

Wind and Water Power Technologies accelerates U.S. deployment of clean, affordable and reliable domestic wind power through research, development and demonstration. These advanced technology investments directly contribute to the President’s goals for the United States to double renewable electricity generation again by 2020 and to achieve 80 percent of its electricity from clean, carbon-free energy sources by 2035 through reducing costs and increasing performance of wind energy systems. Wind power currently provides 3.5 percent of the nation’s electricity, and more wind-powered electricity generation capacity was installed in the United States in 2012 than that of any other power source.

What We Do

The Wind Program consists of an integrated, three-pronged approach to drive technology development and project deployment in the wind energy sector:

- ✓ **Research and Development** provides industry-wide wind technology improvements that are beyond industry’s current capabilities.
- ✓ **Risk Mitigation** activities help overcome financial, institutional and technical barriers to financing and deployment of wind energy projects, with a focus on U.S. offshore wind.
- ✓ **Reduction of Market Barriers**, including solving radar, environmental, and permitting issues that impact access to strong wind resource areas.

Program Goals/Metrics

- Reduce the unsubsidized market levelized cost of energy (LCOE) for utility-scale land wind energy systems from a reference wind energy cost of 7.1 cents/kWh in 2010 to 5.7 cents/kWh by 2020 and 4.2 cents/kWh by 2030, which would compete with the

predicted LCOE of electricity generation from the lowest-cost fossil generation (natural gas). This would include wind grid integration and variability costs.

- Reduce the unsubsidized market LCOE for offshore fixed-bottom wind energy systems from a reference cost of 21 cents/kWh in 2010 to 17 cents/kWh by 2020 to enable regional competitive pricing.
- Support growth of domestic wind energy deployment from 60 GW of total wind-installed capacity in 2012 to 125 GW of capacity by 2020 and 300 GW total by 2030. This targeted total wind-installed capacity would supply an estimated 20 percent of U.S. electricity demand in 2030.

FY 2014 Priorities

- **Enable a U.S. offshore industry** by investing in the development and validation of offshore wind systems, speeding deployment of the first U.S. offshore wind projects and refinement of technologies by domestic wind technology manufacturers.
- **Reduce costs of energy at the wind plant level** by funding and guiding research into complex wind plant aerodynamics, advanced component development, wind plant reliability improvement, and distributed wind applications. Foundational research and analysis that allows project developers to improve overall wind plant capacity factors and plant interactions with the transmission grid system will also reduce costs.
- **Optimize grid integration** by conducting wind-grid integration and transmission studies and developing wind energy forecasting tools for grid system operators.
- **Streamline siting and deployment processes** through wildlife impact analyses, assessment of radar mitigation solutions, and investment in testing facilities at the

(Dollars in Thousands)	FY 2012 Current	FY 2013 Request	FY 2013 Annualized CR*	FY 2014 Request
Wind Energy				
Technology Development and Testing	73,054	71,488	—	99,000
Technology Application	18,759	23,512	—	36,000
NREL User Facility	0	—	—	9,000
Total, Wind Energy	91,813	95,000	93,825	144,000

*FY 2013 amounts show reflect the P.L. 112 175 continuing resolution level annualized to a full year. These amounts are shown only at the “congressional control” level and above; below that level, a dash (—).

national laboratories for academic and industry use.

Key Accomplishments

- **Accelerated the wind industry’s technological progress by an estimated six years:** Without EERE involvement, the overall reliability, commercial risk, and cost of wind energy would be six years behind where it is now¹, at a loss of more than two-thirds of cumulative wind power deployed through 2008. In 2012, wind energy added nearly half of all new power capacity in America – even more than new natural gas capacity.
- **Drove improvements in wind components, and continues to showcase technology innovations to increase viability and reliability of wind:** Through research, development, and demonstration, EERE and its partners have achieved significant improvements in the production of key wind turbine components, particularly composite-related structures. Through innovation and a robust U.S. wind market, U.S. manufacturing captured more than 70 percent of the domestic wind energy market in 2012, up from around 35 percent in 2005. The U.S. is home to more than 400 manufacturing companies, across more than 40 states, in the wind energy supply chain.
- **Awarded funding and began development of the first U.S. offshore wind energy projects:** After a rigorous selection process, seven offshore wind demonstration projects were awarded as part of a planned six-year \$168 million initiative. All teams have begun the engineering phase of the demonstration, which is to be deployed by 2017. These offshore wind projects will accelerate the deployment of breakthrough wind power technologies that will help diversify our nation’s energy portfolio, promote economic development, and launch a new industry in America.
- **Spearheaded construction of wind technology testing centers:** In collaboration with universities and national laboratories, EERE and its partners have driven construction of facilities, where both academic and industry technology developers can validate their wind technology designs in controlled settings and speed up technology transfer, commercialization, and manufacturing.

¹Pelsoci, Thomas M (2010). "Retrospective Benefit-Cost Evaluation of U.S. DOE Wind Energy R&D Program: Impact of Selected Energy Technology Investments".

Wind & Water Power Technologies is a key driver of federal research investments into innovative water power technologies and increased adoption of hydropower and pumped storage. Hydropower currently provides approximately 7 percent of the nation’s electricity, the largest share of U.S. renewable generation, with 78 GW of capacity installed. Further, groundbreaking ocean power projects are being deployed off U.S. shores, including the nation’s first grid-connected tidal energy project and a wave energy device that will be grid-connected as part of a DOE-Navy collaboration at the Wave Energy Test Site (WETS) in 2014.

The Water Power Program guides research and development efforts into new water power technologies capable of generating cost-effective renewable electricity in the United States. These resources include hydropower (domestic rivers, streams, and water conveyance systems as well as marine and hydrokinetic (MHK, including ocean waves, currents, and tides) systems.

What We Do

The Water Power Program uses a research and partnership-based approach to drive technology development and deployment in the hydropower as well as marine and hydrokinetic power sectors:

- ✓ **Research and Development provides** innovative water power technologies with improved efficiency, greater durability and reliability, and in some cases, standardized or modular designs that bring down project costs and enable wider adoption.
- ✓ **Technology Validation** through the construction of a controlled testing center, U.S. technology developers can deploy and demonstrate both prototype and near-commercial marine and hydrokinetic technologies.
- ✓ **Market Barrier Reduction** through development of environmental risk assessment and mitigation tools provides resource data to accelerate permitting

timeframes and drive down costs, and engaging in ocean planning to ensure that MHK energy opportunities are considered in the nation’s marine spatial plans.

Program Goals/Metrics

- Hydropower development at new high-resource sites cost-competitive by 2020 (\$0.06/kWh)
- MHK cost competitive with local hurdle rates by 2030 for (\$0.12-0.15/kWh).

FY 2014 Priorities

- Develop advanced **MHK systems and component technologies** to increase energy capture, reliability, and survivability for lower costs, such as wet-mate connectors, power electronics, and prognostic components.
- Develop advanced **hydropower technologies** that drive down the cost of hydropower project development at new sites and non-powered dams, including standardized generating units with improved energy performance, high-efficiency electrical components, and low environmental-impact technologies.
- Support the construction of a **controlled wave energy converter (WEC) test facility**, including collaboration with the U.S. Navy, to enable testing of wave energy conversion devices at advanced stages of technology development to support U.S. developers of these innovative technologies.
- Research and test **low-cost, high-accuracy detection devices** for the tracking of marine mammals and other aquatic life to facilitate commercial-scale deployments of MHK arrays.
- Study and develop **new, smaller pumped storage designs** that will leverage manufacturing economies of scale and open new markets by avoiding many constraints associated with larger -scale deployments.
- Develop **advanced manufacturing** for making water power technologies lightweight, to reduce

	FY 2012 Current	FY 2013 Annualized CR*	FY 2014 Request
Water Power			
Marine and Hydrokinetic Technologies	33,684	—	39,500
Hydropower Technologies	24,392	—	15,500
Total, Water Power	58,076	59,147	55,000

*FY 2013 amounts show reflect the P.L. 112 175 continuing resolution level annualized to a full year. These amounts are shown only at the “congressional control” level and above; below that level, a dash (—) is shown.

construction, deployment, and maintenance costs.

Key Accomplishments

- **Supported the development and deployment of the first U.S. commercial tidal energy system:** Tidal energy is a resource that can be harnessed wherever changing tides move a significant volume of water – including off the coasts of many U.S. cities where there is high electricity demand.
- **The first-ever grid-connected tidal power project in the United States project is now delivering electricity to the utility grid from an underwater power system in Cobscook Bay, Maine:** A local hydro-electric company verified on September 13, 2012, that electricity generated by an underwater turbine generator is flowing to their power grid from the Cobscook Bay Tidal Energy Project. The device is designed to operate in shallow tidal or deep river sites at depths of 50 to 100 feet and has a peak output of 180 kilowatts – enough electricity to power 25 to 30 homes annually. Two additional devices will be installed at the Cobscook Bay Project site in the fall of 2013, and together, the three-device power system will generate enough energy to power 75 to 100 homes. The devices connect directly to an onshore substation through a single underwater transmission line.
- **Upgraded and expanded U.S. clean hydropower capacity:** Through American Recovery and Reinvestment Act investments, EERE has supported capacity and efficiency upgrades of seven U.S. hydropower facilities by funding low-cost, high-impact upgrades to existing clean energy infrastructure and by applying modern energy generating technologies to sustainably harness water for clean, renewable power generation. When complete, these retrofits are expected to add more than 131,000 MWh of sustainable annual generation of electricity – enough to power about 11,400 homes.
- **Released the first major solicitation for hydropower R&D in over a decade:** EERE's awarded R&D projects support the reduction of hydropower LCOE and demonstrate the dynamic grid benefits of advanced hydropower and pumped storage technologies.