*What's Happening @ EERE*

# Amped Up!

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

## IN THIS ISSUE

A Message from Dave ..... 3
COP 21 and the Road Through Paris ..... 4
Interview with Jonathan Elkind ..... 5
Advancing Clean Energy Technologies ..... 6
- Solar ..... 6
- Wind ..... 7
- Efficiency ..... 8
- Transportation ..... 9

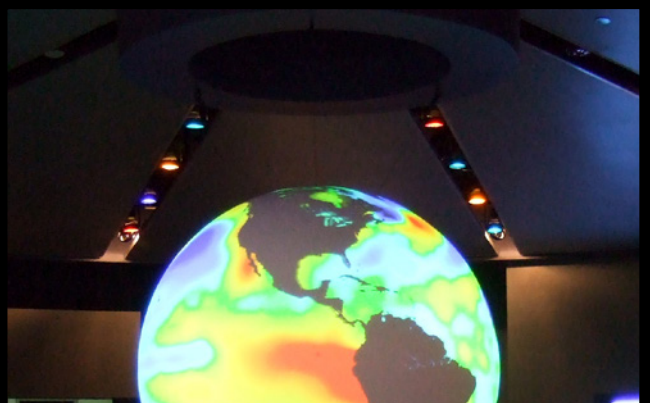
EERE International ..... 10
- China Partnership Helps Reduce Global Footprint ..... 11
- Solar Resource Maps Lead to Solar Exports ..... 12
- Better Building Materials for Brazil ..... 13
- Accelerating Deployment of "Cool Paint" Technologies in South Africa ..... 13

Quadrennial Technology Review Released ..... 14
TIR Selections ..... 15
EERE Investments Tackle Solar Challenges ..... 16
Clean Sweep at Solar Decathlon 2015 ..... 17
Energy on a Sphere ..... 18
Arizona School District Saves on Energy Cost ..... 19
Offshore Wind Buoy Visits Energy Department ..... 20
Office Round Up ..... 22

# EERE INNOVATION

## on the Road Through Paris

Source: CBS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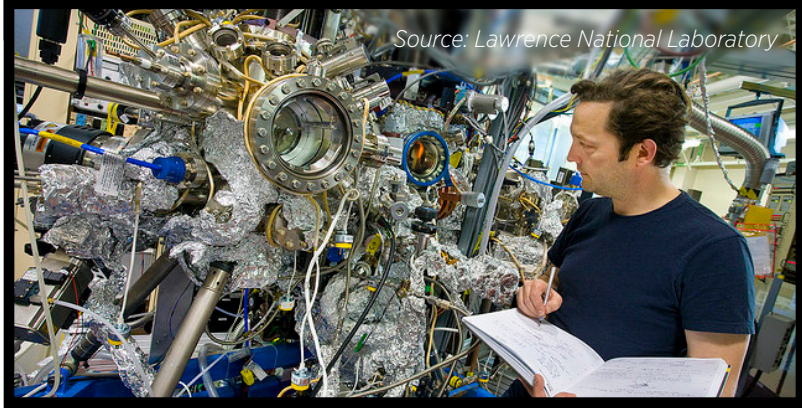

Source: Lawrence National Laboratory

# A Message from Dave

Dear EERE Family,

At EERE, we're not only focused on building a clean energy economy here at home, we're about changing the world. This December, EERE's central role in accelerating innovation and driving the adoption of clean energy technologies worldwide is being highlighted as nations prepare to gather for the highly anticipated Conference of Parties (COP) global climate change event in Paris, France. In fact, EERE's tremendous progress in clean energy innovation and cost reduction are helping countries all around the world see a clear and achievable pathway to our clean energy future, giving them the confidence to make aggressive policy commitments to reduce greenhouse gas emissions. That wouldn't be possible without the tremendous advances in clean energy technologies we've helped achieve.

Today, we are at the beginning of what I believe will be a multi-decadal generational shift toward clean energy. While much more work still needs to be done, clean energy technologies that were pioneered and refined through EERE investments are now transforming the way we live and do business. EERE investments in wind, solar, electric vehicles, and energy efficiency are now beginning to pay off in terms of rapidly accelerating deployment. EERE innovations are helping countries see a pathway to a clean energy future and to make aggressive policy commitments to reduce global greenhouse gas emissions. These policies will in turn allow for new technology and market advances - a cycle that will move the world rapidly forward.

I'm very proud to say that EERE's efforts to place more clean technologies into the marketplace don't stop at our borders. Our EERE International team is working with our technology offices, national labs, the Energy Department's Office of International Affairs, and the Departments of State and Commerce to increase adoption of clean technologies with partner countries and help U.S.-based companies compete in global clean energy markets. Our work in Brazil and China, for instance, is helping these countries set energy efficiency standards and qualification processes that are similar to those in the U.S., creating larger global market opportunities for U.S. companies.

We are also engaging internationally to leverage other countries' experience and expertise in clean energy technology deployment. In November, I plan to meet with top grid modernization experts in Germany and Ireland to learn how they have successfully integrated and managed large amounts of renewable and distributed power onto their systems. I'm hoping this trip will provide key insights that will help strengthen the Energy Department's Grid Modernization Initiative, within which EERE is a critical player, in addition to building stronger R&D bridges in this area between Europe and the U.S. I'll also be speaking at the Chatham House in London telling the world about the tremendous work that you all are doing to advance the clean energy economy in the United States.

It is very timely and appropriate that this latest issue of *Amped Up!* illuminates the exciting and innovative work that EERE is doing to impact the global clean energy economy and the significant role that we are playing internationally. The work that our people do and the benefits to both the U.S. and the world is one of the many reasons I'm so proud to lead EERE. Thanks to the work you are doing every single day, there is no doubt in my mind that we are changing the world.

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.

# Road Through Paris

The world will be keeping a close eye on the City of Lights this December as the 21st Conference of the Parties (COP 21) convenes in Paris, France. The conference, which is governed by the United Nation's (UN's) Framework Convention on Climate Change (UNFCCC), is expected to draw close to 50,000 people, from more than 190 countries, in what will be one of the largest climate discussions ever organized.

The main objective of COP meetings is to achieve a universal and legally binding agreement on climate in an effort to stabilize global warming. The agreement would be a first for the world in more than 20 years of UN negotiations and would go into effect in 2020.

In preparation for these global discussions, each participating country, for the first time, must publish its intended nationally determined contribution (INDC) before the December conference. These INDCs publicly outline what post-2020 climate actions a country intends to take and must meet UNFCCC criteria for scope, ambition, content, differentiation and transparency. The United States has committed to an economy-wide target of reducing its greenhouse gas emissions by 26% - 28% below its 2005 level by 2025.

UNFCCC was adopted during the Rio Earth Summit in 1992 and now has a near-universal membership of 195 parties. The first COP took place in Berlin three years later and is held annually to review the Convention's implementation.

### Earth Summit

*Rio de Janeiro, Brazil - 1992*

First global political response to climate change.

Adoption of UN Framework on Climate Change (UNFCCC).

### First Conference of Parties (COP)

*Berlin, Germany – 1995*

Parties agree to Berlin Mandate; allows parties to make specific commitments.

1990

2000

### UNFCCC Enters Force

*1994*

UNFCCC Treaty enters force after 50 ratifications.

### COP 3

*Kyoto, Japan - 1997*

Protocol includes legally binding emissions targets for developed country parties.

# Q&A with Assistant Secretary Jonathan Elkind

Press play to view the full interview

***Jonathan Elkind serves as the Assistant Secretary for the Office of International Affairs. Prior to joining the Energy Department, Elkind worked as a senior fellow at the Brookings Institution, focusing on energy security and foreign policy issues. He has served in a variety of other government positions including the U.S. National Security Council, National Security Affairs staff of the Vice President, and the Council on Environmental Quality. Mr. Elkind sat down to talk with the Amped Up! team about the upcoming climate talks.***

**How does this COP differ from previous ones?**

COP 21 represents an opportunity for a new construct of how we respond to climate change globally. The outcome that we hope for in Paris this December would fundamentally emphasize that, while we may have different responsibilities regarding climate change, all countries can and should be responding in their own ways.

**What role will EERE and Energy Department (DOE) innovation play in COP 21?**

Energy Secretary Dr. Ernest Moniz has expressed the central role that DOE plays in clean energy innovation. By fostering and supporting technology development at every stage of the game – from basic science in the Office of Science, to pre-commercial technologies at ARPA-E, to applied programs like EERE – all are united by their support for the healthy development of affordable, next generation clean energy technologies. This focus on clean energy innovation is at the core of DOE's unique role in climate action, which is not represented by any other federal agency, and it supplies a precious commodity for all countries trying to figure out solutions to climate change.

**How are advancements in clean energy technologies affecting developing countries?**

Clean energy technologies are all about improving performance, increasing availability, and reducing cost. More affordable access isn't just a theoretical thing for many developing countries. It's the difference of whether or not they are able to provide energy to their households.

For example, some of the work DOE labs have done on quality assurance frameworks for very high efficient microgrid systems have big impacts for village settings, whether it's in Africa or Alaska. Reducing costs for energy systems translates into the ability to keep the lights on, keep a refrigerator running for medicine and perishable foods, run a computer, or charge a mobile phone. So advancements will have very concrete applications that enable a more engaged response to mitigating the climate problem.

**How do other countries view the U.S. in terms of leadership on climate change?**

In the last couple of years, respect for American leadership on the climate issue has really grown. This is in part because of the President's leadership on where we are going as a country and what we are committed to in our own targets for 2020 and now 2030. Our Climate Action Plan emphasizes that we're committed internationally to helping other partners make progress as well. Under the Clean Energy Ministerial, we have a particular program called the Clean Energy Solutions Center, operated by the National Renewable Energy Laboratory. It provides quick response and advice on policy issues relating to clean energy applications. So if I wanted to encourage solar development in my country, I could see what structures and models exist and where they have been applied and to what success or failure. These kinds of concrete engagements that DOE has engaged in are really important because they help countries solve the problems that they have now. This helps them make progress on their own agendas and that translates back into the kind of appreciation and respect that one gets from international colleagues and peers in this space.

**COP 21**

*Paris, France – 2015*

First attempt to achieve legally binding, universal agreement on climate commitments.

2010

2015

**COP 15**

*Copenhagen, Denmark - 2009*

Kyoto Protocol abandoned / Copenhagen Accord established providing explicit emission pledges by all major economies and developing countries.

# Then and Now: How Far We Have Come in Advancing Clean Energy Technologies

*Tremendous progress has been made since COP 15 in Copenhagen, The following highlights four technologies - solar, wind, LEDs, and EV batteries - as a sample of that progress and the incredible contributions that EERE has made.*

## SOLAR

| THEN | NOW |
|---|---|
| 2008 | 2014 |
| Distributed Solar PV<br>0.6 gigawatts | Distributed Solar PV<br>8.5 gigawatts |
| Distributed Price<br>$8.84 per watt | Distributed Price<br>$4.27 per watt |
| Utility-Scale Solar PV<br>0 gigawatts | Utility-Scale Solar PV<br>9.7 gigawatts |
| Utility Price<br>$5.70 per watt | Utility Price<br>$2.34 per watt |

EERE technology investments and federal tax incentives are making solar energy more affordable and accessible to consumers. The cost to install solar photovoltaic (PV) systems has dropped dramatically since the beginning of the Recovery Act in 2009, along with a 30-fold increase in capacity installed between 2008 and 2014.

*Solar PV has revolutionized low-carbon options for America's electricity demands.*

EERE's SunShot Initiative aggressively drives innovation to make solar energy fully cost-competitive with traditional energy sources by the end of the decade. Already, SunShot's efforts have contributed to a substantial drop in the price of domestic solar in the U.S. Since the beginning of 2008, the average cost of solar PV panels has dropped more than 80%, and the cost to install a solar electric system has been cut in half.

Since 2010, the price of solar photovoltaic (PV) panels as well as other solar installation costs have undergone a profound drop in price leading to incredible growth in the market for PV power. These reductions, combined with federal and state policy support, mean solar installations are now cost competitive in a growing number of states. During the first half of 2015, solar represented 40% of all new electric generating capacity brought online in the U.S., making it one of the fastest-growing renewable energy sources. Rooftop solar PV costs about one percent of what it did 35 years ago, helping achieve a 30-fold increase in total PV capacity installed since 2008.

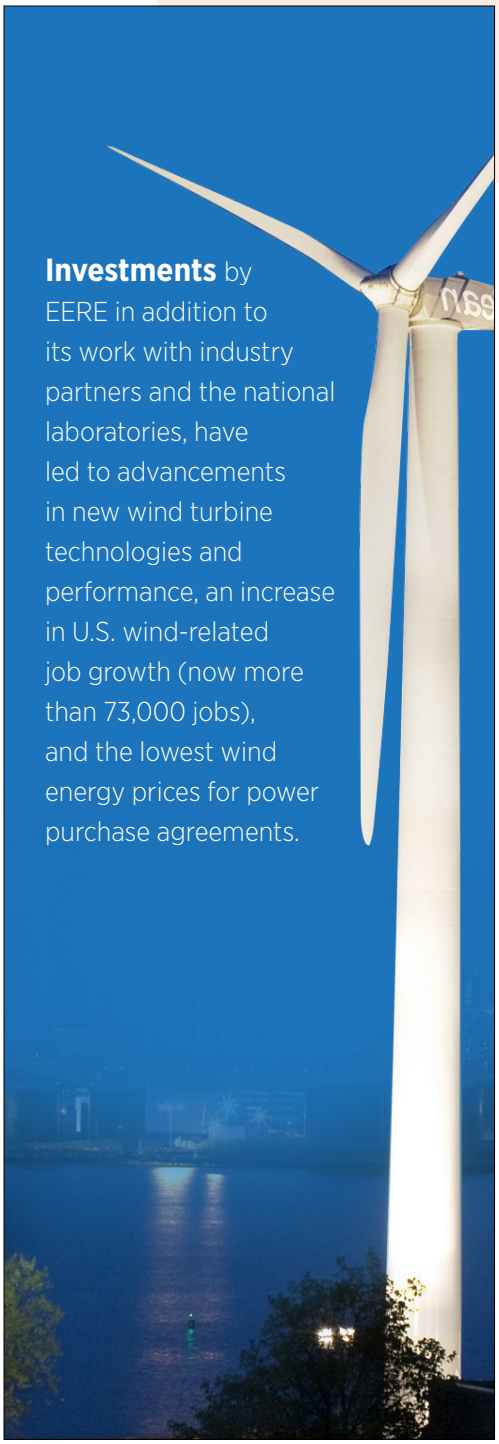
EERE investments in solar technologies have been pivotal in these developments. The Energy Department also played a leadership role by financing the first utility-scale solar PV projects (>100 MW) through the Loan Programs Office (LPO). Using funding provided by the Recovery and Reinvestment Act of 2009, the LPO financed the first five utility-scale solar PV projects in the United States with more than 1,500 MW of total capacity. Today, utility-scale solar is being financed by the private sector at increasing scale. As of summer 2015, there were 21 privately financed utility-scale solar PV projects either built or under construction.

**Did you know:** Solar power is the most abundant energy resource on earth, with a potential estimated at 173,000 terawatts – more than 10,000 times today's energy demand worldwide!

# WIND

| THEN | NOW |
|---|---|
| 2009 | 2014 |
| **Average Hub Height**<br>**78.9 meters** | **Average Hub Height**<br>**82.7 meters** |
| The average hub height, or distance from the turbine platform to the rotor, has increased by nearly five percent since 2009 and almost 50% since 1998-1999. A recent report by EERE's Wind & Water Power Technologies Office is projecting heights to jump even higher, between 110-140 meters. This will increase the potential for wind deployment up to 4.6 million square kilometers, a 67% increase over current technologies. | |
| **Average Rotor Diameter**<br>**81.6 meters** | **Average Rotor Diameter**<br>**99.4 meters** |
| Rotor diameters have increased nearly 22% since 2009. Larger rotors are capable of generating more power at lower wind speeds. In 2008, no turbines employed rotors that were 100 meters in diameter or larger. In 2014, 80% of the turbines met or exceeded that mark. | |
| **Installed Wind Power Project Costs**<br>**$2,298 kW** | **Installed Wind Power Project Costs**<br>**$1,707 kW** |
| With the deployment of new turbine technologies, the industry is seeing an increase in efficiency and scale of production that is lowering cost. Despite an increase in hub heights and rotor diameters, installed wind power projects over time averaged $1,707 per kW in 2014 – a 25% decrease since 2009. | |

Wind continues to be one of America's best options for low-cost, carbon-free renewable energy. According to the August release of EERE's *2014 Wind Technologies Market Report*, the wind industry grew to nearly 66 gigawatts of total installed wind capacity – up roughly eight percent from 2013. That's enough electricity to power more than 17.5 million homes annually or more than the combined total number of homes in Alaska, California, Delaware, the District of Columbia, Hawaii, Idaho, Maine, Montana, Nebraska, New Hampshire, Rhode Island, South Dakota and Vermont!



**Investments** by EERE in addition to its work with industry partners and the national laboratories, have led to advancements in new wind turbine technologies and performance, an increase in U.S. wind-related job growth (now more than 73,000 jobs), and the lowest wind energy prices for power purchase agreements.

**Did you know:** Wind power in the U.S. reduces annual carbon dioxide emissions by more than 115 million metric tonnes and reduces water consumption by more than 36 billion gallons.

# ENERGY EFFICIENCY

The buildings sector –comprised of commercial and residential energy use – leads the nation in energy consumption. One easy step in reducing this load is the energy efficient light bulb - pioneered through EERE research and now widely deployed as a practical means to increase efficiency and reduce building energy use.

## LED (A-Type Bulbs)

A 60-watt equivalent light emitting diode (LED) bulb consumes 85% less energy than incandescent bulbs. This savings has historically come at a huge cost, making them only affordable for specialized applications. More recently, due to investments made by EERE, LEDs have experienced more than a 10x improvement in cost, allowing them to move into the mainstream lighting market.

| THEN | NOW |
|---|---|
| 2008 | 2014 |
| **Cumulative Installations**<br>**0** | **Cumulative Installations**<br>**77.7 million** |
| In just two years, total installations of common home LED A-type bulbs have increased six-fold from 13 million to 78 million. Across all LED product types, LED installations saved $1.4 billion in energy costs and 9.5 million metric tons of carbon emissions in 2014 alone. | |
| **Cost per Kilolumen***<br>**$155** | **Cost per Kilolumen***<br>**$11** |
| Strategic research and development investments by EERE have helped cut cost of LED A-type bulbs by more than 90%. | |

**800 lumens is approximately the same light output of a 60-watt conventional bulb (http://lumennow.org/lumens-vs-watts/)*

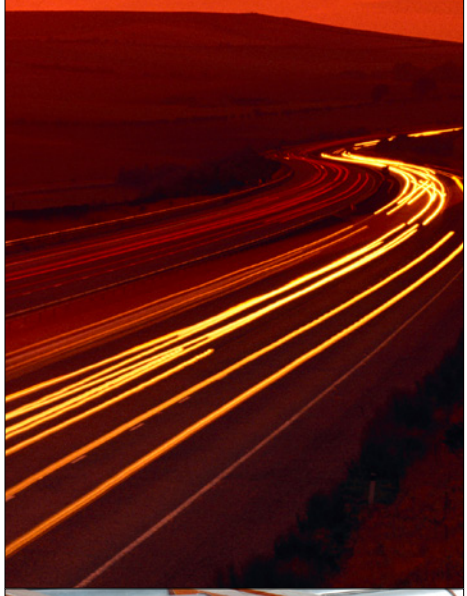
By 2030, LEDs could potentially reduce national lighting electricity use by nearly half—the annual equivalent to saving 3,000 trillion British thermal units, worth $26 billion in today's economy.

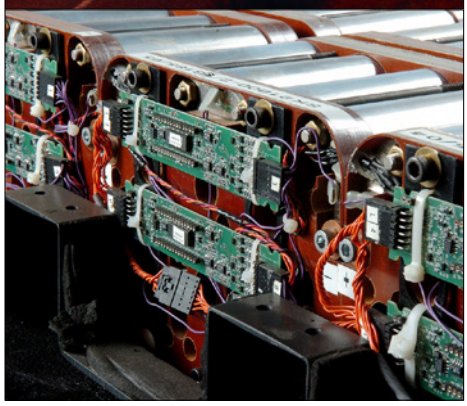
Read more on EERE's Lighting Campaign.

**Did you know:** LED light bulbs can last 25 times longer than traditional light bulbs.

# TRANSPORTATION

The future of EV charging research and development now lies in wireless power transfer - charging a car without a cord.





| THEN | NOW |
|---|---|
| 2011 | 2014 |
| Modeled Battery Cost<br>$580 per Kilowatt Hour | Modeled Battery Cost<br>$289 per Kilowatt Hour |
| The battery is one of the most expensive parts of a plug-in electric vehicle (PEV), but Energy Department research and development advances – including manufacturing efficiencies and new energy-dense storage materials – have reduced the modeled cost 40% since 2012. The Energy Department has set an even more aggressive goal of $125/kilowatt hour by 2022. | |
| U.S. PEV Cumulative Sales<br>17,763 | U.S. PEV Cumulative Sales<br>287,300 |
| The number of PEVs on the road in the U.S. has increased drastically since they first became available on a mass scale in 2011. The increasing number of models available, along with tax incentives of up to $7,500, have contributed to this success. Globally, the one millionth PEV recently sold in September 2015. | |
| U.S. Public/Private<br>Outlets Installed – 3,394 | U.S. Public/Private<br>Outlets Installed – 25,600 + |
| The Energy Department spurred the largest deployment of public and commercial electric vehicle charging stations in the world. As of fall 2015, more than 200 companies have committed to provide workplace charging for its employees through the EV Everywhere Workplace Charging Challenge. | |
| PEV Models – 10 | PEV Models- 20 |
| The number of PEV models has doubled in less than three years. In 2014, there were more than 20 models offered from 13 different automakers available in the market or coming soon. | |

Through EERE's EV Everywhere Grand Challenge, the United States is on a course to its goal of becoming the first nation in the world to produce plug-in electric vehicles (PEVs) by 2022 that are as affordable as gasoline powered vehicles for the average American family. According to the 2014 Vehicle Technologies Market Report, more than 350,000 PEVs are now on the road since 2011 – the year manufacturers first introduced them to the mass market. And with transportation accounting for nearly one-third of the country's carbon pollution, the need is growing for sustainable options to help meet U.S. climate goals and accelerate the global competitiveness of American manufacturing.

Research and development supported by EERE's Vehicle Technologies Office has contributed to lowering the high-volume modeled cost of advanced lithium-ion batteries by 40% since 2012. These and other investments have led to an increase in PEV performance and an expansion in charging infrastructure.

# EERE International

## Our footprint extends beyond our borders to support international efforts that address climate change while promoting deployment of U.S. clean energy technologies.

As a small team of specialists within the Office of Strategic Programs, EERE International provides a very critical capability for EERE to advance the President's Climate Action Plan and National Export Initiative. EERE International works closely with U.S. private sector partners, EERE technology programs, and other government agencies, such as the Departments of State and Commerce, to help partner countries deploy clean energy technologies and transition to clean energy while creating opportunities for U.S. clean energy exports.

"Our vision is a world where clean energy is affordable and reliable and a top choice among all nations, not just the U.S.," said EERE International Director Rob Sandoli.

One of the primary tools for EERE International is to facilitate access to U.S. clean energy expertise, practices, and information. For example, EERE International engages with several countries in the development of codes and standards for buildings, windows, photovoltaic (PV) panels, and other products, providing technical information and analysis that will allow them to adopt standards, labels, and test procedures common in the U.S. This approach has the benefit of providing significant reductions in the country's carbon emissions while also creating a market opportunity for U.S. companies.

EERE International also uses its expertise with partner countries to help U.S. companies build key relationships. For example, for a project with China called Sustainable Energy Business Districts (SEBIZ), EERE International's project team from Optony, Inc. facilitated analysis of energy savings and renewable energy opportunities in two large districts: Wujin National Hi-Tech Industrial Zone and Green Dragon Lake District. Following analysis of 46 facilities, energy savings opportunities totaling 31% were identified, through improved lighting, HVAC systems, building energy management systems, and solar PV. EERE International's team facilitated matchmaking between facility operators in the districts and 12 U.S. technology solution providers. Five commercial deals are now signed or underway. Moreover, tools and resources developed through the course of the project, such as a Clean Energy Development Resource Guide for Local Governments in China, are available online, which will enable the project's success to be replicated.

EERE International serves as the coordinator for international activities across all of EERE's diverse clean energy portfolios. In this role, EERE International helps to facilitate research and development collaborations for EERE technology offices (largely with developed economies), which recognize that world-class experts and facilities are sometimes outside U.S. borders. And EERE International, like its sister offices, interacts daily with the Energy Department's International Affairs Office to ensure that all EERE efforts are effectively represented in briefing materials for the secretary and other administration leaders. EERE International's role in providing this support ensures that EERE is well aligned with Energy Department priorities at large.

**EERE International Team**
from left to right

**Mark Reichhardt, Sheila Moynihan, Rob Sandoli, Abigail Watrous, Josh Harmon**

*Not pictured:*
**John Cabaniss, Bernadette Hawkins**

**"We're looking to provide countries with technical assistance in order for them to make ambitious clean energy commitments today that they will still be committed to keeping tomorrow."**
**– Rob Sandoli**

## CHINA PARTNERSHIP HELPS REDUCE GLOBAL FOOTPRINT

The United States and China are the world's two largest energy consumers and greenhouse gas emitters. Collaboration between these countries, and the rest of the world, is paramount in combatting climate change and transitioning to a green, low carbon economy.

Since 2009, the U.S. and China have been jointly working together on seven presidential clean energy announcements to achieve these objectives. EERE International manages the implementation of two of these efforts – the U.S. — China Renewable Energy Partnership (USCREP) and Energy Efficiency Action Plan. Technical work under these initiatives contributed to last year's groundbreaking U.S.-China Joint Announcement on Climate Change, and to further opportunities to deploy clean energy in China.

### China INDC

Part of China's Intended Nationally Determined Contribution (INDC) for COP 21 is to increase the share of non-fossil fuels in primary energy consumption by up to 20% by 2030. EERE International technical assistance has supported this increased ambition by Chinese policy makers, particularly in the area of renewable electricity grid integration.

Rapid increases in renewable energy generation in China have resulted in significant challenges in effectively harnessing all produced electricity. Through USCREP, a partnership that accelerates deployment of clean energy technologies through design and implementation of technical tools and policies, EERE and the National Renewable Energy Laboratory assisted the Chinese through sharing best practices in power system modeling and drawing upon methods used in the U.S.

"We were able to show them, through robust modeling and analysis, that their grid will be able to accommodate more renewables than previously thought," said EERE International Director Rob Sandoli. "It helped raise the comfort level with setting more aggressive targets."

### Concentrating Solar Power Plant

Building on a series of agreements since 2013, EERE International most recently facilitated a joint venture agreement between BrightSource, a U.S. leader in concentrating solar power (CSP technology), and two Chinese entities to develop the first commercial CSP plant in Qinghai, China. The partnership, which was recognized at USCREP's fourth Renewable Energy Industries Forum this summer, hopes to break ground this year on the first of three sets of two 135 megawatt CSP towers – providing enough renewable energy to power more than 452,000 Chinese homes.

While a majority of the construction will take place onsite, roughly 20% of the economic value will be sourced in the U.S. This includes system design, software customization, and the manufacture of highly specialized solar receivers.

"This really fits in to EERE Assistant Secretary Dr. David Danielson's Clean Energy Manufacturing Initiative," said Sandoli. "These are high-quality jobs being created in the United States. The project will provide clean energy for China and help create jobs there as well."

Construction on the Delingha project is currently pending approval of a government-issued tariff. To inform the tariff rate, EERE International supported analysis by NREL, in partnership with China's State Grid Energy Research Institute, on the economic value of CSP with thermal energy storage. The report was released in June 2015.

### Energy Performance Contracting (EPC) Initiative

EERE International is providing technical and policy advice on energy performance contracts (EPCs), a model that pays for upfront costs of energy efficiency retrofits with utility bill savings over time. As an initiative under the Energy Efficiency Action Plan, technical experts from Lawrence Berkeley National Lab and Pacific Northwest National Lab, in partnership with Chinese experts, developed a policy report comparing the combined $20 billion EPC market in the U.S. and China. The experts also prepared a toolkit that includes standard contract language, protocols on measurement and verification of energy savings, and policy recommendations. EERE International facilitated the formation of an industry-led work group to identify high-profile EPC pilot projects involving U.S. and Chinese entities working together. Three exemplary projects were recognized at the 6th Annual U.S. — China Energy Efficiency Forum in October. Annual energy savings from the three projects, all located in China, ranged from 25% - 51%, and represented millions of dollars in trade and investment. The projects will be jointly monitored by experts to assess actual energy savings, and ideally replicated many times over.

"It's incumbent upon us as the leading emitters to work together to reduce emissions," said Robert Sandoli, director of EERE International. "This relationship with China is arguably the most important in the clean energy space that we have."

*Source: BrightSource*

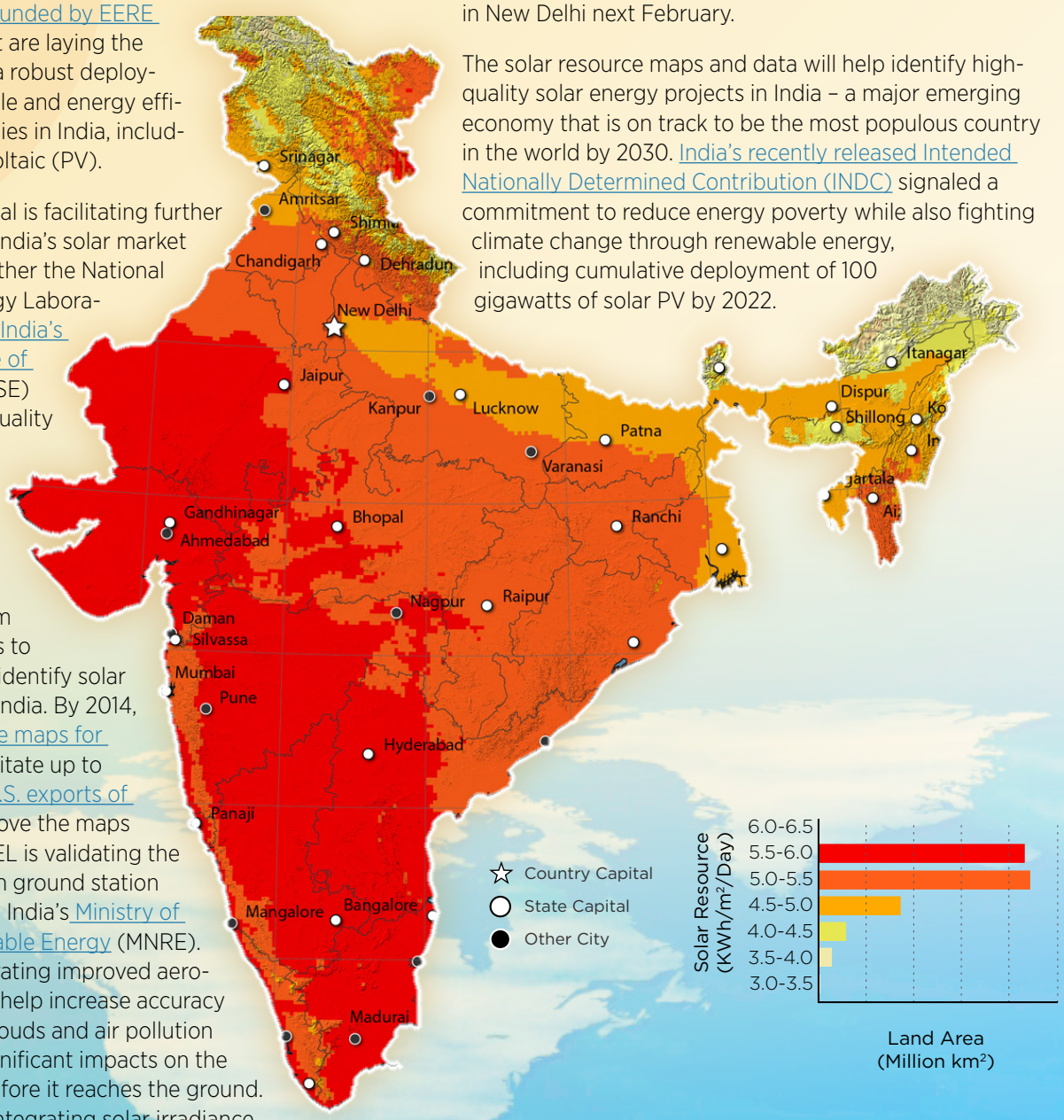
## SOLAR RESOURCE MAPS LEAD TO SOLAR EXPORTS

During September's U.S. – India Energy Dialogue in Washington, D.C., Energy Secretary Ernest Moniz and Indian Power Minister Piyush Goyal highlighted several projects funded by EERE International that are laying the groundwork for a robust deployment of renewable and energy efficiency technologies in India, including solar photovoltaic (PV).

EERE International is facilitating further development of India's solar market by bringing together the National Renewable Energy Laboratory (NREL) and India's National Institute of Solar Energy (NISE) to enhance the quality and accuracy of India's solar resource maps.

Since 2011, NREL has been analyzing data sets from weather satellites to more accurately identify solar opportunities in India. By 2014, the solar resource maps for India helped facilitate up to $350 million in U.S. exports of solar PV. To improve the maps even further, NREL is validating the satellite data with ground station data provided by India's Ministry of New and Renewable Energy (MNRE). It is also incorporating improved aerosol data that will help increase accuracy by factoring in clouds and air pollution that can have significant impacts on the solar resource before it reaches the ground. Finally, NREL is integrating solar irradiance data into a geographic information system platform to visualize the data for any 10-km2 area in India. The improved solar resource maps and data sets are expected to be released in New Delhi next February.

The solar resource maps and data will help identify high-quality solar energy projects in India – a major emerging economy that is on track to be the most populous country in the world by 2030. India's recently released Intended Nationally Determined Contribution (INDC) signaled a commitment to reduce energy poverty while also fighting climate change through renewable energy, including cumulative deployment of 100 gigawatts of solar PV by 2022.



## BETTER BUILDING MATERIALS FOR BRAZIL

Like China and India, Brazil is undergoing rapid growth and a burgeoning economy, especially in its urban centers. The continued growth presents ample market opportunities in the built environment, where EERE International has achieved a win-win for both American businesses and the Brazilian market.

When Brazil expressed interest in improving the efficiency of its building stock, EERE introduced a rating system similar to that used in the U.S. EERE International then helped the country establish a business case for a new testing laboratory and adopt performance standards that would carry across international markets. These efficiency ratings for windows, doors, and insulation – which standardize the measures of energy loss, heat gain and air leakage – prompted participation from U.S. businesses in Brazil. Technical experts from the Lawrence Berkeley National Laboratory (LBNL) recommended which equipment to buy. As a result, Brazil purchased $500,000 in U.S.-made lab equipment for the center, which was completed and validated in 2014. EERE International also trained Brazilians in estimating efficiency with advanced modeling tools and simulators.

Once the new Brazilian laboratory is certified, industry groups are expected to seek approval of a labeling scheme for windows and other products, similar to the labels used in the U.S.

Standardizing efficiency measures is also a win for Brazil. As EERE helps in regulating building efficiencies, new construction will reduce the power load it takes to heat and cool buildings, resulting in cost savings to the commercial customer and the consumer. Additionally, on the eve of climate talks centered on country-by-country commitments to limit carbon emissions, these better building components will mean subsequent carbon reductions. Residually, the standards also provide Brazil with a competitive advantage: as U.S. companies flourish in building trades, there will be new jobs for Brazilians - in finishing supply chain materials and in installation and operations maintenance.

## ACCELERATING DEPLOYMENT OF "COOL PAINT" TECHNOLOGIES IN SOUTH AFRICA

EERE is accelerating the deployment of clean energy products in South Africa, and through doing so, is helping to cut greenhouse gas emissions and create new opportunities for American businesses.

The Accelerating Deployment of Clean Energy Solutions in South Africa project, launched by EERE in 2014, is bringing together experts in the United States and South Africa to strengthen the market for clean energy products in one of Africa's largest economies. The project team also helps American clean energy companies better understand South African policies, develop relationships with potential partners, and demonstrate American products in the country's growing clean energy sector.

A core focus of this two-year project is supporting the development of a robust market for "cool" surfaces in South Africa. The project team shared insights from the U.S. experience with product standards for cool surfaces with South African industry groups. Earlier this year, South Africa adopted its first national standard for cool surfaces, and it is closely aligned with the standard used in the United States.

The team also trained local workers on mixing and applying cool coating materials; and trained leading experts from South Africa on state-of-the-art software tools that model building efficiency. Finally, they supported demonstration projects at a local school and municipal building using cool paints from a small start-up company based in California.

Cool surfaces are designed to reflect sunlight and absorb less heat than standard surfaces. Cool surfaces reduce energy bills by decreasing air conditioning needs and improving indoor air comfort for spaces that are not air conditioned. They can also reduce local air temperatures (sometimes referred to as the heat island effect) and lower peak electricity demand when buildings in a community have them.

Now, more building owners in the region are expressing interest in upgrading to a cool roof and U.S. companies are working with local businesses in South Africa to meet the increased demand.

*EERE International supported local demonstration projects with "cool paint" technologies in South Africa.*

# Quadrennial Technology Review Released

The second Quadrennial Technology Review (QTR) explores the current state of clean energy technologies with an eye toward new opportunities that will modernize the power sector. Emerging technologies bring new options to the nation's economic, environmental, and security challenges, but continued improvements in cost and performance will be crucial to its large-scale deployment.

**The QTR examines six of the nation's core energy sectors and its related innovations and challenges:**

- **Electric grid** – As the centerpiece of the nation's energy economy, the power grid's design and operation are faced with evolving security, cost and environmental challenges.
- **Electricity production** – America's energy balance includes baseload generation, evolving renewable resources, new natural gas plants, and new and pending nuclear and clean coal facilities. Challenges include optimizing the system, minimizing risks and maintaining costs.
- **Buildings** – Residential and commercial building sector accounts for nearly three-fourths of electricity use and 40% of all U.S. primary energy demand. Advanced heating/cooling and lighting are current research and development priorities and represent the greatest end-use energy-saving opportunities.
- **Manufacturing** – Industry annually consumes nearly 80% of total domestic energy use. Improved technologies could drive economy-wide energy impacts, including energy efficiency in manufacturing, innovation in manufactured products, and sustainability of U.S. industry supply chains and life-cycle impacts.
- **Fuels** – Fuels burn virtually all of the energy consumed in the transportation sector – and 70% of energy used to generate U.S. electricity. The economy needs a broad balance of fuels (fossil, bioenergy and hydrogen) to transition to a low-carbon economy.
- **Transportation** - The primary consumer of petroleum in the U.S. and a major emitter of air pollutants and greenhouse gases. This technical portfolio addresses complementary research, development, demonstration and deployment pathways such as advanced combustion, light-weighting battery storage, electric drivetrains, fuel cell systems, and recharging and refueling infrastructure.

## QTR BACKGROUND

The QTR examines energy technologies and research opportunities to effectively address the nation's energy needs. It complements the work of the Quadrennial Energy Review, released in April, which focuses on energy infrastructure and government-wide policy. The two reports are intended to inform community stakeholders on the nation's energy system.

The first QTR was released by the Energy Department in 2011 at the recommendation of the President's Council of Advisors on Science and Technology. QTR 2015 was led by former Deputy Under Secretary for Science and Energy Mike Knotek with guidance and support from an Executive Steering Committee that included a number of senior EERE leaders. It was written by a team that included a number of EERE experts and drew heavily on the expertise of the Energy Department's 17 national laboratories.

*Source: CBS*

## MONIZ ON LATE NIGHT

Secretary Ernest Moniz is becoming a popular guest on late night television. Dr. Moniz appeared on HBO's Real Time with Bill Maher on October 9 and The Late Show with Stephen Colbert back in September. Dr. Moniz talked about the Iran Deal, climate change and the Energy Department's role in clean energy innovation.

*Argonne National Laboratory and Cummins are working to develop range extended electric vehicles during the TIR pilot. (Source: Argonne National Laboratory*

## TIR Selections

During September's American Energy and Manufacturing Competitiveness Summit, EERE announced the seven pairs selected to receive $2.6 million to participate in its Technologist in Residence (TIR) pilot.

The two year pilot is part of the department-wide Clean Energy Manufacturing Initiative and is designed to strengthen relationships between EERE national laboratories and the private sector, in addition to leveraging the national lab network for strategic, long-term, collaborative research and development on clean energy industry needs.

The competitively selected TIR pairs are:

- Pacific Northwest National Laboratory and Tesla Motors,
- Argonne National Laboratory and Capstone Turbine Corporation,
- Argonne National Laboratory and Cummins,
- Argonne National Laboratory and International Consortium for Advanced Manufacturing Research,
- Los Alamos National Laboratory and Proctor & Gamble,
- National Renewable Energy Laboratory and Hewlett Packard,
- Oak Ridge National Laboratory and Alcoa.

As a result of the TIR pilot, the Energy Department will take the lessons learned from each of the pairs to develop a more streamlined set of best practices. This will better help companies establish long-term, strategic relationships with the national labs and leverage the labs' resources moving forward.

### CYCLOTRON ROAD SELECTIONS UNDERWAY

Selections for the second cohort of Cyclotron Road are currently underway. The program is supported by EERE's Advanced Manufacturing Office and the Lawrence Berkeley National Laboratory and focuses on bridging the gap between early-stage energy technology invention and high impact commercial outcomes. Cyclotron Road offers a home for top entrepreneurial researchers to advance technologies until they can succeed beyond the research lab. Appointments are for up to two years and are contingent upon project performance and funding availability.

# EERE Investments Tackle Solar Challenges

Vice President Joe Biden recently announced $102 million in new projects and available funding to support the United States leadership in solar energy innovation. More than $52 million will back 22 new projects in partnership with companies, non-profits, universities, and national laboratories to help make solar energy more affordable and accessible across the nation. The projects and opportunities announced on September 16 will be funded through EERE's SunShot Initiative, and support President Obama's Climate Action Plan to cut carbon pollution as the U.S. continues to build a clean energy economy.

"Since President Obama took office, the total cost of a home solar energy system has fallen by nearly 50%, while solar deployment is up nearly twenty-fold," said Energy Secretary Ernest Moniz. "These solar projects will help communities nationwide to reach goals laid out in the Clean Power Plan and position America to continue to lead the world in clean energy innovation."

In addition, EERE is also offering $50 million in new funding to foster rapid solar innovation and bring new technologies to market. The development activities in these two arenas will continue to drive down solar photovoltaic (PV) costs beyond EERE's current SunShot Initiative goals.

## PROJECT BREAK DOWNS

### Reliability and Predictability of Solar Technology Performance

EERE will dedicate $7 million to improve solar hardware degradation rates. These projects will provide the solar community with improved predictive models, accelerated testing techniques, and more reliable products that will ultimately lead to solar cost reductions and reduced risk in long-term PV performance - a primary goal of EERE's SunShot Initiative.

### Breaking Concentrating Solar Power Barriers

Building on the success of previous investments in concentrating solar power (CSP) systems, the Energy Department awarded $32 million for 14 projects to address technical challenges in CSP plants, including solar collectors and receivers, thermal energy storage, and novel power cycles. This research and development will improve the overall performance and efficiency in CSP plants – eventually leading to more reliable systems and a reduction in cost. CSP systems are important to the President's 'All of the Above' energy strategy because they can store the sun's energy for use when the sun is not shining.

### Expanding Solar Access

Regulatory issues related to permitting and interconnection have a tremendous impact on solar energy pricing and deployment. A recent study showed the consumer cost to "go solar" is as much as $3,000 higher in communities with challenging solar policies. To cut through this red tape, the Energy Department will fund two new projects that will establish a national recognition and technical assistance program to help local governments grow local solar markets and create jobs. This new program aims to qualify at least 300 communities across America for this national designation.

### SunShot Prize Competition

The SunShot Prize: Race to 7 Day Solar aims to slash the time it takes to go solar by 75% with attractive incentives that mobilize communities, solar companies, and electric utilities to collaborate and streamline permitting, installation, and interconnection processes. Finalists in the competition have demonstrated best practices that could be replicated by communities.

# Clean Sweep at the Solar Decathlon 2015

*Stevens Institute of Technology earned top marks at the U.S. Department of Energy Solar Decathlon 2015. Source: Thomas Kelsey/US Department of Energy.*

EERE Assistant Secretary Dr. David Danielson commended the winners of the U.S. Department of Energy Solar Decathlon 2015 in Irvine, California on October 17. Stevens Institute of Technology won top honors overall in the two week competition by designing, building, and operating the most cost-effective, energy-efficient and attractive solar powered house. University at Buffalo, The State University of New York took second place followed by California Polytechnic State University, San Luis Obispo in third place.

"The homes you built demonstrate how affordable, renewable, and energy-saving products available today can cut energy bills, reduce pollution, and protect our climate," said Danielson to the competitors. "You have shown the skills and dedication necessary to advance renewable energy and energy efficiency throughout our economy in the decades to come."

Stevens Institute of Technology – the standout performer in nearly all of the juried contests – took home the top prize for its SURE house that stands up to extreme weather. After Superstorm Sandy debilitated the New Jersey coastline in 2012, Stevens came up with a design that generates all of the energy needed through a storm-rugged solar electric system. To offset huge power outages that accompany hurricanes, the SURE house powers an electric vehicle, uses less energy through smart design and can assist neighbors with enough energy to charge their electric devices.

Solar Decathlon is an award-winning competition that promotes education in sustainable technologies and private sector adoption of solar efficiencies. Since its beginning in 2002, more than 32,000 participants worldwide – from San Jose to Beijing – have undertaken the most rigorous project of their academic careers: designing and building a solar-powered, energy efficient house. Entries must meet the energy demands of the average American family, with enough surplus to power an electric vehicle. As one of the Energy Department's most successful outreach efforts, the Solar Decathlon promotes both clean energy design solutions from leading engineering and architecture universities, and the consumer adoption of solar efficiencies that are increasingly comfortable and affordable.

See more of the competition here.

## American Innovation – Global Impact

**Five Competitions Worldwide**:

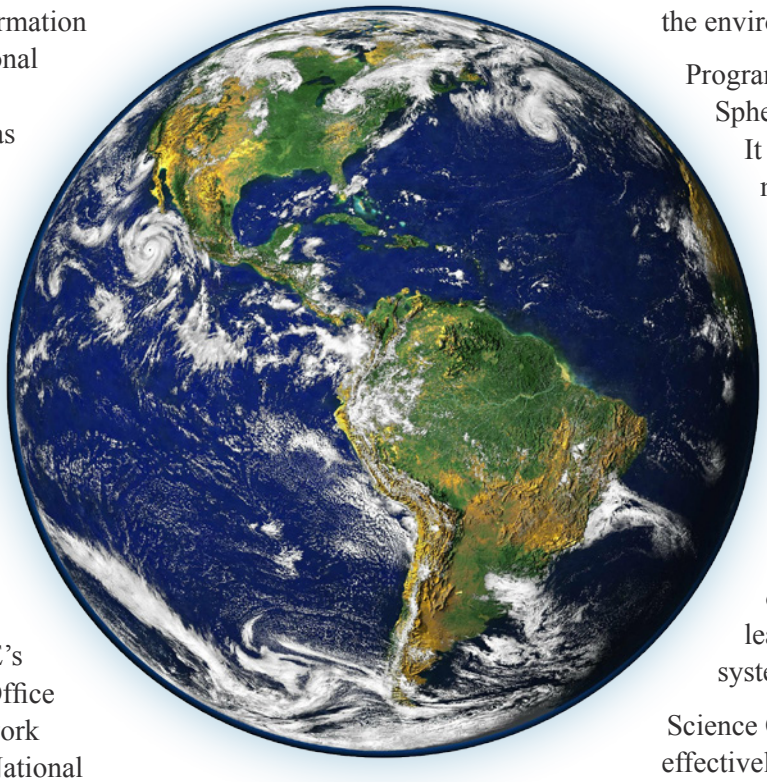
United States, China, Europe, Latin America and Caribbean, and the Middle East

20 teams per event – with a reach of more than 32,000 students globally

# Energy on a Sphere

Americans have an ocean of knowledge at their fingertips today, thanks to the emergence of digital technology. Yet sifting through data records is a deterrent for many. To make earth science information more compelling, the National Oceanic and Atmospheric Administration (NOAA) has found a way to visualize global trends through a new tool they call Science On a Sphere®. This year, EERE joined the game, capturing energy-specific content about renewable solar, wind and geothermal. By coordinating with NOAA and stakeholders to convert relevant energy datasets, Paul Phongsavan – a summer intern in EERE's Stakeholder Engagement Office – led the effort, selecting work created by analysts at the National Renewable Energy Laboratory. He also helped craft scripts to interpret the data and developed best practices for future contributions by the Energy Department.

In August, more than 16 participating museums showcased the datasets at the White House Back to School climate event. EERE's data visualizations are part of an overall commitment to the administration's Climate Education and Literacy Initiative that connects students and citizens with the best available science-based information on climate change. Displays can be found in more than 120 museums and science-technology centers worldwide.



"NOAA created Science On a Sphere to engage audiences around Earth system science," said Beth Russell, the manager of operations for the new tool. "With it, we are able to capture the curiosity of our audiences and help them understand and appreciate the world around them so they can be good stewards of our home."

With colorful maps and images, the energy data projected on the sphere provides an entertaining way to educate young minds about renewable energy and the potential of sustainable energy options. It also enables students of all ages to better understand complex subjects and how they impact the environment.

Programming for Science On a Sphere is virtually limitless. It supplements learning in museums and science centers and offers various sequences ranging from the migration of sea turtles to the surface of Mars. When new images of Pluto recently streamed from NASA's New Horizons Spacecraft, thousands who visited Science On a Sphere exhibits explored the surface of the former planet as they learned more about our solar system.

Science On a Sphere also works effectively as a classroom tool. With the use of the sphere, traditional learning goes high-tech. Math on a Sphere, for instance, challenges students to design and create geometric shapes that display on the sphere through computer programming. Learning about spherical geometry and computer logic bears immediate rewards for these students, who see their handiwork displayed in living color.

Check out all the cool science on display at the Science On a Sphere website.

*Students in the STEM Club at Kingswood Elementary School build houses with different materials to test which is more efficient at keeping heat out. (Photo- Dysart Unified School District)*

## Arizona School District Saves on Energy Costs

Students at Kingswood Elementary, located in Surprise, Arizona's Dysart Unified School District (USD), are still buzzing about the Energy Department's August visit.

"There was a lot of excitement over the summer," said Kingswood Principal Jeremy St. Germain. "Our kids talk solar panels just about every day."

Kingswood, along with 24 other schools in the district, was recognized for increasing the use of energy efficiency and renewable energy technologies through the Energy Department's Better Buildings Challenge. Dysart USD has committed to 20% energy savings over 10 years, spanning more than three million square feet of building space.

"The district's commitment to pursue sustainable practices offers a replicable model for other school districts in the nation to follow," said EERE Assistant Secretary Dr. David Danielson.

Kingswood, one of the district's oldest buildings, is leading by example experiencing 16% energy savings since 2011. That's $44,000 in cost savings each year, providing the district flexibility when it comes to its budget.

"It allows us to put money back in the classroom," said St. Germain. "We can work with teachers more and have it directly impact the students."

Kingswood is equipped with rooftop solar panels that generate 469 kilowatts annually that provide much needed shade from the Arizona sun for playgrounds and parking. The school also has an advanced chiller system to cool the building, along with new lighting controls and fixtures, and solar water heaters that take advantage of onsite solar resource capacity to further reduce the school's annual energy costs.

"It's always nice to learn about your building and see what makes it unique," said St. Germain.

And that learning is spilling over to the classroom, providing real-life examples of clean energy technologies in action – right on the Kingswood campus.

"We're talking about energy and energy conservation throughout our science lessons all the time," said St. Germain. "There are talking points at all grade levels in terms of energy savings, conservation and different ways to promote clean energy."

## INTERIOR LIGHTING CAMPAIGN ANNOUNCES PARTNERS

More than 65 organizations are flipping the switch on current technologies and joining the Better Buildings Alliance's Interior Lighting Campaign (ILC).

In the first year, partners in the ILC will commit to installing 100,000 high efficiency fluorescent lighting fixtures and share best practices with others. By making these upgrades, partners could reduce energy use by five million kilowatt-hours, cut greenhouse gas emissions by 3,000 metric tons of carbon and save $500,000 in annual electric bills.

ILC participants and supporters will also have the option of pursuing even greater savings by meeting the Better Buildings Alliance's High Efficiency Performance Troffer Specification. If all troffers nationwide were replaced to meet this mark, the United States could save $4 billion annually in energy costs.

The ILC is a recognition and guidance program designed to aid facility owners and managers in making smart interior lighting decisions and award those with exemplary achievements.

"If the U.S. upgraded all troffer fixtures to meet the minimum performance requirements in the ILC, the nation could save more than $2 billion annually in electricity costs."

Source: Alana Duerr

# Offshore Wind Buoy Visits Energy Department

**The Wind and Water Power Technologies Office hosted AXYS WindSentinel Light Detection and Ranging (LiDAR) buoy at Energy Department headquarters in September on its way to be deployed off the coast of New Jersey. The WindSentinel is an advanced resource assessment buoy capable of measuring wind characteristics for conventional offshore wind turbines reaching up to 650 feet tall. The buoy weighs more than 14,000 pounds and measures more than 20 feet long and 30 feet tall when full assembled.**

## Energy Department Funds New Offshore Platform Acess Technology

Through Energy Department funding, Fishermen's Energy and Keystone Engineering designed a safer access ladder for offshore wind technicians. Representatives held a demonstration in August to showcase this new system. The access ladder is rotated 90 degrees so workers can safely side step onto the ladder. With this new ladder orientation, workers will be protected from boat motions by a clear fall space. The U.S. innovation meets current safety regulations and could be adapted in future projects around the world, improving the global safety of offshore workers.

*From Left to Right:*

*Noah Golding, Alana Duerr, Greg Matzat, WWPTO Director Jose Zayas, Under Secretary Lynn Orr, Deputy Assistant Secretary Doug Hollett, Ben Maurer, Joel Cline*

Source: East Tennessee Clean Fuels Coalition

### Clean Cities and National Parks Increase Plug-in Charging Stations with Help from Nissan

Clean Cities, the National Park Service (NPS) and Nissan recently announced a new partnership to increase the number of plug-in electric vehicle chargers in the national parks. The project will begin with the donation of two DC fast-chargers from Nissan to Great Smoky Mountain National Park in Gatlinburg, TN. Through the Clean Cities-NPS program, several national parks have installed charging infrastructure which has inspired Nissan's involvement.

### The Remote Alaskan Communities Energy Efficiency Competition

The Remote Alaskan Communities Energy Efficiency Competition, supported by EERE and the Office of Indian Energy, is a new $4 million initiative that will significantly accelerate efforts by remote Alaskan communities to adopt sustainable energy strategies, through a competitive effort to elicit the best approaches. The competition is being designed to empower remote Alaskan communities to develop and implement solutions that can effectively advance the use of reliable, affordable, clean-energy and energy-efficient solutions that are applicable throughout rural Alaska and potentially in other Arctic regions. Last month, President Obama announced new commitments to respond to the unique climate challenges facing remote Alaskan communities.

### Energy Exchange 2015

Federal Energy Management Program (FEMP) Director Dr. Tim Unruh, along with EERE Principal Deputy Assistant Secretary David Friedman, spoke during the 2015 Energy Exchange in Phoenix, Arizona. The annual three day event has trained more than 1,500 federal energy managers and sustainability professionals who are working to improve facility performance, advance the use of renewable energy, and reduce greenhouse gas emissions at federal sites. FEMP organized the training event with the support of Oak Ridge National Laboratory.

## What is 3D Printing, Alex?

Oak Ridge National Laboratory and the 3D-printed Shelby Cobra made its debut on Jeopardy on September 17. The 3D Shelby project was supported by the Advanced Manufacturing Office and Vehicle Technologies Office

Press the play button to view video

# Office Round Up

## TRANSPORTATION

### Vehicle Technologies Office

To increase public awareness of plug-in electric vehicles, EERE just launched the new EV Everywhere website. This new website provides a hub of electric vehicle (EV) resources for consumers, helping them learn about available EV models, incentives, vehicle charging and how driving an EV can save them money.

### Fuel Cell Technologies Office

With support from EERE, fuel cell forklifts at a South Carolina BMW plant are now being powered with hydrogen produced onsite from biomethane gas at a nearby landfill. The plant is home to the world's largest fleet of fuel cell forklifts and supports an estimated 8,800 jobs in South Carolina.

*Source: BMW*

### Bioenergy Technologies Office

Energy Department partner Algenol will work with Protec Fuel to market and distribute commercial ethanol produced from algae. The companies signed an agreement to distribute algal ethanol for fleets and retail consumption from Algenol's commercial demonstration module in Fort Meyers, Florida. The first two gas stations offering the fuel are expected to open next year in Tampa and Orlando.

*The Energy Department invests in alternative biofuels development to reduce America's carbon footprint. Source: NREL*

## RENEWABLE POWER

### Solar Energy Technologies Office

Released its Solar Ready Vets video this month. The video highlights the importance of the program and trainers that educate transitioning veterans on the solar industry. It also features one of the veterans who graduated from the program and landed a job as a systems inspector.

### Wind and Water Power Technologies Office

#### *WATER*

The Wave Energy Prize field narrowed from 92 teams down to 20. These top 20 teams will develop advanced wave energy converters to achieve the Energy Department's goal of doubling the energy captured from ocean waves and reducing the cost of wave energy. Ten finalists will be chosen in March 2016 to build scale models of their devices that will then undergo tank testing in Maryland.

#### *WIND*

Following a banner year, the program released the 2014-2015 *U.S. Offshore Wind Technologies Market Report* showing strong progress for the U.S. offshore wind market – including the start of construction on the nation's first commercial-scale offshore wind farm. It's one of 21 projects totaling 15,650 megawatts that is currently in the planning and development pipeline.

*The Energy Department's Wind & Water Power Technologies Office works with industry, academia and the national labs.*

### Geothermal Technologies Office

The Geothermal Data Repository (GDR) recently celebrated its 500th submission. GDR stores all the data collected by projects funded by the Geothermal Technologies Office and makes it accessible to the entire research community to accelerate the development of geothermal exploration.

*EERE is pioneering technologies that are good for the planet.*

## ENERGY EFFICIENCY

### Building Technologies Office

Recently released a Projects Map, allowing the public to view detailed information on the program's active projects throughout the United States. The map informs industry stakeholders to help craft responses to future funding opportunities and provides the public a transparent view of program investments.

### Federal Energy Management Program

Created an initiative to supply tools, training, renewable energy analysis and direct assistance on energy management of federal campuses. According to the program's database, 450 of the largest campuses consume nearly 70% of federal facility energy.

### Advanced Manufacturing Office

Partnered with Oak Ridge National Laboratory to unveil both a 3D printed vehicle and a 3D printed building in September. The natural gas-powered hybrid electric vehicle connects with the solar-powered building to create an integrated energy system. Power can flow in either direction between the vehicle and building through a lab-developed wireless technology.

*Source: Carlos Joness/ORNL*

### Weatherization and Intergovernmental Program Office

The State Energy Program selected 11 states to advance innovative approaches for local clean energy development. The awards – $5 million in 2015 competitive funds – went to Alaska, Maine, Minnesota, Missouri, Nebraska, New Hampshire, New Mexico, New York, Tennessee, Vermont and Virginia. Funds will be used for energy efficiency and renewable energy projects that aim to reduce energy bills for American families and businesses, reduce carbon emissions, and increase the nation's energy security.

## STRATEGIC PROGRAMS

### Technology-to-Market

The Department of Education recently added a Teaching Energy Literacy to Adult Learners course to its online portal. Instructors can also use the Energy Literacy Framework (available in English and Spanish) to teach adult learners about the role of energy in their lives while generating interest in energy career opportunities. Throughout the course, the energy.gov website and its resources are explored.

*Weatherization technologies are saving consumers energy and money.*

### Communications

EERE Facebook hit a major milestone in late August by surpassing 100,000 people who like and follow news on the page. Since September 2012, EERE Facebook has grown by more than 95,000 people. Among Facebook pages operated by federal government offices and agencies, EERE Facebook is the sixteenth most popular in America.

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