

ISSUE BRIEF

THE ATLANTIC COUNCIL OF THE UNITED STATES

REPORT ON

U.S.-China Cooperation on Clean and Efficient Transportation

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- o the Atlantic Council of the United States and
- o the US/China Energy & Environment Technology Center at Tsinghua and Tulane Universities

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Executive Summary

Because of their significant contribution to global demand for improved living standards, meaningful actions by the United States and China on transportation and energy will be important in any effort to reduce global consumption of traditional energy sources. Together the United States and China consume 40% of the world's energy and are responsible for 50% of the world's greenhouse gas emissions. Given their economic size and impact on global markets, it is imperative that the U.S. and China join in a mutually beneficial process.

The United States has a massive, complex transportation system that is heavily dependent on road vehicles and to a lesser (but still substantial) extent on air, marine, rail, and pipeline transportation. The United States' most immediate and highest priority is on replacing a significant portion of conventional crude oil-based transportation fuels and improving vehicle efficiencies.

In contrast, China is still in the relatively early stages of developing its transportation infrastructure and systems. It is still in a position to choose between transportation modes and the lifestyle implications of different transportation systems and urban designs. Hence, China places its highest priority on creating a sustainable transportation system that will balance the need for transportation services with better urban designs, and will lead to an improved quality of life for its citizens, through rational configuration of regional economic development and sustainable urban mobility.

To address these trends, the U.S.-China Ten Year Energy and Environment Cooperation Framework was jointly established by the United States and Chinese governments in December 2007. The Framework aims to focus



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on extensive cooperation over a ten-year period to address the challenges of environmental sustainability, climate change, and energy security. A Task Force on Clean and Efficient Transportation has been established to contribute to the Framework, and the Atlantic Council of the United States was asked to gather recommendations to contribute to its work. On May 7, 2008, the Atlantic Council held a meeting in Washington, D.C., to hear U.S. perspectives on opportunities and challenges facing the Task Force. The Atlantic Council held a similar meeting in Beijing on May 22, 2008, to elicit Chinese input. Participants in this dialogue represented a cross section of industry, research institutes, academia, and government. In these meetings there was strong support for developing even greater cooperation between the United States and China. Recommendations from these two meetings focused on increasing transportation efficiency, promoting alternative fuels, altering traditional transportation modes, increasing capacity to manage existing systems, and accelerating the pace of change.

The Ten Year Framework will need to be supported across three Five Year Plans in China and by three U.S. administrations. In order for this effort to succeed, it will be necessary to capture the imagination of the leadership in both countries. Cooperation on the issue of transportation and energy will also solidify U.S.-China relations. This will have a positive effect on a multitude of broader issues by strengthening cooperation between the two countries on regulations, trade, and greater economic prosperity. Through this path the two countries can ensure continued progress on sustainable development, coupled with environmental protection, leading to greater economic prosperity for both countries.

The Challenge

The world is facing a global challenge to create sustainable energy systems that will provide energy security, reduce pollution and address climate change. Meeting this challenge will be difficult and complex; however, the need for action is urgent. Global resources are becoming severely strained by the world's growing demand for improved living standards. Business as usual could have disastrous consequences for most of the world's developing nations and lead to major economic disruptions in the developed countries. Because of their significant contribution to these trends, meaningful actions by the United States and China on this issue will be important in any effort to meet this challenge in a timely fashion.

Together the United States and China consume 40% of the world's energy and are responsible for 50% of the world's greenhouse gas emissions. Being at different levels of economic development the two countries share common but different responsibilities for addressing the global needs to improve energy security, reduce pollution and address climate change. However, by jointly cooperating on addressing the complex issues related to changing existing energy trends, the potential to find sustainable solutions can be increased and the demonstration/deployment of new technologies can be accelerated. Both countries need to become thoroughly engaged in the restructuring of their energy sectors. This will require applying a systematic approach to understanding the complex interrelationships between energy and the economic and environmental performance of their economies.

Major steps at initiating new energy and environmental policies have been made in both countries, but the results to date are insufficient to resolve the energy security and environmental challenges facing both countries and the

world at large. World crude oil prices recently rose to \$135 per barrel, which would raise the United States annual oil import cost to almost \$600 billion for over 12 million barrels per day of net imports. The December 2007 Energy Bill made what seemed at the time to be major commitments to supporting a transition towards lower reliance on imported oil and increased energy efficiencies; these commitments now appear insufficient in relation to the magnitude of the challenge. Today China is the world's second largest importer of oil and with \$135/barrel oil would be spending at a rate of \$170 billion a year for 3.5 million barrels per day of net imports, based on 2006 volumes. However, in the last two decades China has experienced an unparalleled pattern of economic growth. Expectations and consumption patterns are being set that, left unchecked could lead China's 1.3 billion people to surpass the United States in the demand for oil imports within the next twenty to twenty-five years. At the same time, China needs to reduce dramatically the levels of environmental pollution associated with economic expansion to improve health and living conditions. Simultaneously, the world has recognized that global warming is a reality that needs to be addressed by major shifts in the forms and efficiency with which energy is consumed. This will require the development, implementation and enforcement of both mitigation and adaptation goals, strategies and policies.

Given their economic size and impact on global markets, **it is imperative that the U. S. and China join in a mutually beneficial process** to make significant progress immediately. Together we need to develop and implement consistent and coherent action plans in order to alter current trends. **The global community is late in taking meaningful action, and the urgency of taking dramatic action is now apparent.**

The U.S.-China Ten Year Energy and Environment Cooperation Framework was jointly established by the United States and Chinese govern-

ments in December 2007 to focus on extensive cooperation over a ten-year period to address the challenges of environmental sustainability, climate change, and energy security. A fact sheet describing this Framework is included as Appendix I.

A joint steering committee has been established to guide the Ten Year Cooperation Framework, co-chaired by Secretary of the Treasury Henry M. Paulson, Jr. for the United States and Vice Premier Wang Qishan for China. The steering committee will be supported by a lead agency from each country: the Treasury Department serves as the lead agency for the United States, and the National Development and Reform Commission (NDRC) serves as the lead agency for China.

China and the United States are already involved in a number of bilateral and multi-lateral energy related agreements. These include:

- An Agreement on Cooperation on Peaceful Uses of Nuclear Technologies
- Statement of Intent on Nonproliferation assurances required for transfers and mutual exchanges of nuclear technology
- A Memorandum of Understanding to Prevent Illicit Trade in Nuclear and other Radioactive Material
- Protocol for Cooperation in the Field of Fossil Energy Technology Development and Utilization with Ministry of Science and Technology (MOST) that has been expanded by several Annex Agreements
- Cooperation with MOST on Vehicle Efficiency and the Development of Electric, Hybrid-Electric, Fuel Cell, and Alternative Vehicle Development
- Cooperation in Clean Energy Technologies for the 2008 Summer Olympic Games in Beijing
- A Memorandum of Understanding with the National Development and Reform Commission (NDRC) on Bilateral Energy Policy Dialogue
- A Memorandum of Understanding with NDRC on Industrial Energy Efficiency Cooperation

- A Memorandum of Understanding on Biofuels Cooperation
- US and Chinese participation in the Hydrogen Initiative
- US and Chinese participation in the International Thermonuclear Experimental Reactor (ITER)
- Pending agreement with Housing and Rural Construction for training
- Pending agreement on Carbon Capture and Storage

A fuller description of most of these agreements is provided in Appendix II.

Action plans to be developed by the task forces may expand the extent and timing of these agreements, but would not replace existing activities in progress. Rather, the new plans would reflect a greater use of inter-agency cooperation from both the U.S. and Chinese side. The plans are to reflect a collaborative model for joint R&D that supports each country's strategic goals, provides more transparency for joint research, demonstration, and deployment, and provides a balanced exchange of benefits.

Comments on the Task Force on Clean and Efficient Transportation

On May 7, 2008 the Atlantic Council of the United States held a meeting in Washington, D.C., to discuss the opportunities and challenges facing the Task Force on Clean and Efficient Transportation. A list of participants in the meeting is shown in Attachment III. There was strong concurrence by the American participants that the initiative should be supported as a long-term commitment across changing administrations in both countries. The undertaking is seen as leading to a common understanding of challenges to both countries and as accelerating the development of appropriate solutions for each country.

It is also seen as enhancing bilateral relations, strengthening economic growth in both countries

and increasing the potential for two-way trade between China and the United States.

A May 22, 2008, meeting in Beijing to elicit Chinese input regarding the value of establishing a Ten Year Cooperative Framework and to identify specific areas for potential cooperation followed the Washington meeting. Participants in this dialogue represented a cross section of industry, research institutes, academia, and government as shown in Attachment IV. Again, while recognizing the substantial level of existing cooperation, there was strong support for developing even greater cooperation between the United States and China.

Although China and the United States are at different stages of development, both face many of the same challenges in revamping transportation for the future. Both must undertake a systematic approach to implement the policies and actions required to meet their similar national goals of energy security and improving the environment. Specific long-term goals need to be established, strategies developed, supporting policies approved and enforced, and enabling technologies developed and utilized. This should be done within a framework that holistically recognizes the interconnections across industry sectors and all segments of society.

In both the United States and China the existing transportation systems are viewed as unsustainable given the need to ensure energy security, reduce pollution and simultaneously lower the emissions of greenhouse gases. Dramatically lowering the dependency on oil through new vehicle technologies and fuel substitution can significantly help achieve these goals. At the same time, the transportation systems in both countries will need to be transformed. The full range of transport modes (pipelines, inland waterways, rail, marine, air and road) needs to be more effectively and efficiently utilized. Freight inter-modal capabilities need to be improved and

urban planning needs to reduce congestion while reducing the magnitude of transportation needs through technological progress and other measures, such as altering current lifestyles and optimizing the rational configuration of economic development. It is also important that the United States and China develop national strategies and plans that establish policies and measures to encourage and support participation by the public and companies in sustainable transportation.

There are also important differences in the two countries that need to be recognized when designing specific action plans within a long-term cooperative framework.

The United States has a massive, complex transportation system that is heavily dependent on road vehicles and to a lesser (but still substantial) extent on air, marine, rail, and pipeline transportation. There is a huge investment in existing infrastructure that was made many years ago and is now in need of significant maintenance. The existing infrastructure historically supported a dynamic automotive industry that fueled economic growth and led to an American way of life that is heavily dependent upon the availability of cheap automotive fuel. Within the United States, the existing system reflects a strong preference for road freight to meet the needs of a very dynamic interconnected economy that is highly dependent upon smoothly functioning supply lines.

The United States is a large country, and transportation accounts for forty percent of total final energy demand. Today, almost all this demand is met by oil. With the country dependent upon over 13 million barrels a day of imports for roughly sixty percent of total oil consumption, the recent explosion in world crude oil prices seriously threatens the viability of the U.S. transportation structure. The problem is compounded by the growing realization that the potential for any significant increase in global conventional oil supplies is severely limited. Hence, it is logi-

cal that **the United States' most immediate and highest priority is on replacing a significant portion of conventional crude oil-based transportation fuels and improving vehicle efficiencies.** Changes to the overall transportation systems will also be necessary. However, such changes will involve difficult political choices and require lifestyle changes and alterations to infrastructure that will take time to sort through and implement.

In contrast, China is still at the relatively early stages of developing its transportation infrastructure and systems. They are still in a position to choose between transportation modes and the lifestyle implications of different transportation systems and urban designs. Today, the migration to urban areas is still ongoing with 20 million people a year moving to cities. This is expected to continue for some time as currently only 45 percent of Chinese live in cities versus over 75 percent in the United States and other developed countries. Although automobile ownership has been growing rapidly, the penetration level of automobiles in the population is only five percent of that in the United States, and the average Chinese travels only one tenth the distance in a week as the average American. This data reflects both the early stages of the country emulating the American experience and the bimodal nature of the Chinese economy. A presentation by Prof. Wu Zongxin of the US-China Energy and Environmental Technology Center provides a fuller understanding of the current status of China's transportation conditions, and can be found on the Atlantic Council website at www.acus.org/programs-energy_.asp. While China's automotive industry is still in its infancy, the experience of the last two decades has resulted in urban traffic congestion that has reduced the speed of travel by 50 percent and become the major source of air pollution in some cities. In looking at this experience, China is very concerned that the current path of transportation developments is not sustainable. China does not want to, nor believe it can, emulate the U.S.

system. **Hence, China places its highest priority on creating a sustainable transportation system that will balance the need for transportation services with better urban designs that will lead to an improved quality of life for its citizens, through rational configuration of regional economic development and sustainable urban mobility.** Improvements to vehicle efficiencies and the development of alternative fuels will also remain critical to reduce the growth in oil import costs and the dependency on unreliable long-term sources to meet growing transportation fuel requirements.

Despite a difference in short-term priorities, both China and the United States share a complete overlap in strategic interest and longer-term goals related to creating clean and efficient transportation systems. The challenge will be to develop action plans that create a set of cooperative activities that meet the short, intermediate and long-term needs of both countries. The Ten Year Plan for Cooperation will need to address all aspects of each country's transportation system. The priorities of both countries should be recognized in designing action plans. This implies that early attention should be focused both on:

1. Assessing the interfaces and tradeoffs between transportation modes, infrastructure issues, and the integration of transportation issues and urban planning,
2. Accelerating improvements in vehicle efficiencies and the introduction of new vehicle technologies, and
3. Identifying and prioritizing policies and measures to encourage and support public and private participation in sustainable transportation.

Both the United States and China would benefit from cooperation on such issues in order to create an efficient, effective and less polluting overall transportation network. Ultimately, both countries need to address both sets of issues.

To ensure mutual commitment to the Ten Year Framework the top priorities of both countries should be addressed simultaneously. Within the ten-year timeframe there is urgency to reduce the levels of conventional oil consumption and associated pollution and greenhouse gas emissions, and to fundamentally realign the public expectations for transportation and the physical transportation systems in both countries. **The task force is encouraged to multi-task and work activities in parallel.**

The development of an action plan focusing on even a segment like light vehicles will require using a multi-agency approach with systems analysis to bring together the different stakeholders to inform decision makers of choices. Policies will need to be developed to incentivize the use of a range of the most appropriate technologies. Because the future development of new technologies related to transportation will be uncertain for some time, it is important that **action plans are designed to reflect a portfolio of technologies.** The potential for various technologies will change over time and the process should maintain the flexibility to make adjustments accordingly. Additional complexity is added by the **requirement to cross-pollinate ideas** between those responsible for other sectors and functions impacted by choices being made.

Undertaking long- term cooperative activities are seen as being mutually beneficial:

- The U.S. and China face the same situation on energy security. To the extent that we can move together to reduce oil imports, the pressures on world oil markets can be reduced and the upward spiral in oil prices mitigated. Current levels of global oil production might be maintained for some time as demand in other developing regions continues to expand.
- There is a common need to change the underlying propulsion technology and vehicle fuels.

- The joint development of markets can lower costs and accelerate the penetration of new technologies.
- Both countries can benefit by systematically determining the most efficient and effective modes of transportation and improving inter-modal capabilities for the efficient movement of freight.
- Both countries need to ensure the development of transportation systems and services that improves their citizen's quality of life and economic wellbeing.

The Ten-Year Framework will need to be supported across three Five-Year Plans in China and by three U.S. administrations. In order for this effort to succeed, **it will be necessary to capture the imagination of the leadership in both countries.** The urgency of dealing with the economic and social consequences associated with existing transportation systems should be enough to maintain leadership support across administrations in the U.S. and Five Year Plans in China. Nevertheless, it is essential to maintain political leaders' enthusiasm for such an intense level of cooperation by ensuring that one or two highly visible actions are undertaken each year.

Expanding cooperation is also seen as providing an opportunity to change the dynamics affecting the current stalemate over intellectual property rights. China's regulations protecting intellectual property rights cause many U.S. companies to be reluctant to invest and transfer technology to China. Investors providing venture capital for new technology are particularly concerned. It may be possible to protect intellectual property rights for technologies that China would find particularly attractive. Eventually, as China develops its own technologies, the need to protect intellectual property rights will be seen as mutually beneficial.

Most importantly, the basic premise of the agreement to establish a U.S.-China Ten Year Energy and Environment Cooperative Framework is that the **two countries would be treated as equal partners.** While national, regional and local governments can establish and support the conditions and incentives for the development and introduction of new technologies and changes to existing transportation systems, actual implementation will depend upon public acceptance and public/private investments and initiatives. Cooperation will entail joint research, development and demonstration projects and in many instances lead to joint ventures for accelerated commercialization. The success of such cooperative activities will require mutual trust and respect. As in any relationship, to be successful this means **both countries will need to maintain an open, transparent relationship** that avoids unilateral decisions and honors commitments. Successful partnerships require mechanisms and procedures for joint decision-making

Opportunities for Cooperation

In the two dialogue sessions, many substantive ideas were suggested for cooperation that could assist and accelerate the rate at which China and the United States can alter their transportation systems to meet the tremendous challenges of obtaining energy security, reducing environmental pollution and mitigating and adapting to global climate change. These ideas for greater U.S.-China cooperation can be grouped into four basic categories, namely recommendations related to:

- Increasing the efficiency of all forms of transportation vehicles and providing alternative fuel sources
- Altering the design and modal choices of transportation systems
- Building both countries' capacity to manage and alter the existing systems
- Finding methods and opportunities for accelerating the pace of change.

Besides noting the opportunities in each category, some challenges to cooperative activities are also noted. In most instances these challenges do not invalidate the value of cooperation, but rather affect the speed at which cooperation can be expected to lead to implementable results. The opportunities listed reflect the output of the brainstorming activities and subsequent discussions in the two meetings. Given historical circumstances, the U. S. side clearly prefers to concentrate on technology developments, and the China side clearly prefers to concentrate on determining how to restructure its transportation system to improve sustainability and life styles. However, each side recognizes the need to do both within the ten-year time frame. Hence, the official work groups should find it possible to develop Action Plans that meet the priorities of both countries. A * has been placed next to those ideas that were emphasized the most during the meetings.

Increasing Vehicle Efficiency and Alternative Fuels

- *Move to electric road vehicles: Hybrid vehicles and plug-in hybrid vehicles (Challenges: development of lithium ion batteries; reliability and availability of electric power and Smart Grid technology)
- Greater use of diesel versus gasoline in motor vehicles
- Greater use of Compressed Natural Gas vehicles where natural gas is available
- Electrification of rail
- *Develop lithium ion batteries capable of extended ranges and fast charging and design practical recycling programs.
- *Hydrogen Fuel Cell vehicles (Challenges: availability and distribution of hydrogen; reliability and shelf life of components; energy cost of producing hydrogen)
- Integration of Solar power and vehicle technology (Challenges: reducing costs and improving efficiency of photovoltaic)
- *Biofuels based on cellulosic materials (Challenges: avoiding adverse impact on food and water supplies; determination of life cycle impacts and transportation of product and feed stocks). Plastics can also be produced from this material.
- *Promotion of Flex fuel vehicles
- Utilize 4 cycle versus 2 cycle engines in two and three wheel vehicles
- Oil from Algae (Challenge: technology is in early stage of development)
- Oil from coal liquefaction (Challenge: carbon capture and storage)
- Development of more efficient engines and lower weight components for motor vehicles.
- Joint Development of a highly efficient airplane for the Chinese market.
- Determination of the potential impact of new vehicle propulsion and alternative fuel technologies on the full integration of petrochemical/fuel industry and on the utility business, including the utilization of renewables for electric power
- *Reduce the pollution impact of existing conventional fuels by improving fuel specifications. Initially focus on diesel and gasoline, later focus on marine and aviation fuels. (Challenge: without a move to market pricing, refiners will not have sufficient cash flow to invest in improved product specifications)
- *Pricing and non-pricing measures to mitigate urban congestion (Challenge: technologies and policies are available but require political will and availability of mass transit)
- *Development of standards and testing methodology to ensure performance and to facilitate international trade
- *Joint cooperation on developing a Technology Road Map that would provide some direction and guidance to investors and industries in assessing the potential and likely timing of wide range of potential technologies.

Transportation Systems

- *Assessment of modal options to determine more efficient utilization of road, rail, inland water, marine and air (Challenge: Would require much closer coordination between states and provinces and some reduction in autonomy)
- *Increase the proportion of traffic moved by rail which requires one-twelfth the energy per kilometer as automotive and truck vehicles
- Assess the potential to reduce commodity flows among regions by determining rational trade offs between resource costs and transportation costs.
- Assess and improve inter-modal capabilities to minimize delays/congestion and reduce the inefficient use of facilities
- Coordinate on undertaking a national assessment of air transportation routes and the size of planes required to provide cost effective service given the costs of fuel and equipment and the availability of pilots.
- *Assess the interface between transportation infrastructure, urban planning and mass transit systems:
 - o Increase public traffic in urban areas with greater use of light rail and bus transit, paying particular attention to providing facilities to reduce inconveniences associated with the “last mile of travel”.
 - o Design urban transportation to encourage the greater utilization of battery driven and non-motorized bicycles.
 - o Assess if urban work/housing can be designed to minimize the desire for a second vehicle.
 - o Rationally redeploy/configure the urban transportation function to reduce the cost and time of daily commute.
 - o Jointly assess the life style impact and transportation costs associated with urban designs that result from creating dense Central Business Districts without convenient, affordable residential buildings.
- o Assess if there is a logical design limitation to the size of cities. Draw on experiences in the United States and China.
- *Establish a set of sister cities to pilot test various new technologies such as:
 - o Congestion pricing schemes and limitations on urban access
 - o Utilization of high speed intercity rail transit
 - o Development of satellite cities utilizing carbon neutral technologies for buildings and transportation (example: Solar city built by China-Himin Solar Group).
- *Determine what can be done to maintain current level of carbon emissions over next five years and what would be the impact on automotive and transportation sector.

Capacity Building

- Create research hubs focused on particular technologies bringing in public and private participation. Align these hubs with U.S. universities and research centers.
- Establish joint teams to study and train in the procedures to assess and establish policies, incentives and enforcement mechanisms related to environmental concerns, urban and mass transit planning, and the development of new technologies. This should consist of Chinese teams to United States and U.S. teams to China for extended periods (one to three months)
- Establish public/private institutions to do systems (modeling and) analysis to assist in developing strategies, enabling policies and incentives, and identifying enabling technologies
- *Establish joint research collaboration between U.S. and Chinese national labs
- Establish a joint program to train in the collection and verification of data to assist in the better analysis of options and to allow the impact of policy decisions to be more accurately assessed.
- Use American experience to jointly assess how national, provincial and local governments can be brought into a financial partnership

Accelerating Change

- Utilize joint Chinese-U.S. task forces to identify opportunities to utilize mass purchasing power to accelerate the introduction of new technologies and fuel and to bring costs down faster.
- Consider military to military cooperation on the introduction of new vehicle technologies and fuels (Challenge: Reaching agreement on the mutual benefits of reducing reliance on imported conventional oil)
- *Establish joint research and development teams for particular technologies, such as hydrogen fuel cells, cellulosic fuels and products, and oil from algae (Challenge: establishment of intellectual property rights for both sides in the commercialization of technology)
- *Accelerate the commercialization of new technology by undertaking joint demonstration projects in China, taking advantage of shorter permitting and construction times.
- *Establish Green Economic Zones in both countries and share results.
- Cooperate in rebuilding a new city in the area impacted by the recent earthquake (in China) to showcase a zero emissions city supporting a high quality life style.
- *Government investments in research and demonstration projects and financial support for the introduction of new technology should be greatly expanded given the urgency and magnitude of the task.
- Establish a trillion dollar fund to be financed equally by both countries for spending on parallel “mirror image” projects to be undertaken simultaneously in both countries over the next ten years. Each country invests \$50 billion a year for ten years.
- Assist in developing structural reforms to the financial system to allow a greater flow of capital to the most attractive projects.
- Assist in identifying innovative financing arrangements that could encourage greater investments in energy efficiency and (deployment of) new technologies.
- Assist in identifying trade barriers that reduce the flow of investments into increasing efficiencies.
- Jointly assess incentive mechanisms and tax systems in both countries to support desired behaviors.
- Jointly assess the mechanisms to ensure the effectiveness of legal enforcement of standards
- *Strong and compelling leadership in both countries will be required to change general behavior and lifestyle. Major message is needed to reduce consumption by becoming more efficient in the use of energy.

Appendix I:

The U.S.-China Ten-Year Energy and Environment Cooperation Framework 12 May 2008

The U.S.-China Ten Year Energy and Environment Cooperation Framework was jointly established by the United States and Chinese governments at the third meeting of the U.S.-China Strategic Economic Dialogue (SED) in December 2007. This Cooperation Framework is focused on extensive cooperation over a ten year period to address the challenges of environmental sustainability, climate change, and energy security.

A joint steering committee has been established to guide the Ten Year Cooperation Framework, co-chaired by Secretary of the Treasury Henry M. Paulson, Jr. for the United States and Vice Premier Wang Qishan for China. The steering committee will be supported by a lead agency from each country: the Treasury Department serves as the lead agency for the United States, and the National Development and Reform Commission (NDRC) serves as the lead agency for China.

The Ten Year Cooperation Framework is a broad, interagency effort encompassing a number of agencies with responsibilities for energy and environment issues in both the United States and Chinese governments. These agencies are represented on an interagency working group that is responsible for developing short-term, medium-term, and long-term goals for bilateral cooperation and establishing a task force for each goal that is identified. For the United States, in addition to the Treasury Department, agencies that are represented include the Department of State, Department of Commerce, Department of Energy, and the Environmental Protection Agency. For China, in addition to the National Development and Reform Commission, agencies that are represented include the Ministry of Finance, the Ministry of Environmental Protection, the Ministry of Science and Technology, and the Ministry of Foreign Affairs.

Task forces will be responsible for guiding development and implementation of initiatives underneath the Ten Year Framework. Representatives from multiple agencies of both governments will comprise the membership of task forces and will draw upon relevant expertise from all sectors of society. Core areas that each task force will address include: participating agencies, targets, responsibilities, timetable and resources; basic research and joint technological research and development; technology commercialization; policy development and incentives; information sharing; scientific exchanges; and capacity building.

Five goals have been identified jointly by both countries and task forces have been established. These five areas are:

- Clean, Efficient, and Secure Electricity Production and Transmission
- Clean Air
- Clean Water
- Clean and Efficient Transportation
- Conservation of Forestry and Wetland Ecosystems

Appendix II:

Existing U.S.-China Energy Cooperation Agreements

Source: U.S. Department of Energy

1) Agreement between the Department of Energy of the United States of America and the State Development Planning Commission of the People's Republic of China on Cooperation Concerning Peaceful Uses of Nuclear Technologies

Description: The areas of cooperation under this Agreement include but are not limited to the following: a) current and advanced light-water nuclear power reactors technologies; b) reactor neutronics analysis and experimentation, including reactor and plant shielding and nuclear data; c) reactor and plant safety, including safety standards, system safety analysis, severe accidents analysis, and accident management; d) fuel and materials, including structural, component, absorber and circuit materials, long-life fuel and clad material; and other related areas.

Date Signed: 29-June-1998 **Expires:** 6/29/2003 - with an automatic renewal for five additional years, unless either Party notifies the other of its intent to terminate Agreement.

2) Protocol for Cooperation in the Field of Fossil Energy Technology Development and Utilization between the Department of Energy of the United States of America and the Ministry of Science and Technology of the People's Republic of China.

Description: This Protocol promotes the Ministry of Science and Technology (MOST) and the Beijing Municipal People's Government (BMPG) use of clean energy technologies as well as to provide technical assistance to MOST and BMPG in energy and environmental policy and planning for the 2008 Summer Olympic Games.

Date Signed: 20-April-2000 **Expires:** 20-April-2010

3) Statement of Intent between the Department of Energy of the United States of America and the Municipality of Beijing of the People's Republic of China Concerning Clean Energy Technologies.

Description: This creates a framework for collaboration in order to improve the environmental quality of Beijing, with a focus on assisting MOB to develop clean energy technologies, and energy and environmental policies in preparation for the 2008 Summer Olympic Games.

Date Signed: 10-Sep-2002 **Expires:** No Ending date

4) Annex II to the Protocol on Cooperation in the Field of Fossil Energy Technology Development and Utilization between the Department of Energy of the United States of America and the Ministry of Science and Technology of the People's Republic of China for Cooperation in the Area of Clean Fuels.

Description: The objectives of this Annex are to "jointly investigate and discuss key factors, analyses, data, processes, and technologies leading to the preparation and utilization of coal as a) an environmentally acceptable and economic resource for the production of alternative transportation fuels, additives, and chemicals; b) a preferred feedstock for the production of power; and c) a source of energy for the industrial sector.

Date Signed: 19-Nov-2002 **Expires:** 19-Nov-2007

5) Statement of Intent

Description This Statement of Intent was signed by former Secretary Abraham of DOE and the Chairman of the China Atomic Energy Authority (CAEA). They reached an agreement on exchange of nonproliferation assurances required for transfers and mutual exchanges of nuclear technology.

Date Signed: 16-Sept-2003 **Expires:** No ending date

6) The Department of Energy of the United States of America and the Ministry of Science and Technology of the People's Republic of China for Cooperation in the Field of Energy Efficiency and Renewable Energy Technology Development and Utilization - Annex V Development of Electric-Drive and Fuel Cell Technologies.

Description: This Annex establishes the framework for collaboration, including research, development, information exchange and demonstrations. Areas of cooperation are: a) Technical Cooperation – Battery.

Date Signed: 29-Oct-2003 **Expires:** 29-Oct-2008

7) Protocol for Cooperation in Clean Energy Technologies for the 2008 Summer Olympic Games in Beijing.

Description: This Protocol covers cooperation in the following areas: a) clean coal; b) natural gas; c) new and renewable energy; d) distributed combined heating/cooling and power system; d) distributed combined heating/cooling, and power systems; e) energy efficient building technologies, including building design, rating systems, solar, and geothermal energy applications; f) alternative fuel vehicles; g) urban transportation systems, including a broad range of public transportation issues and technologies; and h) other areas in alignment with the missions of both DOE and MOST.

Date Signed: 12-Jan-2004 **Expires:** 12-Jan-2010

8) Statement of Intent between the Department of Energy of the United States of America and the China Atomic Energy Authority of the People's Republic of China Concerning Cooperation in the Field of Peaceful Use of Nuclear Energy and Nuclear Non-Proliferation and Counter-Terrorism.

Description This SOI continues the agreement that was transferred between Department of Energy (DOE) and the China Atomic Energy Authority (CAEA), signed on September 16, 2003. Areas of cooperation are: a) Peaceful use of Energy - Nuclear reactors technology and nuclear application technologies: including cooperation on reactor design and safety of nuclear power plants, nuclear fuel and materials; and b) Non-Proliferation - Export Control and International nuclear safeguards and physical protection.

Date Signed: 12-Jan-2004 **Expires:** 12-Jan-2009

9) Memorandum of Understanding between the Department of Energy of the United States of America and the National Development and Reform Commission of the People's Republic of China on Bilateral Energy Policy Dialogue

Description: This MOU forms an Energy Policy Working Group to conduct energy policy dialogues between the United States and the PRC. The Working Group will enhance the understanding of energy issues, promote the exchange of information on energy policies and technologies, and to review and develop cooperative activities on energy-related topics.

Date Signed: 23-May-2004 **Expires:** 23-May-2009

10) **Agreement to Extend the Protocol for Cooperation in the Field of Fossil Energy Technology Development and Utilization between the Department of Energy of United States of America and the Ministry of Science and Technology of the People's Republic of China.**

Description: This extends the reference agreement to continue cooperation in the field of fossil energy technology development and utilization.

Date Signed: 05-April-2005 **Expires:** 20-April-2010

11) **Joint Statement of Intent between by the Department of Energy of the United States of America and the Customs General Administration, the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China Concerning Exploration of Cooperation in Nuclear and other Radioactive Material Detection**

Description: This joint statement explores future cooperation in safeguarding global maritime trade by enhancing, through modern technological means, monitoring at major Chinese ports of high-risk containers that pose a potential terrorist threat, to ensure their in-transit security.

Date Signed: 02-Sep-2005 **Expires:** No ending date

12) **Memorandum of Understanding among the General Administration of Customs, the General Administration of Quality Supervision, Inspection, and Quarantine of the People's Republic of China and the Department of Energy of the United States of America Concerning to Prevent the Illicit in Nuclear and other Radioactive Material**

Description: This MOU provides the PRC participants technical assistance funded by DOE in the form of equipment and materials, as well as training and services, for the use at PRC seaports for detecting and preventing illicit trafficking in special nuclear material and other radioactive material.

Date Signed: 19-Nov-2005 **Expires:** 19-Nov-2008

13) **Memorandum of Understanding between the Department of Energy of the United States of America and the National Development and Reform Commission of the People's Republic of China Concerning Industrial Energy Efficiency Cooperation.**

Description: This MOU "jointly promotes industrial energy efficiency improvements and emissions reductions through the establishment of programs and activities designed to strengthen the PRC's national, regional and local energy efficiency ability to make improvements at energy-intensive factories and facilities".

Date Signed: 12-Sep-2007 **Expires:** 12-Sep-2012

14) **Annex II to the Protocol between the Department of Energy of the United States of America and the Ministry of Science and Technology of the People's Republic of China for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization for Electric, Hybrid-Electric, Fuel Cell, and Alternative Fuel Vehicle Development.**

Description: This Annex establishes the framework for specific collaboration; promotes large-scale deployment in the PRC and the United States of advanced automotive technologies for electric vehicles, light duty passenger and business vehicles, electric buses, and other forms of electric. Areas of cooperation are: a) advanced batteries; b) alternating current motor control systems; c) fast charging batteries; d) advanced materials for vehicle systems; and e) vehicle charging and fueling infrastructure.

Date Signed: 17-Sep-2007 **Expires:** 17-Sep-2012

**Appendix III:
Participants in May 7th Meeting on U.S.-China Cooperation
On Clean and Efficient Transportation (Washington, DC)**

Includes attendees (*) and those companies who were not present but will monitor ongoing progress

***Charlie Ashman**

Director of Business Development
BioEnergy International, LLC

David Bailey

Exxon Mobil

***Kimberly Ballou**

International Relations Specialist
European and Eurasian Affairs
Office of Policy and International Affairs
U.S. Department of Energy

***James Bartis**

Senior Policy Researcher
Rand Corporation

Steve Biegun

Ford Motor Company

***Bo Shen**

Director
China Energy Efficiency Project
Natural Resources Defense Council

***Keith Cole**

Director
Legislative and Regulatory Affairs
General Motors Corporation

***Tom Collina**

Executive Director
2020 Vision

***Rory Cooper**

Senior Policy Advisor
Policy and International Affairs
U.S. Department of Energy

***Daniel Driscoll**

National Energy Technology Laboratory

***George Eads**

Senior Consultant
CRA International

Michael Eckhart

President
American Council on Renewable Energy

***Jay Farrar**

Senior Vice President
Government Affairs
CH2M Hill

James Fowler

International Trade Specialist
U.S. Department of Commerce

***Katharine Fredriksen**

Principal Deputy Assistant Secretary
Office of Policy and International Affairs
U.S. Department of Energy

Stephen Gatto

Chairman and CEO
BioEnergy International, LLC

***Jack Gehring**

Manager
Global Regulatory Policy
Caterpillar, Inc.

David Hawkins

Director
Climate Center
Natural Resources Defense Council

***Peter Haymond**

Chief
Energy and Natural Resources Division
Economic, Energy and Business Affairs
U.S. Department of State

***William Holmberg**

Member
Board of Directors
American Council on Renewable Energy

***S.T. Hsieh**

Director
US/China Energy and Environmental Technology Center
Tulane University

***Eugene Huang**

Policy Advisor to the Secretary
U.S. Department of the Treasury

***Frank Kramer**

Member
Board of Directors
Atlantic Council of the United States

***Richard Lawson**

Vice Chair
Atlantic Council of the United States

***Deron Lovaas**

Vehicles Campaign Director
Natural Resources Defense Council

***John Lyman**

Director
Energy and Environment Program
Member
Board of Directors
Atlantic Council of the United States

***Erica McCarthy**

Assistant Director
Energy and Environment Program
Atlantic Council of the United States

***John Mizroch**

Principal Deputy Assistant Secretary
Office of Energy Efficiency and Renewable Energy
(EERE)
U.S. Department of Energy

***Terry Pritchett**

Director
Energy, Environment and Safety Policy
Public Policy Center
General Motors Corporation (China)

***Arthur Rypinski**

Energy Policy, Office of the Secretary
U.S. Department of Transportation

***David Sandalow**

Senior Fellow
The Brookings Institution

***Les Shephard**

Vice President
Energy Resources and Nonproliferation
Sandia National Laboratories

Wade Sheppard

Senior Advisor for North Asia
Office of Country and Regional Affairs
Foreign Agriculture Service
U.S. Department of Agriculture

***Taiya Smith**

Deputy Chief of Staff
U.S. Department of the Treasury

Joseph Snyder

Director
Asia Programs
Atlantic Council of the United States

Joel Szabat

Deputy Assistant Secretary for Transportation Policy
U.S. Department of Transportation

Barry Worthington

Executive Director
United States Energy Association

***Daniel Wright**

Managing Director
China and the Strategic Economic Dialogue
U.S. Department of the Treasury

Joshua Wu

International Trade Specialist
Office of the China Economic Area
U.S. Department of Commerce

***Phyllis Yoshida**

Deputy Assistant Secretary
International Energy Cooperation
Office of Policy and International Affairs
U.S. Department of Energy

***Charles Zeh**

Director
Project Management Center
National Energy Technology Laboratory

Appendix IV:
List of Attendees at May 22nd Meeting on
U.S.-China Cooperation on Clean and Efficient Transportation (Beijing, China)

Lidian CHEN

PetroChina

Brent Christensen

Environment, Science, Tech. & Health
U.S. Embassy in Beijing

Rory Cooper

Senior Policy Advisor
U.S. Department of Energy

Marco Di Capua

Executive Director
U.S. Department of Energy China Office

Minghua DU

Researcher
Shenhua Group

Michael Eckhart

President
American Council on Renewable Energy

Hua FAN

Institute of Transportation, NDRC

Xiuhua FENG

Former Bureau Director/State Counsel Consultant, MOF

Mark Ginsberg

Member, Board of Directors
Energy Efficiency and Renewable Energy
U.S. Department of Energy

Christopher Green

Environment, Science, Technology & Health
U.S. Embassy in Beijing

Xianrong HAO

Division Director
Department of Science and Education, MOA

Jiankun HE

Director
Low Carbon Energy Lab, THU

S.T. Hsieh

Director, US/China Energy and Environmental
Technology Center, Tulane University

Eugene Huang

Policy Advisor to the Secretary
U.S. Department of the Treasury

Timothy Hui

Chief Representative, Beijing Office
Natural Resources Defense Council (NRDC)

Caroline Katzin

U.S. Department of Commerce

Bryan Larson

U.S. Department of Commerce

MingXiao LI

Division Director
Department of International Corporation, MOF

Li Wan

Government Relations
Caterpillar (China) Investment Co., Ltd.

Yaying LI

PetroChina

Zheng LI

Director
BP-Tsinghua Clean Energy Center

Zhenyu LI

Academy of Transportation Science, MOT

John Lyman

Director, Energy and Environment Program
Member, Board of Directors
Atlantic Council of the United States

John Mizroch

Principal Deputy Assistant Secretary
Energy Efficiency and Renewable Energy
U.S. Department of Energy

Terry Pritchett

Director, Energy, Environment and Safety
Policy, Public Policy Center
General Motors (China)

Dinghuan SHI

Former General Secretary
State Counsel Consultant
MOST

Taiya Smith

Deputy Chief of Staff
U.S. Department of the Treasury

Joseph Snyder

Director, Asia Programs
Atlantic Council of the United States

Joel Szabat

Deputy Assistant Secretary
Transportation Policy
U.S. Department of Transportation

Cindy Wang

Manager, Government and Public Affairs
Exxon Mobil

Daniel Wright

Managing Director
China and the Strategic Economic Dialogue
U.S. Department of the Treasury

Zongxin WU

Director/State Counsel Consultant
US-CHINA Energy and Environment
Technology Center
Tsinghua University

Albert Xie

Ecomagination Program, General Electric

Yang Fuqiang

Vice President, Chief Representative, Beijing
Energy Foundation

Benny Zhang

Manager, Global Energy Systems
General Motors China

Cuiqing ZHANG

Shenhua Group

Xiliang ZHANG

Professor
Research Institute of Energy and Environmental
Economy, THU

Gloria Zhao

Chevron Asia South SBU China

Hu ZHENG

Former Deputy President
State Counsel Consultant
PetroChina

Dadi ZHOU

Former Director
ERI, NDRC

Fengqi ZHOU

Deputy Director
ERI, NDRC

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