

An Asia Society Special Report



A Vital Partnership:

*California and China Collaborating on
Clean Energy and Combating Climate Change*

A PARTNERSHIP AMONG:



This report was completed by Asia Society's Center on U.S.-China Relations and the Asia Society Northern California Center in partnership with the Annenberg Foundation Trust at Sunnyslands, Rockefeller Brothers Fund, Energy Foundation, International Council on Clean Transportation, Energy and Environmental Economics, and Center on Emerging and Pacific Economies at the School of International Relations and Pacific Studies at U.C. San Diego.



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FOREWORD

THE STATE OF CALIFORNIA has undertaken a host of projects with the People's Republic of China as part of a significant effort to jointly address the challenge of global climate change at the subnational level. Some of the most important efforts have been organized directly by the office of California Governor Edmund G. Brown, who is building from a bipartisan legacy of projects, some of which were initiated by his predecessor Governor Arnold Schwarzenegger. Others have been led jointly by state agencies with the support of state-based companies and nonprofit environmental organizations.

The Asia Society and the Annenberg Foundation Trust at Sunnylands have prepared the following summation of these impressive initiatives with the hope that the unique interaction between California and China will help inspire new forms of constructive subnational efforts to address our critical transnational problems. The latest agreement in November 2014 between the United States and China to reduce carbon emissions will help set a new course in the effort for greater international cooperation on climate change, but states, provinces, and municipalities also have a vital role to play.

We hope that subnational government leaders in both the United States and China will find it instructive, helpful, and even inspiring to read this summation of California's experience in seeking ways to collaborate with counterparts in China.

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INTRODUCTION: A VITAL PARTNERSHIP

THE THREAT OF CLIMATE CHANGE AND THE DANGERS IT POSES to human health, economic output, agricultural production, and global environmental well-being confront the United States and China with an urgent new area of common interest: the planet's atmosphere. As the two largest global emitters of greenhouse gases, our countries share the challenge of transforming each of our current fossil fuel-based energy systems into clean twenty-first-century energy systems that remain cornerstones of our vigorous economies while protecting our shared climate, along with our clean air, clean water and other precious natural resources.

The Obama administration has taken some important steps on climate change, but with federal climate protection legislation still not forthcoming from Washington, D.C., there is an opportunity for U.S. leadership in this area from state and local governments. California's legacy of environmental protection is well known. For decades, the state government has enacted many of the nation's strictest environmental standards while maintaining impressive economic growth. As a coastal state with a dry climate, a vital agricultural sector, and world-class biodiversity, California is particularly mindful of the impacts of climate change. In response to the challenge, California is demonstrating the way to take effective actions to reduce greenhouse gas emissions while expanding economic opportunities. With California at the forefront of global science and technology, the state's leaders understand that developing clean, state-of-the-art energy systems is essential to the state's future prosperity, and they also understand that California's future is closely tied to China's progress in this area. Recognizing that subnational cooperation will play an important part in any meaningful overall agenda for addressing the global climate challenge, the state has stepped up its efforts to share its own experience and expertise through direct exchanges with counterparts in China. These exchanges have also allowed California policy makers to learn from China's successes in the climate and clean energy arena.

In California's 2006 Global Warming Solutions Act (Assembly Bill 32), the state legally committed itself to reducing greenhouse gas emissions to 1990 levels by the year 2020. This law's goal is being implemented through a wide array of policies – more than sixty in all – that include a cap-and-trade market that puts a price on carbon, a renewable portfolio standard that requires at least one-third of the state's electric power to come from renewable energy, a mandate to put 1.5 million zero-emission vehicles on the road, and building codes that require new construction to be thrifty with energy use. As ambitious as these policies are, they are just the beginning of a long journey toward the state's goal of an 80% reduction in greenhouse gases below 1990 levels by 2050, consistent with what scientists say will be needed worldwide to keep global warming within tolerable limits.

China's central government has also undertaken a number of important climate and clean energy initiatives, including a binding commitment to reduce the carbon intensity of GDP by

40% to 45% below 2005 levels by 2020, and more recently, a pledge to reach peak emissions by 2030, if not sooner. China is also committed to establishing a national carbon market by 2020 – an idea that is already being tested experimentally in seven provincial pilot programs – and to expanding non-fossil fuels to around 20% of the primary energy supply. A new sense of urgency to clean up China’s energy systems is being felt in the wake of extended periods of severe air pollution in many Chinese cities in 2013. As a result, a new air quality law calls for sweeping new regulations of emissions from power plants and vehicles in China’s densely populated coastal regions.

Despite a renewed bilateral pledge agreed to in November 2014 by the United States and China to confront carbon emissions, there is still lack of agreement on meaningful, legally binding international actions on climate change. As such, subnational levels of government and their ability to form voluntary partnerships have become even more important pieces in the mosaic of any global climate change remedy. The subnational level is particularly important in the United States and China, where the practical implementation of energy and environmental protection policies in such areas as electricity, transportation, and buildings lies largely within the purview of provincial and municipal governments. Moreover, in China, policy experiments at the subnational level often take the form of pilot projects that, if successful, can become models that influence broader policy decisions made by the central government.

California’s government understands the important role that subnational governments can play in addressing the climate problem by forming voluntary partnerships both within their own countries and with international partners. As California’s Assembly Bill 32 states, “National and international actions are necessary to fully address the issue of global warming. However, action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act.”

California and China have already begun to cooperate on what California Governor Jerry Brown has referred to as “the world’s greatest existential challenge.” Last year, the state signed memoranda of understanding (MOUs) on cooperation in air pollution, climate, clean energy, and low carbon development with China’s Ministry of Environmental Protection, National Development and Reform Commission, the governments of Guangdong and Jiangsu provinces (coastal provinces that are among the wealthiest and most industrialized in China, as well as being leading trade partners with California), and the municipal governments of Beijing and Shenzhen (see Appendix). These were the first such formal MOUs signed on climate change issues between an individual U.S. state and China at any governmental level. In addition, they have quickly led to concrete examples of cooperation on emissions reductions. For example, California’s Air Resources Board has been working closely with Beijing’s Environmental Protection Bureau on the development of air quality regulations and monitoring systems, while also advising other Chinese cities and provinces on developing emissions trading systems based on California’s own experience in this area.

Such collaborations present win-win scenarios for both countries. California has been designing and implementing clean energy policies for decades and has accumulated a fund of important experience that can now be profitably shared with Chinese counterparts. Meanwhile, China’s ability to articulate new policy initiatives rapidly and deploy large-scale pilot projects at

the provincial and municipal levels provides an invaluable proving ground for new policy ideas, technologies, and markets that will benefit both sides.

The transition to a clean energy system involves many challenges but will create many opportunities for an evolving California-China partnership in different sectors of the economy:

- **Low-carbon electricity systems.** California is pioneering the transition away from fossil fuel generation toward high levels of renewable energy and is addressing the practical problem of maintaining high reliability and low cost while using energy sources that vary with the wind and the sunshine. China meanwhile is undertaking a vast expansion of non-fossil fuel generation by 2020. Both sides can benefit from each other's experience and know-how.
- **Low-emission vehicles.** As its vehicle ownership grows rapidly even while air quality worsens, China is looking at how California is addressing its own pollution problems and working with auto manufacturers to build cars that reduce both CO₂ emissions and pollutants that damage human health.
- **Energy efficient buildings, industry, and appliances.** California has saved billions of dollars and avoided the need to build new power plants and natural gas pipelines by saving energy. Chinese leaders increasingly understand that reducing demand through energy efficiency is the best option for reducing pollution from energy supply. Both China and California face the challenge of determining how to increase consumer uptake of energy efficient technologies, which save money in the long run but often cost more up front.
- **Forestry, agriculture, and waste management.** Both California and China are looking to grow their forests to store carbon and protect ecosystems. They are also both looking at ways of reducing the emissions of the potent greenhouse gases methane and nitrous oxide from fertilizer use, livestock operations, and waste treatment facilities.

In both the United States and China, a successful transition to cleaner energy systems will require integrated solutions that not only reduce greenhouse gas emissions but also protect air, water, and ecosystems and continue to reliably power the countries' economies at reasonable cost at the same time. The challenges are daunting, but they also open the door to opportunities for many new kinds of subnational collaborations ranging from research and development to trade deals, regulatory approaches to technical know-how, and fact-finding missions to longer-lived institutional relationships, and from education and training to sharing information about both successes and failures.

What California and its counterparts in China have come to understand is that mutual benefits can flow from such partnerships, not only in the quest for climate change solutions, but also in catalyzing increased trade and investment in clean technology. Cooperation between California and China on climate change and clean energy now has a substantial track record in numerous sectors. In California, this cooperation has often had bipartisan support and frequently also involved the active participation of numerous civil society organizations. Indeed, many of the most enduring and effective efforts have been collaborations involving state agencies working with California-based research organizations such as the Lawrence

Berkeley National Laboratory; nonprofits including the Natural Resources Defense Council and the International Council on Clean Transportation; philanthropic organizations such as the Energy Foundation, the Hewlett Foundation, and Rockefeller Brothers Fund; and with businesses, professional societies, public utilities, and universities. Indeed, such public-private partnerships, of which this report itself is a good example, have been critical to California's unique success to date.

This report outlines the types of activities already underway involving agencies in the California state government as well as California-based non-governmental actors and China. As California has taken on some of the functions of a nation-state (in the sense of forming direct relations with foreign governments in sectors of key interest to Californians), it has also helped create something of a state model for subnational international cooperation on climate change and energy issues. We think it is a model worth studying, supporting, and celebrating on both sides of the U.S.-China divide. If we are going to collectively arrive at any kind of meaningful solution to the urgent challenge of climate change, it will most certainly involve active participation by both subnational governmental entities and non-governmental, civil society institutions.

I: NAVIGATING CALIFORNIA-CHINA COLLABORATIONS

THIS SECTION PROVIDES A SAMPLING OF THE CONSTELLATION OF PARTNERSHIPS taking place between state agencies and California-based civil society and non-governmental organizations, public utilities, research institutes, and universities that are spearheading collaborative projects with China in a number of different aspects of climate and clean energy. It is not intended to be exhaustive, but to underscore the role of a range of actors in supporting both California’s and China’s goals in working toward a climate-friendly, clean energy future.

The organizations represented here were invited to contribute their own summaries of their projects in China for this report and were selected based on a few criteria. First, the sampling contains projects implemented by a range of actors, from state government entities to civil society groups to universities. They demonstrate that the effectiveness of these collaborations depends on strong partnerships across the various stakeholders. Second, the highlighted projects fall across a broad range of climate and clean energy issues and illustrate what can be accomplished at the subnational level. Third, the projects highlight the many forms these activities can take – from joint research and policy studies to on-the-ground technical assistance, from trainings to expert dialogues – and the different institutional avenues that climate and clean energy solutions are taking. A summary of these projects is provided in the following table.

TABLE 1: Summary of California-China Collaborations and Activities

ORGANIZATION	TYPE	ACTIVITIES	SECTORS	ISSUES
California Air Resources Board	Government (State)	Exchange, Training	Energy (Power, Transport), Environment (Air, Climate Change), Cross Sector	Emission Trading, Air Pollution, Zero-Emission Vehicle
California Governor’s Office of Business and Economic Development/ California-China Office of Trade and Investment	Government (State)	Business Development	Energy, Environment, Economy, Cross Sector	Low Carbon/ Environment Technologies
California Energy Commission	Government (State)	Exchange, Technical Assistance	Energy (Cross Sector), Environment (Climate Change)	Clean Energy, Energy Efficiency, Renewable Energy, Energy Storage, Alternative Fuels
Pacific Gas & Electric Company	Public Utility	Exchanges	Energy (Power), Environment (Climate Change)	Energy Efficiency

TABLE 1: Summary of California-China Collaborations and Activities—continued

ORGANIZATION	TYPE	ACTIVITIES	SECTORS	ISSUES
Climate Policy Initiative	Civil Society (Research)	Research	Environment (Climate Change)	Climate Finance, Coal
The Energy Foundation	Civil Society (Foundation)	Pilots, Research, Exchange	Energy (Building, Transport, Industry, Power), Environment (Air, Climate Change), Cross Sector	Emission Trading, Climate Change, Low-Carbon City, MRV, Air Pollution
ICLEI-Local Governments for Sustainability	Civil Society (Research)	Research, Exchange	Energy (Building), Environment (Air)	Low-Carbon City, Sustainable City
International Council on Clean Transportation	Civil Society (Non-governmental)	Research, Technical Assistance	Energy (Transport), Environment (Air, Climate Change)	Vehicle Emission, Clean Marine Fleet, Clean Port
Environmental Defense Fund	Civil Society (Non-governmental)	Research, Training	Energy (Transport), Environment (Air, Climate Change)	Emission Trading
Natural Resources Defense Council	Civil Society (Non-governmental)	Research, Technical Assistance	Energy (Building, Transport), Environment (Air, Climate Change)	Energy Efficiency, Green Building, Sustainable Cities, Public Participation
Regulatory Assistance Project	Civil Society (Non-governmental)	Technical Assistance	Energy (Power)	Energy Efficiency, Renewable Energy, Regulation
Lawrence Berkeley National Laboratory China Energy Group	Academic (Research)	Research, Technical Assistance, Exchange	Energy (Industry, Buildings, Appliances, Power), Environment (Climate Change)	Low-Carbon City, Energy Modeling, Energy Efficiency Policies and Programs
University of California, San Diego	Academic (University)	Research, Exchange	Environment, Economy	Carbon Market, Renewable Energy
Bay Area Council	Business (Policy)	Research, Exchange	Energy, Economy	Low-Carbon, Environment Technologies

CALIFORNIA AIR RESOURCES BOARD

Sectors: Energy (Power, Transport), Environment (Air, Climate Change), Cross Sector

Issues: Emission Trading, Air Pollution, Zero-Emission Vehicle

Project: Vehicle Emissions Standards

Time Frame: 2005–present

Approach and Activity: The California Air Resources Board (ARB) has been in dialogue with the Beijing Environmental Protection Bureau (BEPB) on air quality issues since 2005. The focus of the collaboration has been on both general air quality topics and specifically emissions from transportation.

On April 10, 2013, the California Environmental Protection Agency (Cal/EPA) and BEPB signed a Memorandum of Understanding (MOU) on Environmental Cooperation to renew an agreement signed in 2005 and to cooperate on air quality management and other environmental topics. ARB believes that its limited resources should focus on ensuring that it realizes the fruits of its investment with BEPB. Beijing sees itself as the “California of China.” By supporting Beijing’s leadership, ARB influences other cities and China to act in parallel. In support of these efforts, ARB completed an intensive three-month hosting of three vehicle regulation and testing engineers from BEPB for in-depth training on California’s low-emission vehicle program during the winter of 2013–2014.

Over the years, ARB executives and staff have also visited China to participate in summits, workshops, and other exchanges to address vehicle emission challenges, including a visit by ARB’s Executive Officer Richard Corey in December 2013 and staff participation in China’s Automotive Technology and Research Center workshops in April and June 2014. ARB staff continues to interact regularly with BEPB staff to assist with technical questions and provide information to advance BEPB’s own standard-setting process.

Partners: Beijing Environmental Protection Bureau; California Environmental Protection Agency; California Air Resources Board

Goal and Intended Impact: The adoption by the Beijing Environmental Protection Bureau of strong, enforceable standards for air quality.

Project: Vehicle Greenhouse Gas Emission Standards and Zero-Emission Vehicles

Time Frame: 2014–ongoing

Approach and Activity: ARB is collaborating with the China Automotive Technology and Research Center (CATARC), which develops vehicle regulations on greenhouse gas/fuel economy standards and mandates for zero-emission vehicles/new energy vehicles. A number of ARB officials and staff have travelled to China to strengthen this collaboration, including visits by Analisa Bevan, chief of ARB’s Sustainable Transportation Technology Branch (April 2014);

Michael McCarthy, chief technology officer for ARB's low-emission vehicle program (June 2014); Alberto Ayala, deputy executive officer (September 2014); and Annette Herbert, chief of ARB's Emissions Compliance, Automotive Regulations and Science Division (November 2014).

Additionally, ARB will co-chair a Policy Lab with the Industry Coordination Bureau of the National Development and Reform Commission being jointly developed by the University of California–Davis and CATARC.

Partners: China Automotive Technology and Research Center; University of California Davis

Goal and Intended Impact: China will adopt strong, enforceable standards on vehicle emissions.

Project: Air Pollution Controls

Time Frame: April 2013–ongoing

Approach and Activity: On April 10, 2013, the state of California entered into an agreement with the Chinese Ministry of Environmental Protection to enhance cooperation on reducing air pollution. ARB's collaboration with China on non-climate air pollutants is focused on supporting this agreement and the MOU signed with BEPB, described earlier.

In support of this collaboration, ARB staff in 2013 participated in several conferences in Beijing and hosted several delegations in Sacramento. These activities included sending Michael Benjamin, division chief of ARB's Monitoring and Laboratory Division, and Karen Magliano, assistant chief of ARB's Air Quality Planning and Science Division, to Beijing to participate in air quality workshops and meet with representatives from BEPB, the Ministry of Environmental Protection (MEP), and others.

ARB also hosted a weeklong workshop on Ambient Air Quality Monitoring and Planning for two engineers from the China National Environmental Monitoring Center (CNEMC), Division of Ambient Air Quality Monitoring (part of the MEP) in September 2013. As a result of these interactions, ARB has drafted a training proposal that focuses on a structured training program emphasizing the science necessary to develop effective air quality control programs. ARB plans to host BEPB delegations to California in the fall and winter of 2014–2015 on these topics.

Partners: China's Ministry of Environmental Protection; Beijing Environmental Protection Bureau

Goal and Intended Impact: The collaboration aims to reduce coal-fired generation and/or particulate matter emissions from coal power plants in the Beijing air shed (Beijing-Tianjin-Hebei provinces) and strengthen China's inventory methods for accounting for particulate matter/black carbon emissions.

Project: Emissions Trading Systems

Time Frame: 2007–ongoing

Approach and Activity: ARB has been working with China on climate change since 2007. The relationship was formalized with the September 13, 2013, signing of the Memorandum of Understanding to Enhance Cooperation on Low Carbon Development between the National Development and Reform Commission of China (NDRC) and the State of California.

ARB supports this MOU through a continuing series of exchanges of in-depth policy and technical information. During 2013 and spring 2014, ARB hosted five delegations in Sacramento and four webinars/video conferences with Chinese officials regarding California's Cap-and-Trade program. Chairman Mary Nichols traveled to China for the kickoff of the emissions trading system (ETS) in Shenzhen in 2013. An ARB delegation traveled to Shenzhen in June 2014 for several days of technical meetings with the NDRC and the seven Chinese ETS pilot programs.

In addition to providing information to Chinese personnel, these exchanges have also afforded California personnel the opportunity to learn a great deal about the operations of China's ETS programs. ARB continues to be focused on this area of collaboration, as emphasis shifts from the seven regional pilot programs to the development of a national ETS. The most recent video conference with officials from the National Center for Climate Change Strategy and International Cooperation (NCSC) – part of the NDRC – was held in July 2014 in collaboration with the U.S. Environmental Protection Agency. ARB is currently working on plans to host a delegation from the NDRC in Sacramento by the end of 2014.

Partners: National Development and Reform Commission (China)

Goal and Intended Impact: Incorporate reliable reporting and verification protocols into China's emissions trading systems.

ABOUT THE CALIFORNIA AIR RESOURCES BOARD

The California Air Resources Board is a part of the California Environmental Protection Agency, an organization that reports directly to the Governor's Office in the Executive Branch of California State Government. Its mission is to promote and protect public health, welfare, and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state.

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CALIFORNIA GOVERNOR'S OFFICE OF BUSINESS AND ECONOMIC DEVELOPMENT / CALIFORNIA-CHINA OFFICE OF TRADE AND INVESTMENT

Sectors: Energy, Environment, Economy, Cross Sector

Issue: Low Carbon/Environment Technologies

Project: California-China Trade and Investment Office (CTO) Environmental Technologies Initiative

Time Frame: April 2014–ongoing

Approach and Activity: The Governor's Office of Business and Economic Development's (GO-Biz) clean energy/climate change business development activities with Chinese counterparts are spearheaded through its California-China Trade and Investment Office (CTO). The CTO collaborates with Chinese counterparts to find solutions for environmental protection challenges in China that also provide business development opportunities for California companies.

China's central government has placed a heightened urgency on improving the environment, including setting targets to be achieved by 2020, such as increasing the use of non-fossil fuels in China to 15% and reducing greenhouse gases by 20%. As a result, environmental protection is now one of the fastest-growing sectors for California companies in China. China may spend an estimated US \$500 million to US \$1 trillion to meet these targets.

In April 2014, the CTO launched its initiative to position California as the go-to state when seeking solutions to these major challenges, while developing business opportunities for California companies. The CTO is building relationships with decision makers at various municipal and provincial departments to understand how different locations are prioritizing their issues and identifying their needs.

Since launching this project, several premises have emerged: proven technologies or early-stage commercialized technologies are preferred; China has the manufactured commodity products and now needs cutting-edge high technology; partnerships for joint development of technologies should be encouraged; and not all locations are at the same point in their development plan.

An initial list of business development opportunities (or solutions) has been identified: mitigating air pollution through data measurements; clean coal; electric vehicles; alternative renewables – wind turbines, alternative energies, large scale; water resource management; waste treatments – biomass, sludge water, e-waste; energy efficiency management, smart grid; and green building technologies.

The project will continue building relationships at various government levels, identify several more regions that want to collaborate with California, recruit California environmental technology firms to consider the Chinese market, and help bring Chinese buyers and technology companies together with their counterparts from California (e.g. at the October 2014 L.A. Cleantech Incubator Global Showcase). The next locations to work with include Tianjin City, Shenzhen, and Guangdong Province DRC.

Partners: Shandong-Dongying Economic Development Area; Jiangsu-Provincial-level Development and Reform Commission (DRC); Chengdu–City; Tianfu New District

Goal and Intended Impact: Develop business opportunities for California environmental technology companies by working with local and provincial Chinese authorities to find solutions for clean energy and climate change challenges.

ABOUT THE CALIFORNIA GOVERNOR’S OFFICE OF BUSINESS AND ECONOMIC DEVELOPMENT

The Governor’s Office of Business and Economic Development (GO-Biz) was created by Governor Edmund G. Brown Jr. to serve as California’s single point of contact for economic development and job creation efforts. GO-Biz offers a range of services to business owners including attraction, retention, and expansion services; site selection; permit streamlining; clearing of regulatory hurdles; small business assistance; international trade development; assistance with state government; and much more.

Website: <http://business.ca.gov/>

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ABOUT THE CALIFORNIA-CHINA OFFICE OF TRADE AND INVESTMENT

The California-China Office of Trade and Investment (CTO) is California’s official state trade office in the People’s Republic of China. The CTO is a public-private partnership led by the Governor’s Office of Business and Economic Development (GO-Biz), economic development groups, and private sector companies across the state. It was opened by California Governor Edmund G. Brown on April 12, 2013, in Shanghai, China. The CTO is California’s central vehicle for promoting both trade and investment between the state and China. Dedicated experts located in Shanghai, Sacramento, and San Francisco provide services to businesses throughout California and China to forge cross-border trade and investment relationships in all sectors including the innovative environmental technologies, life sciences, advanced manufacturing, IT, lifestyle, and financial services sectors. Programs run by the CTO focus on assisting California companies seeking to engage in the China market and attracting foreign direct investment into California that creates jobs. The CTO is financed entirely free of state funding, largely through the donations of private enterprises and through matching grants received through trade-focused federal programs.

Website: <http://www.cachinatrade.org/>

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CALIFORNIA ENERGY COMMISSION

Sectors: Energy (Cross Sector), Environment (Climate Change)

Issues: Clean Energy, Energy Efficiency, Renewable Energy, Energy Storage, Alternative Fuels

Project: California Clean Energy Business

Time Frame: 2014–ongoing

Approach and Activity: In June 2014, the Energy Commission partnered with the China-U.S. Energy Efficiency Alliance and the California Environmental Protection Agency (Cal/EPA) to host a roundtable discussion with more than seventy-five participants from California clean energy businesses, state and local government, and civil society interested in energy and environmental issues and cooperation with China. The roundtable focused on climate change and air pollution, particularly the important role for clean energy and energy efficiency in reducing greenhouse (GHG) emissions and harmful air pollutants.

The Energy Commission continues to work with the Alliance to promote its trade mission to China in December 2014 for U.S. energy efficiency product manufacturers, designers, installers, and consultants. Chair Robert B. Weisenmiller of the Energy Commission will participate and meet with Chinese government officials, investors, and energy companies to facilitate trade and investment opportunities with U.S. and California energy companies, and the Energy Commission will complement this effort by working in partnership with the California-China Trade and Investment Office. One example includes connecting an innovative California carbon capture utilization and sequestration company with interested Chinese government officials and guiding them into potential Chinese markets.

Partners: China-U.S. Energy Efficiency Alliance; California Environmental Protection Agency; California-China Trade and Investment Office

Goal and Intended Impact: Facilitate California clean energy business development opportunities with China.

Project: Clean Energy Policy and Best Practices

Time Frame: 2013–ongoing

Approach and Activity: Since Governor Edmund G. Brown's trade mission to China in April 2013, the Energy Commission has hosted eleven Chinese delegations consisting of representatives from varying levels of the Chinese government, energy research centers, electric utilities, renewable energy developers, investment firms, and energy product manufacturers. These meetings have been a useful and productive information exchange exercise between Energy Commission staff and the Chinese representatives. Areas of discussion have included

renewable energy policies, goals, programs and development opportunities, building and appliance energy efficiency standards, designing and implementing effective energy efficiency programs, energy research and development initiatives, alternative fuels production, and energy storage demonstration projects.

The Energy Commission, in partnership with the Cal/EPA and the California Air Resources Board (ARB), also met with the representatives from China's National Development and Reform Commission in February 2014 as a follow-up to the Memorandum of Understanding signed by Governor Edmund G. Brown four months prior. The conversation centered on exchanging strategies and expertise to reduce harmful air pollutants, developing and managing robust emissions trading systems to reduce GHG emissions, and exploring commonalities and differences in both California's and China's energy sectors.

In addition, the Energy Commission is working with Energy and Environmental Economics, Inc. (E3) and the Rhodium Group on a California-Guangdong Clean Energy Partnership project, which is focused on identifying challenges and opportunities confronting both California's and Guangdong's electricity sectors (e.g., system planning and operations, energy efficiency, distributed generation) and sharing best practices. Following a series of meetings in October 2014 to examine the differences and similarities between California's and Guangdong's electricity sectors, the project will develop recommendations for high-impact areas of cooperation between California and Guangdong in the electricity sector. The Energy Commission continues to actively pursue partnerships and opportunities to enhance existing clean energy projects and programs and develop new channels of collaboration with China.

Partners: California Environmental Protection Agency; California Air Resources Board; National Development and Reform Commission of China; Energy and Environmental Economics, Inc.; Rhodium Group

Goal and Intended Impact: Exchange clean energy development ideas and implement best practices.

Project: Training Programs and Conferences

Time Frame: ongoing

Approach and Activity: As the developer and implementer of California's pioneering appliance and building energy efficiency standards, the Energy Commission is assisting representatives from China's National Institute of Standardization (CNIS) and the Building Code Compilation Committees in developing and implementing their own standards. The Energy Commission supported the Lawrence Berkeley National Laboratory's China Energy Group training program for CNIS representatives in October 2014 by hosting them at the Energy Commission for a day to discuss and share California's recent experiences in developing energy efficiency standards for new appliances.

The Energy Commission also participated as a technical reviewer in the United States–China Clean Energy Research Center – Building Energy Efficiency (CERC-BEE) annual meeting in late August, which included roughly twelve project teams composed of researchers

and industry partners from both countries conducting pre-commercialization-stage research and development in the fields of building design and operation, envelope, equipment, energy systems, policy, and standards. The CERC-BEE program is funded equally by the U.S. Department of Energy and the Chinese Ministry of Science and Technology to jointly advance energy efficient building technologies and practices. During the first five years, the CERC-BEE's research and development activities were targeted at developing pathways to achieve low-energy buildings. It has now modified its approach to focus exclusively on Zero Net Energy (ZNE) buildings in its next research and development phase from 2016 to 2020.

Finally, the Energy Commission is working with ICLEI–Local Governments for Sustainability on a program of exchanging ideas, tools, and best practices between select California and Chinese cities to effectively reduce local air pollution and GHG emissions from multiple sources, including those directly and indirectly associated with energy production and use. The Energy Foundation also continues to support the Energy Commission's engagement with China.

Partners: Lawrence Berkeley National Laboratory's China Energy Group; United States–China Clean Energy Research Center – Building Energy Efficiency; ICLEI – Local Governments for Sustainability

Goal and Intended Impact: Provide expert insights, expert review, and best practices from California, and support Chinese partners in training and development of implementation plans. The project also supports third-party clean energy and air pollution–greenhouse gas reducing programs.

ABOUT THE CALIFORNIA ENERGY COMMISSION

The California Energy Commission is the state's primary energy policy and planning agency. Established by the Legislature in 1974 and located in Sacramento, seven core responsibilities guide the Energy Commission as it sets California's energy policy.

- Forecasting future energy needs
- Promoting energy efficiency and conservation by setting the state's appliance and building energy efficiency standards
- Supporting energy research that advances energy science and technology through research, development, and demonstration projects
- Developing renewable energy resources
- Advancing alternative and renewable transportation fuels and technologies
- Certifying thermal power plants 50 megawatts and larger
- Planning for and directing state response to energy emergencies

Website: <http://www.energy.ca.gov/>

Contact: Grant Mack, Advisor to Chair Robert B. Weisenmiller, California Energy Commission: grant.mack@energy.ca.gov

PACIFIC GAS & ELECTRIC COMPANY

Sectors: Energy (Power), Environment (Climate Change)

Issues: Energy Efficiency

Project: Fostering Energy Efficiency in China

Time Frame: 2005–ongoing

Approach and Activity: Pacific Gas & Electric Company (PG&E) has supported energy efficiency in China through the China-U.S. Energy Efficiency Alliance since 2005. PG&E representatives serve on the Alliance’s Leadership Council and also share their extensive knowledge and experience in energy efficiency with Chinese policy makers, utilities, energy efficiency practitioners, and research institutes – both by sending experts to China at the Alliance’s invitation and by hosting Chinese delegations at PG&E.

In 2009, PG&E “loaned” one of its employees (Mona Yew) to the Alliance to promote utility implementation of demand-side management and provide hands-on training and education in China on issues that ranged from energy efficiency policy to program design, implementation, and evaluation. With support from PG&E executives, employees (Mona Yew and Sherry Hu) have also taken leaves from the company to work alongside Alliance partners such as the Natural Resources Defense Council (NRDC) to provide project implementation assistance.

For example, Sherry Hu focused on building energy efficiency while working out of NRDC’s Beijing office. In this role, she led a number of energy efficiency and green building research studies under the auspices of the U.S.-China Clean Energy Research Center, which was established with the support of previous Chinese President Hu Jintao and U.S. President Barack Obama. Sherry’s work supported the Ministry of Housing and Urban-Rural Development’s Center of Science and Technology of Construction (MoHURD/CSTC). She also met frequently with researchers and building designers, government officials, and other stakeholders in cities such as Beijing, Shanghai, and Suzhou and has presented her research to the Clean Energy Research Center (CERC) U.S. and China team at the 2012 Annual CERC Project Meeting at Sanya, China.

PG&E’s energy efficiency staff has held exchanges with Alliance partners working in China to share updates on California’s energy efficiency advancements and lessons learned to help promote and replicate California’s success in China. A partial list of PG&E’s participation in training events in China follows:

- 2009 International Forum: Developing Effective Mechanisms for Energy Efficiency Implementation (Beijing)
- International Training Courses on Energy Efficiency Evaluation, Measurement, and Verification (Qingdao)
- International Forum on Energy Efficiency Savings Evaluation, Measurement, and Verification Methodologies (Beijing)

- Technical Seminar on Energy Efficiency Program Evaluation (Beijing)
- Demand-Side Management Program Design and Implementation Workshop (Beijing and Shanghai)

PG&E has also hosted a variety of Chinese delegations within its service area, including meetings with the following:

- MoHURD and mayors and officials of numerous China cities, organized with the U.S.-China Mayoral Exchange Program, ChinaSF, the Energy Foundation, and others
- Officials in MoHURD from different provinces in China
- Officials in energy conservation centers of different provinces, organized in collaboration with NRDC
- Officials from MoHURD Beijing, the China Academy Building Research Institute, and NRDC's China office
- U.S.-China Eco-Cities Mayoral Exchanges Study Tour, organized in collaboration with the China-U.S. Energy Efficiency Alliance and Alliance to Save Energy

Partners: China-U.S. Energy Efficiency Alliance; Natural Resources Defense Council

Goal and Intended Impact: As a provider of electricity and natural gas, PG&E understands its responsibility to promote a diverse set of low- and zero-carbon resources to drive clean energy innovation in California and beyond. As part of this commitment, PG&E has a long history of working collaboratively to find solutions that are environmentally effective and economically sustainable.

ABOUT THE PACIFIC GAS & ELECTRIC COMPANY

Based in San Francisco, with more than 20,000 employees, Pacific Gas and Electric Company (PG&E) delivers some of the nation's cleanest energy to nearly 16 million people in Northern and Central California. PG&E also offers a full portfolio of savings options for customers, including some of the nation's leading programs and incentives for energy efficiency, demand response, and installation of solar and other distributed generation

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CLIMATE POLICY INITIATIVE

Sectors: Environment (Climate Change)

Issues: Climate Finance, Coal

Project: The Finances of China's Coal-Fired Power Sector

Time Frame: July 2014–April 2015

Approach and Activity: The Climate Policy Initiative (CPI) is conducting a research project on the finances of China's coal-fired power sector, analyzing the finance landscape, key actors, and finance methods of coal-fired power plants both domestically and overseas. Through this project, CPI aims to understand the rationale behind these investments, identify trigger points for influencing China's coal strategy, and ultimately provide a foundation to assess potential pathways toward a low-carbon energy transition.

Specifically, the project is intended to help understand and answer the following questions:

1. What are the financial structures and finance sources of utility-scale, coal-fired power infrastructure investments both domestically in China and overseas?
2. How do these financial structures and sources reflect the risks and returns associated with energy production?
3. How, since the control of equity interests and financial flows is organized within the state energy and financial sectors, does China's investment portfolio across its energy options represent its strategy for managing the sovereign assets essential to the economy? What are the policy implications toward a low-carbon energy transition?

This project commenced in July 2014 and is expected to run through April 2015, with work products including four research reports focusing on the domestic coal power infrastructure finance, overseas infrastructure finance, domestic policy brief, and overseas policy brief. The work products will also include seminars and/or workshops accompanying the publications of the research reports to engage stakeholders.

For the Chinese domestic coal power generation portion of the analysis, the project looks into these questions: Who provides the capital to Chinese domestic coal power plants? What is the role of the state-owned enterprises (SOEs) and of state-owned banks? What are the typical financing structures and arrangements? Are these power plants profitable? What are the roles for international investors? How sustainable is this financing system in light of coal-fired plant development and government-directed policy targets?

For the Chinese overseas coal power generation portion of the analysis, the project looks into these questions: Which international coal power projects do Chinese stakeholders financially support? In which countries are these projects located? Which domestic companies are associated with these overseas investments, and what is the role of the SOEs? What is the role of state-owned banks (in particular, policy banks)? Which Chinese stakeholders are involved in the provision of coal-fired plant capital? What are the typical financing structures

and arrangements? Are lending terms for Chinese banks for coal power particularly different from those of major lenders (development banks, etc.)? How has international investment in these projects changed over time?

This project is composed of quantitative and qualitative desk research, including a review of Chinese investments in coal-fired power assets through corporate filings and news reports and the aggregation and analysis of existing secondary data compiled by market analysis and financial information portals such as Bloomberg, Bloomberg New Energy Finance, and Platts. The project will expand these sources with in-country interviews and potential collaborations with experts in Chinese government agencies, banks, state-owned and non-state-owned enterprises, academia, and investment analyst groups on the planning, financing, and regulations of China's coal-fired power sector.

Partners: Chinese government agencies in charge of planning, financing, and regulation of the energy sector; policy and commercial banks; state-owned and non-state-owned power developers and generators; prominent energy- and climate-related academic research institutes; and investment analyst groups.

Goal and Intended Impact: Facing a steady increase of coal-fired power plant installation in the next decade, the project will generate insights on the financing methods and rationales for these investments. This will ultimately provide policy makers, owners, and financiers of coal-fired power assets especially in state-owned institutions a solid foundation for (1) evaluating their policy, investment, and financing decisions in the power sector especially on coal-fired power and (2) optimizing their management of existing sovereign assets to align low-carbon development goals with their own interests. CPI will measure the success of this project according to the quality of the research findings as well as their impact among relevant stakeholders.

ABOUT THE CLIMATE POLICY INITIATIVE

The Climate Policy Initiative (CPI) is a team of analysts and advisors that works to improve the most important energy and land-use policies around the world, with a particular focus on finance. CPI is recognized as one of the world's leading organizations analyzing climate finance, and CPI analysis has helped focus the debate on which levers and barriers might have the biggest impact in scaling up low-carbon, climate-resilient investment. CPI works alongside many of the world's most actively engaged people and organizations that are tracking, advancing, and assessing green investment activities and outcomes.

Website: <http://climatepolicyinitiative.org/>

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ENERGY FOUNDATION

Sectors: Energy (Building, Transport, Industry, Power), Environment (Air, Climate Change), Cross Sector

Issues: Emission Trading, Climate Change, Low-Carbon City, MRV, Air Pollution

Project: Emission Trading System

Time Frame: 2011–2015

Approach and Activity: Since 2011, the Energy Foundation (EF) has been supporting carbon emission–trading pilots by collaborating with China’s National Development and Reform Commission (NDRC). In selected pilots (Shanghai, Guangdong, Beijing, and Tianjin), EF China supports local entities and research groups (Tsinghua University, Shanghai Economy Information Center, Guangzhou Energy Research Institute, Shanghai Environmental Exchange) to draft emissions trading system (ETS) regulations; establish harmonized monitoring, reporting, and verification (MRV) rules across different pilots; and improve allocation rules. To enhance policy design and implementation capacity of local policy makers, EF China organized study tours in 2013 and 2014 for Chinese policy makers and researchers to the offices of the U.S. Environmental Protection Agency and the California Air Resources Board. Currently, EF China is supporting Guangdong, Shenzhen, and Beijing to carry out qualitative and quantitative evaluations of ETS and its impacts on emissions, the environment, and the economy through March 2015. EF China is also working with the Research Institute of Fiscal Science (affiliated with the Ministry of Finance), China Energy Policy Society, and Harvard University on carbon and other environmental taxation.

Partner: National Development and Reform Commission (China)

Goal and Intended Impact: The pilots have established building blocks for a successful ETS, including collection of factory-level carbon emission data and the establishment of comprehensive MRV rules, and they have started to create absolute caps on carbon emission.

Project: Reinventing Fire China

Time Frame: 2013–2015

Approach and Activity: The Reinventing Fire China (RIF) Study is a joint project by EF China, Rocky Mountain Institute (RMI), the Energy Research Institute of China (ERI), and the Lawrence Berkeley National Lab (LBNL). The project focuses on four primary energy-using sectors: transportation, buildings, industry, and electricity. The research will identify a transformational and integrative approach to energy use and generation in China, based on technical feasibility and cost effectiveness; integrate across sectors to unlock hidden energy and capital savings; and link clean energy and energy efficiency to pressing air pollution and

greenhouse gas emissions issues. The research consists of four components:

1. Establish an advisory team in the United States and China to assess and examine research findings
2. Develop an analytically robust model that is deployable over time
3. Document practical case studies of existing best practices in China and in the world for replication in China
4. Organize a series of technical workshops to brainstorm and share the best available sectorial knowledge globally to help drive insights and generate support for research results

The Reinventing Fire China project will issue two reports by mid-2015. The first report will focus on the technical and economic aspects of the modeling, and the second report will take the model results and draw implications for policy.

Partners: Rocky Mountain Institute; Energy Research Institute of China; Lawrence Berkeley National Lab

Goal and Intended Impact: The project aims to identify a pathway by which China can meet its energy needs and improve its energy security and environmental quality while determining the maximum feasible share of cost-effective energy efficiency and renewable supply solutions through 2050.

Project: JJJ Air Quality Improvement Project

Time Frame: 2008–ongoing

Approach and Activity: Since 2008, EF China has been supporting projects in China to help the country achieve clean air through energy efficiency, clean and renewable energy, and sustainable transportation and urban planning measures in an effort to protect public health while reducing greenhouse gas emissions and mitigating climate change. Support is provided for the following types of activities:

1. *Policy Research and Recommendations:* Grants to environmental think tanks and universities in China and to international NGOs.
2. *Pilot Projects:* Funding for the Beijing-Tianjin-Hebei (JJJ) region and in Jiangsu, Guangdong, and Shanxi provinces to assess and develop better air quality management systems and plans and provide technical support for their implementation.
3. *Capacity Building and Training:* Air quality trainings for Chinese government, environment, and air quality officials and technical staff. Together with the Foreign Economic Cooperation Office of the Ministry of Environmental Protection (MEP) and the Clean Air Alliance of China (CAAC), EF China also launched a China Clean Air City Network composed of twelve cities in China.
4. *Workshops, Exchanges, and Study Tours:* Organizing of air quality–themed workshops, exchanges, and study tours, such as facilitating annual visits among Chinese air quality officials to the offices of California’s Environmental Protection Agency and Air Resources

- Board (ARB) and bringing ARB experts to Beijing to provide technical support.
5. *Support for Chinese NGOs:* Support for Chinese environmental NGOs such as the Institute of Public and Environmental Affairs (IPE) to promote air quality–related transparency and enforcement. EF China also partnered with Chinese environmental foundations such as the SEE and Alibaba Foundations to create a “Blue-Sky Defense Fund.”
 6. *Creation of an Air Quality Platform:* Launch of the CAAC, which convenes key institutions in China and abroad and strives to serve as a platform for air quality work in China.
 7. *Public Education:* Creating public education materials on air quality.

Partners: China Council of International Cooperation on Environmental and Development; China Academy of Environmental Planning; Chinese Research Academy of Environmental Sciences; Policy Research Center of Environment and Economy of MEP; Tsinghua University; Peking University; Clean Air Alliance of China

Goal and Intended Impact: EF China’s support is aimed at influencing policy making, such as through the revision of China’s Clean Air Act, the national air quality and pollutants reduction plans (12th and 13th Five-Year-Plans, State Council Air Quality Action Plan), and in air quality and emission standards.

Project: Kunming-Chenggong Pilot Project

Time Frame: 2010–ongoing

Activity and Approach: Since 2010, EF China has worked with the Kunming Municipal Government and Peter Calthorpe to contribute to a “Regulatory Plan for Chenggong New Town Core Area,” which aims to make Chenggong, a Kunming satellite city of 7 million, more sustainable via integrating transit-oriented development (TOD). Completed and passed by the Planning Committee in 2012, the plan is now being implemented in Chenggong, and efforts are being made to apply the guidelines in the plan more widely, including designs for Yuelai Ecocity in Chongqing; Tangjiawan in Zhuhai; Guangdong province; New East Railway Station in Jinan, capital of Shandong province; and Maluan Bay in Xiamen, Fujian province.

Partners: Kunming Municipal Government; Calthorpe Associates

Goal and Intended Impact: The eight “Planning Cities for People” principles jointly developed by ClimateWorks, the Institute for Transportation and Development Policy, Calthorpe Associates, and EF China are gaining traction across China. A manual on how to use these principles – Transit-Oriented Development in China – has been published and training courses have been organized for leaders and urban planners from new town developments to replication of this model elsewhere.

ABOUT THE ENERGY FOUNDATION

The Energy Foundation (EF) is a nonprofit organization that is dedicated to promoting clean energy solutions in the United States and China. Every year, Energy Foundation China works with dozens of Chinese organizations on hundreds of collaborative projects in the areas of clean energy, climate change, environmental protection, and sustainable cities.

Website: <http://www.ef.org/>

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ICLEI-LOCAL GOVERNMENTS FOR SUSTAINABILITY

Sectors: Energy (Building), Environment (Air)

Issues: Low-Carbon City, Sustainable City

Project: California-China Urban Climate Collaborative

Time Frame: 2014–2017

Approach and Activity: The California-China Urban Climate Collaborative is a dynamic, new long-term exchange between cities in California and China seeking to reduce carbon and air pollution and advance the clean energy economy. The program offers tools, trainings, and technical assistance; workshops and site visits; access to expert knowledge; and technology solutions to build the infrastructure for long-term relationships between cities.

To measure programmatic success, ICLEI USA will conduct surveys, interviews, and case studies to identify the program’s strengths and weaknesses and will develop a standard methodology for city exchanges on climate issues. The tracking metrics will include the number of cities that complete climate action plans, the number of implementation programs that are launched through the exchange, the number and type of trade opportunities that result from the program, the number of issues resolved by the “Ask an Expert” team, and any measurable increase in the level of the climate change knowledge and capacity of local government staff.

Partners: Lawrence Berkeley National Laboratory; California-China Office of Trade and Investment; Bay Area Council; Asia Society

Goals and Intended Impact: The collaborative was originally designed to advance the work of California Governor Jerry Brown to engage China to jointly address the global threat of climate change at the city and local levels. The program’s goals are to:

- Assist policy makers in climate action planning
 - Offer tools that collect, analyze, and forecast greenhouse gas emissions data to help policy makers reach informed decisions
- Build organizational capacity for climate action planning
 - Provide resources and training for local government staff on the five milestones of climate action planning: conducting a baseline emission inventory and forecast, adopting an emissions reduction target, developing a local climate action plan, implementing policies and measures, and monitoring and verifying results
 - Offer a Climate College made up of educational workshops and trainings on key aspects of climate action planning, and provide a showcase of successful projects
 - Connect cities with experts in climate action planning to support each city’s unique challenges in reducing its carbon emissions
- Connect clean-tech industries with cities
 - Offer an experienced team to help identify the best available technologies

- o Hold a clean-tech industry event for participants to introduce new clean energy technologies to cities
- o Assist businesses and investors in reaching these new urban markets

ABOUT ICLEI-LOCAL GOVERNMENTS FOR SUSTAINABILITY

ICLEI-Local Governments for Sustainability is the leading association of local and metropolitan governments representing more than one-seventh of the world's population. ICLEI promotes local action for global sustainability and supports cities to become sustainable, resilient, resource efficient, biodiverse, low carbon; to build a smart infrastructure; and to develop an inclusive, green urban economy with the ultimate aim of achieving healthy and happy communities. ICLEI USA's mission is to build, serve, and drive a movement of local governments to advance deep reductions in greenhouse gas emissions and achieve tangible improvements in local sustainability. The ICLEI international network spans more than 1,000 members in 84 countries and remains the leading global association of local governments dedicated to combatting climate pollution.

Website: <http://www.icleiusa.org/>

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INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

Sectors: Energy (Transport), Environment (Air, Climate Change)

Issues: Vehicle Emission, Clean Marine Fleet, Clean Port

Project: Tailpipe Emissions Standards for China

Time Frame: 2012–ongoing

Approach and Activity: In 2013, the Chinese National Development and Reform Commission made a breakthrough commitment to require ultralow-sulfur motor fuel (10 ppm or less sulfur content) by 2018. The availability of clean fuel will remove the major barrier to adopting more stringent vehicle tailpipe emissions standards for China’s rapidly growing light- and heavy-duty vehicle fleet, after a long period of policy stagnation. Because many Chinese cities face an air quality crisis, with severe public health impacts, China needs an even more accelerated schedule for adopting world-class emissions standards.

In 2012, the International Council on Clean Transportation (ICCT) released a groundbreaking study into the costs and benefits of early adoption of Euro 6–equivalent emissions standards for new vehicles in China. This is the first independent, comprehensive cost-benefit analysis of both public health and climate change mitigation benefits considering both the business-as-usual case and enhanced policy scenarios, including adopting a world-class emissions standard nationwide in 2018. By working with the Vehicle Emission Control Center of China’s Ministry of Environmental Protection (VECC-MEP), a quasi-governmental research institute that is commissioned by MEP to develop China’s next vehicle emissions standard, the ICCT was able to access and incorporate China-specific data in its analysis. The analytical model is customized to support Chinese policy making.

In June 2014, the ICCT co-organized with VECC-MEP and the U.S. Environmental Protection Agency the Fourth Sino-U.S. Workshop on Motor Vehicle Pollution Prevention and Control in Beijing. The results from the cost-benefit study were shared with more than 150 regulators from central and local governments as well as experts from research institutes and industry. The results show that only a world-class emissions standard can achieve long-term significant reduction in emissions of particulate matter and other pollutants, and that the benefits far exceed the cost (by four times in 2040 and by seven times in 2050).

The analytical model can also apply to regional policy making. In addition to its support to the national government (MEP), the ICCT has been supporting Guangdong province since January 2013 as it considers moving to China 5/V vehicle emissions standards ahead of the national time line.

Most recently, the ICCT has been closely collaborating with the state of California, especially the California Air Resource Board, to support the Beijing Environmental Protection Bureau (EPB) in developing innovative local vehicle emissions control programs. Beijing EPB seeks to incorporate many successful elements of California’s vehicle emissions control programs.

Partners: Vehicle Emission Control Center of China’s Ministry of Environmental Protection

Goal and Intended Impact: The project aims to accelerate the adoption of world-class vehicle emissions standards in China in an effort to mitigate the impacts of particulate matter and other pollutants on public health in China’s cities.

Project: Clean Marine Fleet and Clean Ports

Time Frame: 2010–ongoing

Approach and Activity: ICCT has been working on reducing emissions from shipping and ports in China for four years, often drawing on best practices demonstrated in California. The effort encompasses increasing shipping efficiency, improving marine fuel quality, and upgrading marine diesel engines. ICCT’s support has been in the form of technical memos, workshops, and briefings/meetings for policy makers, NGOs, research institutes, and other stakeholders.

Partners: Vehicle Emission Control Center of China’s Ministry of Environmental Protection; Hong Kong Environmental Protection Department; Shenzhen Municipal Government; Woodrow Wilson International Center for Scholars

Goal and Intended Impact: At the national level, ICCT is cooperating with VECC-MEP to review best practices in technologies and operations in the United States and Europe and identify elements that can be tailored to fit the situation in China. ICCT’s activities with regard to shipping and ports in China aim to incorporate emissions from shipping and ports into the 13th Five-Year Plan. ICCT is working in multiple fronts – including inventories, technologies, and policies – to assist central and local governments such as in Guangdong and Jiangsu provinces to realize this goal. Experience from California plays an important role. ICCT has brought experts from the Port of Long Beach and the Port of Oakland to Shanghai to share their insights. In the longer term, ICCT seeks to promote establishment of an Emission Control Area (ECA), a policy mechanism that can significantly reduce emissions from shipping. California also pioneered this policy mechanism in the United States.

At the regional and city levels, ICCT worked with Hong Kong Environmental Protection Department (HKEPD) to address technical barriers to switching from high-sulfur bunker fuels to low-sulfur marine gas oils, borrowing heavily from the experience in California. Additionally, in collaboration with the Woodrow Wilson International Center for Scholars, ICCT is partnering with the Shenzhen government to look into emissions from ships at berth and evaluating the shore power proposal by the Shenzhen government from a lifecycle perspective. The project supplements ICCT’s ongoing effort to help Shenzhen establish an EcoPartnership with ports in California.

ABOUT THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

The International Council on Clean Transportation is an independent nonprofit organization founded to provide first-rate, unbiased research and technical and scientific analysis to environmental regulators. Its mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation to benefit public health and mitigate climate change.

Website: <http://www.theicct.org/>

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ENVIRONMENTAL DEFENSE FUND

Sector: Energy (Transport), Environment (Air, Climate Change)

Issue: Emission Trading

Project: Mobile Source Emission Trading System Integration

Time Frame: 2014–2019

Approach and Activity: This five-year project is one of the first research efforts aimed at evaluating the feasibility of incorporating transportation sources into an emissions trading system. The focus is on public transportation (buses, taxis), private vehicles, and land/sea cargo vessels operating in the city of Shenzhen, China, where carbon emissions from the transport sector account for nearly 30% of the city's total emissions and have been increasing at a rate of 15% annually since 2004.

Partners: National Development and Reform Commission; Shenzhen Low Carbon Development Foundation; Shenzhen Development and Reform Commission; California Air Resources Board and select Air Quality Management Districts; U.S. Department of State

Goal and Intended Impact: The Environmental Defense Fund, along with its partners in China and the United States, aims to reduce air pollution from transportation through carbon emissions trading while testing the feasibility of expanding emissions trading systems to mobile sources.

Project: Carbon Emission Trading System Pilot Training

Time Frame: 2013–ongoing

Approach and Activity: Three training sessions have been held, one involving the California Environmental Protection Agency (Cal/EPA) and the California Air Resources Board (ARB) at China's second low-carbon day in June 2014. The most recent occurred in Tianjin in September 2014. Representatives from all seven pilots, associated exchanges, and the Provincial/Municipal and National Development and Reform Commissions participated in the sessions. Training was provided on critical emission trading system (ETS) program elements, regulation development, capacity building, and lessons learned from other ETS programs (in the West and in China). The sessions also provided a forum for China's low-carbon pioneers to compare and contrast challenges, opportunities, and best practices.

Partners: National Development and Reform Commission; Provincial and Municipal Development and Reform Commissions; California Environmental Protection Agency; California Air Resources Board; Southern California Edison; Pacific Gas & Electric

Goal and Intended Impact: The Environmental Defense Fund intends to develop and implement a training program for the benefit of China's low-carbon pioneers who are developing

and implementing its seven carbon emissions trading programs that collectively include about 2,100 enterprises that emit about 1.25 billion tons of carbon dioxide. As a result of the training program, participants have gained knowledge and had the opportunity to engage in discussions that will assist them with building the capacity needed to develop, administer, and comply with an ETS.

Project: California-Shenzhen Emission Trading System and Capacity Building

Time Frame: 2013–ongoing

Approach and Activity: The Environmental Defense Fund intends to establish a working relationship through which ARB and Shenzhen (a city with a population approaching 15 million and an ETS that includes 635 enterprises and a 33 million tonnes cap). Development and Reform Commission (DRC) officials can meet to exchange information that will contribute to a better understanding of ETS-related challenges and opportunities in California and China. After the execution of an MOU between ARB and Shenzhen, a number of training workshops have been held for the benefit of more than 1,000 stakeholders. In a related project, EDF facilitated numerous meetings in California where ETS-related knowledge has been exchanged by and between Chinese and California ETS experts. EDF experts, along with ARB, the California Energy Commission, the California Public Utilities Commission, the Bay Area Air Quality Management District, Northern and Southern California utilities, have participated in these workshops and meetings.

Partners: Shenzhen Development and Reform Commission; Shenzhen Low Carbon Development Foundation; California Air Resources Board; Southern California utility companies; Bay Area Air Quality Management Districts

Goal and Intended Impact: The project aims to share policy design and early experiences from climate trading programs to build strong, stable, and growing markets for clean energy technology and greenhouse gas emission reductions. The collaboration will also aim to build effective systems for data gathering, emissions verification, market monitoring, compliance, and enforcement. Additionally, California and Shenzhen agree to monitor and share climate- and pollution-related science and research. The goal is to use the data to identify and evaluate additional policies, encourage and support low-carbon economic growth, and gain co-benefits (including a reduction in conventional air pollutants, encouragement of energy efficiency, and the spurring of green technology) on both sides.

ABOUT THE ENVIRONMENTAL DEFENSE FUND

The Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. Guided by science and economics, EDF finds practical and lasting solutions to the most serious environmental problems. What distinguishes EDF is the combination of what and how it protects. EDF works to solve the most critical environmental problems facing the planet. This has drawn it to areas that span the biosphere: climate, oceans, ecosystems, and health. Since these topics are intertwined, EDF's solutions take a multidisciplinary approach. It works in concert with other organizations – as well as with business, government, and communities – and avoids duplicating work already being done effectively by others. Over the years, EDF has brought a series of innovations to the work of protecting the environment. Today, its unique approach is the sum of all these innovations.

Website: <http://www.edf.org/>

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NATURAL RESOURCES DEFENSE COUNCIL

Sectors: Energy (Building, Transport), Environment (Air, Climate Change)

Issues: Energy Efficiency, Green Building, Sustainable Cities, Public Participation

Project: Green Buildings

Time Frame: 1992–ongoing

Approach and Activity: The Natural Resources Defense Council (NRDC) was the first international environmental organization to establish clean energy and green building programs in China. In 1992, NRDC helped China develop the world’s first “Agenda 21,” a comprehensive plan of action for sustainable development. NRDC worked with China to obtain the country’s first LEED Gold certification for an office building in Beijing in 2005. Built at no additional cost, the 130,000-square-foot building achieved 74% overall energy reduction and 64% water savings compared to similar buildings. As a result, many government office buildings in China were subsequently retrofitted to improve energy and water efficiency performance.

Partners: China’s Ministry of Science and Technology; U.S. Department of Energy; other universities and research and design institutes from China and the United States

Goal and Intended Impact: To establish and support the implementation of energy efficiency building standards in China.

Project: Industrial Energy Efficiency, Energy Efficiency Policy

Time Frame: 2004–ongoing

Approach and Activity: NRDC works closely with partners at all levels in China to develop efficiency power plants – large-scale, demand-side management (DSM) programs that promote energy efficiency as a cost-effective energy resource that would allow China to meet its growing demand for energy while eliminating the need to build new coal-fired power plants.

In 2004, NRDC worked with China’s national government and Jiangsu province to help launch China’s first large-scale energy efficiency pilot program, based on the California model (leveraging energy efficiency programs that allowed the economy to grow by 40% while maintaining stable electricity use per capita). In 2005, NRDC helped broker and implement an agreement on DSM cooperation between the California Public Utilities Commission, the California Energy Commission, and the Jiangsu Economic and Trade Commission. These two achievements paved the way for a 2009 subnational agreement between California and Jiangsu province to cooperate on reducing greenhouse gas emissions through energy efficiency and renewable energy. In 2010, these efforts culminated in national energy efficiency regulations enacted by China’s central government, which require electricity companies to invest in energy efficiency programs for their customers.

According to the Jiangsu Economic & Trade Commission, NRDC's work has helped the province begin to build a large-scale industrial energy efficiency program that in its first three years saved enough energy to equal that produced by a 300-MW coal-fired power plant. The measures helped Jiangsu reduce 580 MW of peak load, save 2 TW hours of electricity annually, and reduce CO₂ emissions by 1.88 million tons each year during that time period. Jiangsu's program grew rapidly and achieved 13,376,800 tons of cumulative CO₂ reductions by the end of 2010.

More recently, NRDC and the Beijing Energy and Environment Protection Center (BEEC) were selected as a 2013–2015 EcoPartnership to expand large-scale energy efficiency programs in China. The EcoPartnership program was founded under the Ten Year Framework for Cooperation on Energy and Environment signed by the United States and China during the 2008 Strategic Economic Dialogue (SED). With BEEC, by 2015 NRDC will use demand-side management (DSM) to reduce 800 MW of peak load in Beijing that would otherwise be supplied by a standard coal-fired power plant. The Beijing DSM program will include policy research, technical support, program design and implementation, and capacity-building training workshops.

NRDC also collaborates with Shanghai, which was selected as the first “demand response city” pilot by the National Development and Reform Commission (NDRC) of the central government of China. In 2013, the average difference between the daily maximum peak load and the minimum off-peak load in Shanghai reached 12.02 GW. This large difference creates enormous pressure on the electricity grid and puts safety and reliability of the grid at great risk. Demand response (DR) is a DSM measure that can manage the load by having end users reduce or shift their electricity use at peak times on the grid. The Shanghai DR city pilot, which started in May 2014, will test new tools and approaches to implement DR. NRDC has brought in international best practices to help build capacity of local experts and government officials in the early stage and now plays an active role on the implementation team. NRDC is conducting a series of studies on Shanghai's DR potential and cost-effectiveness analysis, measurement and verification methodologies, and market-based trading mechanisms.

NRDC also hosts workshops in China for government officials and other stakeholders on international best practices in energy efficiency and demand-side management. NRDC collaborates with U.S. experts from government, utilities, and businesses to bring customized international best practices to the Chinese audience. NRDC also brings Chinese delegations to the United States to exchange information on successful, large-scale energy efficiency policies and implementation practices. For example, in December 2012 NRDC arranged for NDRC to visit the United States and Canada to learn about practical operational procedures of energy efficiency and DSM programs. The lessons learned helped China implement its national DSM regulation (passed in 2010) and DSM pilot-city programs in a cost-effective way.

Partners: Jiangsu Economic and Trade Commission, Jiangsu province; California Public Utilities Commission; California Energy Commission; Beijing Energy and Environment Protection Center

Goal and Intended Impact: Support design and implementation of energy efficiency,

DSM, and DR policies, plans, and technologies across China. Reduce dependence on coal-fired power plants via DSM, and support international and California-China subnational cooperation on best practices exchange.

ABOUT THE NATURAL RESOURCES DEFENSE COUNCIL

Established in 1970, the Natural Resources Defense Council (NRDC) is an international nonprofit, non-government environmental action group with 1.4 million members and online activists and a staff of more than 400 lawyers, scientists, and other professionals. NRDC's mission is to safeguard the Earth: its people, its plants and animals, and the natural systems on which all life depends. Headquartered in New York City, NRDC has five regional offices in the United States and an office in Beijing, China. NRDC has a long history in China that spans back to 1992; it now works on several projects covering climate change and energy policy research, environmental law, green supply chain, and environmental health in Mainland China and Hong Kong.

Website: <http://www.nrdc.cn/>

Contact: Mona Yew, Natural Resources Defense Council: myew@nrdc-china.org

REGULATORY ASSISTANCE PROJECT

Sectors: Energy (Power)

Issues: Energy Efficiency, Renewable Energy, Regulation

Project: Low-Carbon Power Sector in China

Time Frame: 1999–ongoing

Approach and Activity: The Regulatory Assistance Project (RAP) began in China fifteen years ago in partnership with the Energy Foundation. RAP’s focus is on regulated energy – electricity (power) and natural gas – but its efforts are often cross sector and intersect with energy and industry, transportation, environmental protection, and climate policy.

RAP’s primary approach is to work directly with decision makers in workshops, in one-on-one meetings, and through collaborative research and policy analysis. It engages in a variety of activities – projects with defined outputs and dialogues that are open ended to educate, assist, and cajole. RAP is working with a number of China’s government agencies – the State Council, the National Development and Reform Commission, the National Energy Administration, the Ministry of Environmental Protection, and their provincial analogues – and the research institutes affiliated with them to identify, analyze, and shape policies that will, in the longer term, address China’s and the world’s environmental challenges. In its decade and a half in China, RAP has influenced regulatory restructuring, renewables law, power sector reform, regional air quality rules, the role of end-use efficiency in grid-company planning, and greenhouse gas emissions trading schemes.

RAP measures success by the kinds of policies that are adopted and by assessments, both quantitative and qualitative, of their efficacy. A partial list of achievements to which its work contributed or directly led includes the energy efficiency power plant (end-use efficiency programs whose savings are the equivalent of the output of a conventional power plant); central government policies calling for investment in clean energy resources (efficiency and renewables) as a means of improving regional air quality; more rigorous coal quality requirements; and a renewed effort to reform generation dispatch and compensation, wind and solar grid codes, and feed-in tariffs for renewables.

Partners: Energy Foundation

Goal and Intended Impact: The electric sector is central to the decarbonization of China’s economy and to any effort to combat global warming. RAP’s aim is to help China develop and implement policies today that will put it on a firm trajectory toward a low- (or even no-) carbon power sector by 2050, and to do so in a way that is economically practical. More specifically, RAP’s work in China can be broadly categorized along four dimensions:

- *Power Sector Reform:* The policy, structural, and regulatory foundations upon which a low-carbon future can be built and can thrive.

- *Clean Energy Initiatives:* Technical and policy analysis and advice directed at specific outcomes in the power sector, chief among them increased investment in and reliance on end-use efficiency and nonpolluting generation, primarily renewables.
- *Air Quality Management:* Policy and regulatory actions that will reduce the output of regional air pollutants (in particular, NOX, SO2, PM, and mercury), in ways that will complement rather than exacerbate efforts to reduce carbon dioxide emissions.
- *Carbon Regulation:* Emissions trading and other programs to monetize and, where intended, cap the output of CO2 and other greenhouse gases.

ABOUT THE REGULATORY ASSISTANCE PROJECT

The Regulatory Assistance Project (RAP) was founded in 1992. It is a global, nonprofit team of experts whose core mission is focused on the long-term economic and environmental sustainability of the power and natural gas sectors, which it advances by providing technical and policy assistance to policy makers and regulators on a broad range of issues. RAP does this not as an advocate, but as an advisor: RAP experts meet directly with government officials and regulators and their staffs; they lead technical workshops and training sessions and conduct in-house research and produce a growing volume of publications designed to better align energy regulation with economic and environmental goals.

Website: <http://www.raonline.org/>

Contact: Contact: Frederick Weston, Principal and Director, China Program: rweston@raonline.org, (1-802-760-9508)

LAWRENCE BERKELEY NATIONAL LABORATORY CHINA ENERGY GROUP

Sectors: Energy (Industry, Buildings, Appliances, Power), Environment (Climate Change)

Issues: Low-Carbon City, Energy Modeling, Energy Efficiency Policies and Programs

Project: Low-Carbon Eco-City Development

Time Frame: 2011–ongoing

Approach and Activity: The China Energy Group of the Lawrence Berkeley National Laboratory (LBNL) has developed a low-carbon indicator system and an “ELITE-Cities” tool to help a city measure its progress in low-carbon development and benchmark its energy and carbon performance against that of other cities. The Green Resources and Energy Appraising Tool (GREAT) and Urban Form Rapid Assessment Model (Urban RAM) are the other two in-house tools for city policy makers to use to evaluate the city’s potential for low-carbon emission pathways and assess the city’s energy and carbon footprints. The Benchmarking and Energy Saving Tool for Low Carbon Cities (BEST-Cities) is the China Energy Group’s latest tool for benchmarking Chinese and international cities against thirty-three key performance indicators and include seventy-two policy recommendations. These resources and tools have been introduced to government officials, urban planners, and researchers from the central to city-level governments in the past few years, including pilot cities in Shandong province and in Shenzhen.

Partners: Energy Research Institute of China’s National Development and Reform Commission; Energy Foundation China; Shandong Academy of Science

Goal and Intended Impact: The goal is to offer a comprehensive package of solutions (i.e., quantitative tools and qualitative policy strategies) that a city can adopt to effectively reduce its energy consumption and carbon dioxide and methane emissions and create a real impact on the ground.

Project: U.S.-China Clean Energy Research Center for Buildings Energy Efficiency (CERC-BEE)

Time Frame: 2010–2015

Approach and Activity: LBNL’s China Energy Group is the U.S. lead for the CERC-BEE project, initiated in 2009 by U.S. President Barack Obama and then Chinese President Hu Jintao. The project contains a dozen high-visibility and cost-shared technology subprojects that are R&D oriented and whose output is applicable worldwide. Specifically, researchers from both countries work together to improve efficiency in new and existing buildings, save energy, reduce greenhouse gas emissions, increase indoor comfort, and reduce stress on the electric grid. Recent

accomplishments include six new commercially available products, technologies, and software tools; four patent applications of U.S. technologies in Chinese demonstration buildings; eight newly adopted energy efficiency codes and standards; and publication of more than 150 academic research papers. Together, the U.S. and Chinese research-industry teams aim to:

- Focus on real-world impact through the early commercialization of technologies and by developing intellectual property, software, tools, guidebooks, codes, policies, and more
- Bring new technologies to market
- Create a sustainable platform for lasting partnerships
- Cover the whole business model by involving various stakeholders such as government, academia, and the private sector

Partners: The project involves fourteen research institutes and companies from the United States (i.e., Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Massachusetts Institute of Technology, ICF International, UC-Davis, Bentley, 3M, C3 Energy, ClimateMaster, Dow Chemical, Energy Foundation, Luturon Electronics, Sage Electrochromics) and forty-nine from China (e.g., Ministry of Housing and Urban Development, Tsinghua University, Tongji University, Tianjin University, Chongqing University, China Academy of Building Research, China Society for Urban Studies, Beijing Huaqing Geothermal Development, ENN Energy Holdings, Zhuhai Singyes Green Building Technology).

Goal and Intended Impact: Achieve wide adoption of low-energy buildings by accelerating the development and deployment of clean energy technologies and policies for the benefit of both countries. Once implemented, the United States and China could together save up to \$2 billion and avoid emissions of 100 million metric tons of CO₂.

Project: China 2050 Energy and Emissions Modeling

Time Frame: 2005–ongoing

Approach and Activity: The China Energy Group's 2050 Demand Resource Energy Analysis Model (DREAM) was designed to project China's future energy use and energy-related CO₂ emissions from 2010 to 2050 as well as to evaluate policy impacts. The modeling approach is focused on the key drivers of energy demand and evaluating the diffusion of end-use energy-consuming technologies. Published in 2011, the model results were surprising even to the Chinese because they showed a slowing, peaking, and even declining level of CO₂ emissions in China. Most other studies of that vintage showed either continued growth or later declines in these emissions. The China Energy Group has recently initiated a multi-institution modeling study of China's future energy use and emissions that combines the knowledge that the group and the Energy Resource Institute (ERI) have from their previous modeling, policy, and technology evaluation with the technology and policy expertise of Rocky Mountain Institute (RMI) and Energy Foundation (EF) China. The vision of this effort is to develop a pathway through which China meets its energy needs and improves its energy security and environmental quality using the maximum feasible share of cost-effective energy efficiency and

renewable supply through 2050. Other activities include:

- Host long-term visits by Chinese researchers and provide them with extensive trainings and capacity building
- Joint model development
- Advise policy makers in both countries on energy and climate issues

Partners: Energy Research Institute of China's National Development and Reform Commission; China National Institute for Standardization; Rocky Mountain Institute

Goal and Intended Impact: The goal is to help policy makers prioritize policies and programs in the short term and to inform long-term strategic planning. The project will also provide deeper understanding of the underlying drivers of China's energy consumption and energy-related emissions and form the basis for assessing policy and technology options for shaping China's future energy and emissions pathways.

ABOUT THE LAWRENCE BERKELEY NATIONAL LABORATORY'S CHINA ENERGY GROUP

Lawrence Berkeley National Laboratory's China Energy Group, founded in 1988, works collaboratively with groups in China and elsewhere to understand the dynamics of energy use, improve energy efficiency, and reduce emissions in China; strengthen Chinese capabilities in energy efficiency; and enhance partnerships on energy efficiency among Chinese, U.S., and international institutions. The group's work covers all energy sectors including buildings, appliances, industry, and the transformation sector in China with a focus on energy efficiency and low-carbon development. Its website provides an overview of its current and recent projects.

Website: <http://china.lbl.gov/>

Contact: Lynn Price, China Energy Group Leader, LKPrice@lbl.gov; Nan Zhou, China Energy Group Deputy Leader, NZhou@lbl.gov

UNIVERSITY OF CALIFORNIA SAN DIEGO

Sectors: Environment, Economy

Issues: Carbon Market, Renewable Energy

Project Name: Air Pollution in China

Time Frame: Varied and ongoing

Approach and Activity: With its Scripps Institution of Oceanography (SIO) and School of International Relations and Pacific Studies (IR/PS), UC San Diego has a unique blend of scientific and policy expertise in the area of environment and climate change that is buttressed by a deep knowledge base on China. The interdisciplinary UC San Diego team brings decades of research and experience in its collaborations with Chinese provinces.

On the science side, the SIO is a world leader in assessing how climate pollutants behave in the atmosphere and how different phase-down approaches impact air quality and climate warming. SIO researchers such as Professor V. Ramanathan are pioneers in the science of non-carbon dioxide warming pollutants. In 2008 and 2010, the researchers developed the first study on the quantitative role of short-lived climate pollutants (SLCPs) in mitigating near-term climate warming; in 2010 and 2013, they issued studies on the role of hydrofluorocarbon (HFCs) reduction in mitigating global warming. Prof. Ramanathan is currently working with David Victor and Susan Shirk from the School of IR/PS to initiate collaboration between California and China on climate change and air pollution, modeled after the India-California Air-Pollution Mitigation Program (ICAMP) that is co-chaired by Prof. Ramanathan. SIO's atmospheric brown cloud program has played a major role in developing policies on SLCPs in collaboration with the UN Development Program, the State Department, and the California Air Resources Board. Its members also include Chinese institutions such as Peking University, the Chinese Academy of Sciences, and the Ministry of Environmental Protection.

Other ongoing projects by SIO researchers include the design of air pollution analysis machines and development of measurement protocols (led by Kim Prather), supervision over the operation of Shangdianzi GAW Regional Station (Global Atmosphere Watch program of the World Meteorological Organization), analyzing greenhouse gases in Northern China (led by Ray Weiss), and the study of cloud-aerosol interaction and impact of China's air pollution on California's air quality and rainfall (led by Lynn Talley).

In addition to the previously mentioned scientific projects that focus on the study, monitoring, and mitigation of air pollution and climate change in China, UC San Diego social scientists also engage in several China-related research projects on air pollution and climate change. Such projects include Professor Richard Carson's work on the forecasting of China's CO₂ emissions at the provincial level; Professor Junjie Zhang's expansive research on PM_{2.5} pollution, the impact of climate change on agriculture (led by Jennifer Burney), energy conservation and carbon mitigation, and air pollution data and government malfeasance in China; and doctoral student Debbi Seligsohn's research on the efficacy of policy experiments

in the area of environment. UC San Diego's new 21st Century China Program, based in IR/PS, is a world-class center of education, research, and policy analysis on China, including environmental and climate policy. It plays a unique role in coordinating the pioneering scientific research and cutting-edge social science and policy analysis in the context of China.

Partners: Tsinghua University, Fudan University, and Renmin University in China; the National Development and Reform Commission's National Center for Climate Change Strategy and International Cooperation

Goal and Intended Impact: The goals of the 21st Century China Program at UC San Diego are to focus on collaborative, original, and policy-relevant research in the areas of environment and climate change in China such that new data will be generated in China for the study of the sources, severity, and policy remedies for China's air pollution problems and climate change. A related goal is to prepare the groundwork for a field aircraft campaign to measure air pollution in China and to carry out air pollution mitigation programs in collaboration with the Beijing municipal government.

ABOUT THE 21ST CENTURY CHINA PROGRAM, UC SAN DIEGO

The 21st Century China Program is based at UC San Diego's School of International Relations and Pacific Studies (IR/PS) and coordinates UC San Diego's China-related research on air pollution and climate change. The program is a leading research and educational center dedicated to the study of contemporary China and promotes the use of original research to anchor major policy discussions on China and its strategic and business relations with the United States. It emphasizes both scholarly and interactive engagement with China, in partnership with professionals and Chinese institutions.

Website: <http://china.ucsd.edu/>

Contact: Susan Shirk, Professor and Chair of 21st Century China Program: sshirk@ucsd.edu
(858-822-4349)

BAY AREA COUNCIL

Sector: Energy, Economy

Issue: Low Carbon, Environment Technologies

Project: China Initiative

Time Frame: 2007–ongoing

Approach and Activity: The Bay Area Council’s activities with China focusing on clean energy and climate change derive from the Council’s local efforts in the Bay Area and extend to different cities of China through offices located in Shanghai, Hangzhou, Nanjing, and a representative office in Beijing. The Council’s China Initiative collaborates with local Bay Area government and business partners to identify challenges and connect these organizations with their Chinese counterparts to surface solutions while creating business opportunities in the global clean-tech market.

Two Bay Area Council Economic Institute reports specifically looked into the clean-technology market between the Bay Area and China: *Ties That Bind: The San Francisco Bay Area’s Economic Links to Greater China* (2nd ed., 2014) and *Global Competitiveness, China and California’s Emerging Clean Energy Economy* (2010). The reports find that since 2010, California has taken center stage as a national and global leader in energy and climate policy and in the development of cutting-edge clean energy technology. The Bay Area, with its high concentration of talent in innovation, is a major player in global clean-tech markets in California and in the United States more broadly. However, since 2012, there has been a downward trend in U.S. investments into clean technology. U.S. spending fell 37% to \$35 billion, while in China, investment grew 20% to \$68 billion.

By connecting the Bay Area with China, the Council believes both sides can benefit through available resources and overcome any hurdles that may be currently present, such as cultural differences in business operations, difficulty in opportunity evaluation, and regulatory framework navigation. Since 2007, the Council has done this by:

- Coordinating visits to China for delegations of U.S. business and government representatives to meet with their Chinese counterparts
- Organizing local events at the Council’s San Francisco and China offices to provide a platform for information sharing and relationship development
- Hosting business and government representatives visiting the Bay Area and connecting them with local organizations
- Assisting Bay Area companies with registering and expanding their business in China

Some of the highlights of the Council’s activities since 2007 include the following:

- December 2007: The Council’s first delegation to China, focusing on clean technology, consisted of an event with Tongji University and meetings with the Shanghai Environmental Protection Bureau

- May 2008: *Venture Capital Summit: Focusing on Clean Technology*
- November 2008: *Green Tech Summit in Shanghai*
- May 2009: *Green Cities Conference in San Francisco*
- September 2009: *New Energy and Energy Saving Technology and Finance Forum* in Shanghai
- June 2010: Delegation trip to China with California Governor Arnold Schwarzenegger focused on environmental policy and clean technology
- December 2010: *Scaling Green Finance in China and the U.S.* conference
- June 2011: *Brown Fields Summit*
- September 2011: Chinese Mayor Eco-City Training
- 2012 and 2013: An annual *U.S.-China Collaboration Symposium: Smart Cities* held in the Bay Area or China that provides Bay Area and Chinese business and government leaders an opportunity to share best practices in creating a more sustainable environment

The Council will continue to build on its relationship with China and is further looking to expand its activities into other districts in China. By bringing experts and organizations together to share information, the Council will continue to develop connections and create business and investment opportunities in clean tech between the Bay Area and China.

Partners: Government leaders in Yangpu district of Shanghai, Hangzhou Future Tech City, Gulou district of Nanjing, Beijing, and Tianjin; and other nonprofit government stakeholders in the Bay Area and China

Goal and Intended Impact: The Bay Area Council's China Initiative aims to provide business and collaborative opportunities for Bay Area and Chinese business and government organizations in the global clean-tech market to maximize the Bay Area's and China's global competitiveness in this sector. The initiative also assists Bay Area businesses looking to expand into China, as well as increase investments in the Bay Area from China.

ABOUT THE BAY AREA COUNCIL

The Bay Area Council is a business-sponsored, public policy advocacy organization for the nine-county Bay Area. The Council proactively advocates for a strong economy, a vital business environment, and a better quality of life for everyone who lives there. Founded in 1945 as a way for the region's business community and like-minded individuals to concentrate and coordinate their efforts, the Bay Area Council is widely respected by elected officials, policy makers, and other civic leaders as the regional voice of business in the Bay Area. Today, more than 275 of the largest employers in the region support the Bay Area Council and offer their CEO or top executive as a member.

Website: <http://www.bayareacouncil.org/>

Contact: Del Christensen, Chief of Global Business Development: dchristensen@bayareacouncil.org

II. LOOKING FORWARD

ESTABLISHING BINDING AGREEMENTS AMONG NATIONS to limit greenhouse gas emissions has proven far more difficult than many imagined when the Kyoto Protocol was signed in 1997. In the absence of substantial international action, some of the most effective climate protection policies are being pursued at the subnational level. Subnational governments – states, provinces, municipalities – have undertaken their own measures to reduce carbon emissions, and governors and mayors have filled some of the void national governments have left by establishing cooperative programs with counterparts in other countries. Such efforts are slowly starting to form a mosaic of localized remedies. In this regard, the state of California has made substantial progress both in limiting its own greenhouse gas emissions and in working collaboratively not only with other like-minded U.S. states but also with counterparts in Canada, Mexico, and China.

This report describes the main facets of California's collaborations with the People's Republic of China in clean energy and climate change. These are important not only because China and the United States are the world's two largest energy users and carbon emitters but also because without a significant effort between our two countries at every governmental level, there is virtually no chance that the challenge of global climate change can be effectively addressed.

This report is offered in the hope that California's experience working both with myriad civil society organizations at home and with an expanding array of collaborations of like-minded entities in China will have relevance for others who are also seeking pathways forward on climate protection. The authors of this report hope that this brief sketch will help other stakeholders in the United States and China not only learn about California's singular experience working with Chinese counterparts but also perhaps even inspire some to take bold new actions themselves.

APPENDIX: CALIFORNIA-CHINA MEMORANDA OF UNDERSTANDING

Agreement to Enhance Cooperation on Reducing Air Pollution between the Ministry of Environmental Protection of the People's Republic of China and the State of California of the United States of America (April 10, 2013)

This Agreement to Enhance Cooperation on reducing air pollution is entered into by the Ministry of Environmental Protection of the People's Republic of China (MEP) and the State of California of the United States of America (California), hereafter jointly referred to as the "Participants," in order to strengthen and coordinate efforts to improve air quality and protect public health, promote clean and efficient energy, protect the environment and natural resources, and support sustained economic growth.

This Agreement provides a framework for cooperation between the Participants and facilitates collaboration in areas of mutual interest. It supports capacity building to reduce air pollution by the Participants and facilitates cooperation and trade in environment-friendly technologies.

Section I

Areas of Cooperation

The Participants agree to cooperate in the following areas, on the principles of equality and mutual benefit, and in any other areas agreed to by both Participants:

- Activities that reduce air pollution while enabling sustained economic growth;
- Activities that enhance pollution control strategies for industrial sectors and the transportation sector;
- Activities that strengthen institutions and governance structures that oversee implementation and enforcement of air pollution reduction programs;
- Activities that support joint-ventures, partner-agreement, and capital investments in the design, construction, and operation of projects that reduce air pollution.

Section II

Forms of Cooperation

Forms of cooperation may include the following:

- Exchange of regulatory strategies, policies, programs and incentives to reduce pollution across economic sectors and regions;
- Exchange of information on the structure and design of regulatory institutions that enforce pollution laws and rules, including California's network of regional air quality management districts (AQMDs);
- Visits of personnel from one of the Participants to the other;
- Cooperative research on technologies and strategies of mutual interest;
- Joint organization of symposia, seminars, workshops, and training; and
- Any other mutually agreeable forms of cooperation that contribute to the purpose of this Agreement.

Section III*Implementation*

Each Party will designate a point of contact that will serve as the primary liaisons of ongoing collaboration efforts. These liaisons will work with appropriate staff and policymakers to fulfill the commitments outlined in this Agreement.

The Participants shall encourage their respective environmental protection organization, enterprises, and research institutions to establish and develop direct contacts with each other in the field of air pollution reduction. All activities undertaken pursuant to this Agreement shall be subject to the applicable laws of the Participants, as well as the availability of funds, personnel, and other resources of each Party.

Section IV*Duration, Discontinuation, Amendments*

This Agreement will remain operative for two years from the signing of this Agreement and may be modified as agreed by the Participants in writing. Either Party may withdraw from this Agreement after 45 days written notice to the other Party. The Participants may agree to extend this Agreement.

IN WITNESS WHEREOF the undersigned, being duly authorized by the Participants, have signed this Agreement in duplicate in the Chinese and English languages, both texts being equally authentic.

China's Minister of Environmental Protection

Zhou Shengxian

For the Ministry of Environmental Protection of the People's Republic Of China

Governor of California, Edmund G. Brown Jr.

For the State of California of The United States of America

Memorandum of Understanding on Environmental Cooperation between the California Environmental Protection Agency and the Beijing Municipal Environmental Protection Bureau (April 10, 2013)

The intent of this Memorandum of Understanding on Environment Cooperation is to renew and strengthen the cooperation relationship between California Environmental Protection Agency ("CalEPA") and the Beijing Municipal Environmental Protection Bureau ("Beijing EPB"), who signed the MOU in 2005 in order to promote the cooperation and collaboration on sciences, technologies, and policies in the field of environmental protection.

Article I

Both sides will carry out cooperation in the areas of environmental protection on the basis of equality and mutual benefit.

Article II

Main areas of interaction as of common interest are:

1. Air quality management (air quality monitoring and assessment, vehicle emission control, advance vehicle technologies, industrial pollution control, pollution source management, regional air quality management, etc.);
2. Water technologies and services (surface and ground water protection, water pollution control, waste water treatment, etc.);
3. Solid waste management and recycle;
4. Capacity building (trainings, lecture, workshops, etc.);
5. Public education.

Cooperation may also be undertaken in other areas as agreed by the Parties.

Article III

The cooperation includes:

1. Exchange of scientific and technical information through bi-lateral visits and meetings;
2. Collaborative research on pollution prevention and control;
3. Best policy practices development and experiences sharing;
4. Capacity building through study tours, lab comparison, in-depth technical trainings in California and Beijing, and invited lectures;
5. Exchange of information on environmental technologies, goods, and services;
6. Any other forms of cooperation deemed necessary by the Parties.

Article IV

The Parties will draw up a three-year work plan concerning specific issues of cooperation under this agreement.

The deputy secretary for energy and environment of the CalEPA will be appointed California's liaison. CalEPA will designate a California University as the first academic institution to serve as the California academic facilitator for this agreement of cooperation.

The deputy director of Beijing EPB for foreign affairs (Chief Engineer) will be appointed Beijing's liaison. The Beijing Research Academy of Environmental Sciences will be designated as the first academic institution to serve as the Beijing academic facilitator for this agreement of cooperation.

The Energy Foundation-Beijing Office will participate in the development of the three-year work plan and may provide support on implementing the plan, especially focusing on air quality improvement.

Article V

The agreement may be amended as agreed by the Parties in writing.

Article VI

Unless otherwise extended in writing, this agreement shall be in full force and effect for a period of three years. Any party may withdraw from the agreement 45 days after written notice to the other party.

Article VII

The present agreement will become effective upon signature. This agreement is signed, in duplicate, in the English and Chinese languages in Beijing.

Li Xiaobua
Chief Engineer
Beijing Municipal Environmental Protection Bureau

Matt Rodriquez
Secretary
California Environmental Protection Agency

Memorandum of Understanding on Friendly Cooperation between the State of California, United States of America and Jiangsu Province, People's Republic of China (April 14, 2013)

At the invitation of Mr. Luo Zhijun, Secretary of CPC Jiangsu Provincial Committee, Mr. Edmund Gerald Brown, Governor of California led an official and business delegation to visit Nanjing, Jiangsu on April 14th, 2013. During the visit, Governor Brown and Party Secretary Luo Zhijun held friendly talks and reviewed the cooperation between the two sides since the establishment of the sister-state relationship in the fields of trade and economic cooperation, education, culture, science and technology. With the purpose of pressing ahead the cooperation between the two sides in 2013, the following agreements were reached:

1. To promote high-level visits and friendly exchanges between the two sides. Jiangsu Week will be jointly held by California and Jiangsu in the second half of 2013 at a mutually convenient time to enhance exchanges in culture, humanities and promote pragmatic cooperation.
2. To prioritize the cooperation in the sectors of new energy, new material, biomedicine, new generation of information technology and high-tech agriculture in 2013. Enterprises from both sides are encouraged to carry out trade and investment cooperation with the support from Jiangsu Chamber of International Commerce, Jiangsu Federation of Industry and Commerce, Bay Area Council and California Asia Pacific Chamber of Commerce. Governments from both sides shall provide service and facilitation for such activities, including the California Center Asia Pacific Chamber of Commerce's "California Center" located in Jiangsu Province.
3. To include the Sino-American Technological Innovation Park in Wuxi under the framework of Jiangsu-California Joint Economic Committee. The Park will be built as a highlight of Sino-American technological and economic cooperation, which will provide new opportunities for the development of both economies.
4. To strengthen the cooperation in talents training. Both sides will support the training programs for Jiangsu senior civil servants, management personnel from universities and enterprises (including private enterprises) and high-tech talents in the institutions of higher learning in California.

This Memorandum of Understanding is signed in Nanjing on April 14th, 2013 in the languages of English and Chinese, both texts being equally authentic.

Edmund G. Brown Jr.
Governor of California State

Luo Zhijun
Party Secretary of Jiangsu Province

Memorandum of Understanding to Enhance Cooperation on Low Carbon Development between the Government of Guangdong Province of the People's Republic of China and the Government of the State of California of the United States of America (April 15, 2013)

To enhance cooperation in the area of low carbon development and based on the Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and Environment between the Government of the People's Republic of China and the Government of the United States of America signed in July 2009, the Government of Guangdong Province and the Government of the State of California (hereafter referred to as "the Participants") have reached the following understandings:

1. Purpose

This purpose of this Memorandum of Understanding (MOU) is to support efforts between the Parties to help each achieve its low carbon development goals. This MOU establishes a fundamental framework for the

Participants to carry out pragmatic exchange and cooperation based on the principles of equality and mutual benefits and is not intended to give rise to legal binding rights or obligations.

2. Areas of Cooperation

Areas of cooperation between the Participants include, but are not limited to:

1. Formulating low carbon economic development plans;
2. Increasing energy conservation and energy efficiency;
3. Expanding clean, renewable energy;
4. Enabling low carbon, sustainable transportation;
5. Constructing low carbon, green buildings;
6. Promoting low carbon, sustainable agriculture, forestry, and waste handling;
7. Advancing research and development of promising new low carbon technologies;
8. Developing market-based mechanisms, such as carbon trading system;
9. Financing strategies for low carbon development efforts;
10. Trade and investment in low carbon technologies.

3. Forms of Cooperation

The Participants can use the following forms of cooperation:

1. Exchange of relevant experience and lessons learned;
2. Exchange and visits between the Participants' relevant personnel;
3. Joint research and technology development;
4. Co-organization of relevant seminars, workshops, exhibitions and trainings;
5. Shared investments in low carbon development opportunities;
6. Other forms of collaboration as agreed upon by the Participants.

4. Cooperation Mechanism

1. The Participants have decided to establish a Working Group for Enhancing Cooperation on Low Carbon Development between Guangdong and California in order to strengthen liaison and communication and negotiate specifics of cooperation on a regular basis. The Working Group from Guangdong is composed of the Guangdong Provincial Development and Reform Commission, Guangdong Provincial Economic and Information Commission, Guangdong Provincial Science and Technology Department, Guangdong Provincial Finance Department, Guangdong Provincial Housing and Urban-Rural Development Department, Guangdong Provincial Transportation Department and Guangdong Provincial Foreign Affairs Office. The Working Group from California is composed of the California Environmental Protection Agency, California Air Resources Board, California Energy Commission and California Public Utilities Commission.
2. The Government of Guangdong Province and the Government of the State of California respectively designate the Guangdong Provincial Development and Reform Commission and the California Environmental Protection Agency as the Executive Agencies responsible for coordinating the implementation of relevant cooperation activities between Guangdong and California.
3. During the period of validity of this MOU, the Executive Agencies shall report on the progress of cooperation to the Governor of Guangdong Province and the Governor of the State of California once a year and improve the cooperation plans based on their suggestions.
4. As appropriate, the Parties will utilize third party organizations that are agreed upon by both parties to assist with the implementation of this MOU. These third party organizations, under the direction of the Parties, will help to coordinate information exchange, activities, travel delegations and collaboration between the Participants. These organizations will also explore funding sources to enable travel and other forms of collaboration between the Participants.
5. All activities carried out based on the MOU must abide by the Participants' respective laws, rules and regulations and should be decided by funds, people and other resources available. Data and other information related to China and Guangdong Province's greenhouse gas emissions cannot be shared.

6. Supplementary provisions

1. The Participants have decided that any disagreement arising from the implementation of this MOU be settled over amicable discussion.
2. This MOU is valid for two years upon the date of signature. The MOU may be extended and modified with the mutual consent of the Participants.
3. This MOU may be terminated by either party with a written statement to the other. After the termination of the MOU, the Participants must take necessary measures to conclude the ongoing activities in a swift and appropriate manner.
4. Based on amicable negotiation by the Participants, cooperation items for the near term will be listed in attachments and specific cooperation is not limited to the listed items.
5. This MOU is signed in Guangzhou City, Guangdong Province, on April 15, 2013. This MOU shall be provided in two copies in both English and Chinese. Each party holds one copy and the two copies are equally authentic.

*Authorized Representative from the Government of Guangdong Province
Guangdong Provincial Development and Reform Commission
Director-General, Li Chunhong*

*Authorized Representative from the Government of the State of California
California Environmental Protection Agency
Secretary, Matthew Rodriguez*

Memorandum of Understanding to Enhance Cooperation on Emissions Trading Systems between the Government of Shenzhen Municipality of the People's Republic of China and the Government of the State of California of the United States of America (June 18, 2013)

Based on the Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and Environment between the Government of the People's Republic of China and the Government of the United States of America signed in July 2009, and in order to enhance cooperation in the area of low carbon development, the Government of Shenzhen Municipality and the Government of the State of California (hereafter referred to as "the Participants") have reached the following understandings:

1. Purpose

The purpose of this Memorandum of Understanding (MOU) is to support efforts of the Participants to address the global issue of climate change and to help each Participant achieve its low carbon development goals. This MOU establishes a fundamental framework for the Participants to carry out pragmatic exchange and cooperation based on the principles of equality and mutual benefits and does not provide Participants or third parties with any legal rights, or incur legal obligations by Participants or third parties.

2. Areas of Cooperation

The Participants focus cooperation on low carbon development efforts, including but not limited to: emissions trading systems (ETS) and low carbon technological exchange. Specific areas of cooperation include, but are not limited to, the following:

1. Ensuring robust and effective monitoring, reporting, and verification systems that are based on quality data;
2. Establishing an effective compliance and enforcement system to ensure environmental integrity;
3. Selecting offsets that are limited in quantity and are of high quality;
4. Increasing ETS compliance obligations of direct emission sources through a stepwise restriction of emission allowances issued to direct sources;

5. Identifying complementary measures and regulations to support ETS systems, including performance standards to reduce emissions of carbon dioxide;
6. Employing the most effective tools and information to characterize the impacts of climate policies, including fuel savings and reductions in the emission of toxic pollutants;
7. Supporting low carbon economic growth that creates jobs and improves competitiveness of local industries;
8. Promoting and following the best and most recent climate science and technology; and
9. Other items of interest to the Participants.

3. Forms of Cooperation

The Participants can use the following forms of cooperation:

1. Exchange of relevant experience and lessons learned, including information related to methodologies for measuring, quantifying and verifying greenhouse gas emissions inventories and regulations, programs, and emissions control technologies for greenhouse gases;
2. Exchange and visits between the Participants' relevant personnel;
3. Exchange of scientific research or joint research and technology development;
4. Co-organization of relevant seminars, workshops, exhibitions and trainings;
5. Shared investments in low carbon development opportunities; and
6. Other forms of collaboration as agreed upon by the Participants.

4. Cooperation Mechanism

1. The Participants have decided to establish a Working Group on Enhancing Cooperation on ETS between the Parties in order to strengthen liaison and communication and negotiate specifics of cooperation on a regular basis. The Working Group from Shenzhen is composed of the Development and Reform Commission of Shenzhen Municipality and other entities as defined by the Development and Reform Commission of Shenzhen Municipality. The Working Group from California is composed of the California Air Resources Board and other entities identified by the State of California.
2. The Government of Shenzhen Municipality and the Government of the State of California respectively designate the Development and Reform Commission of Shenzhen Municipality and California Air Resources Board as the Executive Agencies responsible for coordinating the implementation of relevant cooperation activities between Shenzhen and California.
3. During the period of validity of this MOU, the Executive Agencies shall report on the progress of cooperation to the Mayor of the Government of Shenzhen Municipality and the Governor of California once a year and improve the cooperation plans based on their suggestions.
4. As appropriate, the Participants will utilize third party organizations that are agreed upon by both parties to assist with the implementation of this MOU. These third party organizations, under the direction of the Participants, will help to coordinate information exchange, activities, travel delegations and collaboration between the Participants. These organizations will also explore funding sources to enable travel and other forms of collaboration between the Participants.
5. All activities carried out based on the MOU must abide by the Participants' respective laws, rules and regulations and shall be subject to the availability of funds, personnel and other resources available to each Participant.
6. Consultation and exchange of information and documents shall preserve the security and integrity of the systems, processes, and information (including trade secrets) of each Participant and be without prejudice to Participants' legal requirements or obligations, which may prevent the exchange of certain confidential information and documents under this MOU.

5. Supplementary provisions:

1. The Participants have decided that any disagreement arising from the implementation of this MOU be settled over amicable discussion.

2. This MOU is valid for two years upon the date of signature. The MOU may be extended and modified with the mutual consent of the Participants.
3. This MOU may be terminated by either party with a written statement to the other. After the termination of the MOU, the Participants must take necessary measures to conclude the ongoing activities in a swift and appropriate manner.
4. Nothing in this MOU precludes the Government of Shenzhen Municipality or the State of California from entering into any other agreement with an entity inside or outside of the United States of America or the People's Republic of China.
5. This MOU is signed in Shenzhen Municipality on June 18, 2013. This MOU shall be provided in two copies in both English and Chinese. Each party holds one copy and the two copies are equally authentic.

*Authorized Representative from the Government of Shenzhen Municipality
Shenzhen Development and Reform Commission
Director General Xu, Anliang*

*Authorized Representative from the Government of the State of California
California Air Resource Board
Chairman, Mary Nichols*

Memorandum of Understanding to Enhance Cooperation on Low Carbon Development Between the National Development and Reform Commission of the People's Republic of China and the State of California of the United States of America (September 13, 2013)

This MOU to Enhance Cooperation on Low Carbon Development is entered into by the National Development and Reform Commission of the People's Republic of China (NDRC) and the State of California of the United States of America (California) and hereafter jointly referred to as the "Parties," in order to strengthen and coordinate efforts to combat global climate change, promote clean and efficient energy and support low carbon development, while protecting public health, the environment and natural resources.

Article I: Areas of Cooperation

The Parties agree to cooperate in the following areas, on the basis of the principle of equality and mutual benefit:

- Activities to mitigate carbon emissions while enabling sustained economic growth;
- Activities to strengthen performance standards within various economic sectors to control carbon, methane and other high global warming potential gases while enabling economic growth;
- Activities to implement carbon emissions trading systems and other market-based instruments;
- Activities that strengthen support for low carbon and ETS pilot programs;
- Activities that reduce energy consumption among industrial, commercial, and residential buildings;
- Activities that increase the usage of electrified transportation;
- Activities that support new and expanded markets for clean and efficient energy technologies, including within energy-intensive industries and transportation;
- Activities that support joint-ventures, partner-agreements, and capital investments in the design, construction and operation of clean and efficient energy and infrastructure projects; and
- Other mutually agreed activities.

Article II: Forms of Cooperation

Forms of cooperation may include the following and any other forms agreed to by both Parties:

- Sharing information and experiences regarding policies and programs to strengthen low carbon development across economic sectors;
- Sharing policy design of carbon emissions trading programs;
- Inviting the other Party to advise on program and policy design and rule-making processes that it developed;
- Exchanges and temporary assignments of personnel from one of the Parties to the other;

- Cooperative research on clean and efficient energy technologies, including developing shared research, development and deployment projects;
- Joint organization of symposia, seminars, workshops, exhibitions and training; and
- Any other mutually agreeable forms of cooperation that contribute to the purpose of this MOU.

Article III: Implementation

The Parties shall, on a regular basis, inform and consult with one another on matters of common interest that represent opportunities for mutual benefit consistent with this MOU.

In order to explore specifically how to collaborate through the framework of the MOU, the Parties agree to form an MOU Implementation Taskforce, co-chaired by the Director General of the Department of Climate Change for the NDRC side and the Deputy Cabinet Secretary and Senior Advisor to the Governor for the California side. Additionally, NDRC will be represented by the Director General of the Department of Environmental Protection and Resource Conservation, Director General of the Department of International Cooperation, Director General of the Energy Research Institute and Director General of National Center for Climate Change Strategy and International Cooperation, and California will be represented on this taskforce by the Secretary of the California Environmental Protection Agency, Chairman of the California Air Resource Board, and Chair of the California Energy Commission.

The Taskforce will coordinate the implementation of this MOU, as appropriate, with other agreements between entities in California and the People's Republic of China, and will meet in person once annually and by video or telephone conference as often as necessary.

Article IV: Duration, Termination, Modification

This MOU will remain in effect for two years from the date of its signature by the parties and may be amended and/or extend its effective term as agreed by the Parties in writing.

Either Party may withdraw from this MOU after 45 days written notice to the other Party.

The present MOU is signed in San Francisco, California on September 13, 2013 in the Chinese and English languages, both texts being equally authentic.

Xie Zhenhua

National Development and Reform Commission (NDRC) Vice Chairman

Edmund G. Brown Jr.

California Governor

ACKNOWLEDGMENTS

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Orville Schell

Arthur Ross Director
Center on U.S.-China Relations
Asia Society, New York City

CALIFORNIA-CHINA COOPERATION IN CLIMATE CHANGE AND CLEAN ENERGY

Governor Brown and President Xi Jinping of the People's Republic of China (June 8, 2013)
中华人民共和国主席习近平和布朗州长 (2013年6月8日)



Governor Brown and Gao Hucheng, Minister of Commerce (April 9, 2013)
商务部部长高虎城和布朗州长 (2013年4月9日)



Governor Brown and Premier Li Keqiang of the People's Republic of China (April 11, 2013)
中华人民共和国国务院总理李克强和布朗州长 (2013年4月11日)

Governor Brown and Hu Chunhua, Guangdong Party Secretary (April 15, 2013)
广东省委书记胡春华和布朗州长 (2013年4月15日)



Governor Brown and Guangdong Governor Zhu Xiaodan at an MOU signing ceremony (April 15, 2013)
广东省省长朱小丹和布朗州长在谅解备忘录签字仪式上 (2013年4月15日)



加利福尼亚 — 中国

在气候变化与清洁能源领域中的合作



Governor Brown and Wang Rong,
Shenzhen Party Secretary
深圳市委书记王荣和布朗州长



Governor Brown and Luo Zhijun, Jiangsu
Province Party Secretary (April 14, 2013)
江苏省省委书记罗志军和布朗州长
(2013年4月14日)



Governor Brown and Han Zheng,
Shanghai Party Secretary (April 12, 2013)
上海市委书记韩正和布朗州长
(2013年4月12日)



Governor Brown and Xu Shaoshi,
Chairman of the National Development and
Reform Commission (April 10, 2013)
国家发展与改革委员会主任徐绍史和布朗州长
(2013年4月10日)

Governor Brown and Zhou Shengxian, China's Minister of Environmental Protection (April 10, 2013)
中华人民共和国环境保护部部长周生贤和布朗州长 (2013年4月10日)



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