



U.S.-China Renewable Energy Partnership (USCREP)

For more information about USCREP, see www.nrel.gov/uscrep

In November 2009, United States President Barack Obama and China President Hu Jintao formalized the U.S.-China Renewable Energy Partnership (USCREP) as a part of a package of measures to strengthen cooperative clean energy programs between the United States and China. Both sides embraced a vision of the United States and China as leaders in the global transition toward a clean energy economy and in the combat against climate change.

The partnership brings together technical, academic, business, and government stakeholders from both countries to address significant barriers to the competitiveness of renewable energy. Through promotion of close commercial and research partnerships between the United States and China, the partnership extends private and public entities access to the two largest renewable energy markets and addresses significant barriers to the widespread deployment and integration of renewable energy. These programs embody both countries' goals for international cooperation—economic growth, energy security, climate mitigation, environmental protection, and technical innovation.

STRENGTHENING PARTNERSHIPS IN RENEWABLE ENERGY TECHNOLOGY AND POLICY

Under the direction of the U.S. Department of Energy (DOE) and China's National Energy Administration (NEA), the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) and the Energy Research Institute (ERI) of China's National Development and Reform Commission (NDRC) jointly manage USCREP projects.

THE USCREP PROJECT PARTNERS

USCREP partners (see table page 2) form public-private partnerships and corporate partnerships, convene industry forums and targeted workshops, and establish bi-lateral and multi-lateral research platforms to implement USCREP projects.

Key Points

- The U.S.-China Renewable Energy Partnership (USCREP) aims to advance the viability of renewable energy by addressing barriers to deployment and grid integration.
- The USCREP promotes policy, planning, and coordination for renewable energy; supports efficient grid integration for renewable generation; participates in efforts to develop international standards for the quality of wind and solar technology; and promotes the deployment of distributed solar generation and concentrated solar power.
- Opportunities for U.S. clean technologies through USCREP-fostered cooperation lead to potential job creation and expanding exports.

	United States	China
Government agencies	<ul style="list-style-type: none"> • Department of Energy (DOE)—Office of Energy Efficiency and Renewable Energy (EERE) 	<ul style="list-style-type: none"> • National Energy Administration (NEA)—National Renewable Energy Center (CNREC) • Energy Research Institute (ERI)
Research and academic institutions	<ul style="list-style-type: none"> • National Renewable Energy Laboratory (NREL) • Lawrence Berkeley National Laboratory (LBNL) 	<ul style="list-style-type: none"> • State Grid Energy Research Institute (SGERI) • Chinese Academy of Sciences • China Renewable Energy Engineering Institute (CREEI) • Peking University • North China Electric Power University • Shanghai University of Electric Power
Organizations	<ul style="list-style-type: none"> • American Council on Renewable Energy (ACORE) • Energy Foundation • U.S.-China Energy Cooperation Program (ECP) 	<ul style="list-style-type: none"> • Chinese Renewable Energy Industries Association (CREIA) • China Variable Generational Integration Group (CVIG)
Industry Stakeholders	<ul style="list-style-type: none"> • Power generation • Grid operation, transmission, and distribution • Power system and power electronics equipment and services • Certification bodies/independent engineering • Materials and buildings • Transportation/aviation 	

Each year, the results of these collaborations culminate in the U.S.-China Renewable Energy Industries Forum (REIF), which is hosted alternately by U.S. DOE and NEA. The forum is a government-led platform for businesses, academics, and policy makers to outline challenges and opportunities in both markets and find innovative solutions to lower barriers to widespread use and capture the opportunities of renewable energy.

THE CHANGING LANDSCAPE

In 2009, leveraging public and private sector capabilities and resources, USCREP began to identify mutually beneficial opportunities for

widespread renewable energy deployment.

The energy landscapes in both countries have undergone notable transformations since then. Cumulative installed wind capacity in the United States grew from just over 35 GW at the end of 2009 to nearly 66 GW at the end of 2014.¹ By the end of 2014, solar photovoltaic (PV) installations reached a cumulative total of 18.3 GW, compared to just over 1 GW at the end of 2009.² China's total grid-connected wind power capacity reached 96.37 GW, up from 17.67 GW at the end of 2009, and China increased its cumulative PV capacity from over 200 MW in 2009 to over 28 GW in 2014.³ In 2014, renewable sources of energy accounted for approximately 10% of primary energy consumption in both countries.⁴

As the markets and renewable targets of both countries grow more ambitious, the partnership is extending its focus to include technical and institutional strategies for integrating high penetrations of renewables into a modernized grid, and for leveraging the rapid growth of distributed generation.

KEY INITIATIVES UNDER USCREP

The partnership aggregates technical and analytical resources from both countries to undertake collaborative work in four thematic areas:

- **Policy, Planning, and Coordination:** Support for government policy development and implementation of renewable technology deployment targets and roadmaps through mutual activities including policy analysis, energy system modeling, financing mechanism design, and assessment of technical and non-technical barriers.
- **Grid Integration:** Support for efficient integration of renewable energy through research and peer-learning on common interconnection and integration issues for bulk power systems, distributed generation, and microgrids.
- **Standards and Certification:** Increased participation in international standards bodies and joint development of international standards and testing protocols for wind and solar technology.
- **Renewable Energy Technology and Policy:** Develop technologies and policies to increase wind power generation, enhance market conditions for distributed solar generation, and promote commercialization of concentrated solar power (CSP).⁵

The following are examples of activities under each of the initiatives.

USCREP ACTIVITIES

Policy and Planning

USCREP coordinates collaborative research with various U.S. and Chinese government

stakeholders to identify and explain power market institutional reforms in the United States that can inform institutional reforms in China. Specifically, research focuses on the rules and procedures of Independent System Operators,⁶ the policy and legal frameworks underlying power contracts, and the system operational approaches to economic dispatch with high penetrations of variable renewable energy generation. Under the partnership, the collaborators are creating a curated digital library to navigate through the rules, regulations, and mechanisms within the complex system of the U.S. power sector.

Grid Integration

Chinese and U.S. collaborators under USCREP are working together to conduct comparative analysis of wind and solar PV interconnection standards⁷ in the United States and China in order to make recommendations for future improvements.

The work on grid interconnection standards has various potential benefits. Engagement with the technical leads from industry and regulatory bodies in standard revision and implementation could lead to policies that enhance renewable energy generator reliability, increased utilization hours, and system operation protocols. More stringent grid requirements could also increase demand for renewable generators with advanced control strategies and advanced power electronics to support power system reliability. Performance-based incentive structures could encourage equipment manufacturers to source higher quality components. Enhanced interconnection requirements could not only ensure that China meets its installation targets, but also alleviate curtailment and other grid integration issues to consume a greater percentage of power from renewables.

Standards and Certification: The PV Quality Assurance Task Force

The International PV Quality Assurance Task Force (PVQAT) is a global effort to craft a common set of quality and reliability standards for the solar PV modules across the industry, including a rating system for durable design, a

guideline for manufacturing quality assurance, and a comprehensive system for PV system certification. Created in 2010, the task force originally consisted of international firms and research organizations from the United States, Japan, and European Union under the management of NREL, the European Commission's Joint Research Center, and the Japanese National Institute of Advanced Industrial Science and Technology.

In addition to having the top global suppliers of PV modules, China has become a major demand market since 2011 and is poised to remain dominant for years to come. Thus it was crucial to bring Chinese participants into the standard-making process in order to realize its goal of increasing investor confidence, decreasing testing costs for manufacturers, providing benchmarks for insurance providers, helping governments design incentive programs, and lowering the overall system cost to make solar electricity even more competitive. Since joining PVQAT in 2014 under the stewardship of the China General Certification Center, more than 100 participants from Chinese firms, standardization bodies, and research institutes have been engaged in technical working groups to draft standards submitted to the International Electrotechnical Commission and International Organization for Standardization for adoption, helping to ensure healthy development of the global industry.

Renewable Technology and Policy: Concentrated Solar Power Commercialization

At the fourth annual Renewable Energy Industries Forum in July 2013, U.S.

CSP company BrightSource Energy and Chinese renewable energy developer Huanghe Hydropower Development, subsidiary of China Power Investment Corporation, announced a Memorandum of Understanding (MOU) to collaborate in the development of one of the first commercial CSP pilot projects in China. BrightSource had also entered into a MOU with the China Renewable Energy Engineering Institute to share its successful experience in commercialization of CSP technology through guidance on site selection, construction and completion, potential cost reduction, and training.

In support of the pilot project and the development of CSP tariffs in China, NREL and State Grid Energy Research Institute co-organized and participated in a technical workshop in Beijing focused on modeling methods to estimate the economic and system value of concentrated solar power. Hosted by the State Grid Energy Research Institute, the workshop consisted of experts from NREL, BrightSource Energy, and the CSP Alliance sharing their experience in making CSP a viable commercial option in the energy market.

This fact sheet is a product of ChinaFAQs, a joint project of the World Resources Institute and experts from leading American universities, think tanks and government laboratories. Find out more about the ChinaFAQs Project at: <http://www.ChinaFAQs.org/>.

Sources

- ¹ American Wind Energy Association (2014) U.S. Wind Energy Capacity Statistics <http://www.awea.org/Resources/Content.aspx?ItemNumber=5059>
- ² Solar Energy Industry Association (2014) Solar Market Insight Report 2014 Q4 <http://www.seia.org/research-resources/solar-market-insight-report-2014-q4>
- ³ China National Renewable Energy Center Renewable Energy Handbook 2015, (2015)
- ⁴ U.S. renewable energy generation includes hydroelectric power, wind, solar, non-traditional biopower, and geothermal; Chinese renewable energy generation includes hydroelectric power, wind, solar, and non-traditional biopower. Based on numbers from U.S. Energy Information Agency and China National Renewable Energy Center
- ⁵ Concentrating solar power technology collects heat from the sun to produce electricity. Solar photovoltaic technology, by contrast, converts sunlight directly into electricity. http://www.nrel.gov/learning/re_csp.html; http://www.nrel.gov/learning/re_photovoltaics.html
- ⁶ An Independent System Operator is a federally regulated entity which coordinates regional electricity transmission and ensures the safety and reliability of the electric system. <http://www.ferc.gov/help/glossary.asp>
- ⁷ Interconnection standards are rules for connecting electrical generation systems to the grid.

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