Center for American Progress Action Fund

The Challenge of China's Green Technology Policy and Ohio's Response

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Good morning, thank you for the opportunity to testify before this distinguished commission on the role of China's policies in the development of its clean energy sector.

My name is Julian L. Wong and I am a Senior Policy Analyst at the Center for American Progress Action Fund. I speak before this commission after having spent the past two and a half years of my professional life almost exclusively devoted to analyzing Chinese energy policies, including spending the first 10 months of this period in China as a Fulbright researcher. Most recently in April, I led a delegation of senior staffers from the Center, along with key Senate staffers from Ohio and other important districts, to Beijing and the surrounding area to look at advances in clean energy innovation and manufacturing.

To put it simply, there can now be very little doubt that China is aggressively and decisively making the necessary investments and laying the policy foundations as it seeks to become the world's leader in the invention, production, and deployment of clean energy technologies. My testimony will address five issues. First, I will outline some of China's accomplishments in its clean energy push. Second, I will analyze the comprehensive policy framework the Chinese government is using to promote the development of this sector. Third, I will describe how China's promotion of clean energy fits within its broader national economic development policy. Fourth, I will assess certain claims by the international business community that China is unfairly shutting foreign firms out of its clean energy market. I will conclude by identifying the lessons that policymakers in the United States can learn from China's example.

China's clean energy push

Over the course of the past year, there have been a series of front-page articles in top American dailies such as *The New York Times*, *The Washington Post,* and *The Wall Street Journal* describing China's massive investments in clean energy technologies. In just a few years, China has been gradually but steadily recasting its image from a coal-hungry, rapidly growing industrial economy and manufacturer of low-value added, labor intensive consumer goods, to an advanced economy where an increasingly educated and innovative workforce is creating and producing technologies of the future. Central to this concept of economic modernization is the role of clean energy technologies.

The statistics are dizzying. In 2009, China manufactured and installed more wind turbines than any other country, and now ranks third in aggregate installed wind capacity at 25 GW. China is also the world's leading manufacturer of solar panels, with six Chinese companies ranking among the top 10 silicon-based solar manufacturers of the world in terms of production capacity.[1] China also boasts the largest fleet of hydropower stations in the world (almost 200 GW) and is currently building out more new nuclear power plants (23) than any other country. China now possesses some of the most efficient coal combustion technologies and over the next decade, China will build out the densest network of ultrahigh-voltage grid transmission and electrified high-speed passenger rail.

According to a report by WWF,[2] China ranked fourth globally in clean energy technology sales in 2008 while the United States ranked second, just behind Germany. However, when it comes to clean energy technology sales as a proportion of each country's gross domestic product, the United States falls to a dismal nineteenth while China ranks sixth. As another telling comparison, China invested $34.6 billion into renewable energy and energy efficiency sectors in 2009, more than any other country, according to a study by Pew .[3] The United States was a distant second at $18.6 billion.

China's comprehensive approach to clean energy promotion

As my colleagues and I describe in a report "Out of the Running?" earlier this year, China (together with other countries like Germany and Spain) is undertaking a comprehensive approach to developing its clean energy sector.[4] This comprehensive approach consists of three "pillar" strategies of creating market, financing RD&D, and building infrastructure.

Creating markets and driving demand

Above all, the Chinese government has successfully articulated a clear, long-term vision for clean energy development, sending a stable market signal to local governments and companies.

China develops its future economic growth strategies through a series of five-year plans. Its current five-year plan (2006-2010) contains the country's most ambitious environmental targets to date, including reducing energy consumption per unit of GDP by 20 percent from 2005 levels. Each provincial level jurisdiction must meet a share of the national energy intensity target, and to increase accountability, the promotion prospects of provincial governors and government-appointed leaders of state-owned companies are rewarded or penalized based on a points system that is scored based on their ability to implement policies and ultimate achievement of such targets.

In support of this five-year target, the Medium- and Long-Term Energy Conservation Plan released in 2004 sets extensive targets for energy and resource efficiency across two dozen specific industrial sectors and equipment types and identifies 10 priority energy conservation projects in coal, petroleum, buildings, lighting, transportation, and other areas. These energy conservation targets have attracted major government and private sector investment, and

preliminary studies indicate that China will achieve or come close to achieving most of its energy conservation goals.

The Medium- to Long-Term Development Plan for Renewable Energy sets out 2010 and 2020 targets for renewable energy. China aims to generate 15 percent of its primary energy from nonfossil fuel sources by 2020, benefitting the hydropower, wind, solar, and nuclear sectors.

A range of complementary policies support these national goals. The Renewable Energy Law of 2006 requires grid companies to purchase electricity from renewable sources, and other policy initiatives require those companies to clarify how the additional costs of producing and connecting renewable energy is to be shared across all power consumers. The "mandated market share" requires power generators with an installed capacity of more than 5 GW to produce 3 percent of their electricity from nonhydro renewable sources by 2010 and 8 percent by 2020.

All these national standards and policies were not driven by climate change considerations, but by a national focus on domestic energy security and economic competitiveness gained by growing new technology sectors. But the increased frequency of droughts and floods is raising the urgency to combat climate change. Last year, China announced that it would reduce its carbon dioxide emissions as a proportion of each unit of GDP produced by 40 to 45 percent of 2005 levels by 2020. China is poised to enact new domestic measures for its next five year plan (2011 to 2015) that curb the growth of carbon emissions and will spur further growth of China's clean-energy industries.

Financing research, development, production and deployment

Another distinct advantage of the Chinese system is its ability to both mobilize large volumes of low-cost capital through various channels, including state-owned investment vehicles and financial institutions, and economic stimulus programs. Planners also use smart, targeted, and sometimes novel financial and tax policy instruments to stimulate investments in clean energy projects.

First and foremost are the "Big Four" state-owned commercial banks, which really seem to play the role of development banks and whose lending activities are often times driven by central government policy.[5] As a "priority sector," clean energy and its related infrastructure projects have received preferential access to bank loans, and at borrowing rates below what is available in other countries for similar projects. The role of credit has been particularly significant in the wake of China's economic stimulus plans, which unleashed a floodgate of bank lending—an unprecedented $1.5 trillion in 2009, and $680 billion in the first half of 2010 despite efforts by China's de facto central bank to tighten up bank lending due to concerns about inflation.[6]

National programs provide public funding to clean energy R&D, something discussed in more detail below. There are also a variety of technology-specific fiscal allocations by central and provincial governments in the clean energy sector. In 2009, the central government announced two major incentive programs for solar electricity—one for distributed rooftop solar programs, and another for utility-scale solar plants.[7] This year, the central government just last month allocated 2 billion yuan for energy conservation projects.[8] Alternative energy vehicles are also a beneficiary of financial incentives provided to public and private purchasers in a number of pilot cities.[9]

In the wind and other renewable energy sectors in particular, China has employed a comprehensive suite of financial policies to promote industry growth, including preferential feed-in tariffs for renewable electricity producers, carbon financing for clean energy project developers through the clean development mechanism under the Kyoto Protocol, subsidies to grid operators to build out transmission lines to clean energy projects in remote areas, the mandated market share as described earlier, and tax reduction incentives. On top of these national-level incentives additional carrots are dangled by provincial and local governments in the form of additional tariffs per kilowatt hour for renewable electricity, tax breaks, and favorable land pricing, among others.

State-owned enterprises are another critical driver of clean-energy deployment. China's "Big Five" power companies, all government owned, are major investors in renewable energy projects. Together, they accounted for 55 percent of all domestic installed wind capacity as of the end of 2008. China Investment Corporation, a recently formed state wealth fund with $300 billion of managed assets, is now making major investments in Chinese clean energy companies. The China Energy Conservation and Environmental Protection Group, a state holding company with more than 90 subsidiaries and 20,000 employees, invests widely across a broad range of energy conservation, pollution control, and renewable energy businesses.

Finally, Chinese planners are experimenting with novel policies that may not directly finance clean energy projects, but clearly demonstrate a preference for them by imposing restrictions on carbon-intensive projects. These include a possible carbon tax by 2014, denial of stock exchange listing of energy-intensive and pollution-intensive companies, and the denial of bank credit to such companies.

Building physical and economic infrastructure

China's ability to rapidly scale infrastructure build-out is currently unrivaled due the available of low-cost capital and vast pools of skilled and reasonably priced labor. Approximately $100 billion of its $586 billion economic stimulus plan of November 2008 is dedicated to building transmission lines and railways. China is an emerging world leader in ultrahigh-voltage, or UHV, transmission technology, with more than 100 domestic suppliers of UHV equipment. A transmission line from Shanxi to Hubei boasts the highest capacity in the world and is able to transmit 1,000 kilovolts over 400 miles. The State Grid Corporation will invest $88 billion through 2020 in building UHV transmission lines and has just unveiled a 10-year road map to build out a national smart grid.

China is also embarking on the largest railway expansion history and plans to spend almost $300 billion expanding its railway network from 48,000 miles today to 75,000 miles in 2020. Of this, 8,000 miles will be comprised of high-speed, long-distance rail that runs on electricity, displacing the use of oil. Several times, including this April, I have taken the high-speed rail between Beijing and Tianjin, and it is impressive. The train reaches a top speed of 205 mph (compared to a top speed of 110 mph on the Amtrak) and covering the 73-mile journey—roughly the distance between New York and Philadelphia—in less than 30 minutes.[10]

Just as important as the physical infrastructure is the soft infrastructure to develop its human capital. It is strengthening its education system, particularly its colleges and universities, and seeking to bolster its innovation networks through the establishment of more than 100 science parks and luring foreign researchers and returning overseas Chinese scientists. China recently

launched a medium- to long-term talent development plan to oversee its human capital investments over the next decade.

China's clean tech push is consistent with overall economic development strategy

There is no turning back on China's clean energy push. Harnessing clean domestic sources of renewable energy not only increases energy security by reducing reliance on foreign oil and coal resources, but it also reduces environmental pollution problems that threatens social stability and ultimately undermines the Party's authority to govern. Less recognized is that China's push to develop clean energy fits precisely within China's general economic development strategy.

It is no exaggeration to say that history has never seen an economic engine that has accomplished so much in so short a time as the Chinese economy in the 30 years since its reform and opening up to foreign investment. Over three decades, 400 million citizens have been lifted out of poverty while gross domestic product has increased more than twentyfold. Yet, such economic advances have come at a high price. Li Keqiang, China's executive vice-premier (and likely successor to Premier Wen Jiabao in 2012), recently used a high-profile speech to emphasize the urgent need for economic reform, including correcting several structural imbalances: an over-reliance on heavy industry, an overcapacity of backward industrial processes, an over-reliance on exports, and growing wealth gaps between coastal and western interior provinces and between urban and rural residents.[11] Li suggested the following strategies to help resolve these imbalances:

- Investing in science and technology innovation to create new high-tech and environmentally friendly industries
- Shutting down of backward capacity in heavy industry
- Reforming hitherto artificially suppressed natural resource and power prices through taxation and fees
- Actively promoting investment and job creation in western provinces through incentives and direct government expenditures to close the regional income gap
- Boosting domestic consumption so as to reduce reliance on exports

Clean energy development is in many ways the "sweet spot" industry that fits very nicely with all these goals of economic reform, which is why it garners the political support that it does from governments at all levels. Both government and private sector R&D is being encouraged in clean energy technologies (described more below); backward inefficient capacity in steel, cement, and coal power plants are being shut down; new taxes on and price liberalization of oil, coal, and gas,[12] and tariff increases of water and electricity are better reflecting scarcity values and environmental damage related to natural resource consumption;[13] and the country is actively building or promoting large-scale wind and solar farms, grid infrastructure, and high-speed rail lines in western provinces, creating jobs and contributing to additional domestic consumption in those regions.

Another aspect of China's economic reforms is the promotion of private sector "national champions" and the encouragement of such companies to expand operations internationally. One example of this "Going Out" strategy is the state-owned China Energy Conservation and Environmental Protection Group, a rapidly growing developer of domestic clean energy projects that is now considering developing large-scale solar projects in Europe. We are also seeing State

Grid acquiring Brazilian grid companies, Chinese high-speed rail companies participating in contract bids for projects in Brazil, Turkey, and even the United States, and a more established history of Chinese companies building hydropower dams in Southeast Asia and Latin America.

Because clean energy development is so compatible with China's overall economic reform, it is likely to continue enjoying strong political support from the highest level of government. The scale of the necessary transformation also means that such support is likely to be long term and sustained.

China's aggressive clean energy technology innovation strategy

A dedicated discussion on innovation is warranted because science and technology plays a central role in the economic progress of China in the eyes of the government and has direct relevance to its ambitions to become a global leader of clean energy technologies. However, certain aspects of the methods by which China promotes innovation is now being attacked by the international business community as being overprotectionist and inconsistent with principles of free trade.

China is strengthening public support of energy technology R&D

Science and technology is seen by Chinese planners as pivotal in the drive to restructure the economy from one dominated by heavy industry to a more service and knowledge-based economy, and fuel future economic growth. Fostering home-grown innovation, or "indigenous innovation" as it is now commonly termed, is a long-term strategy of China's economic planners. And clean energy technologies lie at the heart of China's science and technology push. At the World Economic Forum in September 2009, Chinese Premier Wen Jiabao proclaimed:

> We should see scientific and technological innovation as an important pillar and make greater effort to develop new industries of strategic importance. Science and technology is a powerful engine of economic growth. . .We will make China a country of innovation. . .We will accelerate the development of a low-carbon economy and green economy so as to gain an advantageous position in the international industrial competition.

In the same vein, President Hu Jintao, pioneer of the party's "Scientific Development" concept, delivered a major speech last month to the Chinese Academy of Science and Chinese Academy of Engineering—the scientific elite of China. [14] There, Hu put the development of energy conservation and new energy technologies at the top of his list of recommendations for the nation's overall science and technology strategy. Technology innovation and R&D have not been, and by many measures are still not, traditional strengths of modern Chinese industry, which is better known for its ruthless efficiency in cost cutting and manufacturing. But this is starting to change and there are already some exceptions to this in the clean energy field—China's possesses some of the world's leading technologies, such as supercritical and ultrasupercritical coal combustion technologies and ultrahigh-voltage grid transmission wires.

The Medium- to Long-Term Science and Technology National Plan, or S&T Plan, unveiled in 2006, establishes the Chinese government's strategic role in innovation activities through 2020.[15] The plan includes tangible benchmarks such as achieving global top-five rankings in patents

generated and citations in international science publications. It also identifies five priority industries with top priority given to technologies relating to "energy, water resources, and environmental protection."

To help achieve China's objectives in its S&T Plan, the government funds and administers a number of noteworthy R&D initiatives including the Key Technology R&D Program, 863 Program, 973 Program, Torch Program, and Spark Program.[16] Chinese government R&D funding has increased significantly from $6.8 billion in 1998 to $39 billion in 2008. The absolute dollar amount invested through these programs is still not by itself impressive given the size of China's economy or the scale of investment needed to truly transform China to a clean energy economy, but the S&T Plan calls for a increase in R&D funding as a percentage of gross domestic product to reach 2.5 percent by 2020 compared to just over 1.5 percent today (and 3 percent in the United States and 4 percent in Japan, today), a sizeable increase considering China's 2020 GDP would be twice that of 2010's if it grew at 8 percent per year over that duration.

However, while some of these programs have been in place for nearly two decades, it is not clear that they are yielding the hoped-for results. Some critics note that China's R&D funding is heavily skewed to applied research and experimental development, while less than 5 percent of such funding in 2007 was allocated to basic research—the result is an unbalanced innovation workforce, with basic science struggling to appeal to scientists and technicians and a continued reliance on licensing many foreign clean energy technologies instead of innovating novel technologies at home. Other challenges in China's innovation remain. There is a systemic failure to protect intellectual property rights that are so crucial in promoting innovation and a deficit in scientific integrity in many parts of its scientific community as evidenced by numerous cases of data falsification in scientific publications. Without resolving these serious and complicated issues, it will be difficult for China to build a genuine clean energy economy.

What is clear, however, is China's long-term commitment to innovation through sustained programmatic funding rather than an ad hoc approach such as providing funding through legislation that is subject to annual unpredictable appropriations, as occurs in the United States. As an example, China announced in December 2009 the establishment of 16 new energy R&D centers that will work in key sectors such as nuclear power, wind power, high-efficiency power generation and transmission, and facility materials.

But innovation does not originate in a vacuum. One of the historical features of China's technology innovation is the role of foreign technology in the innovation chain. To achieve its goals of indigenous innovation, China's government has adopted a model of "import-absorb-digest-re-innovate." Thus, the early stages of all technology development include heavy reliance on foreign technologies. These technology transfer opportunities sometimes result from intergovernmental cooperation—as was the case with energy conservation technologies made available to China through the auspices of the Japanese Green Aid Plan between 1992 and 2003. They can also result from purely commercial negotiations, as in the case of Goldwind, a Chinese wind company that acquired much of its intellectual property and know-how by licensing foreign technologies and ultimately outright acquiring a German wind company. Goldwind was virtually unheard of two years ago. Now it has gone public and is the world's eighth-largest wind turbine manufacturer.

Today, China continues to increase its R&D capacity by welcoming expertise from Western multinational high-tech corporations. Applied Materials, the world's biggest supplier of solar manufacturing equipment, has opened a new major R& D facility in China and has relocated its chief technology officer from Silicon Valley to China. Applied Materials's move follows on the

heels of DuPont, another American company that expanded its solar R&D facilities in Shanghai last summer, and IBM, which opened its R&D facility for software control systems for high-speed rail in Beijing around the same time. Consistently, my colleagues and I heard from several foreign business executives during our April visit that these companies are choosing to locate R&D centers in China because that is where both the manufacturing infrastructure and the ultimate demand for these products is, and that it makes economic and business sense to conduct R&D close to other parts of the value chain. But this trend also represents a potential threat to American innovation because clean-energy manufacturing activities and markets are growing more rapidly abroad.

Are China's innovation policies overly protectionist?

In recent months, foreign governments and businesses have been up in arms about China's various trade, economic, and industrial practices. In the clean energy sector, there has been particular attention on government procurement policies and other measures such as domestic content requirements and standards setting. While these measures are not unique to clean energy, they are the focus of international attention because clean energy is a new industry and represents a rapidly growing market that foreign firms want to plant a stake in; there is also a widely held notion in the international business community that clean energy does not implicate the same levels of national security concerns as do tightly held industries such as defense or telecommunications, and hence should be more open to foreign competition. There is a growing question, however, whether China is using industrial policy beyond legitimate means of promoting domestic development of fledgling industries, and actively shutting out foreign competition so as to cultivate national champions. After all, the S&T Plan does explicitly call for the "the country's reliance on foreign technology [to] decline to 30 percent or below."

In November 2009, the government released draft guidelines regarding the creation of official product catalogues (two of the six broad categories of products are energy efficient products and new energy technology equipment), and linking such product catalogues to government procurement decisions. The release has foreign businesses up in arms. These companies rightly charge that the criteria used to determine whether or not a firm's product qualifies for the catalogue discriminates against products sold by foreign firms, and hence excludes such foreign products from potentially lucrative Chinese government procurement contracts. Excellent overviews of the details surrounding these government guidelines are publicly available,[17] but I take the opportunity to note the following:

- What the Chinese government is doing is not unique and the use of government procurement to promote innovation is a legitimate policy tool acknowledged in the literature. The U.S. government itself engages in some degree of preferential access to government procurement contracts for American businesses for national security reasons but also to stimulate innovation in small businesses. The American Recovery and Reinvestment Act also contains "Buy American" provisions. Although numerous waivers to the provisions are allowed, they demonstrate the propensity to favor American businesses over foreign.[18]
- The Chinese government has demonstrated flexibility in response to international diplomacy. After the initial set of product certification guidelines were announced in November 2009, written comments from a number of international trade groups led to a revised set of guidelines, released in April 2010, that significantly reduced (though not completely eliminated) these foreign concerns.

- Just a few weeks ago, China announced intentions to submit by the end of this month a proposal to join the Government Procurement Agreement under the World Trade Organization, which if accepted would bar China from discriminating against products in government procurement solely because it is foreign in origin.

The indigenous innovation product certification regime is just one of a range of protectionist measures that the Chinese government has employed to encourage indigenous innovation and support the development of domestic clean energy companies. Other measures include domestic content requirements, technical standards setting that may favor domestically produced technologies over foreign ones, and consistent failure to award foreign firms bid contracts in government-run wind projects. A recent study commissioned by the National Foreign Trade Council,[19] while drawing no specific conclusions on the legality of such industrial policies with respect to international trade law, has become the most often cited report in demonstrating the protectionist nature of China's clean energy development policies. In respect of this report, I urge this commission to also consider the following:

- The NFTC report focuses on a limited number of clean energy subsectors (solar, wind, hydropower, and biomass) that represent only a small proportion of China's clean energy opportunity. A study by United Nations Development Program China found that for China to fulfill its carbon intensity reduction pledge of 40 to 45 percent by 2020, some $30 billion to $51 billion per year from now till 2020 will have to be invested and some 62 key technologies will need to be deployed, of which China lacks 43 (meaning significant business opportunities for foreign firms that possess these technologies), and of which a mere five fall under the clean energy sectors discussed by the NFTC report.[20]
- Even within solar and wind sectors, there are success stories of American companies such as First Solar, eSolar, and American Superconductor making headway into the Chinese market. In these cases, the companies offer world class technologies or designs that cannot be offered by domestic firms. As described in the final section of this testimony, there are alternative business models, other than the direct sale of goods and services in the Chinese market, which foreign firms can use to participate in the Chinese economy without running into market access barriers described above. Moreover, the government is also reportedly revising the 2007 foreign investment catalogue that will encourage foreign firms to invest in China in selected sectors that are generally hi-tech in nature, including clean energy.
- As is the case with government procurement, diplomacy has worked to blunt or eliminate several of China's protectionist policies. Last October, U.S. trade representatives successfully negotiated a repeal of China's domestic content requirements in wind farm projects. There is a sense in the wind industry that this is a measure that comes "too little, too late" because of other existing policies that prevent foreign firms from competing on an equal footing and the notion that the few years that the domestic content requirement has been in place has already successfully localized much of the wind supply chain. Still, this outcome shows that the Chinese are willing to listen, and also sets a positive precedent for trade diplomacy to address some of the other policies mentioned in the NFTC report.

From a U.S. national policymaking standpoint, however, if our concern is the competiveness of our country in the clean energy sector, we'd be losing the forest for the trees by only complaining about the protectionist measures of other countries, as real as they are. The discussion on the aggressiveness of Chinese industrial policy is a symptom of a larger ill. The larger ill is that the United States has "protected" its own clean energy market by failing to develop it in the first

place, leaving American clean energy companies with few opportunities to invest in at home. The claims by U.S. companies that China is unfairly shutting them out through market barriers, however legitimate, is ultimately a distraction to the more fundamental question we should have at home—Why haven't we gotten our own house in order?

Implications for the United States

The United States risks falling behind not just China, but other Asian and EU countries, because of its failure to create a national long-term vision for clean energy development, and a supporting stable policy framework to realize that vision. Instead, what the United States has is a patchwork of differing state and local policies, and federal policy tools that are temporary and unpredictable. The result is that while the United Sates, on its traditional strength of its innovation and entrepreneurial capacity, has been tremendously successful in inventing many important clean energy technologies, it has faired less well in the mass production and commercialization of such technologies relative to the size of its economy. For instance, we found that at the end of 2008, the United States had just over 2 watts per $1000 of gross domestic product of installed renewable power capacity, compared to 9 in Germany, 14 in Spain, and 18 in China.[21]

Some observers subscribe to the notion that with economic globalization and increased trade liberalization, nations should strive to climb the value chain of technology development over time and outsource lower-value parts of the value. In the case of the United States and clean energy, those observers would say that we should focus our strengths on early stage R&D and innovation, and get used to the idea that the manufacturing of clean energy products will inevitably be offshored to countries that can do so at lower costs. This, they say, is the most efficient outcome.

There are at least three problems with that reasoning:

- It is harder to monetize the value of innovation and R&D in the short term compared to manufacturing and selling clean energy or clean technologies—one does not get rich through patent filings and scientific journal citations alone.
- Activities centered around manufacturing and deployment of clean technologies not only create more jobs per dollar of investment compared to R&D (or fossil fuels for that matter), but do so for a broader class of society. While R&D creates a few high-skilled, high-paid jobs, and while the value of a product like the iPod can create wealth for a slightly larger number of elite investors, manufacturing activities create many more jobs and those jobs have a much higher multiplier effect.
- Geography matters. Innovation activity thrives, and in fact, relies on being closely situated with manufacturers, project developers, and the end-user market because of the complex interactions among the lab researchers, engineers, factory floor operators, and clean energy developers in the field that influence how innovators think about product design.

We are seeing evidence that ultimately, the creation of a stable market for clean energy technologies exerts a pull on the co-location of other parts of the value chain. China is a case in point. In my discussions with many executives of multinational firms doing business in the clean energy sector in China, one message rings consistently clear—their decision to locate factories or R&D centers in China is not primarily motivated because of any domestic content requirement or the dangling of tax benefits or discounted land prices, but rather a desire to be close to the single

largest and fastest growing market for clean energy technologies in the world – a market created by a clear, long-term commitment by its government through stable, comprehensive policies.

The implications for the United States are clear. In the United States, there is a tendency to overstate the role of free markets and understate the role of government support in nascent industries. However, it is generally accepted economic theory that government intervention is proper where there is a market failure. In energy, the very maturity of the fossil fuel sector along with the global subsidies paid to it create a drastically uneven playing field for clean energy development.

If the United States wants our companies to thrive in the clean energy sector, we need to get our own house in order and adopt a comprehensive package of policies that creates market demand for clean energy technologies, channels adequate levels of public and private finance across the full value chain of clean energy development (and not just R&D), and builds the physical and economic infrastructure that can support this new market and enable the deployment of clean energy technologies. We detail a range of concrete policies that fit within this comprehensive framework in "Out of the Running?"[22] but by far the most important is a comprehensive climate and energy policy that sets a price and a cap on carbon while funneling investment into renewable and efficient technologies at every stage of the value chain.

Developing export markets overseas is also important. In order to support President Obama's goal to double U.S. exports in five years under the National Exports Initiative, we must develop a long-term strategy to provide support for American companies, particularly small and medium enterprises, through government institutions like the Export-Import Bank, U.S. Trade and Development Authority, and Overseas Private Investment Corporation.

But the "clean energy race'" is not a zero-sum game. There is much to be gained through diplomacy and cooperation. In order to address frustrations by the U.S. business community in the inability to participate in the Chinese clean energy market on an equal footing with Chinese companies, we should continue to use existing forums in our government-to-government engagement with China such as the Strategic & Economic Dialogue, Joint Commission on Commerce and Trade, and U.S.-China Investment Forum. Such engagement, as described earlier, has shown that it can deliver results. We should also remember that the United States is not alone. Beyond the Sino-American bilateral interaction, the United States can also leverage its international trading partners who have similar concerns about China to exert multilateral diplomatic pressure and engagement with China on these difficult and complex issues.

Finally, we should also not lose sight of the full range of opportunities that the Chinese economy presents to American clean energy businesses. The direct sale of products and services into the Chinese market is just one way for a U.S. company to have a footprint in China. There are other business models that do not implicate the kinds of market access barriers that are alleged and that result in meaningful and productive participation in China, such as using China as an R&D base to tap into their abundant skilled engineering talent, contract manufacturing, sourcing manufactured components at competitive prices, and increasingly, licensing world-class Chinese technology.

Take Coda Automotive, a company whose China operations my colleagues and I visited this April, as an example. Coda is a California start-up that aims to be among the first companies to commercialize a pure electric vehicle. Coda's target market is California, but it manufactures its car batteries and assembles its final product in China with various Chinese partners for final export to California. It also takes advantage of China's auto supply chain by sourcing other key

components, but continues to import 35 percent of its parts from the United States because the best quality parts are still here. The primary reasons for locating its operations in China are the ability to rapidly build out manufacturing infrastructure, availability of low-cost capital in the form of generous financial incentives and credit lines provided by the local government, and availability of skilled technicians and existing auto supply chain in China. Coda has taken advantage of many of the benefits that the Chinese economy provides, yet encountered none of the market access barriers described earlier because their ultimate market is the United States. (As a side note, Coda just announced that it will build its first U.S. manufacturing plant in Columbus, Ohio, not too far from here.[23])

One way to catalyze more activities in these alternative business models is through public-private partnerships. In a whitepaper released last year, my colleagues and I describe concrete steps on how China and the United States can actively collaborate to develop and commercialize carbon capture and storage technologies by engaging government institutions, research organizations, and the private sector of both countries.[24] The series of agreements on clean energy collaboration coming out of the U.S.-China presidential summit of November 2009 represents a concrete agenda to develop just this sort of public-private partnerships that can lead to mutual gains.[25]

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[1] Bloomberg New Energy Finance, "Joined at the hip: the US-China clean energy relationship," White Paper, May 17, 2010, p. 8, available at http:// bnef.com/Download/pressreleases/116/pdffile/.

[2] Ward van den Berg and Anound van der Slot, "Clean Economy Living Planet: Building strong clean energy technology industries," WWF-Netherlands, November 2009, p. 12-13, available at http://assets.panda.org/downloads/rapport_wwf_cleaneconomy_international_def.pdf.

[3] The Pew Charitable Trusts, "Who's Winning the Clean Energy Race? Growth, Competition and Opportunity in the World's Largest Economies," available at http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Global_warming/G-20%20Report.pdf

[4] See Kate Gordon and others, "Out of the Running? How Germany, Spain, and China are Seizing the Energy Opportunity and Why the United States Risks Getting Left Behind" (Washington: Center for American Progress, 2010), available at http://www.americanprogress.org/issues/2010/03/out_of_running.html.

[5] See Godfrey Yeung, "How Banks in China make Lending Decisions," *Journal of Contemporary China* 18 (59) (2009): 285-302.

[6] This has raised concerns by analysts that Chinese banks are making lots of bad loans, leading to a possible banking crisis. See, e.g., Victor Shih, "Moral Hazard and China's Banks," *The Wall Street Journal*, June 20, 2010, available at http://online.wsj.com/article/SB10001424052748704050804575319582177841808.html. But for an alternative view on why such fears may be exaggerated, see Nicholas Lardy, "Yes, China Does Need That Infrastructure," *The Wall Street Journal*, June 22, 2010, available at http://online.wsj.com/article/SB10001424052748704853404575323653207685016.html.

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