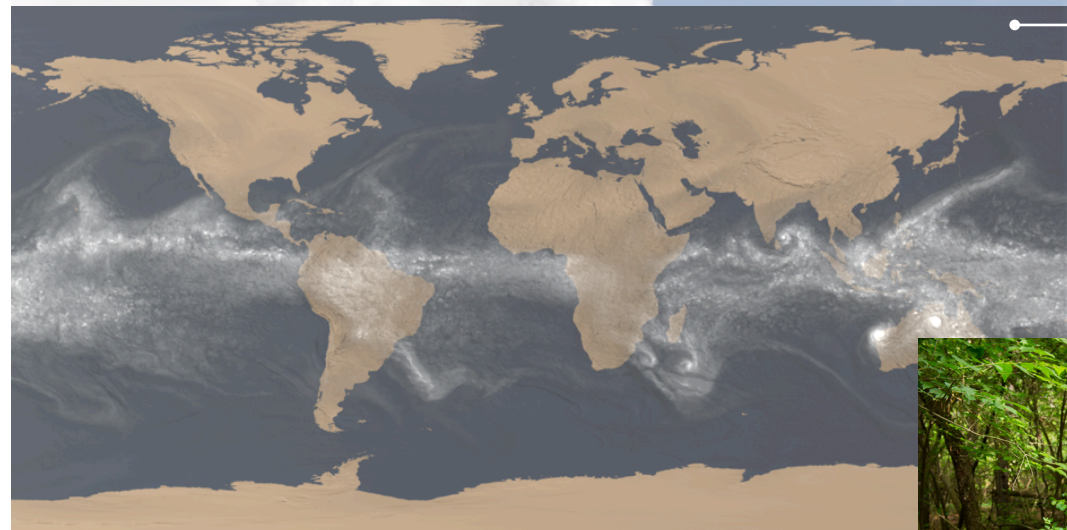


## Protected and Restored our Environment

- National Lab scientists are collecting information critical to understanding the earth's climate and addressing the risks posed by global climate change. For example, the multi-laboratory Atmospheric Radiation Measurement Climate Research Facility is providing climate scientists with data from strategically located remote-sensing and field observatories around the world to improve our understanding of the role of clouds and aerosols in the Earth's climate system.

- At DOE sites across the country, National Labs have conducted research and demonstration projects to test new cleanup technologies and remediation approaches, ranging from active engineered systems to natural processes, to address a variety of contaminants. Successful approaches are integrated into remediation efforts across the DOE complex.



Hurricane resolving (14km resolution) atmosphere simulation performed on 67,000 cores of a DOE supercomputer. A National Lab effort to improve the scalability of the Community Atmosphere Model makes such petascale simulations possible.

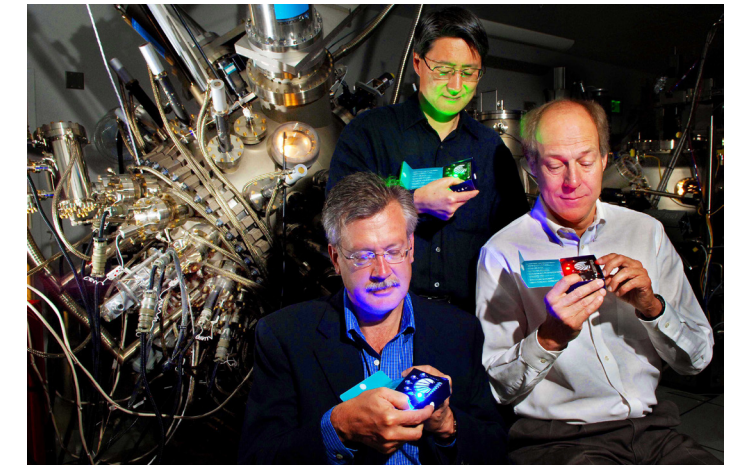


Roser Matamala is a terrestrial ecologist who specializes in biogeochemistry and global climate change research. She studies the carbon stored in the earth, including in the Alaskan permafrost, which may contribute to climate change as the planet warms.

Affordable, clean and secure energy is essential for improving U.S. economic productivity, enhancing our quality of life, protecting the environment, and ensuring our nation's security. The National Laboratory System is leading transformational research, development, demonstration, and deployment for clean energy and efficiency technologies across energy sectors. Successfully commercializing these technologies is critical to the success of an "all of the above" energy strategy that drives economic growth and job creation while reducing carbon emissions.

Realizing the full potential of this strategy requires advances in fossil, nuclear, renewable, and efficiency technologies, all with a view toward the future clean energy economy. Given the longevity and high cost of energy infrastructure, decisions made today will influence our nation's energy mix for much of this century.

Research conducted at our National Labs translates cutting-edge scientific advances into technological innovations, and accelerates progress in areas that industry is not likely to undertake because of technical or financial risk. Scientists and engineers at our National Labs have been involved in many energy and environmental innovations, from innovations that increase energy efficiency, our most cost-effective energy resource, to innovations that allow us to tap new sources of energy and better protect the environment.



Jerry Simmons, left, is leading a team including Jeff Tsao, center, and Mike Coltrin that was awarded funding by the U.S. Department of Energy for research and development on advanced, highly efficient light-emitting diodes or LEDs.

## Increased Energy Efficiency

- About one-fifth of the electricity produced around the world is used for lighting. From developing fluorescent lighting ballasts in the 1970s to ultra-efficient LEDs in the last decade, the National Labs developed technologies that are helping reduce the amount of electricity needed to light homes and businesses.
- National Lab scientists created highly insulated windows with intelligently controlled, motorized shades to modulate interior temperatures and reduce heating and cooling loads. These windows could save about 3 percent of the nation's total energy budget if installed more widely.

For more information about our National Laboratory System:

DOE Website: [energy.gov/science-innovation/national-labs](http://energy.gov/science-innovation/national-labs)



Facebook: [www.facebook.com/energygov](http://www.facebook.com/energygov)

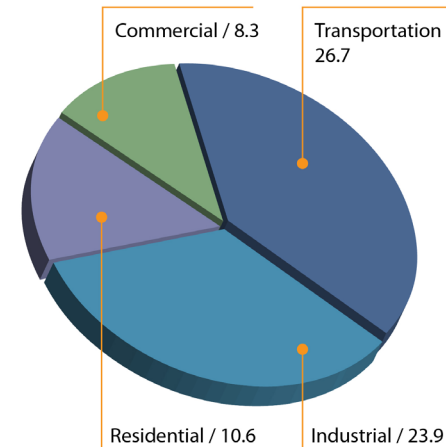


Twitter: [twitter.com/energy](http://twitter.com/energy)

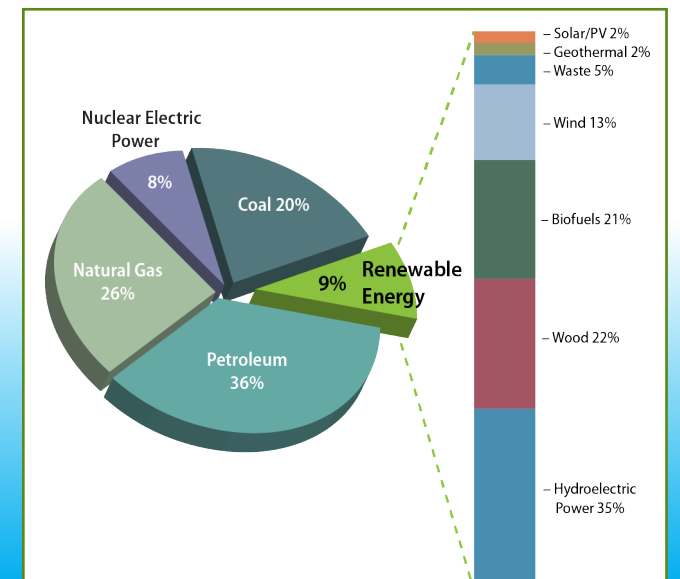


U.S. DEPARTMENT OF ENERGY

Delivered Energy Consumption by Sector  
(figures represented in quadrillion btu units in 2012)



How do we use energy?



Where do we get our energy?





2013 was a record year for the U.S. solar industry with more than 4,750 megawatts of new photovoltaic capacity installed—a 41 percent increase in deployment over 2012. More than 13,000 megawatts of solar electric capacity is currently operating in the U.S., enough to power more than 2.2 million average-sized American homes.

Geothermal modeling code development in conjunction with laboratory testing and validation is underway at a National Lab.

### Pioneered Renewable Energy Technology

- Boosting wind-turbine performance with high-efficiency airfoils reduced the cost of wind power by more than 80 percent over the past 30 years. Now deployed at wind farms nationwide, these turbines are the direct result of National Lab research.
- As part of DOE's SunShot Initiative, the National Labs are working to drive down the cost of solar photovoltaic (PV) technology. With costs falling by nearly half since 2010, utility-scale solar PV is well on its way to becoming competitive with conventional electricity generating sources.

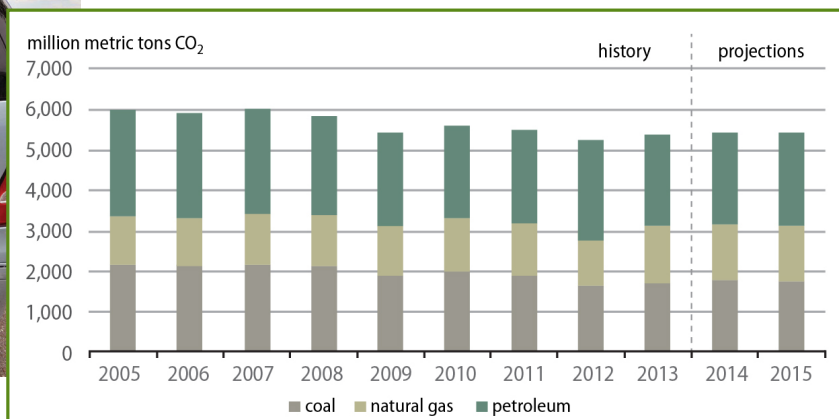
- The first commercial-scale, binary-cycle geothermal power plant in the world was constructed and tested under the administration of a National Lab. It has since become the world's leading technology for producing electricity from moderate temperature geothermal resources.

### Reduced Environmental Impacts from Transportation

- National Lab research into how catalysts behave paved the way for a new, "lean-burn" diesel engine that meets tightened emissions standards and improves fuel efficiency by 25 percent over conventional engines.



Fuel-cell vehicle from the coast-to-coast Hydrogen Tour, sponsored in part by DOE.



U.S. Energy-Related Carbon Dioxide Emissions

Safe, dense batteries continue to be particularly important for plug-in hybrid vehicles.



- All-electric and plug-in hybrid electric vehicles reduce carbon dioxide emissions in the transportation sector. The Chevrolet Volt would not be able to cruise on battery power without the advanced cathode technology that emerged from a National Lab. The same technology is also sparking a revival of America's battery manufacturing industry.

### Harnessed the Atom

- Discoveries from our National Labs paved the way for commercial nuclear power, and for the development of nuclear-powered submarines and aircraft carriers.

- Today, our National Labs are helping to develop safer, more efficient nuclear reactor designs and advanced technologies for managing and disposing of used nuclear fuel.



### Improved and Protected Transmission Infrastructure

- New power lines made from superconducting materials can carry electric current with zero energy loss. Prototypes recently developed by National Lab scientists could usher in a new era of ultra-efficient power transmission.
- Electric grids in the United States and around the world are vulnerable to terrorism, vandalism, physical deterioration, and extreme weather. A small device invented at a National Lab makes it easier to prevent widespread failures by detecting human tampering, natural threats such as earthquakes or fires, and dangerous conditions like sagging power lines.

