitors in their illustrious 30 under 30 list.



“The power of our collegiate competitions is that they support technology transfer from universities into legitimate companies. Our companies are applying business acumen to real physical products, taking them beyond the lab into the marketplace.”

- Jennifer Garson

## SPURRING START-UPS

Cleantech UP is part of a larger story about how EERE is helping startups. Back in 2011, a California Institute of Technology team competed in the [U.S. Department of Energy Solar Decathlon](#). In the process, they realized that consumers needed an easy way to measure energy consumption in their homes.

By harnessing the data coming off of residential advanced meters, they developed a phone app that syncs with the home's smart meters to help consumers conserve energy. The team joined Cleantech UP and won as runners up at their regional contest, which yielded new connections with investors and a spot in the [Los Angeles Cleantech](#) incubator.

After raising several million dollars in follow-on funding, the team was selected as one of two residential companies to participate in the state of [California's Energy Demand Response](#) program. Ultimately, the new Chai Energy startup leveraged industry engagement into a successful product launch, and today, they have pilots in several states and an opportunity to work with utility partners.

And it all started with student competitions at EERE.

# Solar Decathlon 2017 Moves to the Mile High City

From the steps of the Colorado State Capitol, Under Secretary for Science and Energy Franklin Orr joined Mayor Michael Hancock in March to announce the City of Denver as the next host of the [U.S. Department of Energy Solar Decathlon](#). The 2017 competition will be staged near a future commuter rail station and community complex that is predicted to become a national model for sustainable green field development. Energetics Incorporated, a national energy and environmental consulting firm, will manage the competition.

Sixteen collegiate teams from around the country and across the world have two years to design, build, and operate solar-powered houses that are innovative and highly energy efficient. The houses will be judged in ten distinct



Under Secretary for Science and Energy Franklin Orr announces Denver as next host of the U.S. Department of Energy Solar Decathlon 2017. Photo|Ellen Jaskol

contests, with the winning trophy going to the team that best blends aesthetics and modern conveniences with maximum energy production and efficiency. For the first time, the teams selected will compete for prize money totaling \$2 million.

Solar Decathlon 2017 is the eighth biennial competition since 2002. Previous competitions—held in Irvine, California and Washington, D.C.—have drawn more than 60,000 visitors during the 10-day event.

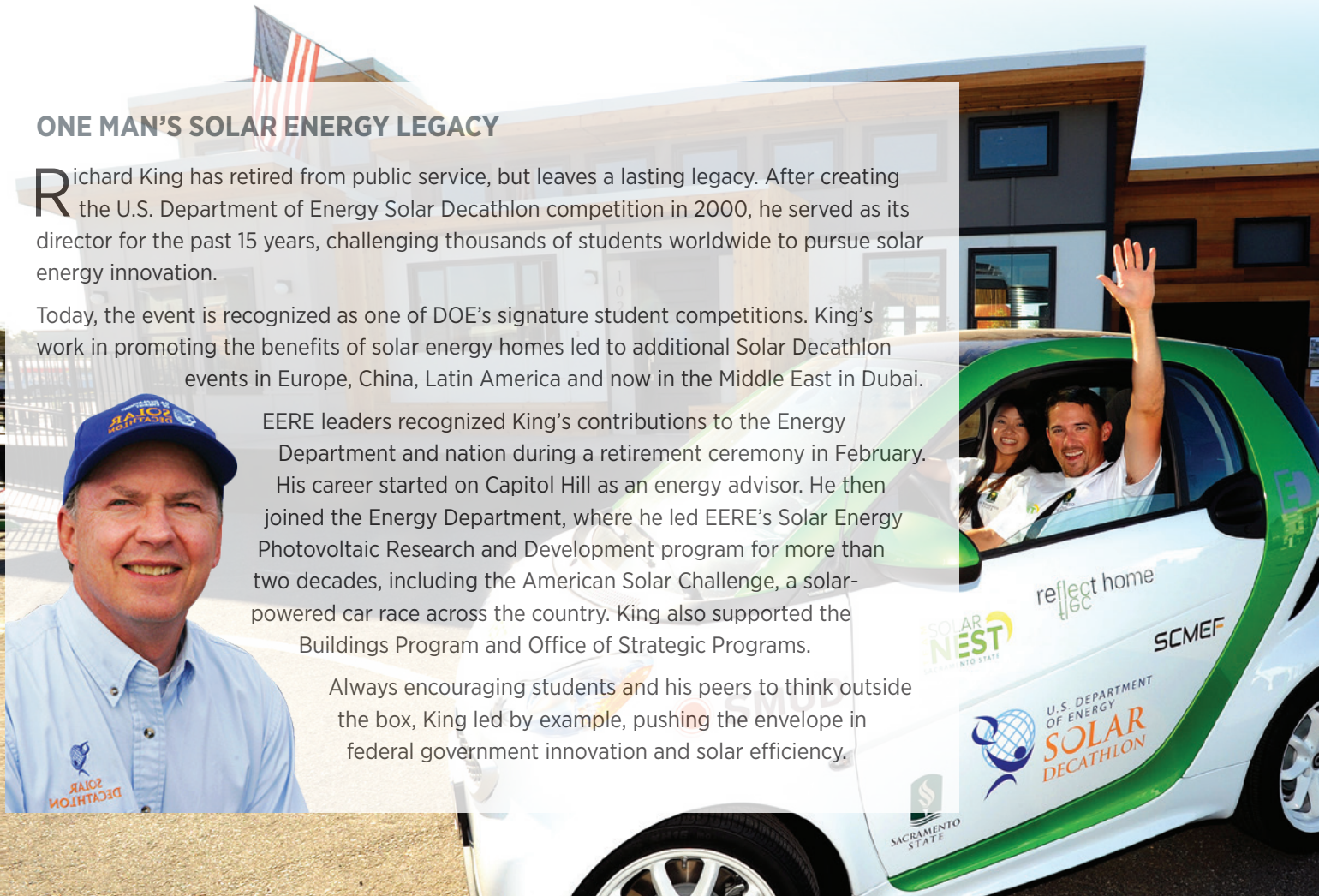
## ONE MAN'S SOLAR ENERGY LEGACY

Richard King has retired from public service, but leaves a lasting legacy. After creating the U.S. Department of Energy Solar Decathlon competition in 2000, he served as its director for the past 15 years, challenging thousands of students worldwide to pursue solar energy innovation.

Today, the event is recognized as one of DOE's signature student competitions. King's work in promoting the benefits of solar energy homes led to additional Solar Decathlon events in Europe, China, Latin America and now in the Middle East in Dubai.

EERE leaders recognized King's contributions to the Energy Department and nation during a retirement ceremony in February. His career started on Capitol Hill as an energy advisor. He then joined the Energy Department, where he led EERE's Solar Energy Photovoltaic Research and Development program for more than two decades, including the American Solar Challenge, a solar-powered car race across the country. King also supported the Buildings Program and Office of Strategic Programs.

Always encouraging students and his peers to think outside the box, King led by example, pushing the envelope in federal government innovation and solar efficiency.







## Wave Energy Prize Inspires Innovation

Wave energy is not a novel concept. But despite being around for more than four decades, it's still not a viable resource option to power American homes—yet. Enter the [Wave Energy Prize](#).

[Recent studies](#) found that America can technically recover up to 1,229 terawatt hours of wave energy per year, distributed across the United States, the Gulf of Mexico, and Puerto Rico. The total has the potential to power all the homes as technology progresses.

The 20-month Wave Energy Prize competition, sponsored by the [Wind & Water Power Technologies Office](#), aims to double the performance of wave energy devices to help the resource become more cost-competitive with traditional sources of energy.

“While prizes and challenges are not new, they are now becoming well-honed tools in the government’s toolkit,” said Darshan Karwat, the technical lead of the Wave Energy Prize. “This competition is truly inspiring innovation.”

Nine finalists and two alternates remain from an initial 92-team field, whose 1/50-scale models of wave energy devices were tested and evaluated at small-scale wave generating tanks across the country.

“We lack an understanding of how different kinds of wave energy devices perform in different kinds of wave climates,” said Karwat. “The Wave Energy Prize will give us an apples-to-apples comparison of the performance of diverse device archetypes under the exact same wave climates, providing better knowledge about the advantages and disadvantages of different designs.”

The finalists and alternates, ranging from university teams to established companies, will receive seed funding to build 1/20-scale

device prototypes for testing and data analyst support from the national labs. Final testing takes place this summer at the nation’s most advanced wave-making facility—the Naval Surface Warfare Center’s Maneuvering and Seakeeping Basin, located in Maryland.

The competition goal is to double the current state-of-the-art performance of 1.5 meters per million dollars—a proxy metric for the levelized cost of energy. The winner takes home \$1.5 million, but all teams will benefit from valuable tank testing and data on their devices, along with significant media attention.

“We’re trying to put wave energy on a path to commercialization,” said Karwat. “This competition helps us do that by getting the brightest ideas in the wave energy space out into the public eye.”



*Darshan Karwat, Wave Energy Prize technical lead*

## Risser Assumes Top Renewable Power Role

Roland Risser, the former director of EERE's Building Technologies Office, is the new acting deputy assistant secretary for the Office of Renewable Power. Risser replaces Doug Hollett, who is now the principal deputy assistant secretary with the Office of Fossil Energy.

In announcing the move, Assistant Secretary David Danielson said Risser brings "a wealth of experience" to the role on issues related to the grid and power sector. Before joining EERE, Risser served for many years in a variety of executive roles at Pacific Gas & Electric, a major utility in California.

A new acting director for the Building Technologies Office is expected to be announced soon.

Danielson also saluted Hollett's work during his tenure at EERE, calling him instrumental in advancing a number of EERE national priorities that include the Grid Modernization Initiative and the Frontier Observatory for Research in Geothermal Energy.

Hollett will collaborate on the Energy Department's SubTER project between EERE and the Office of Fossil Energy to develop underground resources that include geothermal energy and carbon dioxide storage.



## GEOTHERMAL WORKSHOP SHOWCASES R&D EFFORTS

The [Geothermal Technologies Office](#) (GTO) participated in February's Stanford Geothermal Workshop, one of the world's longest-running technical meetings on geothermal energy. Energy Department-funded activities accounted for more than 30% of overall project submissions presented by GTO staff and more than 35 awardees.

GTO presented on [Play Fairway Analysis](#), an initiative aiming to advance the success rate of geothermal development projects by improving the exploration process. Phase I highlights included refining techniques that help improve success rates for exploration drilling. Phase II awardees' projections include collecting new geochemical, geophysical, and geological data in the field, with the ultimate goal of identifying drilling targets for Phase III.



*Stanford University*

In addition, all five awardees from the [Frontier Observatory for Research in Geothermal Energy](#) (FORGE) Initiative presented at the workshop. FORGE is the first dedicated site where scientists and engineers will develop, test, and accelerate breakthroughs in enhanced geothermal system technologies and techniques. As many as three teams will be selected for Phase II this summer. Selected teams will further characterize the proposed sites and complete all environmental and permitting requirements.



## EERE's SunShot Initiative Supports Little Box Challenge

With funding from EERE's SunShot Initiative, the [National Renewable Energy Laboratory](#) provided critical evaluation and testing of inverters developed by 18 team finalists vying to win a lucrative global competition sponsored by Google and the Institute of Electrical and Electronics Engineers (IEEE).

Under the Little Box Challenge, Belgium's Red Electrical Devils, a team from CE+T Power, was recently named the winner of the Little Box Challenge to invent smaller, more efficient inverters that connect solar power systems to the electric grid.

The team won a \$1 million prize in the Little Box Challenge for proving that residential photovoltaic inverters can be as tiny as a tablet or one-tenth the size of current inverters. Inverters

that are less expensive to produce and install will enable more solar-powered homes and more efficient distribution grids, while helping to bring electricity to remote areas.

For the competition, inverters had to first meet all critical safety-related inspections and function normally. Next, inverters had to complete three-hour procedures at different operating points and verify key challenge specifications were met. The remaining inverters went through 100-hour testing under simulated, real-life conditions by NREL at its Energy Systems Integration Facility in Golden, Colorado.

The Red Electrical Devils team's inverter had a power density far greater than the minimum requirement (and 50% higher than the nearest competitor). Judges also found that its inverter

performed better on measurements of emitted from electromagnetic noise.

Inverters from Schneider Electric and the Virginia Tech Future Energy Electronics Center received honorable mentions. All the leading teams' winning designs featured the use of wide bandgap semiconductors, a technology that enables power electronics to operate higher voltages and conversion frequencies, allowing them to transmit more energy through smaller volumes.

Google and IEEE launched the Little Box Challenge in July 2014. More than 2,000 teams from across the world registered for the competition and more than 80 proposals qualified for further review. Last October, 18 finalists were selected to take their inverters to NREL for testing.



## SuperTruck II Gets Green Light

To further improve the efficiency of commercial rigs, EERE Deputy Assistant Secretary for Transportation Reuben Sarkar announced \$80 million in funding in March to launch SuperTruck II at the GreenTruck Summit in Indianapolis. Subject to congressional appropriations, EERE funding builds on the successes of the SuperTruck program and aims to accelerate innovation and market adoption. Sarkar also announced three new cost-shared projects worth more than \$12 million focused on developing [plug-in electric powertrain technologies](#) for medium- and heavy-duty vehicles.

In collaboration with industry and the use of advanced technologies, SuperTruck II will increase efficiencies in tractor-trailer fuel, engines, and drivetrains. The next benchmark is to achieve more than 100% improvement over manufacturers' best-in-class efficiencies in 2009—with an emphasis on making these technologies more widely available and affordable by 2020.

America's tractor-trailer and heavy-duty truck fleet hauls as much as 80% of the nation's goods despite making up just 4% of the total vehicles on the road today. They also represent one-fifth of the total energy consumed by vehicles on the nation's highways.

Through EERE's [SuperTruck program](#), a \$260 million initiative started in 2010, designs for Class 8 trucks recently hit a record 12 miles per gallon in freight efficiency—a 115% increase over conventional tractor trailers, which average 5.8 miles to the gallon. SuperTruck technology has the power to save individual truck operators an estimated \$20,000 a year on fuel, which could add up to 300 million barrels of oil annually if the technology is adopted industry-wide.



**SuperTruck Team  
Achieves 115% Freight  
Efficiency Improvement  
in Class 8 Long-Haul  
Truck**



## Simplified Refinery Process Yields Big Gains in Algal Biofuel Production

A new biorefinery process demonstrated production of significantly more fuel products from algae than previous methods. The simplified process, developed by the [National Renewable Energy Laboratory](#) (NREL) with support from EERE's [Bioenergy Technologies Office](#) (BETO), is capable of reducing the cost of algal biofuel production by nearly \$0.95 per gallon gasoline

equivalent (GGE)—a 9% reduction compared to prior efforts.

NREL researchers significantly increased the amount of ethanol from algae by using combined algal processing with a highly productive algal strain. This simplified process skips the traditional step of separating solids and liquids and exposes all algae components directly to fermentation,

after which ethanol and other fuel precursors can be recovered. [Results showed](#) a total fuel yield estimated at 126 GGE per ton of algae. That's 88% of the theoretical maximum yield.

This new approach, combined with reduced costs for biomass production, provide a path forward in achieving cost-competitiveness with petroleum—a major priority for BETO.

## EERE Promotes Clean Energy Innovation in Japan

EERE Principal Deputy Assistant Secretary David Friedman and Fuel Cell Technologies Office Director Sunita Satyapal were among the 45 global experts to provide keynotes at Tokyo's [World Smart Energy Week](#), Japan's largest trade show for smart and renewable energy.

Friedman participated in a ceremonial ribbon cutting to launch the event, held March 1-3, and stressed the importance of clean energy innovation to accelerate to a low carbon future. Satyapal focused on EERE projects and advancements in hydrogen and fuel cell activities.

During the trip, Friedman and Satyapal also met with a variety of automotive and energy industry representa-

tives. They toured Honda and Nissan fuel cell and electric vehicle research and development facilities, and visited the new Tokyo Tower Hydrogen Refueling Station, previously visited by Prime Minister Shinzō Abe. The trip

also included an international meeting with invited leaders from government, industry, and non-profits from Europe, Asia, and North America to foster self-sustaining fuel cell electric vehicle fuel infrastructure.



*Principal Deputy Assistant Secretary David Friedman and Fuel Cell Technologies Office Director Sunita Satyapal highlighted clean energy innovation and fuel cell technology advances at a smart and renewable energy event in Japan.*

# Office Round Ups

## EFFICIENCY

### Federal Energy Management Program

Mark your calendars for [Energy Exchange 2016!](#) From August 9-11, in Providence, RI, federal personnel from across civilian agencies and the military, along with the private sector, will come together for 2 1/2 days of training sessions on funding, designing, and operating energy efficiency and renewable energy projects in the federal government. To control event costs, the event is invitation-only for Energy Department-funded attendees. For more information visit the [Energy Exchange website](#).

### Advanced Manufacturing Office

The Advanced Manufacturing Office's (AMO's) Compressed Air Sourcebook has been recently revised, introducing industry to compressed air systems, performance opportunities and where they can find help on optimizing these important industrial systems. The sourcebook is available on AMO's [publications](#) webpage.

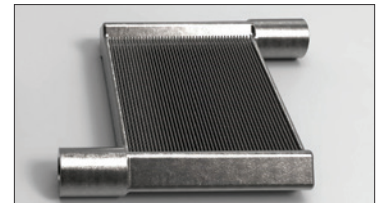


### Weatherization and Intergovernmental Program Office

With support from the State Energy Program, Alaska's State Energy Office has developed monitoring software that increases a building's efficiency and performance. The software is already being widely applied in Alaskan Native villages, helping to cut energy costs.

### Building Technologies Office

The University of Maryland, through a [partnership](#) with 3D Systems and the Building Technologies Office, used 3-D printing to prototype one of the most important enabling technologies in a building—the heat exchanger. The next-generation heat exchanger weighs 20% less, performs 20% more efficient, and can be manufactured much quicker, compared to current designs.



*Heat exchanger prototype.  
Photo| University of Maryland Center for Environmental Energy Engineering.*

## TRANSPORTATION

### Fuel Cell Technologies Office

The Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation takes place June 6-10 in Washington, D.C. The merit review provides an opportunity for the program to receive updates, evaluations, and recommendations on the projects it supports. Last year, more than 370 experts peer-reviewed 120 of the program's projects – conducting a total of more than 600 individual project reviews.

### Vehicle Technologies Office

EV Everywhere will release its EV Impact Study Series this spring highlighting the benefits of electric vehicles (EVs) for consumers, organizations, and the nation. The first reports for release will include an analysis on the economic impact of EVs for utilities and ratepayers, case studies on utilities' efforts to educate their customers on transportation electrification, and a case study on what a Vermont town is doing to encourage the use of EVs that may be used as an example for other small and mid-size towns.



### Bioenergy Technologies Office

The U.S. Department of Agriculture recently released the [Federal Activities Report](#) on the bioeconomy, focusing on the current steps federal agencies are taking to support and develop the bioeconomy. The Bioenergy Technologies Office and several EERE offices support research to develop renewable biofuels, bioproducts, and biopower.



## RENEWABLE POWER

### Water Power

The Executive Summit on Marine and Hydrokinetic (MHK) Research and Development brought together executive members from the Energy Department, national laboratories, and industry in early March. The summit showcased EERE's MHK research capabilities at the national labs and identified activities ripe for technology transfer.

### Wind Power

March marked the one-year anniversary of the Energy Department's Wind Vision Report which analyzes the prospects of the wind industry through 2050. Wind capacity in the United States reached 74.5 GW in 2015 and is on target to reach the Wind Vision study scenario of 10% (113 GW) by 2020. The United States is on target to avoid \$400 billion in global climate change damages.



### Solar Energy Technologies Office

The SunShot Initiative is funding post-doctoral research, worth a total of \$1 million, to help develop the next generation of solar energy investigators. The five awards span physical science, engineering, and social science technical areas to decrease the cost of solar energy.

### Geothermal Technologies Office

The Geothermal Technologies Office hosted representation from academia, public and the private sectors to facilitate feedback on the GeoVision Study. The initiative will provide analysis-driven assessment on the future of a full continuum of geothermal energy technologies. Six national labs presented active research and deliverables that included updated taskforce milestones.



## STRATEGIC PROGRAMS

### Clean Energy Manufacturing Initiative

The Clean Energy Manufacturing Analysis Center's (CEMAC) first annual 2015 [Research Highlights](#) report offers fresh insights on challenges and opportunities in the rapidly growing global market for clean energy technologies. It focuses on solar photovoltaic modules, wind turbines, automotive lithium-ion batteries, and carbon fiber, with information on where these technologies are being manufactured and where opportunities may exist for market disruption or new entrants. This manufacturing analysis represents some of the most comprehensive global trade and supply chain work in these clean energy technology areas to date.

### EERE International

Four seawater desalination pilot plants recently began operation near Abu Dhabi, United Arab Emirates. EERE International is funding the National Renewable Energy Laboratory to serve on the technical advisory committee to Masdar (the government-owned "Abu Dhabi Future Energy Company") to evaluate these innovative desalination processes that aim to use significantly less energy than current commercial technologies. One of the four pilots is a forward osmosis plant by California-based Trevi Systems.



*Vice President Biden drinks bottled water from the desalination plants depicted in a model of the plant site. Source: State Department Image*

### Technology to Market

The [Incubatenergy](#) network celebrated its one year anniversary in February. Incubatenergy is a national network of clean energy business incubators supporting startups as they scale their businesses. Last year, the network added more than nine new incubator members. The network incubators represent startups that have raised more than \$1 billion in follow-on funding.

U.S. DEPARTMENT OF  
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