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BROADENING THE BILATERAL: SEIZING THE OPPORTUNITY FOR MEANINGFUL U.S.-CHINA COLLABORATION ON CLIMATE CHANGE

A REPORT

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LETTER OF TRANSMITTAL

UNITED STATES SENATE,
COMMITTEE ON FOREIGN RELATIONS,
Washington, DC, July 21, 2009.

DEAR COLLEAGUE: On Monday, June 27, the United States Government will host the inaugural meeting of the Strategic and Economic Dialogue, the framework governing our bilateral relationship with China. The stakes are high. We must show our own governments and our people that our two countries can and do collaborate. And we must jointly tackle one of the most important and complex global issues: the threat of catastrophic climate change.

As we move toward the U.N. climate change negotiations in Copenhagen in December, I am hopeful that our two countries will close the remaining gaps in our high-level positions on climate change. I also believe we must visibly and powerfully extend our cooperation on all levels.

The attached staff report establishes the scientific arguments and domestic emissions and policies in both countries and reviews the current areas of U.S.-China energy collaboration. It also recommends three areas for the Administration to pursue more robust cooperation in support of a global climate change agreement.

Sincerely,

JOHN F. KERRY,
Chairman.

BROADENING THE BILATERAL: SEIZING THE OPPORTUNITY FOR MEANINGFUL U.S.-CHINA COLLABORATION ON CLIMATE CHANGE

EXECUTIVE SUMMARY

Negotiations for a global climate change treaty at Copenhagen are only five months away. Landmark legislation has passed in the House, and parallel legislation is now being drafted in the Senate. In short, climate change has finally taken its proper place among the most significant international challenges facing this country and the global community.

With the upcoming launch of the Strategic and Economic Dialogue (S&ED)—the talks that govern our bilateral relationship with China—on July 27 and 28, 2009, the United States and China have acknowledged that their relationship is perhaps the most important in the world.

This report from the Senate Foreign Relations Committee looks at these two crucial international issues in tandem, by focusing on U.S.-China climate change and clean energy collaboration. Our cooperation has the potential both to drive global efforts to address climate change and to strengthen and deepen our vitally important bilateral relationship. The report draws on a series of hearings and briefings conducted by the committee, Chairman John F. Kerry's May 2009 visit to China, and a host of independent reports on U.S.-China climate collaboration.

There is increasing agreement among policy makers, national security specialists, and private sector leaders—and near universal consensus in the scientific community—that climate change poses a potentially catastrophic threat to the environment and to global security. There is also a growing realization that addressing the policies and emissions of the United States and China is the key to a global solution. Both countries have recognized the importance of the threat, and the need for their engagement; both have begun taking domestic action to alter their energy use patterns and emissions profiles. However, neither has yet been willing to take the dramatic actions that many experts deem necessary to achieve critical mass for a global effort. Many in the United States frankly doubt China's commitment to reduce emissions. The ranking member of the committee, Senator Lugar, remarked in his opening statement on June 4, "The American domestic debate on the issue will be profoundly influenced by perceptions of China's willingness

to set aside doctrinaire positions and agree to verifiable steps to limit greenhouse gas emissions." [1]

The United States has begun to change its stance. President Obama has made clear his support for binding emissions reductions. In addition, the American Clean Energy and Security Act recently passed in the House would require emissions reductions of at least 17 percent by 2020 and 80 percent by 2050. However, the absence of specific emissions reduction commitments from China has stoked fears of an unfair economic advantage for China, a hobbled U.S. economy, and an insufficient response to the threat of global climate change.

After an investigation by the committee's staff and the Chairman's frank conversations with Chinese leaders, it is the Chairman's strong view that China recognizes the dangers of climate change and is prepared to work with the United States and other members of the international community to address it; though, as Senator Lugar noted, the American perception of China's actions will remain equally important. At the most senior level, as Al Gore noted in his testimony on January 28, 2009 before the committee, China has recognized climate change as an issue of paramount importance to itself and the world, and is committed to action.[2] Vice-Premier Li Keqiang in his conversations with the Chairman explicitly stated his commitment to making the negotiations in Copenhagen a success. Over the past several years this leadership has begun to build consensus among national policy makers and gain support from certain local and provincial government leaders that dramatic steps must be taken. Internal hurdles remain, but the Chinese Government appears willing to engage.

Of course, achieving an agreement on climate change policy that includes fixed commitments from China will still continue to prove extraordinarily difficult, as evidenced by the important, but limited, movement during the recent G8 and Major Economies Forum in July 2009. This report therefore has focused on the areas where the United States and China should concentrate their efforts now, particularly in the context of the S&ED, in order to move closer on climate issues and to begin incorporating climate change into the bilateral framework.

There exists a strong base on which these cooperative efforts can build. Many governmental, private-sector, and non-profit entities have already succeeded in building strong partnerships, and the two countries made a great step forward with the signing of the U.S.-China 10 Year Energy and Environment Cooperation Framework (10 Year Framework) under the previous administration. Today there is an opportunity to dramatically expand the collaboration and to include addressing climate change as an explicit goal of the cooperation framework. China itself has recognized that collaboration, broadly speaking, is essential—and desirable. As Foreign Minister Yang Jiechi said in March:

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[1] Opening Statement of Senator Lugar, hearing on "Challenges and Opportunities for U.S.-China Cooperation on Climate Change." 4 June 2009.

[2] Testimony of the Honorable Albert A. Gore, Jr. before the Senate Foreign Relations Committee, United States Senate, hearing on "Addressing Global Climate Change: the Road to Copenhagen" 28 January 2009.

> Exchanges, cooperation and mutual benefit should be the defining features of the 21st century. Gone should be the days when countries competed at the expense of each other's interests under a zero-sum mentality because those who preach such a competition approach and model are bound to be the biggest losers today. China and the United States should and can set an example in achieving win-win progress and making greater joint efforts for an even better world.[3]

By focusing on three areas, (i) Building a bilateral laboratory, (ii) Creating green landmark projects; and (iii) Training a clean energy corps, the United States and China can deepen their ties, build trust, and ultimately catalyze a binding, comprehensive, and fair global agreement on climate change. We have already seen signs of progress on the first area, with Secretaries Chu and Locke's announcement in China of a joint clean energy research center.

If the United States acts now to extend and deepen this relationship-and begins incorporating climate change goals into its bilateral energy relationship with China, there is a very real opportunity for this country, with China, to lead the international community to a global solution to one of the world's most pressing problems.

This report addresses these issues in five sections.

1. Summary of Climate Change Science
2. United States and China Emissions History
3. A Review of Domestic Actions in China
4. Current areas of Collaboration Between the Two Countries
5. Areas of Bilateral Focus Moving Forward

1. Summary of Climate Change Science

Today, there is near-universal consensus within the scientific community that climate change has begun, is accelerating, and will have catastrophic effects—both physical and human—if efforts are not taken address it.

Ice core analysis and atmospheric measurements indicate that, since 1750, the concentration of carbon dioxide in the atmosphere increased 38 percent, from 280 to 385 parts per million (ppm). Current levels are higher than at any other point in the past 800,000 years. In the absence of limits on greenhouse gas emissions (GHG), atmospheric concentrations are expected to reach 600–700 ppm by 2100. In order to avoid the risk of catastrophic climate change, the scientific community led by the Intergovernmental Panel on Climate Change (IPCC), the world's authoritative scientific body on climate change, recommends that atmospheric concentrations stabilize at 450 ppm.[4] This represents a global average temperature increase of 2 °C above pre-industrial levels, and matches the agreed target reached during the July, 2009 G8 meeting.

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[3] http://www.fmprc.gov.cn/eng/wjdt/zyjh/t542505.htm

[4] IPCC, "Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report" (Intergovernmental Panel on Climate Change, 2007), at http://www.ipcc.ch/index.htm (accessed November 27, 2007).

While a number of factors contribute to atmospheric carbon dioxide concentrations, the IPCC has concluded that the primary cause of this surge in carbon dioxide has been the human use of fossil fuels.

Increasing atmospheric concentration of carbon dioxide has already caused temperatures to rise globally, by three-quarters of a degree Celsius over the 20th century. In fact, the 10 warmest years on record have all occurred since 1997. These changes have already resulted in significant impacts on the physical environment. This is most evident in the Arctic, where temperatures are rising at twice the global average and where the consequences of warming are immense, as Al Gore made clear in his testimony. In 2007, the Arctic experienced record ice loss—almost 40 percent below the long-term average. The past six years have produced the six lowest levels of winter ice coverage on record. Experts project that the North Pole could see its first ice-free summer as early as 2013. These effects are not restricted to the poles. The U.S. Global Change Research Program issued a report in June 2009 demonstrating the impacts of climate change on every region of the United States. Floods, droughts, storms and other extreme weather events are projected to increase throughout the United States. China has already seen extended droughts in the north, extreme weather events and flooding in the south, and rising sea levels along its densely populated coast. According to Elizabeth Economy, Director for Asia Studies at the Council on Foreign Relations, farmers in rural China often cite climate change as the cause of poor land quality and water scarcity.[5]

While these physical impacts are the most visible, the effects of climate change extend far beyond our natural environment. Climate change is a threat to public health: changing temperatures already have increased the areas susceptible to malaria outbreaks worldwide. Heavier precipitation events, which are predicted to become increasingly prevalent, will lead to increased outbreaks of *e. coli* and *cryptosporidium.*[6]

Climate change exacerbates conflict. Growing competition for scarce resources, due to desertification and water shortages, threatens to lead to increased conflict and to inflame pre-existing tensions. In South Asia, India's rivers are not only vital to its agriculture, but central to its religious practice. Pakistan, for its part, is heavily dependent on irrigated farming to avoid famine. Both share the water that flows from the Himalayas and which could disappear completely by 2035.[7] At a moment when the American Government is working to decrease tensions and preparing to invest billions to strengthen Pakistan's capacity to deliver for its people, climate change is working in the opposite direction.

Climate change also leads to massive population migration. Estimates of populations displaced by climate change, either from nat-

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[5] Testimony of Elizabeth Economy before the Senate Foreign Relations Committee, United States Senate, hearing on "Challenges and Opportunities for U.S.-China Cooperation on Climate Change." 4 June 2009.

[6] Paul Almendares and Paul R. Epstein, Climate Change and Health Vulnerabilities. *Climate Change.* 2009

[7] (Citing report by Syed Hasnain, a scientist at the Energy and Resources Institute (TERI)). http://www.telegraph.co.uk/earth/earthnews/3458927/Himalayan-glaciers-could-disappear-completely-by-2035.html

ural disasters or evolving changes to the climate, range from 25 to 200 million. These migrations put enormous strain on governmental institutions, as well as the traditional international institutions, like the Office of the United Nations High Commission for Refugees, which has traditionally worked with these groups.

2. United States and China Emissions History

While the United States remains the world's largest historical emitter of GHG, China surpassed the United States in 2007 to become the largest current annual contributor.[8] Combined, China and the United States represent more than 40 percent of global annual emissions.[9] Any strategy to address climate change that does not include China and the United States is doomed to fail.

This section lays out the primary sources of emissions in each country. Although some observers have expressed concerns with the accuracy of Chinese data, most experts agree that current estimates are relatively accurate.[10] The main driver globally of GHG emissions is energy—both its production and its end usage.[11] While China and the United States differ significantly in their current and projected usage, both countries share similar energy production profiles.

ENERGY USAGE

In the United States, the majority of emissions derive from the production of electricity. By end use,[12] transportation is the largest share, at just over one third of total emissions. Residential buildings and industrial facilities each represent about one quarter of total emissions, with commercial buildings consuming just under one fifth. Historically, U.S. emissions have been affected by two major trends. First, energy "intensity"—the ratio of energy consumption to GDP—has fallen over time, primarily from the United States' movement to a more services-oriented economy. Second, emissions growth has historically tracked closely with population growth. Since 1990, the population has grown 19 percent and emissions have grown 16 percent.

China's energy profile, by contrast, is dominated by industrial emissions. Of total emissions, around 70 percent come from industry. Emissions from this sector have accelerated over the past decade, increasing by 46 percent from 2002–05 and then another 32 percent from 2005–07.[13] These dramatic increases have been driven by the rapid industrialization of the country, including infra-

[8] Includes CO_2 emissions only as China does not report non CO_2 emissions. http://cdiac.ornl.gov/trends/emis/top2006.tot

[9] "Energy, Emissions, and National Circumstances" by the Asia Society.

[10] China has officially reported one year of emissions data, 1994, which was only released ten years later. To estimate emissions, most groups use energy consumption statistics; however, due to poor reporting at the local level and at times immature data systems, the energy data that China does release can often be inconsistent (e.g., national data and aggregated provincial level data often vary significantly). In general the discrepancies do not appear to stem from intentional manipulation.

[11] Other important sources of emissions include land-use changes, especially forestry issues, agriculture, biomass, and coal fires.

[12] Defined by the EIA as Residential, Commercial, Industrial, and Transportation.

[13] EIA, 2008, Emissions of Greenhouse Gases Report, available at: http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html; China emissions calculated using 1996 revision of IPCC default carbon emission factors; commercial fuels only, not including biomass.

structure development and a surge in heavy industry.[14] In addition, as supply chains have integrated across Asia, China has increasingly become a hub for final assembly.

While industrial emissions currently dominate China's emissions profile, two population trends have the potential to alter that balance. China's per capita emissions are currently only one-fifth of the U.S. figure. However, the ongoing urbanization of China will result in 350 million Chinese moving to the cities by 2030—the equivalent of a new city of 1.25 million people every month.[15] Given that meeting the needs of urban-dwellers (including constructing housing and urban infrastructure) requires approximately 3.5 times the energy required to meet the basic needs of rural Chinese, this mass migration will contribute to growing emissions in the future.[16] In addition, Chinese per capita incomes have risen rapidly in recent years, driving increased consumption of energy-consuming products like vehicles and appliances.

ENERGY PRODUCTION

While China and the United States are, respectively, the first- and second-largest consumers of renewable electricity, both countries are also highly dependent on coal. Coal supplies about 70 percent of China's energy, and results in 81 percent of its CO_2 emissions.[17] Coal generates 22 percent of U.S. energy-more than the European Union, Japan, Russia and Indonesia-and accounts for 36 percent of its total emissions. Half of U.S. electricity is generated from coal; in China that figure is 80 percent.[18] Experts predict that China will remain highly dependent on coal as its economy continues to grow. Kenneth Lieberthal, a visiting fellow at the Brookings Institution, testified on June 4, 2009 in a hearing before the committee, "There is no serious alternative to coal for many decades to come." [19]

With relatively large coal deposits in both countries, the question of coal extends beyond emissions and into energy security. For China in particular, where 97 percent of its fossil fuel base is coal, there is a strong domestic security incentive to continue using coal, rather than switching to natural gas or oil, both of which are relatively scarce domestically.[20]

In light of this situation, both China and the United States have become global leaders in coal technology. China has improved upon the most common coal technology to create some of the world's most efficient plants, allowing for higher energy production from the same quantity of coal. The United States has pioneered new technology that also increases efficiency and simplifies any subsequent carbon capture and sequestration (CCS). Despite these ad-

[14] Zhou, Nan, Levine, Mark, and Fridley, David. Taking out one billion tons of CO°: the magic of China's 11th five year plan? *Energy Policy,* No. 26. 2008, December 2007. LBNL-757E.)

[15] Testimony of Ken Lieberthal before the Senate Foreign Relations Committee, United States Senate, hearing on "Challenges and Opportunities for U.S.-China Cooperation on Climate Change." 4 June 2009

[16] John L. Thornton China Center at Brookings. "Chinese Climate Policy." Overcoming Obstacles to U.S.-China Cooperation on Climate Change. 31–2.

[17] National Bureau of Statistics, China Statistical Abstract, various years.

[18] Asia Society

[19] Testimony of Ken Lieberthal before the Senate Foreign Relations Committee, United States Senate, hearing on "Challenges and Opportunities for U.S.-China Cooperation on Climate Change." 4 June 2009.

[20] National Bureau of Statistics, China Statistical Abstract, various years.

vances, both countries will have to address the question of emissions from coal, which will require further technological progress and investment, especially in CCS.

3. A Review of Current Domestic Actions in China

The United States has already begun to tackle the question of climate change, and the recent passage of the American Clean Energy and Security Act in the House of Representatives suggests that the U.S. Government may adopt a cap on emissions. While many analyses have explored the range of federal, regional and local U.S. action on climate change, changes in Chinese policy are significantly less well understood.

In 2005, China unveiled its 11th Five Year Plan, which featured a new focus on energy and the environment. In 2008, the environmental agency was elevated to Ministry status, a significant internal political move, reflecting the heightened priority of environmental matters in the government. Moreover, outside observers, including the Chairman, have noted a significant change in public and private rhetoric on the question of climate change. As the Chairman noted in his speech to the Council on Foreign Relations on June 15, 2009:

> What I saw and heard from top Chinese political and military leaders, energy executives, scientists, students, and environmentalists was enormously encouraging. People who, a few short years ago, weren't even willing to entertain this discussion, are now unequivocal: China grasps the urgency of the problem, is eager to embrace clean energy, and is ready to be a "positive, constructive" player in negotiations going forward.

Still, the political situation in China remains complex. Senior leaders in Beijing appear to acknowledge tacitly that China must eventually sign on to a binding agreement to reduce emissions, but they face many hurdles. First, as former Foreign Minister Li Zhaoxing made clear to Chairman Kerry in Beijing in May, 2009, China is unwilling to take on commitments that it may not be able to achieve. And while the central government may be close to a consensus on the importance of addressing climate change, many regional and local governments, who ultimately will be responsible for enforcing emissions targets, have a mandate to maximize economic growth. They may not yet be convinced that their own interests will be best served by moving decisively to implement sustainable growth strategies.

As in the United States, measures to curb carbon emissions face stiff opposition from certain heavily affected geographic areas and industrial sectors. The regional mayors and industry leaders, often from poorer provinces, have exerted pressure on the central government to postpone any binding commitments. To them, environmental and emissions restrictions are seen as limiting economic growth.

Slowly, the central government has sought to alter this viewpoint. It has made adjustments to the all-important metrics by which regional and local leaders are evaluated, decreasing the importance of economic growth and increasing the importance of envi-

ronmental issues. Local officials have now been told that their jobs will be in jeopardy if they fail to meet targets to reduce energy intensity and emissions. It has also successfully "piloted" greater environmental control in specific cities, like Dalian, to demonstrate that economic growth need not run counter to environmental health. However, it will still take time to build consensus among the 650 cities across China that will ultimately enforce any such agreement.

In spite of the internal political difficulties of committing to a binding emissions agreement, China has established targets in a variety of areas, including energy efficiency, renewable energy, nuclear power, industry, and transportation. In fact, as James Rogers, CEO of Duke Energy, noted in his testimony on May 19, 2009, "China now has renewable energy, energy efficiency, and fuel economy standards that are all more aggressive than our own." These targets have been repeatedly strengthened as China has exceeded its own interim benchmarks. Beyond specific targets, China has also continually sought to improve the efficiency of its standard coal plants and, in the past few years, some argue China has surpassed the United States in power generation efficiency.[21]

In addition to ordinary funding for these initiatives, China has also made significant commitments in its 2008 economic stimulus program to green efforts, including energy efficiency and renewables. While stimulus infrastructure spending is frequently allocated with abbreviated environmental impact assessments and little scrutiny, the additional funding for energy and climate issues is significant. These investments—if effective—will shift Chinese patterns of energy production.

To date the progress has been impressive. Investment in new renewables capacity is now second in the world, only to Germany, with more than $12 billion in 2007 alone.[22] China's wind capacity grew at an astonishing 91 percent in 2008, making the country the fourth largest wind market globally. Success in solar photovoltaics (PV) has likewise been remarkable: Suntech, the market leader, grew from just 20 employees in 2002 to a market value of $6 billion, making its founder at one point the richest man in China. Today, China is the largest producer of PV panels, with more than 200 manufacturers creating 1700 megawatts of the panels in 2007, which amounts to about half of the world's total production.[23]

ENERGY EFFICIENCY

Energy efficiency improvements are a focal point for Chinese energy policy. For more than two decades, China saw its energy intensity[24] decrease annually by approximately 5 percent. However, between 2002 and 2005, energy intensity increased by 2 percent annually. In response to this new and troubling trend, the government announced a 20 percent energy intensity reduction target for the period from 2006 to 2010. From 2005–08, due to a variety of programs, energy intensity has decreased 10 percent, with a 4.6

[21] http://www.serc.gov.cn/jgyj/ztbg/200903/W020090324593421835268.pdf

[22] http://www.renewableenergyworld.com/rea/news/article/2008/03/powering-chinas-development-the-role-of-renewable-energy-51586

[23] http://www.scientificamerican.com/article.cfm?id=chinas-big-push-for-renewable-energy

[24] Energy use per unit of gross domestic product.

percent decrease from 2007 to 2008.[25] Among the most important programs in this effort are the "Top 1,000" enterprises programs, which cover a set of enterprises responsible for one third of all energy consumption in China. This effort requires companies to perform and publish energy audits and calculate their energy intensity. Each enterprise is then required to draw up plans to achieve required reductions, and report annual, measurable results to the National Development and Reform Commission (NDRC), a government body with broad administrative and planning control over the Chinese economy.[26]

There is significant funding behind these efforts. Annual spending on energy efficiency increased from $244 million in 2007 to $1.3 billion in 2008 to $1.8 billion in 2009.

RENEWABLE ELECTRICITY

China has one of the most ambitious renewable energy programs globally. In 2005, the government released a target of 10 percent renewable electricity generation by 2010 and 15 percent in 2020. China has already exceeded its 2010 generation target and, in response, tripled its wind production goal and increased its solar production goal by five-fold. Zhang Xiaoqiang, the NDRC's vice-minister in charge of international cooperation, has publicly suggested that the 2020 target, which does not include hydroelectric power, may need to be revised upward as well. He suggested China could reach 18 percent, or even 20 percent, renewable power generation by 2020.

Much of this success has stemmed from the significant investments from the Chinese central government in renewable energy, with commitments of almost $300 billion between now and 2020. China's progress in building local industries for wind turbines and solar panels, among other renewable technologies has also resulted in vastly lower prices and speedier adoption rates.

NUCLEAR POWER GENERATION

China is also investing in nuclear power, committing to large deals with the major nuclear providers, including Areva and Westinghouse. In their energy planning, they have continually increased their nuclear targets, which currently stand at 60GW by 2020, but may be increased again to somewhere between 75 and 100 GW of installed capacity. During the Chairman's visit, officials stated that 110 GW would be installed or under construction by 2020.

These agreements have been among the largest nuclear deals ever concluded and include significant technology transfer. They may also hasten the advance of new nuclear technologies, as the opportunity to build plants results in more efficient techniques and greater opportunity for at-scale experimentation.

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[25] Eleventh Five-Year Plan: Reducing 20% of energy consumption per unit GDP by 2010. *Energy Weekly.* CHINA5E E-Magazine, May 26, 2009, Vol. 204.

[26] The Challenge of Reducing Energy Consumption of the Top-1000 Largest Industrial Enterprises in China, Lynn Price, Xuejun Wang, Jiang Yun. Page 7–8. Berkeley, CA: Lawrence Berkeley National Laboratory. *See also,* Price, L., Xuejun Wang, Jiang Yun, 2009. "The Challenge of Reducing Energy Consumption of the Top-1000 Largest Industrial Enterprises in China," *Energy Policy.*

TRANSPORTATION

China has pursued significant improvements in the efficiency of its vehicle fleet and has put in place a corporate average fuel economy standard of 36 mpg by 2008 (stronger than the accelerated U.S. target for 2016). China also is in the process of setting fuel economy standards for trucks and agricultural vehicles.

In addition, China has heavily invested in electric vehicles, with a $1.5 billion subsidy for electric vehicle technology. The federal government hopes to pioneer the use of electric vehicles in public fleets in thirteen cities over the next four years.[27] In January, for the first time, more new cars were sold in China than the United States, and while China's installed base remains relatively small, it is likely to increase rapidly.[28]

China is also pursuing an expansive public transit system. It plans to extend its high speed rail system by 38 percent by 2013 and build more than 170 mass transit systems by 2025. These investments are transforming the urban landscape and fundamentally changing the mobility of the Chinese.

4. CURRENT AREAS OF COLLABORATION

The United States and China are already working together through a wide variety of venues and organizations to share technology and expertise on climate change and energy issues. To date, most of these collaborations have focused primarily on energy and energy efficiency, rather than directly addressing climate change and greenhouse gas emissions.

Admittedly, these efforts have proved challenging. Low levels of funding, fluctuations in support for programs, and lack of continuity of organizations or personnel often decrease effectiveness. In addition, the sheer number of programs can result in agencies working in overlapping areas and at times contradicting each other. But although some programs have been undermined by lack of follow-up or coordination, many of these efforts have built lasting and productive bilateral relationships and concrete results to support future bilateral cooperation on climate change.

Simply at the federal level, there are dozens of bilateral agreements, including memoranda of understanding (MOUs) and cooperative agreements, which provide political clearance and frameworks for technical cooperation. Bilateral programs have been supported with federal funds, typically through the Department of Energy (DOE) or the Environmental Protection Agency (EPA) but are often carried out through national laboratories or through environmental or energy non-governmental organizations and research institutes. Many of the successful programs have included broad partnerships among different organizations providing special expertise, and have involved the private sector as well.

One of the first major U.S.-China bilateral partnerships on energy issues was the U.S. Country Studies Program, which was initiated in 1992 under President George H. W. Bush. Under this program, officials from DOE, EPA, and others worked with officials

[27] "China-made electric cars to enter US market," People's Daily Online (23 February 2009).
[28] http://worldblog.msnbc.msn.com/archive/2009/02/09/1787089.aspx

from China's Energy Research Institute, State Planning Commission, and Chinese Academy of Sciences to develop a methodology to inventory China's greenhouse gas emissions. This effort laid the foundation for China's 1994 inventory submission to the UN Framework Convention on Climate Change (UNFCCC). The Country Studies Program also assessed the impacts of climate change and options for adaptive response policies; identified technological options for GHG mitigation and analyzed their socioeconomic and environmental implications; developed integrated modeling capabilities to support policy analysis; and supported climate policy dialogue between the Chinese and U.S. governments. Many projects since the mid-1990s have grown out of the Country Studies Program.

Several long-standing partnerships have evolved, including several centers established in China as focal points for research, training, and information sharing on energy efficiency and environmental technologies and measures. DOE and EPA have supported technical projects to expand natural gas production and use, renewable electricity and nuclear power production, energy efficient building codes, and planning for carbon capture and storage technologies.

Among the most fruitful collaborations has been work undertaken in China on energy efficiency with help from U.S. experts—both from the private sector and our national laboratories. Notably, Lawrence Berkeley National Laboratory (LBNL) has provided technical assistance to the Chinese regarding energy efficiency for over 20 years, including assistance related to the development and implementation of China's Top-1000 program. Working together with researchers and policy-makers in China, LBNL helped design and pilot the initial efforts in Shandong Province that lead to the national-level Top-1000 program. LBNL has also worked closely with the China National Institute of Standardization in the development of over 20 minimum energy efficiency standards and energy efficiency labeling specifications.

Last year, the two countries consolidated and formalized their cooperation with the signing of the 10 Year Framework. This agreement represents the closest collaboration thus far on climate change-related issues and provides an umbrella agreement under which the two countries can address a variety of concerns. Notably, from the Chinese side, both President Hu and Premier Wen played a significant role in establishing this accord and approving all provisions.

The 10 Year Framework covers six areas: (1) Clean and Secure Electricity Production and Transmission; (2) Energy Efficiency (3) Clean Water; (4) Clean Air; (5) Clean and Efficient Transportation; and (6) Conservation of Forest and Wetland Ecosystems. Notably, the agreement does not currently include climate change or emission reductions.

Three breakthroughs in this Framework are worth highlighting. First, significant progress was achieved regarding technology transfer, as defined in the text:

> For purposes of this cooperation as an exchange of expertise between our two countries and cooperation to jointly reduce or remove barriers including costs associated

with technology research and development, commercialization and deployment.

This definition recognizes the significant efforts, including government-to-government transfers of energy efficiency technology and private sector transfers of technology, which are already ongoing and emphasizes the importance of competition and commercialization in lowering costs associated with technology.

Second, the 10 Year Framework has given rise to a large number of government facilitated "eco-partnerships" that continue to deepen the relationship between the two countries. Whether between academic institutions like Tulane University and East China Normal University, or public-private efforts, like those that Denver, Colorado and Ford Motor Company, have undertaken with Chongqing municipality and Changan Auto Group Corporation, these partnerships increase the density and depth of the U.S. relationship with China on energy and climate change.

Lastly, the most recent agreement on the timeline for a Chinese roadmap to introduce low-sulfur fuels, despite the cost increase that this switch would entail, suggests a growing potential for the U.S. and China to work collaboratively to address emissions questions.

AREAS OF TENSION

Despite significant progress on clean energy technologies and practices, direct collaboration on climate change issues and emission reductions continues to encounter resistance. Collaboration appears to be constrained due to the entrenched positions both countries continue to maintain within the UNFCCC. In the lead-up to the Copenhagen negotiating session, China has staked out a particularly demanding and uncompromising position, calling for 40 percent cuts in greenhouse gas emissions by 2020 by developed countries, as well as additional assessed contributions, indexed to GDP and as high as 0.5–1.0 percent of GDP, for emissions reductions. It is also not clear how willing China is to address this problem should it require significantly compromising near-term economic growth. As Senator Lugar noted in his opening statement to the committee on June 4, 2009, China's actions have been "complex and contradictory," with a burgeoning appetite for renewable energy juxtaposed against a rapid build-out of coal power plants and its collaborative relationship with the United States on energy in contrast to its often strident rhetoric in multilateral fora.

5. AREAS OF BILATERAL FOCUS MOVING FORWARD

This month, the United States and China will formally relaunch their bilateral relationship with the meeting of the S&ED, the successor to the Strategic Economic Dialogue (SED) of the previous administration. As discussed in the prior section, the SED successfully launched the 10 Year Framework, and the S&ED has the opportunity to broaden and deepen U.S.-China collaboration on these issues.

Over the past year, a variety of institutions have analyzed the various areas where the United States and China could broaden their collaboration. Among them are the Asia Society, the John L.

Thornton China Center at the Brookings Institution, the Council on Foreign Relations, the Center for Strategic and International Studies, McKinsey & Company, the Natural Resources Defense Council, the Pew Center on Global Climate Change and the World Resources Institute. This committee has also conducted a series of relevant hearings and briefings, and the Chairman visited China in May 2009 to meet with political leaders, academics, businesses, and non-governmental organizations to discuss climate change and the bilateral relationship.

One clear conclusion emerges from this broad set of analyses: the United States and China must jointly address the question of climate change. Without these two countries, it is impossible to achieve the global reductions necessary. There is broad recognition that achieving this collaboration will not be easy. Both countries have been hesitant to accept any binding cuts or caps. Neither country is comfortable acting without commitments from the other. China, as discussed earlier, has unveiled a particularly problematic list of demands.

The United States recognizes, as Special Envoy on Climate Change Todd Stern described in his testimony before the committee on April 22, 2009, that developing nations and developed nations will undertake different actions, but fundamentally China must agree to "significant national actions that . . . they quantify and that are ambitious enough to be broadly consistent with the lessons of science."[29] Under the guiding principles of the UNFCCC, the commitments of all parties to take actions to mitigate climate change must incorporate their common but differentiated responsibilities. But, as the Chairman has noted, per the negotiations in 2007 in Bali, Indonesia, every country should be responsible for measurable, reportable, and verifiable commitments.

These are challenging starting conditions. However, deep relationships already exist on energy and environmental issues. Moreover, many of the key elements of a climate agreement have already been agreed to in the 10 Year Framework. Using the Framework as a base, there is a real and significant opportunity for the United States and China to reach an accord and become leaders on this pressing global issue.

It is worth noting that these bilateral negotiations support and do not supplant the multilateral process. The negotiations in Copenhagen will determine the global course of action, but without some kind of understanding between the United States and China in advance of these talks, it will be very difficult to reach a robust treaty. As noted by Todd Stern, "If the two goliaths on the world stage can join hands and commit each other—at the highest levels—to a long-term, vigorous climate and energy partnership, it will truly change the world."[30]

The Chairman strongly encourages the United States and China to build upon existing relationships and continue deepening and broadening ongoing partnerships, with a goal toward an expanded energy and environmental cooperative agreement that includes a

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[29] Testimony of Todd Stern, Special Envoy for Climate Change, before the Senate Foreign Relations Committee, United States Senate, hearing on "Global Climate Change: U.S. Leadership For A New Global Agreement." 22 April 2009.

[30] Remarks from Todd Stern as Prepared at Center for American Progress 6/3/09.

shared perspective and set of actions to combat the threat of climate change.

The Chairman believes that three areas offer significant potential to bring the two countries closer on climate change issues and, in turn, lead to a global agreement. Finding visible opportunities to work together also reminds key opinion makers in China and in the United States (including Congress) that our two countries can and do collaborate effectively.

i. *Build a bilateral laboratory* focusing on mutually beneficial technologies, such as advanced vehicles, carbon capture, and smart grid technology.
ii. *Create green landmark projects* by jointly designing, financing and implementing pilot projects to test key near-commercial technologies, including carbon capture and storage methods and concentrated solar power.
iii. *Train a clean energy corps* within each country, focused on energy efficiency, policy design, monitoring and verification, and enforcement of standards.

I. BUILD A BILATERAL LABORATORY

The United States' system of national laboratories has proven an extraordinary breeding ground for cutting-edge scientific developments. Though China does not have a parallel system, the country has a variety of topnotch research institutions working on next generation technologies—and among the highest research outlays in the world.[31] By focusing talent and resources on the joint problems of the two countries in a dedicated bilateral laboratory, the two countries would have access to some of the best minds, the best resources and the biggest markets. Secretaries Chu and Locke have begun down this road, but it remains to be seen how collaborative an entity the proposed joint clean energy research center will become.

To be effective, this new laboratory should, of course, take advantage of the deep scientific communities in both countries, but also focus on specific areas of mutual interest, receive joint funding from the two nations, and include a mechanism for reporting on and updating the mission of the center. Its primary goal would be the research, development, and small-scale demonstration of new technologies with the potential to deeply reduce GHG emissions. By working together to combine know-how on topics of shared interest, the two countries can not only bring about significant change in these areas, but also streamline commercialization and deployment through joint testing and certification.

Expert opinion has focused on a few high priority technologies: carbon capture and storage, new renewable energy technologies such as solar PV and biofuels, "smart" buildings, electric vehicles, and efficient grid technologies. In many of these areas, the United States and China already have complementary technologies under development. On both sides of the Pacific, giving relatively greater attention to "human dimensions" and related barriers to technology deployment could reap mutual benefits—like the installation of

[31] Shahid Yusuf and Kaoru Nabeshima, Strengthening China's Technological Capability (Washington DC: World Bank, Development Research Group, August 2007).

smart metering. In particular, collaboration may be particularly helpful on the design of incentives for businesses and households.

II. CREATE GREEN LANDMARK PROJECTS

The United States and China have independently accomplished some of the world's most impressive feats of engineering. By working together to build ground-breaking environmental projects at scale, they can help commercialize near-to-market technologies and inspire further commitment to these issues. In so doing, they also encourage and facilitate firms in both countries doing business in the other.

Combining the technical, financial and manufacturing resources of both countries promises significant breakthroughs. By identifying key technologies that are close to market, but that have not had either the testing or the scale construction necessary, and then realizing these projects at full potential, China and the U.S. would prove their technical leadership to the world, significantly reduce costs, and accelerate their adoption globally. Beyond the choice of projects, this effort would also require the United States and China to work together to streamline import and export processes for high priority advanced technologies, simplify the process for foreign firms to do business, and consider supportive provisions under the World Trade Organization.

Coal-fired power generation should be a priority area for collaboration. Experts broadly agree that U.S.-China efforts should target the construction of commercial-scale, integrated carbon capture and storage pilot projects. The U.S. is moving forward with the FutureGen project in Mattoon, Illinois, and China has three projects at various stages of development. By working to improve the efficiency and performance of power generation technologies and link them with carbon capture mechanisms, the United States and China could bring this critical technology closer to financial viability for global deployment. And by viewing these projects as more than technical feats but as visual landmarks of the bilateral relationship, these two countries can inspire the 1.6 billion Americans and Chinese to actively engage in solutions to climate change.

III. TRAIN A CLEAN ENERGY CORPS

Experts broadly recognize energy efficiency improvements as a near-term and cost-effective opportunity for real changes in energy use patterns and associated emissions. To capture this low-hanging fruit, the two governments should establish and train a clean energy corps of efficiency experts, architects and students from the U.S. and China to expand access to the lowest-cost energy solutions on an accelerated schedule to achieve the greatest short-term reductions.

In China, many of the small-scale "distributed" opportunities—like energy efficient building practices—have proven difficult to implement. These decisions are typically implemented at the provincial or municipal level, where there is insufficient knowledge about opportunities and practices for improvement. The United States has one of the best information and monitoring systems of any country, and a track record in working with other countries to improve their own. Local-to-local partnerships can also play an impor-

tant role. Often, where leaders share analogous responsibilities, opportunities and challenges, and the implementation capacity is both severely lacking and extraordinarily important.

In addition to our first-class programs at the Department of Energy, including the Industrial Assessment Centers as well as the Energy Savings Now program, our state utility regulators, private energy service companies, and green building councils have a broad range of experience conducting energy audits and implementing effective, cost-effective energy efficiency solutions. By translating our energy efficiency expertise to the provincial, local, and business level, the U.S. will significantly improve China's ability to implement some of the easiest and least expensive reforms.

"The most important single issue for the future . . . might be how the United States takes a leadership role to encourage, under tremendous international and domestic pressure, India and China to join with us in becoming much more efficient." These were former President Carter's words to the committee during his testimony on May 15, 2009. With emissions from China more than four times those from India, it is truly the United States and China relationship that will dictate our success or failure.

The three action areas highlighted in this report do not encompass the full set of activities where the United States and China can or should collaborate. But they do represent three arenas where concentrated effort to build consensus both within and between governments could lead to growing understanding and ultimately to agreement on the thorny questions of GHG emissions gaps and reductions.

Ultimately the opportunity at stake, as well as the potential cost, is enormous. As the United States and China open the first Strategic and Economic Dialogue, just a few months before the United Nations climate change negotiations in Copenhagen, Chairman strongly encourages both parties to build on the impressive work and partnerships already underway and begin to lead the world towards a global solution.

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