U.S.–China Clean Energy Research Center
中美清洁能源研究中心

U.S.-China Clean Energy Research Center Overview

Dr. Robert C. Marlay, U.S. Director

U.S.-China Clean Energy Research Center

Office of Policy and International Affairs

U.S. Department of Energy

DOE Laboratory Energy R&D Working Group

Washington, DC

June 22, 2011

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History of U.S. - China S&T Cooperation

- **Period I: S&T Cooperation (1978-1990)**
  - Agreement on High Energy Physics (1979)
  - Protocol on Nuclear Physics and Fusion (1983)
  - Protocol on Fossil Energy R&D (1985)
  - Agreement on CO2 Research under the Fossil Energy Protocol (1987)
  - Reduction in Cooperative Activities (1989), due to IPR Issues

- **Period II: Energy Policy Consultations (1991-2000)**
  - Agreement on Superconducting Super Collider (1992)
  - Two Annexes Added to the Fossil Energy Protocol (1994)
  - MOU on Energy Consultations: Reactor Fuel, RE, and EERE (1995)
  - Three Annexes Added to the EERE Agreement (1996)
  - The 1st Oil & Gas Industry Forum (1998)
  - Agreement on Peaceful Use of Nuclear Technology (PUNT) (1998)
  - Revised Fossil Energy Protocol (2000)

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Background & History of S&T Cooperation

- **Period III: Broadened Relationship (2001-2007)**
  - OGIF, APEC, JCC (PUNT)
  - Statement of Intent on Nuclear Non-Proliferation (2003)
  - Joining the ITER; and the CSLF (2003)
  - Sec. Abraham's Visit to China; MOU on Energy Policy Dialogue (EPD)
  - Megaports Initiative; Reduced Enrichment for Research and Test Reactors; and Gen IV International Forum (2004)
  - DOE China Office Opened; Conduct of 1st EPD (2005)
  - APP; 2nd EPD; and 1st Strategic Economic Dialogue (SED) (2006)
  - GNEP (2007)
  - Ten Year Framework (2008) with objectives to pursue energy efficiency, environmental conservation, new energy, and energy security.

- **Period IV: Seven Joint Clean Energy Initiatives (November 2009)**
  - Seven Joint Clean Energy Initiatives (see next slide)

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U.S.-China Clean Energy Initiatives – Period IV

Seven Joint Clean Energy Initiatives (2009)

- Electric Vehicles Initiative
- Energy Efficiency Action Plan
- Renewable Energy Partnership
- 21st Century Coal
- Shale Gas Resource Initiative
- Energy Cooperation Program
- U.S.-China Clean Energy Research Center

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WHY CHINA & THE U.S. ?

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Why China and the U.S.?

- China and U.S. S&T Cooperation is Important, Because:
  - United States and China are the world's two largest economies.
  - United States and China are the world's largest producers and consumers of energy, and share many common challenges and common interests.
  - China and the United States together account for 40 percent of annual global emissions of greenhouse gases.
  - Both countries are highly dependant on coal for electricity – about 50% in the U.S. and 80% in China.
  - Significant actions by both nations are critical to combat climate change globally.
  - Both are heavily reliant on foreign sources of oil.
  - Both recognize the vital importance of secure, affordable and clean energy.
  - Both face common challenges of diversifying sources of energy and transforming users of energy.
  - Both see strengthening scientific discovery, as a means to inspire economic competitiveness and quality of life through innovation.
  - Both countries are expanding 21st Century infrastructure, most of which has yet to be built and can be significantly influenced by advanced technology.

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The Promise of Combining Strengths

- Each Country Brings S&T Strengths to the Table
- U.S. Strengths:
  - World Class Research Universities, Institutes & National Laboratories
  - Pioneering Businesses, Entrepreneurs, and Technology-Based Private Partners
  - Well-Developed Financial & Legal Infrastructure
  - Excellence in Large-Scale Computational Models & Simulations
- China Strengths:
  - Large and Growing Presence in Basic & Applied Research
  - Facility in Translating Scientific Advances into Prototypes
  - Facility in Carrying out Large-Scale Pilot Projects & Demonstrations
  - Facility in Authorizing Site Use for Demonstrations and Experiments
  - Expertise in Rapid, Large-Scale Technology Deployment
  - Largest and Fastest Growing Energy Market; Test Bed for New Technologies
- Both Countries Gain from Accelerated Deployment of Clean Technologies

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CERC START-UP & INT'L DIPLOMACY

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CERC Protocol

- CERC Protocol Signed, Nov. 2009
- Calls for Joint U.S.-China Clean Energy Research Center (Virtual, not Physical)
- CERC Goals:
  - Spur Innovation of Clean Energy Techs
  - Diversify Sources of Energy Supply
  - Improve Energy Efficiency
  - Accelerate Transition to a Low-Carbon Economy
  - Avoid the Worst Consequences of Climate Change
- Three Areas for Initial Cooperation
- Open to Other Areas in the Future

Signing of CERC Protocol Nov. 2009

Steven Chu, U.S. Secretary of Energy
Liu Yandong, PRC State Councilor (S&T, MOST)
Gary Locke, U.S. Secretary of Commerce
Wan Gang, PRC Minister of S&T:

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Principles of US-China Cooperation on R&D

- Cooperative Activities Shall be Conducted on the Basis of the Following Principles:
  1. Equality, mutual benefit, and reciprocity;
  2. Timely exchange of information relevant to cooperative activities;
  3. Effective protection of intellectual property rights;
  4. Peaceful, non-military uses of the results of collaborative activities; and
  5. Respect for the applicable legislation of each Party's country.
- Each Country's Funds Flow Only to Own-Country Partners.

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New Model

Cooperation (Traditional)

- Work Plans Coordinated, but Separate
- Independent Work on Similar Projects
- Interactions Characterized by Research Visits, Personnel and Student Exchanges
- R&D Focuses on Institutional Strengths
- Relationships Collegial
- R&D Results Shared Externally
- Benefits Mainly Academic. Transfer of Knowledge via Technical Papers & Reports
- No guaranteed IP Rights in Other's Territory. IP Provisions Not Flexible

Collaboration (New)

- Work Plans Developed Jointly
- Work Together on Same Projects
- Research Characterized by Division of Labor Among Participants on Joint Tasks
- R&D Exploits Complementarities
- Relationships Interdependent
- R&D Results Can Arise Jointly
- Benefits are Embedded among Partners and Extended by Interests in Commercialization
- Guarantees a Right to IP in Other's Territory. IP Terms & Conditions May be Negotiated

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Chinese Ministries

Ministry	Responsibilities
National Development and Reform Commission	Macroeconomic management agency formulates economic and social development policy
Ministry of Science and Technology	Supports science and tech research & development
National Energy Administration	Administers energy sectors (coal, oil, natural gas nuclear & renewable)
Ministry of Housing and Urban Rural Development	Draft plans related to city, village and town planning & construction, the building industry and industrial works
Ministry of Industry and Information Technology	Regulation and development of communications including electronic information goods and IP policy
Ministry of Environmental Protection	Develops national policies and plans for environmental protection and regulation
China Atomic Energy Authority	Regulation of the nuclear energy industry

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CERC Governance Structure

Steering Committee

U.S.: Steven Chu (DOE)

China: Wan Gang (MOST); Liu Tienan (NEA); Qiu Baoxing (MOHURD)

Secretariat

U.S.: DOE (Ass't Secretary, David Sandalow)

China: Senior–Level Representatives of MOST; NEA; MOHURD

- Executive Committee for Clean Coal Consortium
- Executive Committee for Buildings Consortium
- Executive Committee for Clean Vehicles Consortium

MOST: Ministry of Science & Technology; NEA: National Energy Administration; MOHURD: Ministry of Housing and Urban-Rural Development

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CERC LOGO

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CERC PROGRESS TO DATE

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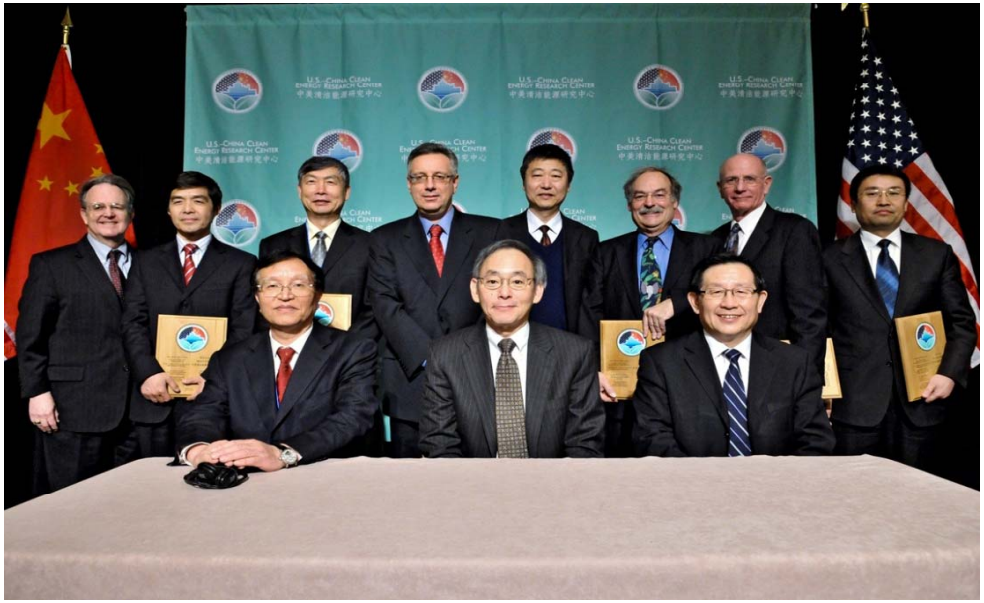
Joint Work Plans
CERC Signing Ceremony



Signing of Joint CERC Work Plans (January 18, 2011)

Front Row (left to right), CERC Steering Committee: Zhang Guobao, Vice Minister, PRC National Reform and Development Committee, and Administrator, National Energy Administration; Steven Chu, Secretary, U.S. Department of Energy; Wan Gang, Minister, PRC Ministry of Science & Technology; Not Shown, Qui Baoxing

Back Row (left to right): Bob Marlay, U.S. DOE, U.S. Director, U.S.-China CERC; Ouyang Minggao, Tsinghua University, PRC Director, CERC Vehicles; Li Peigen, President, Huazhong University of Science and Technology, Representing PRC, CERC Coal; Dennis Assanis, University of Michigan, U.S. Director, CERC Vehicles; Jiang Yi, Tsinghua University, PRC Director, CERC Buildings; Mark Levine, Lawrence Berkeley National Laboratory, U.S. Director, CERC Buildings; Xu Shisen, Clean Energy Research Institute, Huaneng Energy Group, PRC Technical Program Manager, CERC Coal; Not shown: Liang Junqiang, PRC Ministry of Housing and Urban-Rural Development, PRC Technical Program Manager CERC Buildings

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CERC Funding

Final U.S. CERC Awards (Over 5 Years)

Technology Area	U.S. DOE Funding	Partners Funding	Total Project Funding
I. Clean Coal	$12.5M	$13.6M	$26.1M
II. Clean Vehicles	$12.5M	$17.3M	$29.8M
III. Buildings	$12.5M	$16.4M	$28.9M
Total U.S. Funding for CERC			**$84.8M**
Matched by Chinese Funding			**$75.0M**
Total to Date			**$159.8M**

Note: $ = U.S. Dollars
M = Millions

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CERC Research Teams

	Coal		Vehicles		Buildings	
U.S.	WVU	Director Dr Jerald J Fletcher	UM	Director Dr Dennis Assanis	LBNL	Director Dr Mark D. Levine
	LLNL	Tech Pgm. Mgr. Julio Friedmann	UM	Deputy Director Jun Ni (US)	ORNL	Deputy Director Michaela Martin
	WVU	Collaboration Mgr Sun Quingun	UM	Deputy Director Huei Peng (China)	LBNL	Deputy Director Nan Zhou
			UM	Operations Manager Carrie Morton		
China	HUST	Director Dr Zheng Chugang	Tsinghua	Director Dr Ouyang Minggao	MOHURD	Director Liang Junqiang
	Huaneng CERI	Chief Engineer Dr Xu Shisen			Tsinghua MOHURD	Tech Pgm. Mgr. Dr Jiang Yi
	Tsinghua	Chief Scientist Dr Yao Qiang				

RESEARCH FOCUS

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ADVANCED COAL TECHNOLOGY

Vision: Advance coal technology needed to safely, effectively, and efficiently utilize coal resources in both countries, including the ability to capture, store and utilize emissions from coal use.

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Clean Coal CERC Projects*

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Advanced gasification with CO2 Capture	Test and simulate IGCC plants in the field, including integration with CO2 separation technologies and a variety of feedstocks and coal types.	West Virginia Univ., GE, Duke Energy, National Energy Technology Lab, Univ. Wyoming, Los Alamos National Lab	China Power Engineering Consulting Group Corporation (CPECC); Huaneng Power Int'l., Inc; Tsinghua University
Post-combustion CO2 capture, utilization, and storage technology	Assess performance of advanced capture technologies, developed in the US and China, with retrofits to US power plants.	West Virginia Univ; Duke Energy, Inc; Alstom; Lawrence Livermore National Laboratory; Univ. of Kentucky	Huaneng Power Int'l, Inc; Huaneng Clean Energy Research Institute
Sequestration capacity and near-term opportunities	Examine sequestration risk assessment methods, needs and goals in US and China; develop abstractions of subsurface simulations to inform risk calculations; calculate risk profiles and reduce uncertainty.	West Virginia Univ; Los Alamos Nat. Lab; Lawrence Livermore Nat. Lab; Nat. Energy Technology Lab; Pacific Northwest National Lab; Univ of Wyoming; Wyoming State Geologic Survey	Shenhua; Inst. for Rock & Soil Mechanics, Chinese Academy of Sci.; Tsinghua Univ.; NW Univ. of China; China Univ. of Mining and Tech.; Yanchang Petroleum
CO2-Algae bio-fixation and use	Characterize and assess CO2-algae utilization and construct model to estimate cost of CO2 fixation and utilization costs.	West Virginia University; Duke Energy, Inc; Univ. of Kentucky, Pacific Northwest National Lab	ENN (XinAo Group)

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Clean Coal CERC Projects*
(Continued)

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Research, development and demonstration of oxy-fuel firing combustion	Characterize performance of indigenous Chinese coals under oxy-fuel combustion conditions, then model, evaluate at pilot scale, and develop a commercial scale low emission, high efficiency power plant design for China	West Virginia Univ.; Babcock & Wilcox; Alstom	Tsinghua Univ.; Huazhong Science and Technology Univ.
Coal co-generation with CO2 capture	Pursue high conversion efficiency with low cost, footprint reductions, low carbon emission, and pollution control for new coal co-generation systems with CO2 capture, including new coal-to-chemical co-generation, new CO2 capture process, and co-generation systems with combined pyrolysis, gasification, and combustion.	West Virginia Univ; LP Amina, Lawrence Livermore National Lab	Zhejiang University, Hangzhou ; Center for Energy and Power, Chinese Academy of Sciences; China Univ. of Mining and Technology
Advanced coal conversion power generation	Develop advanced ultra-supercritical boiler and turbine cycle configurations utilizing Chinese coals for 700C, providing immediate CO2 reductions from new coal-fired power plants through efficiency improvements.	West Virginia University; Babcock & Wilcox; Alstom; LP Amina	Tsinghua University; Shanghai JiaoTong University

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Advanced Coal Technology Consortia

U.S.

- **Project Lead**
  - West Virginia University (WVU)
- **Partners:**
  - Alstom
  - Babcock & Wilcox (B&W)
  - Duke Energy (Duke)
  - General Electric (GE)
  - GreatPoint Energy
  - Indiana Geological Survey (IGS)
  - Lawrence Livermore National Lab (LLNL)
  - Los Alamos National Lab (LANL)
  - LP Amina
  - National Energy Technology Lab (NETL)
  - Ramgen Power System
  - U.S.-China Clean Energy Forum (CEF)
  - University of Wyoming (UWy)
  - University of Kentucky (UKy)
  - World Resources Institute (WRI)
  - Wyoming State Geological Survey (WGS)

China

- **Project Lead**
  - Huazhong Univ. of Science and Technology
- **Partners:**
  - Ctr. for Energy & Power, Ch. Acad. of Sciences;
  - China Huaneng Group Clean Energy Res. Inst.
  - China Univ. of Mining and Technology
  - China Power Engineering Consulting Group Corporation (CPECC)
  - ENN (XinAo Group)
  - Huaneng Power Int'l., Inc
  - Inst. for Rock & Soil Mechanics, Chinese Academy of Sci.
  - NW Univ. of China
  - Shanghai JiaoTong University
  - Shenhua Group
  - Tsinghua University
  - Yanchang Petroleum
  - Zhejiang University, Hangzhou

CLEAN VEHICLES

Vision: Contribute to dramatic improvements in vehicle technologies with potential to reduce the dependence on oil and improve fuel efficiency in both countries.

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Clean Vehicles CERC Projects*

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Energy Systems Analysis, Technology Roadmaps and Policies	Assess the feasibility of large-scale advanced biofuel production and electrified vehicles by considering the full supply chain for production and delivery of fuel or electricity given regional constraints. Develop fuel economy and GHG standards and labels for PEVs from a lifecycle perspective	University of Michigan; Sandia National Lab; Argonne National Lab; Massachusetts Institute of Technology; Oak Ridge National Lab	Tsinghua University, and others TBD
Advanced Batteries and Energy Conversion	Characterize aging mechanisms in Li-ion and Li-sulfur batteries; identify rate-limiting processes in high-capacity Li-air systems. Develop models to enable materials design and performance improvements in future batteries. Improve the thermoelectric figure of merit to make materials available for practical applications at power generators for harvesting waste industrial heat from the exhaust system of cars and trucks and converting it into useful electrical energy	University of Michigan; Ohio State University; Massachusetts Institute of Technology, Argonne National Lab	Beijing Institute of Technology; Tsinghua University; Shanghai Jiao Tong University, Wuhan University of Technology
Vehicle Electrification	Develop innovative electric drive and power electronics to achieve electrified powertrain with significantly higher power density. Develop methodologies, processes, and design software for vehicle system integration, diagnosis and prognosis methods.	University of Michigan; Ohio State University	Tsinghua University; Tongji University; Chinese Academy of Sciences; Shanghai Jiao Tong University

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Clean Vehicles CERC Projects* (Continued)

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Advanced Biofuels and Clean Combustion	Create and demonstrate a framework for co-engineering biofuel production processes and their combustion behaviors. Develop methodologies for integrated clean vehicle power-train and after-treatment system control	University of Michigan; Sandia National Lab; Oak Ridge National Lab; Ohio State University	Shanghai-Jiao Tong University; Tianjin University; Tsinghua University
Advanced Lightweight Materials and Structures	Develop models and algorithms to optimize multi material lightweight vehicle components and body structures, and support these with performance data for materials and unions.	University of Michigan; Ohio State University; Oak Ridge National Laboratory	Tsinghua University, Shanghai Jiao Tong University
Vehicle-Grid Interactions	Develop control strategies that mitigate distribution-level issues associated with high penetrations of PEVs, and that allow PEVs to provide operational services to the wider grid.	University of Michigan; Ohio State University, Oak Ridge National Laboratory	Tsinghua University, Shanghai Jiao Tong University

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Clean Vehicles Consortia

U.S.

- **Project Lead:**
  - University of Michigan (UM)
- **Partners:**
  - A123 Systems
  - American Electric Power (AEP)
  - Argonne National Laboratory
  - BorgWarner
  - Chrysler, Engine
  - Cummins
  - Delphi
  - FirstEnergy
  - Ford Motor Company (Ford)
  - Fraunhofer USA
  - General Motors (GM)
  - Huntsman
  - Magnet
  - Massachusetts Institute of Technology (MIT)
  - Oak Ridge National Laboratories (ORNL
  - Ohio State University (OSU)
  - Sandia National laboratories, Livermore (SNL)
  - Toyota Motor Company (Toyota)
  - Transportation Research Center (TRC)

China

- **Project Lead**
  - Tsinghua University
- **Partners:**
  - Beijing Institute of Technology
  - CHANA
  - China Potevio
  - Chinese Academy of Sciences
  - Geely Automobile
  - SAIC
  - Shanghai Jiao Tong University
  - Tianjin University
  - Tongji University
  - Wuhan University of Technology
  - Wanxiang

BUILDING ENERGY EFFICIENCY

Vision: Build a foundation of knowledge, technologies, human capabilities, and relationships that position the United States and China for a future with very low energy use and highly energy efficient multi-family residential and commercial buildings.

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Building Efficiency CERC Projects*

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Monitoring and Simulation	Simulation and building performance: Identify key energy-related behavior of building operators and occupants, develop models describing variations in behavior and their impact , and integrate the occupant behavior models with EnergyPlus and DeST. Perform a comparison between EnergyPlus and DeST so that differences between the two model results can be understood and reconciled. Successful completion of this task will remove a major bottleneck to the revision of building energy standards in China.	Lawrence Berkeley National Lab, Bentley	Tsinghua University, Building energy center of MOHURD, Xinao Group, UTRC-China, BRSG
Monitoring and Simulation	Sensors and controls: Develop and install a standardized monitoring platform, including hardware and software, to collect and analyze building energy use data.	Honeywell; Schneider Electric; Lawrence Berkeley National Lab; Oak Ridge National Lab	Tsinghua University
Building Envelope	Glazing materials and systems: Use simulation tools to develop and evaluate integrated façade systems that address differences in occupant behavior and building practices in China and US, and demonstrate and evaluate prototype systems in full-scale applications using static and dynamic components.	Lawrence Berkeley National Lab , Saint-Gobain, GE	Chongqing University; China Academy of Building Research; Tongji University; Tianjin University; Center of Science and Technology of Construction of MOHURD; Tsinghua University; Southeast University; Guangdong Provincial Academy of Building Research

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Building Efficiency CERC Projects* (Continued)

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Building Envelope	Building Insulation materials and systems: Reduce building energy use in China via improved building materials and systems.	Oak Ridge National Lab, DOW, Saint-Gobain	Chongqing University; China Academy of Building Research; Tsinghua University; MOHURD Center for Building Energy Efficiency
Building Envelope	Cool roofs and urban heat islands: Advance the understanding, technology, infrastructure and code requirements for cool roofs and heat island mitigation in China.	Lawrence Berkeley National Lab, DOW, Saint-Gobain	Chonqing University, China Academy of Building Research
Building Envelope	Natural ventilation: Develop integrated design program for natural ventilation giving air flow, temperature and comfort conditions and yearly energy savings. Design and support implementation of natural ventilation in two demonstration buildings (one in China and other in US.). Monitor and verify performance. Produce validated design process for different generic building types and different climatic zones in the US and China.	Massachusetts Institute of Technology	Chonqing University

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Building Efficiency CERC Projects* (Continued)

Joint Work Plan Research Area	Short Project Description	Key U.S. Participants	Key Chinese Participants
Building Equipment	Develop new generation of ground source heat pumps (GSHP) by incorporating: innovative low-cost ground coupling, integrated multi-function GSHP unit, smart controller and performance monitor, simulation-based design and optimization tools. Establish demonstrations of energy-efficient lighting.	Oak Ridge National Lab, ClimateMaster, UC Davis	China Academy of Building Research (CABR), Chinese Society for Urban Studies (CSUS)
Building Systems Integration	Create an open-access web based tool that optimizes renewable and distributed energy as a function of key variables: system cost; performance at different times of day; tariffs for all fuels and energy forms; operating schedule; etc.	Lawrence Berkeley National Lab, ICF International	China Academy of Building Research (CABR); Tsinghua University; Southeast University; Shenyang Architecture University; China Building Standard Design Institute; MOHURD Center for Building Energy Efficiency
Policy Research	Review policy approaches to saving energy use in different countries to establish best practices; develop policy relevant to China (with emphasis on policies for existing buildings, building energy labeling, quotas and CO2 emissions trading, and promotion of 'green' buildings). Develop and apply benchmarking tools for comparison of energy use in buildings.	NASEO, NRDC, ICF	MOHURD Center for Building Energy Efficiency; Chinese Green Building Council

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Building Energy Efficiency U.S. Consortium

U.S.

- **Project Lead:**
  - Lawrence Berkeley National Laboratory (LBNL)
- **Partners:**
  - Bentley
  - CertainTeed Corporation Saint-Gobain (CertainTeed)
  - ClimateMaster
  - Energy Foundation China Sustainable Energy Program
  - GE Global Research (GE)
  - Honeywell International Incorporated (Honeywell)
  - ICF International (ICF)
  - Massachusetts Institute of Technology (MIT)
  - National Association of State Energy Officials (NASEO)
  - Natural Resources Defense Council (NRDC)
  - Oak Ridge National Laboratory (ORNL)
  - Pegasus Capital Advisors (PCA)
  - Schneider Electric
  - The DOW Chemical Company (DOW)
  - UC Davis (UCD)

China

- **Project Lead**
  - Ministry of Housing and Urban-Rural Development (MOHURD)
- **Partners:**
  - Beijing Industry University
  - Center of Science and Technology of Construction of MOHURD
  - China Academy of Building Research (CABR)
  - China Building Standard Design Institute
  - Chinese Green Building Council
  - Chongqing University
  - Guangdong Provincial Academy of Building Research
  - MOHURD Center for Building Energy Efficiency
  - Shenyang Architecture University
  - Southeast University
  - Tianjin University
  - Tongji University
  - Tsinghua University

INTELLECTUAL PROPERTY

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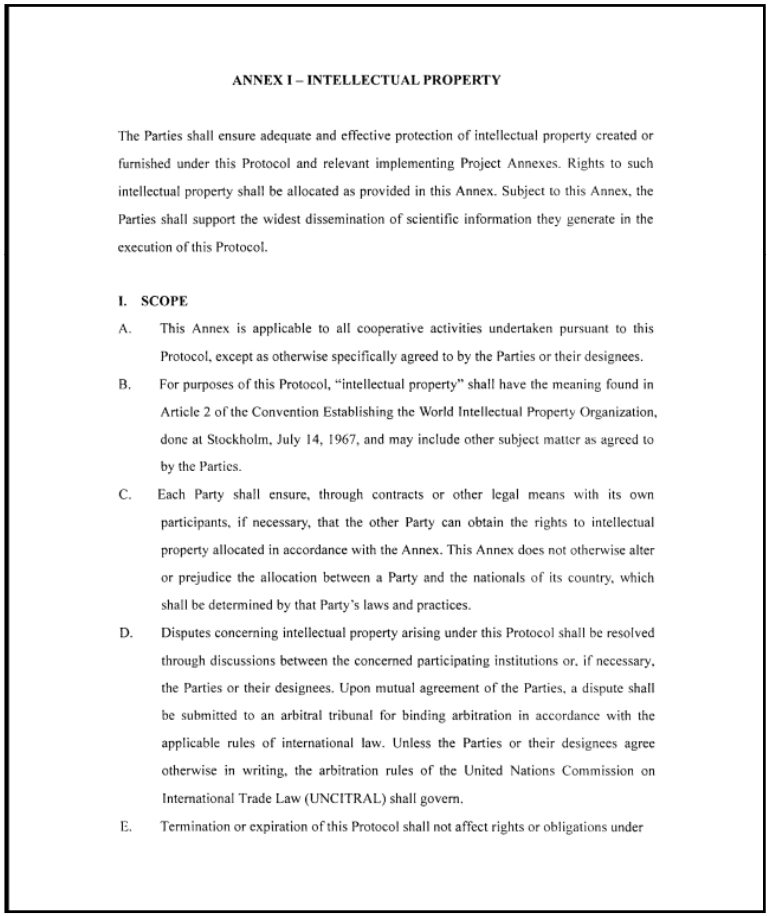
Joint Position on CERC Intellectual Property

- Protection of IPR is one of the most important steps to promote innovation.
- In recent years, China has made strides in upgrading its IP system.
- The U.S. and China ensure rules and regulations are enforced.
- The U.S. and China ensure a fair and level playing field for companies doing business in both countries.
- Under CERC, the provisions of the IP Annex to the Protocol guide approaches.
- Disputes will be resolved in neutral settings under international law.



ANNEX I – INTELLECTUAL PROPERTY

The Parties shall ensure adequate and effective protection of intellectual property created or furnished under this Protocol and relevant implementing Project Annexes. Rights to such intellectual property shall be allocated as provided in this Annex. Subject to this Annex, the Parties shall support the widest dissemination of scientific information they generate in the execution of this Protocol.

I. SCOPE

A. This Annex is applicable to all cooperative activities undertaken pursuant to this Protocol, except as otherwise specifically agreed to by the Parties or their designees.

B. For purposes of this Protocol, "intellectual property" shall have the meaning found in Article 2 of the Convention Establishing the World Intellectual Property Organization, done at Stockholm, July 14, 1967, and may include other subject matter as agreed to by the Parties.

C. Each Party shall ensure, through contracts or other legal means with its own participants, if necessary, that the other Party can obtain the rights to intellectual property allocated in accordance with the Annex. This Annex does not otherwise alter or prejudice the allocation between a Party and the nationals of its country, which shall be determined by that Party's laws and practices.

D. Disputes concerning intellectual property arising under this Protocol shall be resolved through discussions between the concerned participating institutions or, if necessary, the Parties or their designees. Upon mutual agreement of the Parties, a dispute shall be submitted to an arbitral tribunal for binding arbitration in accordance with the applicable rules of international law. Unless the Parties or their designees agree otherwise in writing, the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL) shall govern.

E. Termination or expiration of this Protocol shall not affect rights or obligations under

http://www.us-china-cerc.org

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Protocol's IP Annex

- Under CERC:
  - Party that Makes or Creates the IP, Owns the IP
  - IP Jointly Made is Jointly Owned; IP may be "assigned" to others.
  - Regardless of Ownership, unless otherwise agreed, each Party has "a Right" in its Own Territory to Use or license
  - Rights outside its Territory are to be Determined via Negotiation under a Technology Management Plan (TMP)
  - TMP is to be Jointly Agreed Upon by the Participants
  - TMP is to be Endorsed by Both Governments
- The Protocol Does Not Alter or Prejudice Allocation of IP between a Party and its Nationals, which is Determined by that Party's Laws
- The TMP Clarifies Meaning of Key Phrases, such as:
  - "Participants" (those entitled to preferential licensing)
  - "Cooperative Activities" and "Jointly Funded Research Projects"
  - Basic Rules for IP Allocation
- Additional Details May be Negotiated in Sub-Agreements, Consistent with Principles.

SUMMARY AND NEXT STEPS

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Summary

- Much Work Still to Do – Much Benefit to Gain
- For the Technical Agenda, U.S. and China will Benefit:
  - From attracted participation, expanding rapidly
  - From research knowledge and breakthroughs
  - More rapid technology experimentation and deployment
  - Opportunities created domestically for clean energy technology manufacturing, sales and installations, with potential for export.
- For the Strategic Agenda, U.S. and China will:
  - Accrue to its peoples the benefits of greater deployment of clean and affordable energy technology at scale, including
  - More efficiency, lower energy use and costs, and lower pollution and reduced greenhouse gas emissions.
  - Enhanced Bi-Lateral Relationship

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Expected Benefits to Industrial Partners

- Industrial Partners Benefit from CERC
- CERC Platform Enables:
  - More ambitious and protected partnering
  - Partners are embedded in the innovative process;
  - Partners gain insights on research processes underway;
  - May own or license IP for commercial purposes;
  - New technology is exposed to potentially large markets
- Valuable Relationships Among R&D Performers in U.S. & China

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Next Steps

- Clarify for Each CERC Jointly Funded Research Project
  - Research Objective
  - Background and Technical Approach
  - Task Statements
  - Roles and Responsibilities of Leads, Performers, Partners
  - Equipment, Resources, Sites, Facilities to be Supplied
  - Work Schedule, with Interim Milestones (or Decision Points)
  - Deliverables and Dates
  - Estimated Costs (or Person-Hours Equivalents) and Commitments
  - Reporting Requirements (Interims, Final)
  - Technical Management Plan and Sub-Agreements, as Appropriate
- Monitor Progress, with Project Site Visits, and Annual Program Reports
- Potential Expansion of the CERC Model to Other Countries, Other Tech. Areas

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CERC Website

- Website (Public Access)
  - DOE maintains an external website in English for CERC
  - http://www.us-china-cerc.org
- Public Content Available
  - Joint Work Plans, January 18, 2011 (English and Chinese)
  - Protocol and IPR Annex
  - S&T Agreements that Govern other U.S.-China R&D
  - Names and Bios of CERC Directors
  - Partnering Institutions
- Future Postings:
  - Will consult with Chinese partners on content prior to posting
  - Will share with Chinese partners files to enable them to create in China a corresponding website

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Acronyms for Selected Chinese Organizations

CABR	China Academy of Building Research
CAS	Chinese Academy of Sciences
CERI	Clean Energy Research Institute (China Huaneng Group)
CHANA	Chang'an Automobile (Group) Co., Ltd
China Potevio	China Potevio Co., Ltd
CPECC	China Power Engineering Consulting Group Corporation
ENN	ENN
Huaneng	Huaneng Power International, Inc. (China Huaneng Group)
HUST	Huazhong University of Science and Technology
MOHURD	Ministry of Housing and Urban-Rural Development
Shenhua	Shenhua Group Corporation Ltd.
Tsinghua	Tsinghua University
UTRC-China	United Technologies Research Center - China
Wanxiang	Wanxiang Group