

What's Happening
@ EERE

Amped Up!

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IN THIS ISSUE

2014 ANNUAL REPORT

A Message from Dave.....	2
EERE All Hands Meeting.....	3
Staffing Update.....	4
2014 Success Stories	6
Sustainable Transportation.....	6
Renewable Electricity Generation	10
Energy Efficiency.....	14
Mission-Critical Support & Crosscutting Programs.....	17
EERE Staff Recognition	21
Calendar of Events	23

**2014
YEAR
IN
REVIEW**



A MESSAGE FROM DAVE



Dear EERE family and supporters,

The many tremendous achievements of EERE in 2014 demonstrated clearly EERE's critical importance for the country's clean energy future and the world-class quality of our people in delivering on that mission. To all of our staff, lab personnel, contractors, and other stakeholders, I want to say thank you for your support and contributions. As we begin a new year, I am very proud of what we have been able to accomplish together in 2014, and I am excited about the opportunities before us in 2015 and beyond.

Our work has never been more important. In this past year, President Obama set a new goal for the United States to cut climate pollution by up to 28% by 2025. Accomplishing this aggressive goal will be critical to our nation leading the world toward a transition to a clean energy economy. Continued rapid progress in EERE's technology areas will be absolutely central to implementing the President's Climate Action Plan and achieving this bold new goal.

EERE's work is already delivering real-world results. We've helped reduce the modeled, high-volume production cost of advanced batteries for electric drive vehicles to less than \$300 per kilowatt-hour (kWh), which is more than 40% lower than the EV Everywhere baseline cost established in 2012. The SunShot Initiative is more than 60% of the way toward its goal of achieving competitive solar photovoltaics (PV) by 2020. EERE's 250 Better Buildings Challenge partners are on track to meet their energy savings goals of 20% within 10 years, with average partner annual savings of 2.5% achieved and total energy savings of 36 trillion Btu (or \$300 million) since the program launched. News of our work is quickly spreading, with more than 2,500 news stories relating to EERE catalogued in 2014 and appearing in publications such as *The New York Times*, *Popular Science*, and *Nature*.

These and others successes detailed in this special Annual Report issue of Amped Up are just a few of the many accomplishments we had in 2014 and reflect why I have such great confidence in our road ahead. On February 2, Secretary Moniz announced the President's Fiscal Year 2016 Budget Request for the U.S. Department of Energy (DOE), which includes a robust \$2.7 billion request for EERE. This request reflects the Administration's strong commitment to clean energy and to EERE, with increases for each of our sectors to continue our important work toward our goal of creating and sustaining American leadership in the global transition to a clean energy economy.

Thank you for your commitment and for joining EERE leadership and me to make energy cleaner, more efficient, and more affordable for American families and businesses. I am looking forward to an even better 2015 together.

Dave

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Looking Back at 2014

EERE ALL HANDS MEETING

On November 20, EERE held its annual year-end All Hands meeting for all EERE federal employees and contractors.

Staff gathered at DOE headquarters (HQ) in Washington, D.C., and DOE's Golden Field Office in Golden, Colorado, to celebrate the impactful year for EERE in 2014 and to rally around the exciting opportunities ahead for EERE in 2015. Assistant Secretary David Danielson started off the meeting by thanking EERE staff for a wonderful year and sharing his excitement for the years ahead.

Next on the agenda, DOE Chief of Staff Kevin Knobloch provided opening remarks, saying that it was an honor to celebrate EERE's meaningful accomplishments that support the President's goals to reduce our nation's greenhouse emissions as we transition to a clean energy economy.

Mr. Knobloch described climate change as the single biggest challenge and potential threat to life on the planet that we face today.

"Climate change is a problem that we do have to meet squarely and responsibly...a problem for which we cannot fail because the stakes are so high," said Mr. Knobloch. "It's a problem that will take our biggest and best minds in science and engineering, and also in communications and education and outreach and management."

Mr. Knobloch reiterated that the dedicated professionals across EERE are critical in facing this challenge and are centrally featured in the President's Climate Action Plan.

Following Mr. Knobloch, Dr. Danielson took the stage and discussed further the criticality of the work taking place at EERE every day. He then cited the 2014 update of DOE's *Revolution Now* report, which shows that the historic shift to a cleaner, more domestic, and secure energy future is not some faraway goal. We are living it today.

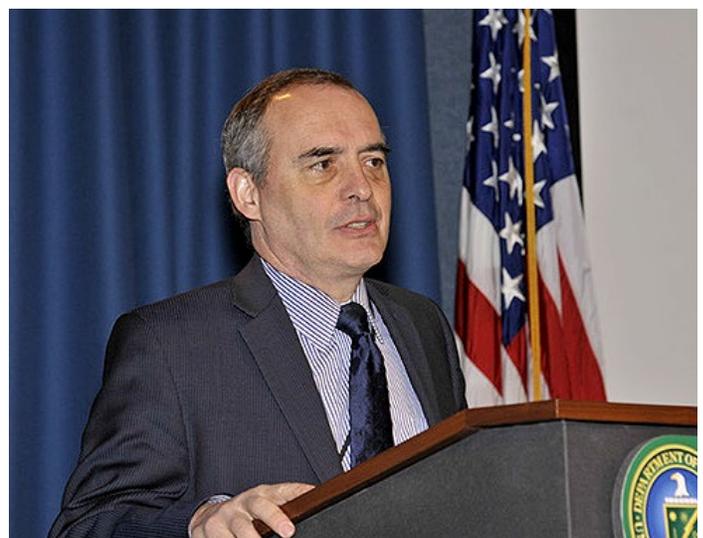
"Thanks in large part to the innovation and market accelerations programs that EERE has implemented, we are



Assistant Secretary Danielson speaks at the EERE All Hands meeting on November 20, 2014. Photo by DOE Graphics.

actually in a position today where clean energy technology costs are dropping more rapidly and deployment is growing more rapidly than anyone would have predicted 5, 10 years ago," said Dr. Danielson.

Also during the meeting, each EERE Deputy Assistant Secretary (DAS) took the stage and spoke about his/her respective sector—sharing many of the successes that occurred in 2014. Each DAS recognized the great work done in 2014 and spoke positively about EERE's exciting plans for 2015.



DOE Chief of Staff Kevin Knobloch speaks at the EERE All Hands meeting on November 20, 2014. Photo by DOE Graphics.

Dr. Danielson concluded the meeting by discussing some of EERE's priorities for 2015:

- Focusing even more on EERE's most important asset—its people
- Strengthening and solidifying EERE's leadership team
- Strategically implementing EERE projects and initiatives
- Supporting management and staff training and development
- Improving internal communications
- Providing more opportunities for direct employee engagement and feedback on how to make EERE a great place to work
- Continuing to unify core business processes.

To ensure that we build on success, Dr. Danielson announced several important steps to improve how EERE functions as an organization. One of the main announcements was that Steve Chalk will be transitioning from his role as DAS of Renewable Power to a brand new position—DAS of Operations and Strategic Innovation. As DAS of Operations and Strategic Innovation, Steve will work to streamline and solidify EERE business processes, including hiring policies, active project management, and corporate information technology systems.

Doug Hollett, former Director of the Geothermal Technologies Office (GTO), will be replacing Steve as DAS of Renewable Power. Jay Nathwani will be the Acting Director for GTO, with Doug continuing to assist the office until a full-time replacement is found.

The future looks bright for EERE, and together, EERE leadership and staff can make EERE a great place to work—helping America transition toward a clean and sustainable energy future.

STAFFING UPDATE

Core Leadership Changes



Steve Chalk,
*Deputy Assistant Secretary
for Operations and Strategic
Innovation*

Formerly Deputy Assistant
Secretary for Renewable
Power



Douglas Hollett,
*Deputy Assistant Secretary
for Renewable Power*

Formerly Geothermal
Technologies Office Director



An event attendee looks under the hood of a Toyota Prius on display at the National Alternative Fuel Vehicle (AFV) Day Odyssey in Washington, D.C. The biennial event, coordinated by the National Alternative Fuels Training Consortium, is dedicated to promoting the use of AFVs and advanced technology vehicles. (Photo by Scott A. McCall, The Hannon Group).



Photo of the Energy Systems Integration Facility (ESIF) at the National Renewable Energy Laboratory (NREL) in Golden, Colorado. In 2014, ESIF was named R&D Magazine's 2014 Laboratory of the Year. (Photo by Dennis Schroeder, NREL.)



Domestically produced renewable biofuels will soon be helping the U.S. military increase the nation's energy security, reduce greenhouse gas emissions, and create jobs in America. In September 2014, DOE joined the Departments of Agriculture and Navy to announce three projects that will produce renewable jet and diesel for the military. (Photo courtesy of the U.S. Navy).



DOE's 2014 Race to Zero Student Design Competition (Race to Zero) teams. Race to Zero is an annual competition, open to students and faculty from any interested collegiate institution, and is based upon a real-world scenario where a builder needs to update an existing product line (house plan) to a high-performance house design or is developing a new high performance home product line. (Photo by Dennis Schroeder, NREL).

2014 SUCCESS STORIES

SUSTAINABLE TRANSPORTATION



INTEGRATED BIOREFINERIES

Building upon the 2013 opening of the first commercial-scale cellulosic biorefinery—INEOS New Planet BioEnergy’s Indian River BioEnergy Center in Vero Beach, Florida—EERE made several important steps toward making renewable fuels cost competitive with petroleum and reducing U.S. dependence on foreign oil. In 2014, two more pioneering EERE-supported cellulosic biorefineries opened.

“Integrated biorefineries reflect a culmination of a multi-year effort, and it’s really the pinnacle of all of our success in terms of bringing together research, development, demonstration and deployment,” said DAS for Sustainable Transportation Reuben Sarkar. “It’s

truly a cross-functional endeavor—not just from our program offices, but to all the operational support contracting people.”

In 2010, U.S. Congress set an ambitious goal to produce 21 billion gallons of advanced biofuels in 2022. These two additional integrated biorefineries will fill an urgent need to bridge the gap between promising research and production of advanced biofuels.

POET-DSM’s Project LIBERTY in Emmetsburg, Iowa, celebrated its grand opening in September, becoming the first commercial-scale cellulosic ethanol plant to use corn waste as a feedstock and the second commercial-scale cellulosic biorefinery to come on line.

This facility is designed to produce 25 million gallons of cellulosic ethanol per year using corncobs, leaves, husks, and corn stalk harvested by local farmers within a 40-mile radius of the facility.

In October, the nation’s third commercial-scale cellulosic ethanol biorefinery, Abengoa Bioenergy Biomass of Kansas (ABBK), held its grand opening in Hugoton, Kansas. This plant will produce cellulosic ethanol from non-edible corn stalks, stems, and leaves harvested within a 50-mile radius of the plant.



The mechanical building (front), solid/liquid separation (left) and anaerobic digestion areas (back) at POET-DSM’s Project LIBERTY biorefinery in Emmetsburg, Iowa. Photo courtesy of POET-DSM.



Secretary Moniz and Assistant Secretary Danielson attended the grand opening of the Abengoa Bioenergy Biomass of Kansas (ABBK) facility on October 17, 2014, in Hugoton, Kansas. Photo courtesy of Abengoa.

Once both facilities become fully operational, they will have a combined production capacity of 50 million gallons of cellulosic ethanol per year—enough to avoid 400,000 tons of carbon dioxide emissions annually.

In addition to the Project LIBERTY and ABBK successes, in September 2014, three new commercial-scale biorefinery projects were selected to begin construction in Nevada, Oregon, and the Gulf Coast. These biorefineries are part of an interagency initiative to produce more than 100 million gallons of biofuels annually by 2017. Since 2011, DOE has been working with the Navy and U.S. Department of Agriculture to develop commercial-scale biorefineries that will produce drop-in renewable jet and diesel fuels, and this announcement is a significant stride toward meeting these ambitious goals.

FUEL CELL CATALYST ADVANCEMENTS

In February, a team of EERE scientists from Lawrence Berkeley National Laboratory (LBNL) and Argonne National Laboratory (ANL) reported the discovery of a new class of bimetallic

nanocatalysts potentially leading to a big breakthrough in the development of next-generation fuel cells.

Professor Peidong Yang (LBNL) and Dr. Vojislav Stamenkovic (ANL) led the team responsible for this discovery.

The new catalysts comprise hollow polyhedral nanoframes consisting of platinum and nickel, which outperformed conventional catalysts by more than 30 times during performance testing at ANL.

“We continue to make strong progress in the area of catalyst development cost for fuel cells through EERE,” said Sarkar. “We’ve decreased the platinum loading content by five-fold and lowered the fuel cell system costs by two-fold since 2006, all while doubling the durability.”

In order to achieve such outstanding results, the research team led by Yang and Stamenkovic reconsidered the entire structure of the catalyst.

Conventional catalysts are essentially nanoparticles consisting of pure platinum, so what the team did was to combine platinum and nickel nanoparticles to make alloyed solid polyhedral

bimetallic nanoparticles. After being exposed left under ambient conditions in a solvent exposed to air for two weeks, the nickel dissolved. As a result, the team created a dodecahedron nanoframe, a 3-dimensional, 12-sided hollow structure. Annealing these nanoframes in argon gas creates a platinum skin on the nanoframe surface.

“Through both progressive science and a little bit of serendipity, the researchers noticed that they were given spontaneous de-alloying of a nickel-rich platinum catalyst under certain conditions,” said Sarkar.

“The resulting platinum-enriched enamel frames allow easier access for oxygen, which dramatically improves the catalyst mass activity performance,” said Sarkar.

In other words, incorporating these catalysts into fuel cells has the potential to translate to more efficient and less expensive hydrogen fuel cell systems.

This work was performed in coordination with EERE’s Fuel Cell Technologies Office and DOE’s Office of Science’s Basic Energy Sciences.

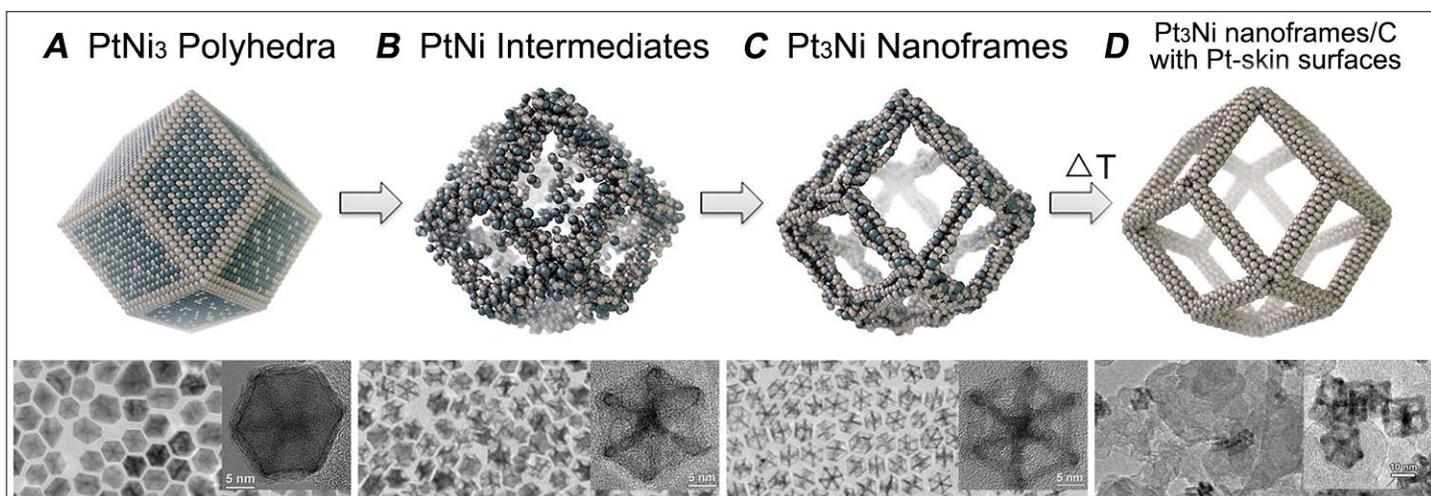


Illustration shows the catalyst's evolution through the different stages of its manufacturing process. Illustration courtesy of LBNL.



Amy Gandy, project manager for West Virginia University's National Alternative Fuels Training Consortium, explains the benefits of a plug-in hybrid Toyota Prius to a child during the National Alternative Fuel Vehicle (AFV) Day Odyssey event held October 17, 2014, on the National Mall in Washington, D.C. The purpose of the biennial event, held at various locations across the country, is to bring attention to AFVs and other advanced vehicle technologies. Photo by Scott A. McCall.

FCEVS DEPLOYED

Announced on May 13, 2013, H2USA is a public-private partnership focused on advancing hydrogen infrastructure to support the growing fuel cell electric vehicle (FCEV) market and providing the U.S. consumer with more transportation energy options.

By the end of 2014, the H2USA partnership tripled its number of partners and now includes the State of California and leading global car manufacturers. H2USA's partners work together to coordinate research and identify cost-effective solutions to deploy infrastructure that can deliver affordable, clean hydrogen fuel.

H2USA now has almost 40 members, including automakers, government, national laboratories, hydrogen and fuel cell industry representatives, academia, and NGOs such as the

Association of Natural Gas and the Association of Convenience and Fuel Retailing.

"We are very proud to say that fuel cell vehicles have arrived," said DAS Sarkar. "From auto shows to showroom floors and to our driveways, fuel cells are delivering on the vision for a zero-emission, hydrogen-powered fuel cell future.

These vehicles are starting to arrive for consumers in Europe and Japan, and they are being offered in limited areas across the United States. Car manufacturers Hyundai and Toyota are showcasing their commercial FCEVs across the globe. Honda, GM, Daimler, and others are following suit.

- **Hyundai** has started leasing its Tucson Fuel Cell vehicle in California, as well as in European cities.

- **Toyota** announced at the 2014 LA Auto Show that its FCEV, the Mirai, which means "future" in Japanese, will be available in 2015 in the United States.
- **Honda** has shown its FCEV concept car at several Auto Shows in the United States.

Significant advances in fuel cell and hydrogen technologies have led to cost reductions and improved performance. Research and development efforts from the national laboratories and private industry, with support from EERE, have helped reduce automotive fuel cell costs by more than 30% since 2008 and by more than 50% since 2002. Fuel cell durability has also doubled and the amount of expensive platinum needed in fuel cells has fallen by 80% since 2005.

In addition, EERE-funded research and development (R&D) has enabled more than 500 patents and 45 commercial technologies that have entered the market.

SUPERTRUCK

EERE's SuperTruck initiative goal is to develop tractor-trailers that are 50% more efficient than baseline models by 2015. In 2014, Cummins and Peterbilt developed a SuperTruck that achieved:

- 20% increase in engine efficiency
- 70% increase in freight efficiency.



This Class 8 tractor-trailer by heavy-duty manufacturers Cummins and Peterbilt reaches more than 10 miles per gallon under real world driving conditions. The truck was on display at DOE HQ in February 2014. Photo by Sarah Gerrity, DOE.

EV EVERYWHERE

Recognizing the significant role vehicle electrification plays in the nation's energy strategy, President Obama launched the EV Everywhere Grand Challenge in 2012. EV Everywhere has the goal of bringing scientists, engineers, and business together from across the nation to work collaboratively to make plug-in electric vehicles (PEVs) as affordable and convenient to U.S. consumers by 2022 as gasoline vehicles are today.

As a result, drivers across the United States are realizing the benefits of PEVs, with yearly sales reaching more than 118,000 in 2014. More than 280,000 EVs are on American roadways.

Since EV Everywhere's launch, the production cost of advanced batteries for EVs has been reduced to less than \$300 per kWh. This is more than 40% lower than the initial costs established in 2012, and it is more than a 60% reduction since 2008.

"We've made very strong progress both in the areas of our R&D, as well as in our market transformation efforts," stated Sarkar. "We're well on our way to achieving our milestone of the total battery cost reduction targets of \$125 per kWh by 2022."

Workplace Charging

The Workplace Charging Challenge began in 2013 as part of EV Everywhere, with 13 partners committing to provide plug-in vehicle charging access for employees. By the end of 2014, more than 150 organizations are providing plug-in electric vehicle charging access for more than 600,000 employees at 300 work sites across the country.

Vehicle Lightweighting

Another integral part of the EV Everywhere "Blueprint" for success is vehicle lightweighting. In 2014, Ford Motor Company unveiled its lightweight concept vehicle that was developed with \$10 million in support from EERE (plus \$10 million in industry cost-share).

Using a 2013 Ford Fusion as the base, Ford—in partnership with Magna—integrated multiple lightweight materials into a variety of vehicle components. As a result, the companies were able to reduce the vehicle weight by nearly 25%, while maintaining vehicle safety and performance. This weight reduction brings the Fusion, a family sedan, down to the weight of the subcompact Ford Fiesta. As reducing a vehicle's weight by 10% can increase its fuel economy by 6%–8%, the technology in this unique vehicle offers huge potential for increasing vehicle efficiency.

Ford and Magna are currently addressing challenges related to affordability, manufacturability, and repair through a development effort that includes building prototype vehicles, conducting crash tests, and executing performance and durability testing.

2014 SUCCESS STORIES

RENEWABLE ELECTRICITY GENERATION



FORGE

On July 17, DOE announced up to \$31 million in funding to establish the Frontier Observatory for Research in Geothermal Energy (FORGE). The mission of the FORGE initiative is to enable cutting-edge research, drilling, and technology testing, allowing scientists to identify a replicable commercial pathway to enhanced geothermal systems (EGS).

This funding opportunity announcement is the culmination of years of work within EERE's Geothermal Technologies Office.

FORGE will be a dedicated EGS field laboratory where novel technologies and techniques will be tested, with a primary focus on EGS optimization and validation. FORGE is a critical step toward creating a commercial pathway to EGS; it will promote transformative and high-risk science and engineering that the private sector alone is not financially or operationally equipped to undertake.

FORGE is a collaborative and inclusive effort involving a diverse group of geothermal and subsurface stakeholders; participation and contribution from industry, national laboratories, and academia is integral to its success.

Unlike natural geothermal systems, an EGS is a man-made geothermal reservoir, created beneath the surface

of the Earth, where there is hot, but relatively impermeable rock with limited pathways for fluid to flow. Small amounts of water are injected into the rock, safely creating pathways for fluid to flow, bringing heat to the surface that can be used to generate electricity.

The initiative is focusing on methods to increase our understanding of the key elements controlling EGS success—re-opening or creating fluid flow pathways in hard rock, innovative drilling techniques and well orientations; technologies for accurately imaging fluid flow; and long-term reservoir sustainability.

FORGE consists of three phases. In Phase 1, DOE will make \$2 million available for selected teams to perform analysis of a proposed site and develop plans for Phase 2. Based on those evaluations, up to \$29 million will be made available in Phase 2 for teams to further characterize the proposed sites and to complete all environmental and permitting requirements.

Phase 3 will focus on full implementation at a single site. Throughout this phase, university and industry partners, along with the national laboratories, will conduct interdisciplinary R&D focused on advancing technolo-

gies associated with reservoir characterization, creation, and sustainability.

In parallel, a comprehensive data collection effort will capture high-fidelity data from both surface and subsurface instrumentation. Real-time dissemination of this technical data to all stakeholders will revolutionize the geothermal community's understanding of EGS creation and evolution, and pave the way for a rigorous and reproducible methodology that reduces costs of deployment and therefore, industry development risk.

If successful, EGS could enable access to carbon-free energy up to 100 gigawatts, enough to power about 100 million homes or approximately 10% of electricity.

“If we can successfully develop technologies and techniques for creating sustainable EGS, we can do geothermal not just anywhere in the United States, but anywhere in the world,” said Chalk. “We could have clean, base-load renewable power available to really address climate change.”



Solar energy's growth is demonstrated here as Kyle Travis (left) and Jon Jackson (right) with Lighthouse Solar install microcrystalline PV modules on top of a town home. By 2014, solar PV installations were about 15 times what they were in 2008 (SEIA and GTM Research, 2014). Photo by Dennis Schroeder, NREL.

SUNSHOT

In February 2014, the Energy Department announced that less than four years into the 10-year SunShot Initiative, the solar industry is already more than 60% of the way toward achieving its goal of \$0.06 per kWh by 2020.

Achieving this goal will have many potential positive impacts for the United States, including the following:

- Creating 390,000 new jobs by 2050
- Meeting 14% of U.S. electricity needs by 2030 and 27% by 2050.

DAS Chalk noted that “when we reach our \$0.06 per kWh goal, we are on par with fossil energy generation, and you have all of the carbon benefits as well because it’s zero emissions.”

The SunShot Initiative and solar industry as a whole have seen some significant successes this past year. One of the major successes was the collaboration to increase access to financing options and standardize the process to make solar more accessible and affordable through the National Renewable Energy Laboratory’s Solar Access to Public Capital (SAPC) working group.

SAPC is a working group of 150 stakeholders, including banks, project developers, law firms, rating agencies, and experts at the national labs, who are working to bundle solar projects for financing in the marketplace.

Over the past 12 months, SAPC has worked to develop standardized solar lease and power purchase agreement

SOLAR QUICK FACT

In the United States, the average price for a utility-scale PV project has dropped from about \$0.21 per kWh in 2010 to \$0.11 per kWh at the end of 2013.

templates, thereby reducing cost of capital, which is one of the largest costs for a solar PV system.

SOLAR MANUFACTURING

SunShot has supported numerous companies to develop and implement innovative technologies that reduce costs and increase efficiency in manufacturing processes used to make photovoltaic and concentrated solar power technologies. And, in 2014, three SunShot awardees announced new factories or factory expansions.

SolarCity Corporation acquired **Silevo**—a previous SunShot awardee—on June 17, taking aim at building a solar-panel module plant in Buffalo, New York. This facility would be triple the size of the largest solar plant in the United States, competing directly with Chinese manufacturers.

According to *The Wall Street Journal*, Solar City expects this acquisition to enable a significant breakthrough in the cost of solar power.

“This is going to be 5,000 jobs initially and 3,000 jobs permanently,” said Chalk. “What is really impressive here is this is actually going to occur where a steel plant used to exist. As you can see, we are bringing jobs to an area of the country that has suffered a lot of job loss over the last couple of decades.”

Suniva Inc. began construction of a 200-megawatt (MW) solar module assembly factory in Saginaw Township, Michigan. William A. Kibbe & Associates, Inc. is designing this new state-of-the-art 129,000 square foot facility.

The facility was formerly a Sears Warehouse and will now become Suniva’s second U.S. solar manufacturing facility, creating 350 jobs.

SOLAR QUICK FACTS

- Solar employment has grown by 86% in the past five years alone.
- One out of every 78 new U.S. jobs created over the past 12 months was created by the solar industry.
- The solar industry is adding workers at a rate nearly 20 times faster than the overall economy.

On October 30, **SolarWorld** announced that in 2015, it will begin a \$10 million expansion to its Oregon plant. The proposed expansion will include a solar-panel production line that will bring the factory’s panel assembly capacity up to 530 MW. The expansion will also increase advanced cell production capacity by 100 MW, and SolarWorld anticipates creating up to 200 new jobs.

The U.S. solar industry achieved tremendous success in 2014, with job creation and returns on investment.

To celebrate and recognize industry efforts, in his January 2014 State of the Union speech, President Obama said that “Every four minutes, another American home or business goes solar; every panel pounded into place by a worker whose job can’t be outsourced.”

NEW VISIONS FOR U.S. HYDROPOWER AND WIND POWER

Looking toward the future of both hydropower and wind power generation in the United States, EERE is leading two separate initiatives to develop visions for these industries. Assessments conducted by EERE’s Wind and Water Power Programs and their national laboratory partners show that major opportunities exist for tapping additional wind and hydropower generation capacity across the country.

EERE launched the national Hydropower Vision on April 29, 2014, at the National Hydropower Association’s (NHA’s) annual conference. EERE’s Water Power Program is partnering with NHA and other industry stakeholders to develop this long-



The Youngs Creek Project in Washington State went online in October 2011, with an annual production of 18,000 megawatt hours—enough to power 1,500 homes. Photo courtesy of Snohomish County Public Utility District.

range vision, which will establish the analytical basis for responsible growth in domestic hydropower over the next half century. To aid in this process, DOE has organized Hydropower Vision Task Forces around topics critical to the hydropower community. The Water Power Program anticipates completing a draft Hydropower Vision report by fall 2015.

EERE launched the national Wind Vision on May 6, 2013, at the American Wind Energy Association's annual conference.

The initiative's Wind Vision Report, which updates and expands on DOE's 2008 report, *20% Wind Energy by 2030*, represents a collaboration between EERE's Wind Program and a wide range of stakeholder groups. The report analyzes the impacts of wind power supplying the nation's end-use electricity demand under three scenarios: 10% by 2020, 20% by 2030, and 35% by 2050.

Within these scenarios, the report examines the costs and benefits of wind energy's impacts on electricity prices, jobs and manufacturing, water and land use, and greenhouse gas and pollution reductions. The Wind Program anticipates releasing the Wind Vision Report in February 2015.

OFFSHORE WIND

On May 7, 2014, the United States took a significant step forward in offshore wind power when EERE's Wind Program announced the selection of three offshore wind demonstrations to be located off the coasts of New Jersey, Oregon, and Virginia.

These three projects were selected from seven candidates originally announced in 2012 that focused on design, engineering, and permitting work. The selected projects will receive up to \$47 million to deploy offshore wind installations in U.S. waters.

New Jersey: Fishermen's Energy, an offshore wind energy project developer, will install up to 6 wind turbines with a total capacity of at least 20 MW roughly three miles off the coast of Atlantic City. This project will act as a laboratory for researchers to learn about offshore wind and investigate interactions between the turbines.

Oregon: Principle Power Incorporated, a technology developer focused on the intermediate and deepwater depths of offshore wind energy, is developing the second project. The company will install a wind farm that will have a capacity of up to 30 MW of electricity about 18 miles off the coast of Coos Bay. These turbines will be installed in water more than 1,000 feet deep to demonstrate an innovative solution for deepwater turbine projects.

Virginia: Dominion Virginia Power will install two 6-MW direct-drive wind turbines 26 miles off the coast of Virginia Beach. This project will demonstrate installation, operation, and maintenance methods for wind turbines located far offshore. Dominion will also install and test hurricane-resilient designs to ensure offshore wind facilities can be placed in hurricane-prone waters.

The development and demonstration of these selections will position the United States to lower the barriers to



Both Dominion Virginia Power and Fishermen's Energy will use a twisted jacket foundation, where three legs are twisted around a central column. Photo courtesy of Fishermen's Energy.

significant offshore wind, thus contributing to a low-carbon future.

Broadly, DOE's efforts to advance innovative offshore wind technologies support the Obama Administration's comprehensive National Offshore Wind Strategy to develop a sustainable, world-class offshore wind industry. As part of that strategy, DOE continues to work with partners across the government, including the Department of the Interior, to conduct resource assessments, streamline siting and permitting, and overcome technical and market challenges to installation, operations, and grid connection.

2014 SUCCESS STORIES

ENERGY EFFICIENCY



APPLIANCE AND EQUIPMENT STANDARDS

In 2014, the Building Technologies Office's Appliance and Equipment Standards Program issued 10 final rules that are expected to have a total utility bill savings of \$78 billion for U.S. consumers from 2014–2030. Further, these standards will save 435 million metric tons of carbon dioxide emissions from 2014–2030.

Looking ahead, to build on this momentum, the Administration is committed to continuing to establish new efficiency standards that—when combined with the progress already made through previously finalized standards—will reduce carbon pollution by at least 3 billion metric tons in total by 2030, equal to more than a year's carbon pollution from the entire U.S. electricity system

BETTER BUILDINGS

Before the Better Buildings Challenge, residential, commercial, and industrial facilities consumed nearly 50% of the electricity in the United States, costing American consumers more than \$400 billion in energy consumption.

A cornerstone of the President's Climate Action Plan, the Challenge enlists leaders from across the nation to achieve 20% portfolio-wide energy savings over the next decade.

Since its 2010 launch, partners have shown consistent progress and are on track to meet their goals, with an average annual savings of 2.5%—a total annual energy savings of \$300 million.

In 2014, a number of participants achieved portfolio-wide savings greater than 10%, including Best Buy, University of California-Irvine, Cummins, Macy's, and Legrand North America.

As of September 2014, partners have developed more than 80 showcase projects and 50 implementation models. These solutions, posted on the Better Buildings Challenge website, provide an inside look at the innovative strategies that organizations are deploying to achieve energy savings through energy efficiency.

Altogether, Challenge partners have initiated energy efficiency projects at more than 9,000 facilities across the country.

DOE'S RACE TO ZERO STUDENT DESIGN COMPETITION

In April 2014, 28 college and university teams from the United States and Canada participated in the inaugural Race to Zero Student Design Competition at NREL. Students and advisors competed to create zero-energy ready home designs that are market-ready, efficient, durable, and incorporate best practices from DOE's Building America and Zero Energy Ready Home programs.

The goal of the competition was to inspire young architects, builders, and entrepreneurs to learn about zero-energy ready homes and develop the skills to be leaders in the sustainable housing industry. The competition—originally intended to be held every two years—met with enough success in its inaugural year that it will now be an annual event.

BETTER PLANTS

EERE's Better Plants Program recognizes partner companies that commit to reducing the energy intensity of their U.S. manufacturing operations by 25% or more within 10 years. In 2014, the Better Plants Program added 23 new companies, resulting in:

- More than 140 total partners
- More than 2,300 manufacturing sites
- Coverage of over 11% of the manufacturing energy footprint (well over a quad!) committed to driving energy efficiency and productivity in the manufacturing sector.

FEMP WINS GREENGOV AWARD

In 2014, staff members from the Federal Energy Management Program (FEMP) were recognized with a GreenGov Presidential Award in the Green Dream Team category.

GreenGov Presidential Awards celebrate extraordinary achievement in the pursuit of the President's Execu-



The FEMP half of the award-winning GreenGov Presidential Green Dream Team. Pictured left to right: Brad Gustafson, Mark Reichhardt, David Boomsma, Sarah Jensen, and FEMP Director Tim Unruh. DOT team members (not pictured) include Nancy Henry, Hetal Jain, Brent Kurapatskie, Steve Renzi, and Eugene Tumblin. Photo courtesy of the Federal Energy Management Program.

tive Order on Federal Leadership in Environmental, Energy and Economic Performance.

Achieving this award was a collaborative effort with members of the Department of Transportation (DOT) in a Strategic Sustainability Partnership that began in 2013.

The partnership focused on three main priority areas: (1) energy audits and efficiency improvements, (2) vehicle fleet sustainability, and (3) sustainable buildings.

The partnership helped FEMP develop and test a new desk audit tool, which provided \$1 million in government savings and helped the Federal Aviation Administration increase facility evaluation.

FEMP also provided assistance that allowed DOT to reduce total fuel consumption by 5% and increase alternative fuel consumption by 20%.

Dr. Hogan said that FEMP is “working with the federal agencies to help those agencies achieve very aggressive energy, water, and other sustainability goals.”

Thanks to the FEMP team, DOT is well poised for continued progress in meeting its goals.

3D PRINTED CAR

In September 2014, thousands gathered at the International Manufacturing Technology Show (IMTS) in Chicago, Illinois, to witness the unveiling of the world's first 3D-printed car—named for the designer, Strati. During the six-day IMTS, the car was printed, assembled, and successfully taken for its inaugural drive, marking an important moment in history.

The origins of building a car with a 3D printer began earlier in 2014 when the Advanced Manufacturing Office looked to its Manufacturing Demonstration Facility at Oak Ridge National Laboratory to collaborate with Cincinnati Incorporated and Local Motors on a highly innovative project that would display how 3D printing has come of age.

The team designed, developed, and prototyped the Strati in an incredibly fast six-month time frame using 3D printing, proving that cars can be created in an entirely new way. Prior to the Strati, 3D printing had been largely used to make relatively small novelty items like cell phone cases, toy pieces, clothing, and art, as well as limited numbers of high-priced customized parts for robots and aircraft components.

Hailed as a breakthrough by Popular Mechanics, Popular Science, *The Washington Post*, and *The Wall Street Journal*, the 3D-printed car project also represents the benefit of a public-private partnership; it brought together some of the best minds and capabilities from industry and our national laboratories to develop an innovative product that will accelerate American manufacturing.



3D printed car on display on Oak Ridge National Laboratory's (ORNL) east quad. Photo by ORNL.

ACCELERATORS

EERE's Weatherization and Intergovernmental Programs Office launched two new and exciting Accelerators as part of the Better Buildings Challenge. The Energy Savings Performance Contracting (ESPC) Accelerator, launched in December 2014, is engaging 14 state and 6 local government partners to achieve \$2 billion in performance contracting in public buildings by 2016. The ESPC Accelerator has already reached 80% of that goal, with new partners on the horizon. The office also introduced the High Perform-

mance Outdoor Lighting Accelerator at the Better Buildings Summit in May 2014, with an initial group of 9 municipal partners working collaboratively to develop solutions and best practices that will replace 500,000 poles to high-efficiency lighting in two years. The High Performance Outdoor Lighting Accelerator will add new partners in fiscal year 2015.

2014 SUCCESS STORIES

MISSION-CRITICAL SUPPORT & CROSSCUTTING PROGRAMS



COMMUNICATIONS

EERE Facebook growth skyrocketed in 2014, becoming one of the most popular in the federal government with more than 65,000 “likes,” up 458% from last year. It has even become more popular than the Departments of Education, Commerce, Treasury, Labor, and Housing and Urban Development.

POLICY AND ANALYSIS

EERE’s Strategic Policy and Impact Assessment team completed a study projecting that the United States is on pace to double renewables by 2020

(having already doubled from 2008–2012) to meet the Administration’s renewable energy generation goals. By continuing at this pace, we have the potential to not only meet, but exceed the President’s goals.

INTERNATIONAL

The international group provided critical support to DOE, developing and managing relationships with key international partners on clean energy engagements. An example of this was improving solar resources maps in India, resulting in additional \$300 million in solar exports to that market for U.S. companies.

STAKEHOLDER ENGAGEMENT

Stakeholder Engagement facilitated a total of 357 high-impact external relationships through engagements, meetings, and presentations. This team serves as a critical gateway between many different stakeholder groups and all parts of EERE.

LEGISLATIVE AFFAIRS

In 2014, Legislative Affairs achieved record levels of congressional engagement, providing 45% more interac-

More than 2,500 news stories relating to EERE were catalogued in 2014.

tions between EERE senior leadership and members of Congress than in fiscal year 2013. Further, senior leadership participated in 68 individual meetings or events with members of Congress—a 100% increase from fiscal year 2013.

TECH-TO-MARKET

EERE’s Tech-to-Market team launched the National Incubator Initiative for Clean Energy (NIICE) in January. By providing critical services to bring startups closer to market readiness, NIICE aims to create a national support network to serve the clean energy small business and entrepreneur community.

In June, Secretary Moniz announced selections for awards with Mayor Rahm Emmanuel in Chicago. Three incubators were selected for awards, and a partnership between the Electric Power Research Institute and the National Renewable Energy Laboratory established a national organization to coordinate with the incubator community. The \$3.2 million grant leverages nearly an additional \$5 million in cost share.



Cell in the World was the top EERE Facebook post for 2014. It was viewed 56,608 times, liked 511 times, and shared on 483 other Facebook pages.

CEMI

Launched in 2013, the Clean Energy Manufacturing Initiative (CEMI) expanded in 2014, becoming a DOE-wide priority initiative to boost energy productivity and manufacturing in the United States.

In January, President Obama declared 2014 a “year of action” and announced a goal of generating 80% of the nation’s electricity from clean energy sources by 2035. CEMI will play an integral role in meeting this goal by helping industry to develop efficient manufacturing processes, as well as to

OPERATIONS

Project Management Coordination

- Trained 450 EERE staff members on both APM and FOA processes and supported AOP training.

Golden Service Center

- Accomplished contracting and Financial oversight of \$1.52 billion EERE portfolio of uncosted balances.
- Obligated \$831 million, 56% EERE obligations.
- Processed 3,634 actions.

Workforce Management

- Training and personal assistance on the Individual Development Plan process that led to the increase in EERE Headquarters completion rates from 11.28% in FY 2013 to 71.04% in FY 2014, a six-fold increase.

manufacture cutting-edge clean energy technologies—spurring innovation in the U.S. energy infrastructure.

Later in the year, DOE announced two new National Manufacturing Innovation Institutes to further strengthen U.S. manufacturing and create new jobs.

The first of these institutes announced by President Obama was the Next Generation Power Electronics Manufacturing Innovation Institute located on the campus of North Carolina State University, called PowerAmerica.

This \$140 million advanced manufacturing institute will unite academic, government, and industry partners to revolutionize energy efficiency across a wide range of applications.

The institute’s mission is to develop wide bandgap semiconductors that will allow electronic components to be smaller, faster, and more efficient than those made from silicon.

In January 2015, President Obama announced that the University of Tennessee will lead another DOE-supported institute, the Institute for Advanced Composites Manufacturing Innovation (IACMI), a \$259 million public-private partnership.

The vision for IACMI, a 122-member consortium, is to revitalize American manufacturing and support domestic manufacturing competitiveness—focusing on low-cost, energy-efficient manufacturing of fiber reinforced polymer composites.

CEMI is also helping offices within EERE to increase their focus on the competitive opportunity for the United States to be the leader in the clean energy manufacturing industries and jobs of today and tomorrow:

- **The SunShot Initiative** is improving manufacturing in solar PV systems by making clean, low-cost, reliable solar energy available for home owners, communities, busi-

nesses, and government. Through its Technology to Market subprogram, SunShot provides strategic competitive R&D funding programs to move products to market quickly while leveraging American ingenuity and innovation. SunShot supports innovation in manufacturing to ensure U.S.-developed technologies can capture a larger portion of the global value in solar manufacturing, currently estimated to be about \$100 billion worldwide in hardware alone, with a strong growth trajectory in coming years.

- The **Wind Program** is working to manufacture taller wind energy towers by utilizing construction processes that will cost effectively reduce the cost of wind energy and expand the geographic areas where wind turbines can successfully be deployed in the United States.
- The **Vehicle Technologies Office** is developing fabrication technologies for lightweighted materials by improving their manufacturing through material cost, production rate and/or yield. Additionally, chemical manufacturing partnerships have resulted in the development of cathode materials that can increase energy density, reduce cost, and reduce the weight of lithium-ion batteries used in electric vehicles on the road today.



Smart grid work in progress at the FREEDM Systems Center at North Carolina State University (NCSU). Photo courtesy of NCSU.

- The **Fuel Cells Technologies Office** improves processes and reduces the cost of manufacturing components and systems for hydrogen and fuel cell applications with an emphasis on quality assurance and quality control. The Office recently announced the selection of three projects to receive up to \$2 million in new funding for analysis of the hydrogen and fuel cells domestic supply chain and global manufacturing competitiveness.

Looking ahead, CEMI expects to have an even larger impact on industry and within DOE in 2015, with a major new Advanced Materials Manufacturing effort, to be jointly developed through the Clean Energy Manufacturing Initiative with DOE's Offices of Nuclear Energy and Fossil Energy, that is applying Materials Genome Initiative principles to manufacturing processes to accelerate materials to manufacturing.

"The whole department is rallying around the unique opportunity of clean energy manufacturing, which is a very exciting development over the last year," said Dr. Danielson. "I am looking forward to what we can accomplish together in the coming years."

GRID MODERNIZATION

A modern electric grid not only has to deliver affordable, clean electricity to consumers at all times, but also requires increased efficiency and resiliency against potential attack or a natural disaster. And, according to Dr. Danielson, achieving this modern grid "is one of the most important challenges that we're facing today."

For years, work supporting grid modernization at the national laboratories has been supported by multiple offices across DOE without a central multi-year plan. As part of the cross-cutting grid modernization effort,



Visitors get a first-hand look at 3D technology as they visit the 3D Visualization Lab during a tour of the ESIF during a Community Open House at NREL. Photo by Dennis Schroeder, NREL.

EERE has worked with the Office of Electricity Delivery and the Office of Energy Policy and Systems Analysis to develop a Grid Modernization Laboratory Consortium that will unify all grid modernization activities under a single work breakdown structure and allow DOE and the national laboratories to work collaboratively and cooperatively to address the Department's priorities.

The consortium will employ an integrated approach, ensuring that DOE-funded studies, along with research and development, are efficiently coordinated to maximize taxpayer dollars. To support the modernization of the electricity grid, one of the major first steps will be for consortium leaders to coordinate all of DOE's grid-related activities—avoiding connectivity issues and redundancies, as well as identifying any gaps in the grid's development. To help solidify an approach, consortium leaders will work together to develop a multi-year program plan for the development a modern electricity grid.

"I think the real opportunity here is to really pull together, build relationships, map out a path together and make sure that the work that's being done is work that we think is the right work," said Danielson.

ENERGY SYSTEMS INTEGRATION FACILITY

Part of EERE's Grid Integration Initiative is the National Renewable Energy Laboratory's Energy Systems Integration Facility (ESIF). ESIF is a first-of-its-kind, LEED Platinum-certified research user facility, located at the NREL campus in Golden, Colorado and is the nation's premier lab for testing how clean energy technologies interact on the grid at megawatt utility scale.

In 2014, ESIF was named R&D Magazine's 2014 Laboratory of the Year for its ability to uniquely merge three specialized components: (1) an ultra-energy-efficient workplace that consumes 74% less energy than the national average for office buildings, (2) one of the world's most energy-efficient high-performance computing data centers, and (3) sophisticated high-bay laboratory spaces with outdoor test areas.



Dr. Danielson participates in a tour of Argonne National Laboratory. Photo by Mark Lopez, Argonne National Laboratory.

NATIONAL LAB IMPACT INITIATIVE TOURS

Throughout 2014, Assistant Secretary Danielson toured six DOE laboratories to launch EERE's National Lab Impact Initiative.

The initiative is part of DOE's drive to deliver on President Obama's 2011 directive to accelerate the transfer of federally funded research and innovations to the private sector.

The goals of the Initiative are to:

1. Increase and enhance lab-private sector relationships
2. Increase and streamline access to national lab capabilities
3. Demonstrate the value of lab-developed science and technologies.

As part of the Lab Impact Initiative, EERE developed a Lab Principles document that define the unique,

long-term relationship between EERE and the national laboratories, the operational requirements to maintain that relationship, and the interactions necessary for the labs to achieve maximum industry and market impact.

The principles document articulates and establishes a clear framework that lays a foundation for how EERE will engage with the national laboratories in a consistent, coherent, and strategic way in order to foster greater innovation, entrepreneurship, and market impact.

During the tours, Danielson introduced a variety of proposed concepts and pilots that signaled DOE's intent to expand its support of tech-to-market activities among the Department's enterprise of national laboratories. These include:

- Allocating 1% of EERE's annual \$800 million laboratory support to fund new technology transfer efforts, private-sector engagement, and focus on big ideas

- A Small Business Voucher pilot to encourage labs to provide technology assistance to small businesses and help them with their commercialization efforts
- A Lab-Corps pilot to empower lab teams to identify market applications and create business models for commercializing high-impact technologies
- A national lab Technologist-in-Residence pilot featuring laboratory-industry exchanges of "embedded" researchers.

The six labs that hosted the tours were Lawrence Livermore National Laboratory, Lawrence Berkeley National Laboratory, Sandia National Laboratory, Argonne National Laboratory, Los Alamos National Laboratory, and the National Renewable Energy Laboratory.

Additional tours will be scheduled for 2015.



Assistant Secretary David Danielson speaks to federal employees and contractors at Argonne National Laboratory during an All-Hands Meeting. Photo by Mark Lopez, Argonne National Laboratory.

EERE STAFF RECOGNITION



John Cymbalsky, BTO

Finalist for the Samuel J. Heyman Service to America Science and Environment Medal. He made unprecedented progress adopting many new energy conservation standards for residential appliances and commercial equipment.

Rob Ivester, AMO

Named a Fellow in the Society of Manufacturing Engineers and a Fellow in the American Society of Mechanical Engineers.



Rob Ivester shakes President Obama's hand at the White House.

David Forrest, AMO

Named a Fellow in The International American Society of Metals.

Jonathan Male, Valerie Reed, and Joyce Yang, BETO

Voted #15 for Biofuels Digest's ranking of Top 100 People in Bioenergy 2013-2014.

Energy Rock Stars

EERE Energy Rock Stars are recognized by their peers and selected by an EERE Committee for their efforts in helping to work toward EERE's mission.

May 2014

- Elena Alschuler, BTO
- Robert Bedick, PMCO
- Bryna Berendzen, BETO
- Natalie Committee, VTO
- Beverly Dyer, FEMP
- Richard King, SETO
- Sarah LaMonaca, ASEE
- Leslie Pezzullo, BETO
- Glenn Schatz, BTO
- Lidija Sekaric, SETO

October 2014

- Robert Anders, DAS/RP
- Antonio Bouza, BTO
- Michael Buck, GSC/FAO
- Jennifer DeCesaro, SPO
- Glenn Doyle, BETO
- Kelsie Hammond, WIP
- Zia Haq, BETO
- Timothy Ramsey, WWPTO
- Karma Sawyer, BTO
- Arah Schuur, BTO
- Jacob Spendelow, FCTO
- Ericka Sutherland, FCTO
- Amy Van Dercook, GSC/EOO

The National Hispanic Heritage Month celebration was held in the DOE HQ Forrestal Auditorium on October 14, 2014. The national theme for 2014 was *Hispanics: A Legacy of History, a Present of Action, and a Future of Success.*



CALENDAR OF UPCOMING EVENTS

Event	Date	Start Time	Location
Coffee Hour hosted by AMO	February 10	9:00 a.m.	DOE HQ, room 6A-112
American Red Cross Blood Drive	February 10	9:00 a.m.	DOE HQ, room 6E-069
Black History Month Observance	February 11	10:00 a.m.	USDA, Jefferson Auditorium, Washington, D.C.
DOE 2015 Regional Science Bowl (High School)	February 14		DOE HQ
DOE 2015 Regional Science Bowl (Middle School)	February 21		DOE HQ
Colorado Regional Science Bowl	February 21	7:30 a.m.	Dakota Ridge High School
Happy Birthday PowerPedia	February 23	11:30 a.m.	DOE HQ Auditorium
DOE Energy Toastmasters Seminars	February 25	12:00 p.m.	DOE HQ, room GH-035
Golden All Hands Meeting	March 4	8:30 a.m. (MT)	DOE Golden Field Office, San Juan Conference Room
DOE Energy Toastmasters Seminars	March 11 & 25	12:00 p.m.	DOE HQ, room GH-035
2015 DOE Acquisition and Project Management Workshop	March 24-26		Sheraton Pentagon City Hotel, Arlington, Virginia
EERE All Hands Meeting	April 2	TBD	DOE HQ

