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Report of the U.S.-China Climate Change Working Group to the 7th Round of the Strategic and Economic Dialogue
June 23, 2015

The U.S.-China Climate Change Working Group (CCWG) submits this Report to the Special Representatives of the Leaders of the United States and China for the Strategic and Economic Dialogue (S&ED).

Executive Summary

China and the United States have a significant role to play in reducing the threat of global climate change. Last November, President Barack Obama and President Xi Jinping made an historic Joint Announcement on Climate Change, underscoring both countries' intentions to achieve a long-term transition to low-carbon economies. In support of this long-term effort, the Presidents announced ambitious and achievable respective post-2020 climate targets. They also committed to working together, and with other countries, to complete a successful global climate agreement this December in Paris, and called for expanded and strengthened bilateral policy dialogue and practical cooperation on climate change.

This report summarizes progress achieved to date in the CCWG, the premier mechanism for facilitating constructive U.S.-China cooperation and dialogue on climate change. Launched in April 2013, the CCWG has grown to include eight action initiatives covering major sectors of the economy. Five action initiatives were launched in 2013: Heavy-Duty and Other Vehicles; Smart Grids; Carbon Capture, Utilization, and Storage; Energy Efficiency in Buildings and Industry; and Collecting and Managing Greenhouse Gas Emissions Data. Three more were launched in 2014: Climate Change and Forests; Climate-Smart / Low-Carbon Cities; and Industrial Boilers Efficiency and Fuel Switching. These action initiatives, guided by joint implementation plans, are led by interagency actors on both sides, and engage a diverse group of stakeholders including national and sub-national governments, universities, civil society, and the private sector.

In addition to the action initiatives, the CCWG includes two additional elements. First, it facilitates constructive dialogue and collaboration to support implementing President Obama and President Xi's 2013 commitment to phase down production and consumption of hydrofluorocarbons (HFCs). Second, the CCWG hosts a regular Enhanced Policy Dialogue on pre- and post-2020 action, including in the context of the international climate negotiations, as well as on respective domestic plans for achieving climate targets.

The post-2020 climate targets announced by President Obama and President Xi are part of the longer range effort to transition to low-carbon economies, mindful of the global temperature goal of 2 °C. Meeting these respective targets will require significant domestic action in both countries. Bilateral constructive dialogue and collaboration through the CCWG supports and accelerates this domestic progress through sharing experience to overcome common challenges, conducting joint research, piloting advanced technologies, connecting government and private sector, and more.

The CCWG is a comprehensive framework for understanding and addressing climate change in the United States and China. Current cooperation on direct mitigation efforts – i.e., reducing emissions and improving the efficiency of vehicles, buildings, and boilers; piloting and deploying smart grid and carbon capture systems – target sectors responsible for significant emissions of greenhouse gases. Furthermore, many of the initiatives have co-benefits, including improving air and water quality and energy security.

The CCWG complements an array of other U.S.-China energy and environment cooperative mechanisms, including the Clean Energy Research Center and Ten-Year Framework for Cooperation on

Energy and Environment. Together, these initiatives demonstrate that the U.S.-China commitment to cooperation on addressing the global climate challenge is stronger than ever.

This report summarizes progress achieved to date and upcoming plans for the ten major elements of the CCWG.

ACTION INITIATIVES

1. Heavy-Duty and Other Vehicles

The United States and China agreed to cooperate in three areas: (1) enhanced heavy-duty and other vehicle fuel efficiency standards; (2) clean fuels and vehicle emissions control technologies; and (3) promotion of efficient, clean freight. Progress achieved through intensive workshops and exchanges over the last year is outlined below.

1. Enhanced heavy-duty and other vehicle fuel efficiency standards

Both countries are developing more stringent vehicle fuel efficiency and greenhouse gas emissions standards to significantly improve air quality and reduce climate impacts. The United States is currently developing new greenhouse gas emissions and fuel economy standards for medium- and heavy-duty vehicles for post-2018 model years, to be finalized by the end of 2016. China is developing new fuel consumption standards for light- and heavy-duty commercial vehicles for 2020 model years and thereafter, to be finalized by the end of 2015 and the end of 2016 respectively.

In March 2015, the U.S. National Highway Safety Administration (NHTSA), the U.S. Environmental Protection Agency (EPA), and the Chinese Ministry of Industry and Information Technology (MIIT) conducted policy exchanges regarding the development of new greenhouse gas emissions and fuel economy standards. The agencies agreed to follow-up on these discussions and establish a workshop to include more in-depth exchanges on these topics in the second half of2015.

In addition, the two sides decided to launch a new project titled “Race to Zero Emissions” to challenge U.S. and Chinese cities/metropolitan transit districts to take measurable steps to reduce transit fleet vehicle greenhouse gas emissions through increased deployment and operation of Zero Emission Buses (ZEBs). The collaborative effort, to begin in fall 2015, encourages cities/metropolitan transit districts to take ambitious actions to put a new generation of advanced, non-polluting transit buses on the road in communities across the United States and China.

2. Clean fuels and vehicle emissions control technologies

Cleaner fuels (especially ultra-low sulfur fuels) are the necessary foundation for implementing more stringent emissions standards and thus for improving air quality and reducing PM2.5 and black carbon emissions. The United States continues to implement its 2010 heavy-duty emission regulations. These regulations require the use of advanced emission control technologies, diesel particulate filters and oxides of nitrogen reduction strategies. The United States intends to implement new ultra-low sulfur (10 ppm) gasoline standards by the end of 2016. China has accelerated its timeline for implementing ultra-low sulfur gasoline and diesel fuel nationwide by one year, to the end of 2016. China is currently developing the China VI emission standards for light- and heavy-duty vehicles, to be finalized approximately by the end of 2017.

In November 2014, the Ministry of Environmental Protection (MEP) of China organized and led an engine compliance workshop in Beijing to initiate discussions between the United States and China regarding small engine imports into the U.S. China is exporting a large number of small engine

vehicles/equipment to the U.S., and the manufacturers are submitting related mandatory fuel consumption/GHG data to EPA. China is improving its emission standards compliance and enforcement regime for light-duty and heavy-duty vehicles. This workshop was established to support China in enhancing their compliance data gathering systems for engine exports. During this workshop, EPA shared technical expertise and experience in U.S. methods for accomplishing these activities. There continues to be keen interest on the part of the Chinese government to adopt compliance programs that are more in line with U.S. programs. Finally, a very positive outcome of the workshop is that there was a clear message sent that a number of Chinese government agencies are teaming together to more aggressively enforce China's mobile source emission regulations.

Also, during this visit, MEP hosted EPA officials at the Engine and Motorcycle Testing Facility at Tianjin University in Tianjin, to gain a better understanding of how MEP tests/evaluates the emissions of motorcycle engines. EPA exchanged information with Chinese lab managers with regard to vehicle and engine emissions testing and management. Officials from Tianjin University shared their technical expertise in monitoring emission testing equipment for motorcycles.

In March 2015, MEP hosted EPA officials to engage in further discussions related to heavy-duty vehicle compliance programs. MEP noted how well-received, by industry and MEP officials, the Heavy-duty Compliance workshop was from the previous June. They believe it was a good technical exchange on how to establish/implement various compliance programs. As a result of this workshop, MEP has developed a more targeted focus on heavy-duty engine compliance programs this year. China's new Air Pollution Prevention and Control Law is projected to include additional compliance/enforcement programs. The two sides are collaborating on how to implement those programs. Plans for this year include completing a round-robin heavy-duty engine test program and conducting a heavy-duty engine compliance workshop.

3. Promotion of efficient, clean freight

The United States and China continue to work together to further develop China's Green Freight Initiative (CGFI), which is an initiative to improve transport efficiency in freight transport, similar to the EPA SmartWay Program. In July 2014, the Ministry of Transport (MOT), the China Road Transport Association (CRTA), and EPA participated in the annual international CGFI Conference in Beijing. This conference brings together industry, NGOs, and government to discuss freight efficiency. EPA hosted a SmartWay Technical Training workshop the following day.

In March 2015, as a result of that conference, MOT and CRTA discussed the newly developed Green Freight standards for the CGFI with EPA. There is currently a pilot project with 20 companies to evaluate the draft standards, which are being revised and will be published during the 2015 international CGFI Conference. CRTA also developed a green driving book highlighting various improved fuel efficiency driving techniques. Membership in the CGFI has grown over the year and now includes multi-national companies such as Lenovo and Proctor & Gamble. Plans for this year include developing the annual CGFI Conference to also include a "shipper day" for recruitment into the CGFI, and carrying out the technical verification for the green freight vehicles and relevant technologies & products. Finally, the two sides plan to work together to explore more energy-saving technologies such as green tires, weight reduction measures, and the development of multi-model strategies.

In March 2015, MOT's Research Institute of Highways (RIOH) hosted EPA and NHTSA and provided a tour of the Tongzhou Proving Grounds Laboratory and Vehicle Testing Site. The delegation visited the testing facilities, including various types of road conditions for durability testing, vehicle emission and fuel economy testing facility, vehicle collision lab, lab for vehicle warranty testing and testing facility for intelligent transportation system. EPA met with senior leadership at RIOH to learn about the technology testing and verification efforts underway. RIOH currently publishes a catalog of

energy-saving vehicle technologies but aims to enhance the testing and verification process to create more confidence in listed technologies and credibility for fuel saving devices for commercial in-use vehicles. RIOH has been studying EPA SmartWay verified technologies and the EPA verification process to learn how it might enhance its processes. EPA supports the goal of more refined and credible technology verification as a way to strengthen the goals of the CGFI and provide more information for fleet operators and truck owners to enhance fleet performance. EPA discussed possible collaboration going forward, on training RIOH staff on Smart Way Technology Verification methods and standards. In addition, NHSTA participated in a site visit to the China Automotive Technology & Research Center'sTianjin Test Lab where U.S. and China experts exchanged information about each country's fuel economy rulemaking and enforcement.

2. Smart Grids

Four smart grid collaborative demonstration projects, two in the United States and two in China, have been agreed to by both sides, and their project plans are being carried out. These four projects are designed to meet the collective needs of both countries for increased reliability of the grid, maximizing efficiency of the grid, increasing renewable energy penetration in the grid, reducing greenhouse gas emissions from the system, impacting demand management, reducing overall system costs, and increasing resiliency to climate events. The two U.S. projects are: development of a campus microgrid by the University of California, Irvine and the Irvine Smart Grid Demonstration (ISGD) by Southern California Edison, together serving as one project; and the Philadelphia Navy Yard by Philadelphia Industrial Development Corporation. The two China projects similar in scope to the U.S. projects are the Tianjin Eco-City by State Grid Corporation of China and the Qianhai Bay Cooperation Zone by China Southern Power Grid. Notable progress on the four demonstration projects included over 60% energy usage savings and over 80% electricity cost reduction, both realized in 2014, from zero net energy homes as part of the ISGD project in the U.S.; and completion of development of functionalities and application scenarios for the four subprojects at China-Singapore Tianjin Eco-City.

Both sides held the third in a series of six workshops in March 2015 in Westminster, California. The objective of this third workshop was to further information exchanges on the four collaborative demonstration projects, and on cost/benefit methodologies employed by the countries. In addition, the two subgroups, established after the second workshop last October, held their first in-person meetings to discuss their chartered activities and work plans. One subgroup, advanced technology, had presentations and discussions on three new smart grid integration technologies: high penetration of distributed renewable energy; data analytics for large volumes of data from connected devices; and microgrids. The subgroup discussed sharing the final project reports on these integration technologies and, further, suggested applying their technological advances to the four collaborative smart grid demonstration projects. As decided by a majority of the subgroup members, smart grid standards will be the subject of technical exchange at the next workshop. The other subgroup, benefits evaluation, presented the achievements made on methodology developments from both sides, and introduced several case examples involving applications of their respective methodologies. The subgroup agreed to jointly work on unifying the methodologies inclusive of their development achievements, establishing a comprehensive assessment of the unified methodology and applying it to evaluate the benefits of the four CCWG collaboration projects. The workshop included attendees from CCWG Smart Grids members, project performers and partners, and other smart grid stakeholders (from industry, research institutions, an environmental group, and consulting firms). A technical tour of the Advanced Technology Laboratories at Southern California Edison followed immediately after the workshop. The workshop report, in English and in Chinese, was produced and distributed to all attendees.

Recognizing that the collaborative demonstration projects and the development of a unified cost/benefit methodology are well underway, both sides agreed to place a greater emphasis on industry engagement and technical assistance going forward, aiming to expand institutional capacities for smart grids in both countries. Concrete steps for both are being worked on, with support from the two subgroups, and will be presented and implemented at the next workshop, which will be held in fall2015 in Beijing and Tianjin.

Additionally, the U.S. Trade and Development Agency (USTDA) organized a separate smart grid study tour in October 2014, which introduced Chinese energy sector officials and representatives from Chinese power utilities to U.S. technologies, equipment, and best practices in smart grids. The Chinese delegation met with U.S. companies, trade associations, and regulators, and also had on-site visits and daytrips to smart grid demonstration projects at the University of California San Diego and the Philadelphia Navy Yard.

3. Carbon Capture, Utilization, and Storage (CCUS)

Under the CCWG CCUS initiative, the United States and China are working together to accelerate the adoption of carbon capture and storage (CCS) and CCUS in both countries through joint efforts on large, integrated demonstration projects.

To kick off the initiative, the Department of Energy (DOE) and the National Development and Reform Commission (NDRC) hosted a CCUS workshop in Beijing in April 2014, where U.S. and Chinese companies and universities presented projects for recognition under the CCWG/CCUS Initiative. Following the workshop, DOE and NDRC jointly selected four projects – each with U.S. and Chinese partners – which were formally announced on the margins of the 2014 U.S.-China Strategic and Economic Dialogue (S&ED). These four CCUS projects are focusing on carbon dioxide use for enhanced oil recovery (EOR) and other beneficial uses, as well as storage in deep saline formations, wherever possible. These projects are essential to proving the technological and commercial viability of CCS/CCUS, thereby accelerating the creation of markets and widespread deployment.

The key thrust of the CCWG/CCUS Initiative is to create a robust exchange of information and best practices related to CCS/CCUS deployment in both the United States and China, and, where possible, create business opportunities for two countries' companies. This is achieved by matching U.S. and Chinese partners, from industry, research institutes, and academia, with similar projects and/or areas of research that could be leveraged to create an impetus for large-scale CCS/CCUS demonstrations in both countries.

In some cases, U.S. and Chinese demonstration projects have been matched to create a two-way flow of information that can strengthen both projects. In other cases, U.S. organizations have been matched with Chinese organizations that are interested in implementing CCS/CCUS demonstrations in the future. In all projects, DOE and NDRC help with matchmaking by funding workshops to connect U.S. and Chinese partners and by formally recognizing the selected projects under the CCWG framework.

The four existing projects are as follows:

1. Yanchang Petroleum Company and West Virginia University, University of Wyoming, andUS companies

Yanchang Petroleum Company (Yanchang) is using captured CO2 at existing coal-to-chemical plants for enhanced oil recovery (EOR) in their oil fields in the Ordos Basin in Shaanxi Province. For the Jingbian Pilot Project, more than 41,000 tons CO2 have been injected into five wells from September 2012 to April 2015, resulting in enhanced oil recovery compared to pre-injection output. For the Wuqi Pilot Project, about 1,800 tons of CO2 were injected into three wells in March 2015. Yanchang is

presently conducting a pre-feasibility study for what will be the world's largest CCUS project in Shaanxi Province with their U.S. partners. CO2 will be captured from coal conversion facilities near Yulin and transported to the Yanchang oil fields via a 300-kilometer pipeline for EOR application. The project goal is to inject as much as 4 million tons of CO2 per year by 2020. The primary U.S. partner for the CCUS project is West Virginia University (WVU) that is collaborating with Yanchang on project planning and conducting a prefeasibility study for capturing, transporting, and injecting the CO2 for EOR. The University of Wyoming has been developing geological assessments and evaluating the enhanced oil production potential based on pilot tests in Wuqi County. Kinder Morgan and Air Products (APCI) have been invited to participate in the project.

2. Shengli Oilfield Company of Sinopec Corporation, Sinopec Petroleum Engineering Construction Corporation, Schlumberger and University of Kentucky

Shengli Oilfield Company plans to capture 1 million tonnes of CO2 per year at an existing power plant using post-combustion capture. CO2 from the plant would be used for EOR activities in the Shengli Oilfield using Sinopec proprietary technology. The project aims to optimize existing and develop new technologies for post-combustion CO2 capture, transportation, EOR, and storage, and obtain basic data and operational experience for CCS/CCUS. The collaboration also helps to promote CCS/CCUS industry application process development. Schlumberger and Shengli Oil field will collaborate on CO2-EOR and storage optimization and reservoir studies. The Center for Applied Energy Research at the University of Kentucky will collaborate with Sinopec Petroleum Engineering Construction Corp. on integrating and optimizing the CO2 capture system, solvent contaminate cleanup, and wastewater treatment.

3. Shanxi International Energy Group (SIEG) and Air Products and West Virginia University

SIEG is developing a new 350-megawatt oxy-fuel combustion power plant project with carbon capture in the Duanshi-Jiafeng Industrial Park at Jincheng City, Shanxi Province. The project will investigate various options for CO2 storage and utilization, including use of CO2 to synthesize methanol and to manufacture gypsum plaster, enhanced the recovery of coalbed methane and CO2 storage in coal seams, and extraction of aluminum oxide from coal ash. Identifying potential revenue streams for CO2 utilization can help incentivize broader adoption of CCS/CCUS technology by offsetting costs for demonstrations and, eventually, commercial operations. Air Products is conducting a pre-feasibility study with SIEG, which will include an estimate for the air separation and CO2 purification units. West Virginia University will assist in evaluating various CO2 storage options.

4. China Huaneng Group's Clean Energy Research Institute (CERI) and Summit Power Group

CERI and Summit Power Group will conduct technical exchanges and collaborate on design, startup, testing, and commissioning of integrated gasification combined cycle (IGCC) power plants. Huaneng's GreenGen IGCC Plant in Tianjin is undergoing operational testing; this experience will be shared with Summit to facilitate its development and initial start-up of its Texas Clean Energy Project (TCEP). TCEP is a planned IGCC facility in Texas that will incorporate CCS/CCUS technology in a first-of-its-kind commercial clean coal power and chemical plant. Low-carbon power, urea, and CO2 utilization for EOR will be produced via coal gasification at the TCEP facility. Summit will share experience and best practices in CCS/CCUS, including CO2 compression, transport and injection for EOR application learned in developing its project and from its staff's involvement in other U.S. projects.

Under the CCWG platform, DOE and NDRC will jointly monitor the progress of these four CCS/CCUS projects and continue to exchange technical information via site visits in both countries by respective technical experts.

The 2nd CCUS Workshop was held on April 20, 2015, in Beijing. The status of the current CCUS projects were presented as well as various updates on the CCUS technologies. Several new CCUS projects were proposed. NDRC has selected two new projects and requested DOE to recommend counter-facing projects. The two projects are:

1. CCS-EOR Demonstration Projects in Shaanxi, Gansu, and Ningxia sponsored by China National Petroleum Corporation (CNPC) and Shenhua Group or other coal-to-chemicals company. Shenhua or other coal-to-chemicals company will supply the CO2 from their coal-to-chemicals plant. CNPC will conduct the CO2-EOR testing in their Changqing Oilfield. The proposed pilot project will inject about 100,000 tons CO2 per year. By 2020-2025, the CO2 injection rate will be 1 MM tons a year.
2. Guangdong Offshore CCUS Project (GOCCUS) is operated by CNOOC and China Resources Power, led and coordinated by the Guangdong CCUS Center (GDCCUSC).At the phase I of the project, China Resources Power Haifeng Power plant will begin the carbon capture activities by setting up a testing facility at its #1 unit in 2016, and by generating the operational data and know-how experience from testing prior to constructing the large commercial scale capture unit for its #3 or #4 unit on the same site with a post-combustion technology selected from the testing facility. CNOOC is investigating the engineering feasibility to use their existing offshore oil platforms at Huizhou Oil field to inject CO2 into the existing oil & gas fields at Pearl River Mouth Basin. At the phase II of the project, the nearby refinery complex operated by CNOOC is proposed to capture and supply CO2 from its industry process and to join the backbone pipeline mixed with captured CO2 from China Resource Power for storage. The Shanwei-Huizhou region has the potential to be developed into a major CCUS demonstration cluster around 2020. At the phase III of the project, the large scale integrated CCUS project and CCUS cluster will potentially start the full chain capture, transportation, utilization and storage of CO2 at commercial scale subject to the result from a comprehensive feasibility study. The project is also jointly funded by the United Kingdom government.

Concurrently, DOE is working with NDRC and others on site selection for a large-scale CCS project with a view to announcing the selection of CCUS demonstration site by the time of President Xi's next visit to the United States. A logical starting point for site selection is to leverage ongoing efforts under the CCWG CCUS Initiative, and specifically, to evaluate each of the CCWG CCS/CCUS projects to determine whether one could be adapted and accelerated to meet the goals of the large-scale CCS project.

4. Energy Efficiency in Buildings and Industry

Energy efficiency presents one of the greatest opportunities to address climate change. According to the International Energy Agency, energy efficiency accounts for nearly 40% of the potential greenhouse gas emissions reductions needed by 2050 to stop the most serious impacts of climate change. With that potential in mind, energy efficiency was identified as one of five initial topic areas under the Climate Change Working Group. Joint work to date has focused on two key areas:

1. Expansion of the use of energy performance contracting (EPC) for energy savings in buildings and industry through deep energy efficiency retrofits

In January 2015, the working group released a nearly 60-page White Paper analyzing the current practice and potential for growth of energy performance contracting in the U.S. and China. The paper assessed the $7.6B EPC market in the U.S. and $12B EPC market in China in 2013, and informed development of a policy Recommendations Report to foster market development. Sample recommendations include: China should allow tax incentives, rewards, and M&V guidelines to support models other than shared savings, such as guaranteed savings; and the U.S. should consider providing enhanced targets and incentives to promote deep retrofits and leverage large-scale, market-based financing. The paper was produced by technical institutes, with input from industry associations, enterprises, financial institutes, and universities in both China and the U.S.

Also in January 2015, the Working Group released an energy performance contracting toolkit. This 10-page resource contains online links to guidelines, protocols, best practices, model contract language, and other information in three broad categories: project development, project implementation, and training.

The White Paper, Recommendations Report, and Toolkit were released and discussed at length at the first-ever U.S.-China Energy Performance Contracting Symposium. The Symposium was conducted on the sidelines of the ESCO summit of the ESCO Committee of the China Energy Conservation Association (EMCA) in January 2015.

The next step is to develop pilot projects in the U.S. and China. Criteria for selection of pilot projects, including use of innovative contracting mechanisms, third party finance, and use of standardized M&V protocols, have been developed. The selected pilot projects are to be announced at the 6th Annual Energy Efficiency Forum, scheduled for September 2015 in Washington DC.

Finally, the working group has facilitated the launch of an industry-led working group to accelerate the speed and scale of deep energy retrofits, consistent with the pilot project criteria. The new industry-led working group held its first meeting on May 7, 2015, and is working diligently to identify pilot projects.

2. Development and promotion of "TOP TENs" best available technologies (BATs) and best practices(BPs) lists for energy efficiency improvement

Both China and the United States have experience using incentives to promote deployment of technologies and practices that deliver energy saving and energy efficiency benefits. The goal of the TOP TENs effort is to develop and use a rigorous analytical process to identify BATs and BPs. China is leading the TOP TENs workstream through a multilateral forum of 16 major economies, called the International Partnership for Energy Efficiency Cooperation, or IPEEC. Australia is co-chair of the IPEEC TOP TENs Task Group, with participation by the U.S., Japan, Korea, Canada, and France; other countries may join in the future.

So far, under China's leadership, technical experts from these countries have participated in five workshops, more than fifteen teleconferences and developed the valuation methodologies. China has led the participating countries to pilot the BAT and BP methodologies using a robust internal peer-review process. China, Japan, and the United States have presented the initial draft results to TOP TENs Task Group. BAT categories include high efficiency heat pumps, energy saving technologies for data centers, heating, cooling, and waste heat recovery processes, energy management systems, and others.

Moving forward, each participating country will submit its list of BATs and BPs, and, consistent with domestic policy, may provide the names of specific companies that manufacture the technology or provide the service to advance best-practice methods for energy efficiency. China will then organize the Task Group to evaluate all the lists using the evaluation methodologies and present one consolidated list. Both consolidated list and the lists submitted by participating countries will be posted on the IPEEC website.

Of course, the end goal is to promote the speed and scale of deployment of the most suitable technologies and practices for energy efficiency improvement. Each country will determine its own policy mechanisms to do so, such as tax incentives, or special outreach to owners and stakeholders. In addition, there could be general outreach and publicity of the TOP TENs lists by IPEEC and by member countries of the TOP TENs Task Group. So far, the TOP TENs BAT lists cover all sectors and BP lists include two sectors: building and industry. In the future, the TOP TENs BP lists could expand to cover transportation and social services.

5. Collecting and Managing Greenhouse Gas Emissions Data

Both the United States and China are working to collect comprehensive and accurate greenhouse gas data as a critical foundation for smart climate change policies. Through the GHG data initiative, the United States is providing technical expertise and support that is helping China build capacity for collecting and managing greenhouse gas emissions data, drawing on U.S. experience implementing a successful national greenhouse gas reporting program.

In 2009, the U.S. Environmental Protection Agency (EPA) created a national Greenhouse Gas Reporting Program (GHGRP) that collects and verifies facility and supplier greenhouse gas data used to support U.S. GHG policies and improve the U.S. Inventory of Greenhouse Gases.

In March 2015, the EPA successfully collected its 5th year of detailed GHG data from over 8,000 entities across the United States, representing 41 industries and 90% of total U.S. GHG emissions. Key elements of EPA's program include a regulatory program designed with industry consultation, electronic reporting and verification, and hands-on compliance assistance.

Since the inception of the GHGRP, EPA has made hundreds of program improvements. In 2014, EPA fine-tuned monitoring methods to ensure high-quality emissions data, and addressed concerns associated with confidential business information. EPA also updated its user-friendly electronic reporting system which guides facilities through the reporting and provides real-time feedback on compliance and data quality. These efforts have resulted in high-quality, timely data that informs potential greenhouse gas policies in the U.S.

In 2014, China announced a mandatory national GHG reporting program that would cover companies and organizations in key GHG emission industries. By the end of 2014, China had released draft GHG accounting guidelines to cover 14 key industries, with an additional nine guidelines under development for 2015. China has also begun the process of planning and designing the national electronic reporting system that will collect and manage GHG emissions data from across the country.

Under the CCWG GHG Data Initiative, the U.S. provided technical guidance on several of China's draft guidelines through a series of capacity building workshops and a study tour in 2014. In the coming year, under this initiative, the U.S. will continue to leverage its information, tools, and experience gained from designing and implementing a successful national greenhouse gas reporting program to assist China's efforts to develop a national GHG reporting program. EPA will provide additional technical guidance on new GHG accounting methodologies under development and assist China in the process of

turning the 14 draft methodologies into national standards through the Standardization Administration of China. The U.S. will also continue to provide training on greenhouse gas reporting and data verification for key Chinese stakeholders to improve both the collection and verification of emissions data.

In addition to these capacity building efforts outlined above, the United States and China will collaborate on improving monitoring and reporting methods in key sectors. In 2014, the United States announced an ambitious strategy to cut U.S. methane emissions in support of President Obama's 2013 Climate Action Plan. Oil and Gas was one of several key sectors announced in the strategy, and in early 2015 the U.S. announced a new methane reduction goal from the Oil and Gas sector of 40-45% from 2012 levels, by 2025. High quality Oil and Gas emissions data collected by the U.S. Greenhouse Gas Reporting Program will be critical to achieving this goal by helping to identify opportunities for reductions. The U.S. Oil and Gas Reporting rule was one of several important lessons learned by China before the release of a draft Chinese Oil and Gas GHG emissions accounting methodology in late 2014.

In 2014, EPA made several regulatory improvements to its Oil and Gas GHG reporting rule, and also proposed additional data including gathering and boosting systems that may be covered in future years. Under this new effort, the U.S. and China will exchange knowledge and expertise on Oil and Gas GHG emissions reporting to improve China's GHG accounting and reporting guidelines in this sector. The United States and China will identify a pilot project in the oil and gas sector where the improved GHG accounting methodologies will be applied.

6. Climate Change and Forests

The creation of the Climate Change and Forests Initiative was announced at the last Strategic and Economic Dialogue in July 2014. Since then, the State Forestry Administration of China, the NDRC, and the U.S. Department of State have engaged in productive discussions on specific areas of work. A formal, two-year implementation plan for the initiative has been agreed.

The United States and China have agreed to cooperate through four workstreams under the Climate Change and Forests Initiative: (1) Policy dialogue on forestry-related agenda item under the UNFCCC climate change negotiations; (2) Technical cooperation in measuring, reporting, and monitoring of forestry-related greenhouse gases; (3) Exploration of technologies and polices for synergy of forest mitigation and adaptation to climate change; and (4) Forests, climate, finance, and investment. The two sides are to further explore engagement on commodities, forests and greenhouse gas emissions. These four work streams are outlined in the implementation plan agreed during the Climate Change Working Group meeting. Progress achieved to date under this new initiative is outlined below.

1. Policy dialogue on forestry-related agenda item under the UNFCCC climate change negotiations

An initial dialogue was held on forestry-related agenda items under the Subsidiary Body for Scientific and Technical Advice (SBSTA) of the UNFCCC. Negotiators shared views on specific agenda items in order to increase the understanding of respective positions and facilitate negotiations. Additional dialogues on forest- and land sector-related agenda items are planned in 2015 in advance of the upcoming Ad-hoc Working Group on the Durban Platform (ADP) and COP 21, and before relevant negotiations in 2016, with an objective of exchanging views and facilitating negotiations.

2. Technical cooperation in measuring, reporting, and monitoring of forestry-related greenhouse gases

The initial technical dialogue under this work stream will be held through a video conference. The initial technical dialogue will focus on discussing how to prepare the workshop on estimating and reporting forestry-related greenhouse gases that is to be planned for late 2015. This workshop will be followed by a study tour on related topics in the United States in 2016, and by additional workshops and dialogues that will be refined as implementation progresses.

3. Exploration of technologies and polices for synergy of forest mitigation and adaptation to climate change

Activities under this work stream are expected to start in the second half of 2015, with the identification of pilot sites that will be the focus of this work stream in each country. This will be followed by a series of technical workshops and visits designed to help identify best practices in fostering both mitigation and adaptation outcomes in forest landscapes.

4. Forests, climate, finance, and investment

Activities under this work stream will start in late 2015, and will include a workshop for sharing management and services being provided to the direct forestry-related oversea investment in the United States and China among government, civil society, forest companies, and investment experts to explore how GHG emissions potentially caused by forestry-related investment can be taken into account in finance and investment decisions. Activities in 2016 will include a visiting tour to U.S. forestry-related oversea investment to learn the good practice, management and service being provided by U.S. government and relevant institutions, and a workshop is expected to be planned, which will aim at identification of best practices and tools relevant to institutions seeking to reduce their impact on direct forestry-related emissions.

7. Climate-Smart / Low-Carbon Cities

The Climate-Smart / Low-Carbon Cities initiative of the CCWG was launched last November in the Presidential Joint Announcement on Climate Change. In the months since, the two sides have held regular exchanges to develop the initiative, and have agreed on a two track plan.

In the first track, the United States and China will hold an annual Climate-Smart/Low-Carbon Cities Summit. The first summit is to be held infall 2015 in Los Angeles, and in 2016 in China. The summit will include multiple elements, including a high-level plenary at which leaders declare their resolve, ambition, and actions on climate change; working-level technical exchanges to share experience and best practices; and an exhibition to highlight private sector solutions to climate mitigation and resiliency.

The second track of the initiative will focus on Smart Infrastructure for Urbanization. Both sides reached an initial consensus for cooperation in the following fields: Climate Smart Cities in Pilot and Demonstration Projects, Global Team Cities Challenge, and smart cities R&D and demonstration. Both sides will continue discussions on potential new topics.

8. Industrial Boilers Efficiency and Fuel Switching

China's industrial boiler systems consume 700 million tons of coal annually, accounting for 18 percent of the nation's total coal consumption. Together these boiler systems are responsible for 33 percent and 27 percent of total soot and sulfur dioxide (SO2) emissions in China, respectively. The United States and China are pursuing a collaborative effort under the U.S.-China Climate Change Working Group to conduct a comprehensive assessment of China's coal-fired industrial boilers and to develop an implementation roadmap that will improve industrial boiler efficiency and maximize fuel switching opportunities. Two Chinese cities – Ningbo and Xi'an – were selected for the assessment representing coastal areas with access to LNG imports and inland regions with access to interprovincial natural gas pipelines, respectively.

The joint U.S.-Chinese technical team conducted a comprehensive techno-economic analysis to assess the cost-effectiveness of various alternatives to coal-fired industrial boilers. The analysis utilizes case study information from the cities of Ningbo and Xi'an and focuses on three options that align with coal-fired boiler policies mandated by national and local governments of the two cities: *Option 1 - Fuel switch by replacing coal-fired boilers with boilers fueled by natural gas, biomass, oil, and electricity*; *Option 2 - Retrofitting existing boilers to improve energy efficiency*; and, *Option 3 - Eliminate scattered boilers and serve the aggregated demand via a community-scale system.*

The technical team evaluated the three options and concluded that single community or industrial park-scale systems could meet the aggregated industrial heat and steam loads of scattered units installed and operated separately by individual facilities more efficiently and at more cost-effective rates. A distributed energy center such as a community-scale system can use more efficient technologies that are not always cost-effective if used at smaller scales. Replacing a number of scattered boilers with a single community-scale system could also significantly reduce the cost of controlling and monitoring emissions. The study assessed the case of replacing scattered natural gas boilers in five industrial facilities within a 10-kilometer diameter in Xi'an's Lintong district with a potential community-scale system that can supply the aggregate steam and heat loads of the existing facilities.

The techno-economic analysis has shown that retrofitting existing coal-fired boilers, fuel switching from coal to natural gas, and effectively using resources via a community-scale distributed CHP system can be effective alternatives to industrial coal-fired boilers.However, the team's site visits in Ningbo and Xi'an and research on challenges revealed that China faces many barriers that can prevent these solutions from being fully realized. The roadmap outlines strategies to realize cost-effective opportunities and remove the barriers identified in this assessment:

- Creating enabling policy, including those that can increase market competition and reduce "soft costs" by adopting facilitation policies and reducing administrative hurdles to encourage the market entrance of private service providers and third-party suppliers;
- Accelerating technology development and deployment via incentives, including through tax and financial incentives provided by the government could help accelerate the development and deployment of alternative energy solutions;
- Developing effective standards and guidelines, including energy efficiency standards and proper testing protocols;
- Developing and deploying cost-effective compliance strategies;
- Promoting advanced technologies and integrated solutions via implementation pilots;
- Stimulating greater investment via innovative business models and financing mechanisms;
- Strengthening enforcement and enhancing its effectiveness via greater flexibility; and,

- Enhancing technical support and building strong capacity.

As the study concludes in June, the NDRC and the Department of State have decided to continue a next phase of cooperation to execute the implementation roadmap developed by the joint technical team. Both sides will explore the strategies outlined in the roadmap as well as explore public-private financing, sovereign guarantees, and other long-term financing vehicles for the two pilot cities.

OTHER INITIATIVES

Hydrofluorocarbons (HFCs)

In agreements made in 2013 and 2014, President Obama and President Xi decided to work domestically, bilaterally, and with other countries to phase down the production and consumption of HFCs. The two sides are making progress on these agreements. Over the course of dialogues and workshops over the past year, the two sides identified several policies and approaches in common, and identified areas where further cooperation would be pursued to reduce the use of high-GWP HFCs in each country, including a future bilateral meeting on policy measures.

Domestically, the United States is identifying and approving climate-friendly alternatives to high-GWP HFCs and proposed prohibiting the use of certain high-GWP HFCs in specific applications, such as in motor vehicle air conditioning. Key actions being taken in the United States include: (1) required reporting of HFC-23 byproduct emissions; (2) recent actions that expand the list of climate-friendly alternatives to HFCs; (3) proposed regulatory changes to no longer find acceptable certain high GWP HFCs for specific applications; and, (4) efforts to promote climate-friendly alternatives through public procurement.

China has implemented HFC-23 byproduct controls from all emitting chemical production facilities. All HCFC-22 facilities are required to build and operate HFC-23 incineration facilities with significant financial support from the Chinese government.

The two sides recognize there is a need for further action to reduce use and emissions of HFCs both domestically and multilaterally.

The two sides exchanged views on multilateral process on HFCs, agreeing to work together and with other countries through multilateral approaches that include using the expertise and institutions of the Montreal Protocol to phase down the production and consumption of HFCs, while continuing to include HFCs within the scope of the UNFCCC and its Kyoto Protocol provisions for accounting and reporting of emissions. The sides continued to emphasize the importance of the Montreal Protocol, including as a next step through the establishment of an open-ended contact group to consider all relevant issues, including financial and technology support to Article 5 developing countries, cost effectiveness, safety of substitutes, environmental benefits and an amendment. The United States agreed to work on addressing the concerns of Article 5 countries on an HFC phase down under the Montreal Protocol. The two sides agree to further exchange views on domestic, bilateral, and multilateral issues prior to or during important meetings, including through face to face meeting on HFCs.

Finally, both sides welcome the progress already made through a project on reducing HFC emissions with U.S. and Chinese companies, and agree to explore with their respective industry the possibility for additional projects to promote climate-friendly alternatives.

Enhanced Policy Dialogue

Led by the U.S. Special Envoy for Climate Change Todd Stern and China Special Representative for Climate Change Affairs Xie Zhenhua, the two sides met regularly over the past year for the Enhanced Policy Dialogue under the CCWG. The Enhanced Policy Dialogue facilitates the sharing of information regarding each side's respective post-2020 plans to limit greenhouse gas emissions, and was an important enabler of the November 2014 Joint Announcement on Climate Change. The two sides held another meeting of the Enhanced Policy Dialogue on the margins of the S&ED in June 2015 and decided to hold the next meetings on the margins of bilateral and international meetings, in preparation for a successful global climate agreement in Paris.

Domestic Policy Dialogue

In parallel, to support further constructive dialogue on each country's respective domestic actions towards achieving its pre- and post-2020 targets and achieving low carbon economies, the two sides established a new Domestic Policy Dialogue under the Enhanced Policy Dialogue to share information on domestic policy goals, plans, challenges, and successes. The first two meetings of the Domestic Policy Dialogue were held in May and June 2015, with additional meetings planned for August 2015 and at the upcoming winter CCWG intersessional meeting. A high-level exchange on domestic policy also occurred during the Joint Session on Climate Change at the S&ED.

Possible Areas of Future Cooperation

The two sides agree to consider cooperation on green ports and vessels. The two sides also agree to consider expanding collaboration under the Climate Change Working Group on promotion of zero emission vehicles; working together in assisting least developed countries, small island developing states, and African countries to build their capacity to address climate change; and non-CO2 gases including methane.

Institutional Framework

The CCWG is chaired by Ministerial Representatives from both sides, who meet throughout the year for in-depth discussions with the active participation of relevant government ministries on both sides. The CCWG reports annually to the S&ED and also holds an intersessional meeting each winter. The CCWG will continue to serve as a high-level forum to coordinate the action initiatives outlined in this report, develop recommendations for new action initiatives, and enhance the policy dialogue on the multilateral climate negotiations process as well as on domestic climate policy in the two countries. Both sides intend to continue to involve other stakeholders, where appropriate, in the work of the CCWG. The two sides plan to hold the next CCWG intersessional meeting in early 2016.