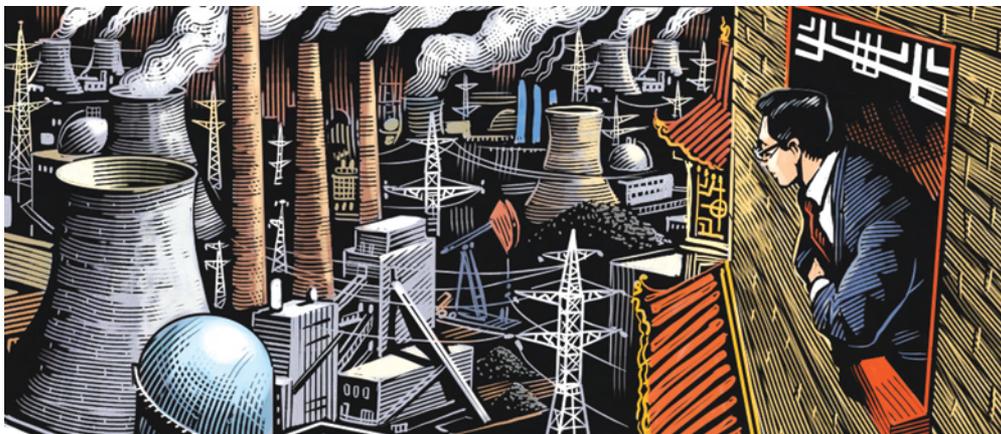


China's Green Future

by Jennifer Warren



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GIVEN THE AILING state of the economy in the United States, many believed that President-elect Barack Obama would backtrack on his campaign promises on climate change. Yet he reiterated his message recently at a major climate-change conference by pledging to spend \$150 billion over 10 years to secure a clean-energy future for America. This is a wise strategic direction which could help move the U.S. out of its economic malaise, and restore its leadership on the issue of carbon-dioxide emissions reductions.

A clean-energy future will not come to the U.S. cheaply or easily. Nor will America be able to achieve it working alone. China needs to be involved. The two largest energy-consuming nations in the world—China and the U.S.—can complement each other's efforts toward sustainable, cleaner energy. The spillover effects—increased employment, economic growth, enhanced long-term energy security and stronger foreign-policy initiatives—should tantalize

politicians searching for 21st-century policy solutions.

Understanding China's huge energy-related challenges illuminates the out-sized opportunity for America. China took the lead from the U.S. as the greatest carbon emitter in 2006: The trajectory continued with China emitting an estimated 1.8 billion tons of carbon to the U.S.'s 1.6 billion in 2007, with India ranked third. Notably, between 1980 and 2000, China quadrupled its GDP, but only doubled its energy consumption. The squeeze on energy demand, through conservation and efficiency measures, was achieved by focused policies and management practices, investment targeted in energy-conservation projects, and new conservation institutions.

China's unexpectedly high emissions in the period 2000-06 were driven by mar-

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ket reforms, urbanization, increased trade and coal dependence, says China energy expert Mark Levine of the U.S. Berkeley National Laboratory. Investment clustered in heavy polluting industries, such as cement and steel production, stimulated economic growth and increased energy usage. The legacy of the controlled economy meant conservation in energy use was not prioritized. Greater urbanization—city dwellers jumped by 26% to 577 million people in 2000-06—brought more building, infrastructure development and greater energy consumption.

China's current and future energy portfolio mix contributes greatly to its increasing CO₂ emissions, called an oncoming "carbon tsunami" by China energy expert Mikal Herberg of the Pacific Council on International Policy. The International Energy Agency projects that coal, the heaviest polluter, will produce 80% of China's energy, in spite of intentions to use more renewables and nuclear power. The IEA says China, with four times the population, will overtake the U.S. in primary energy consumption after 2010.

China's problem is the need to supply power now to upwardly mobile urbanites, growing businesses, and an expanding economy versus moving toward longer-term goals of an energy mix that's clean and sustainable. China has to do both simultaneously. Slower economic growth brought by the global financial crisis could give China breathing room to further policy objectives in energy, in spite of Beijing's recently announced \$586 billion stimulus plan.

Given the challenges facing China, Beijing's energy goals can be fast-tracked with the help of American companies, and

both countries will benefit from enhanced green trade routes.

Powering China Together

COOPERATION IN ENERGY between the U.S. and China has a rich but overlooked history. Three decades ago, the U.S. Department of Energy (DOE) and China's National Development and Reform Commission began cooperation in science and technology, a relationship that has grown increasingly complex and broad. Cooperative projects in renewables—solar, biomass, hydropower (including the Three Gorges Dam), geothermal and ocean energy—were launched in 1978. Joint programs on high-energy physics, nuclear physics, fusion and fossil energy accompanied the introduction to clean coal technology.

Just 14 years ago, the Chinese considered themselves too poor to worry about climate, recalls then-senior DOE executive Robert Price. But after the U.S. assisted China in climate-change studies and

reductions of methane from coal, the Chinese began to grasp the gravity of energy's impact on health and wealth.

Importantly, helping China power its country would require U.S. private-sector capabilities and create export opportunities. One American energy firm and its Chinese partners show how joint ventures can evolve, and are a future source of synergies. To serve the natural-gas rich regions of Xinjiang Province, Patrick Jenevein and Yih-Min Jan formed the clean energy firm Tang Energy in 1996, helping China National Petroleum process gas more efficiently.

Soon Tang entered China's developing wind-energy market, but wind-farm development proved unprofitable. Instead, the

The U.S. and China can complement each other's efforts toward sustainable energy.

joint venture, HT Blade, was created in January 2001. Formally known as Zhong Hang (Baoding) Huiteng Windpower Equipment Company, it's now the second largest global manufacturer of wind-turbine blades. The first Chinese wind turbines were recently exported to the U.S. through the partners. Mr. Jan says that even European manufacturers of wind-turbine components are setting up shop in China, helping China become the global manufacturing hub for the turbines.

The networks required to achieve synergies will take time, but they exist in varied forms. Over 15 years, Tang Energy developed working relationships with an array of Chinese players. This created new green-tech trade routes, a "real" \$1 billion to \$2 billion asset in the form of a blade company, and a blueprint of sustainability.

At the same time, government policies on both sides are guilty of inhibiting sustainable-energy ventures. China's energy policy is surprisingly similar to the U.S.'s in that it is "fragmented, diffuse and not very coherent," says Mr. Herberg. "Many 'half-policies' exist which work at cross purposes." Moreover, China doesn't have an overarching DOE, making policy coordination even more difficult. Though the central government passes stringent measures, some provincial and local leaders circumvent them.

Governments, eager to claim clean-energy victories, must engage the private sector to ensure that policies, whether subsidies or incentives, do no harm. At two different intervals, both the U.S. DOE and U.N. Development Programme policies had negative impacts on projects. A DOE reverse auction proposal discouraged experienced wind-farm developers, clearing the way for the politically motivated and inexperienced to participate. Today, the most successful developers in China's wind-energy market are either government-, grid- or power-generation-related

firms. Tang's Dabancheng wind farm was dealt a "fatal blow" when the U.N. gave a grant to a competitor immediately adjacent to their wind farm, who ultimately allowed the wind farm to languish. This "energy welfare" deterred long-term players that would maintain the farms, with profitability driving sustainability.

Top-ranking government officials' participation in energy and economic dialogues, initiated by the U.S. Treasury's Hank Paulson, are promising, Mr. Herberg believes. And a 10-year plan will focus on renewables, noncoal-based generation, clean-coal technology and other generation efficiencies. But high-level communiqués do not necessarily foster understanding at the House and Senate levels, where a good deal of policy bartering and protectionism is born. Mr. Price suggests more action and less talk. These strategic dialogues spend resources needed to fund projects which further the energy paradigm over reporting on what's been done. The DOE and the Department of Commerce should engage key, smaller U.S. firms in energy efficiency and renewables, offers Mr. Price.

Energy System Overhaul

CHINA'S ENERGY SYSTEM developed according to its needs and resources, now moving a step away from its fossil-fuel beginnings. American firms have a vast array of technologies that can be deployed to help China reduce its greenhouse gas emissions.

Coal power: For China, the reduction of pollution from coal is a priority. True "clean" coal technology is expensive, and its commercial application is still many years away. Yet there are interim steps that can be taken. Tang Energy and its Chinese partners recently piloted the Tengjin power plant in Shanxi Province. The 60-megawatt plant captures the exhaust emissions from a coal-based manufacturing plant,

cleaning the atmosphere, and then recycles the emissions to make electricity. Yet examples such as this are still rare.

Oil as transport fuel: China's consumption of oil is an escalating concern, as its vehicle market is expected to surpass the U.S. in 2015, thus quadrupling oil demand. Though concerned about global warming, surveys show that young Chinese still want cars. U.S. automakers already have a foothold in the Chinese market. They should factor in a China strategy as they develop smaller, more fuel-efficient cars, including hybrids, electric and dual-fuel vehicles, while both governments work together on next-generation efficiency technologies. At the same time, Beijing can set the agenda for its citizens on personal versus public-transit options—weighing the manufacturing of autos or infrastructure investment for congested cities.

Natural gas: Cleaner burning natural gas has played a small role in China's energy mix. Natural gas may hold untapped potential, emitting 45% less CO₂ than coal and 30% less than oil. It has the ability to morph into a variety of end uses, including transportation fuel. China intends to increase power generation from natural gas by 13% annually to 2030, which will require more liquefied natural gas imports.

Natural-gas reserves, beyond its 80 trillion cubic feet, may exist in China in places that are yet to be discovered. In the last decade, U.S. drilling technology advances have allowed gas to be captured more cost-effectively from difficult, shale formations. A U.S. business group plans to export their experience in drilling techniques to aid China's exploration of gas. But it will cost billions of dollars in infrastructure development to bring the gas to market. GE Oil & Gas recently completed work related to China's landmark West-to-East gas pipeline, revealing how American expertise and techniques can further natural gas expansion.

Nuclear power: China's nuclear-power program is ambitious. The government plans to install 45 gigawatts by 2030, an 8.8% growth rate. This would supply around 5% of China's electricity generation. Westinghouse Electric of the U.S. is helping China use new third generation nuclear-power technology in a series of nuclear reactors. Through China's market, engineering costs are defrayed for future production, thus allowing more cost-effective nuclear-power plants to be built in the U.S. But a tension remains. "What the Chinese build over the next 25 years in nuclear energy, they are now building every five months in coal generation," says energy expert Mr. Herberg.

Renewables: China recently took the global lead in renewables with 152 gigawatts of installed capacity, two-thirds of it from hydropower. It leads in the manufacturing of solar photovoltaic technology. The country could claim, by 2009, the title of the world's leading exporter of wind turbines. With many clean-energy projects stalled because of dried-up funds, Tang's Mr. Jan suggests allowing the cash-rich Chinese opportunities to invest in U.S. green-energy projects such as wind farms. China's "green tech" in terms of export possibilities and scale of usage domestically could become the envy of the world.

Regeneration

A SUSTAINABLE ENERGY system will require consumers of a critical mass to start a different Cold War—one that cools the planet through cooperation. This "race" is really more of a dance, where one partner leads at times and, at other times, they dance in unison. The stakes are high, with the opportunity to "outperform" attainable. The CNOOC-Unocal incident created the oil-competition story, and a shape-shifting cloud of protectionism against China. Better cooperation on energy and environment

can bring more transparency and build trust to extinguish protectionist embers.

New forms of regional cooperation can cut through policy clutter. In the U.S., state- and city-level green initiatives outpace federal efforts, with China evolving similar green hubs. States and cities with their Chinese counterparts could “adopt” each other to share their best practices and innovations from the bottom up. Areas that have similar energy-mix problems (a heavy dependence on coal), natural-resource advantages (gas- or wind-rich topographies), or shared goals (high energy efficiency clusters) could develop cooperative ventures. Initiatives in sustainable cities could be co-opted: Guangzhou’s push for a greener city, sprucing up brownfield sites, could inspire Dallas’ southern sector revival efforts.

Moderate technology improvements and structural shifts in the economy could help China reach its goal, according to Mr. Levine and colleagues. China’s 11th Five-Year Plan targets a 20% reduction of energy intensity over the 2005-10 period—one of the most significant carbon-reduction efforts on the globe. It will require efficiency gains on all energy fronts for China: in the industrial sector, power generation and consumer goods; expansion of the services sector; plus more rounds of this policy.

Entrepreneurs want and need consistent policies by both U.S. and Chinese governments to facilitate exchange. China’s potential as a U.S. export market, tripling to \$62 billion since China’s WTO entry, can be leveraged by natural technological advantages. China also needs to allow the market mechanism of price to encourage a sustainable energy system. Artificially low prices and subsidies deter adoption of better technologies and waste resources. Both the U.S. and China need to reduce barriers, policies, and practices that blunt clean energy ambitions.

A U.S. economic revival will come part-

ly by way of clean energy. While cooperation has been a key element of U.S.-China energy relations in the past, populist cries for energy security are distracting to the dialogue. The private sector’s penchant to create sustainable markets far outweighs governments’ ability to pick winners. Though the U.S. has lacked a comprehensive energy policy, it has delivered more energy in varied forms at lower prices—that is increasingly clean—over the past 30 years to 50 years, says Mr. Jenevein.

The push toward cleaner energy should include further U.S.-China green-tech and clean energy trade routes. China is projected to need \$3.7 trillion in energy-supply related infrastructure from 2006-30. The IEA calculates that each dollar invested in more efficient electrical appliances saves \$3.50 of investment on the supply side. When China makes more efficient consumer goods that it exports, the world wins. Price says that public funds spent on U.S.-China programs have a high rate of return—leading to sales for U.S. firms. Allowing greater Chinese participation and investment in U.S.-based green-energy ventures would complement the intended \$150 billion investment.

The U.S. must lead on climate change before we get closer to an unknown tipping point. Games of emission’s brinkmanship are harmful to the entire world, and deter action now needed for the development of clean-energy markets. Some have suggested that the country that dominates clean energy or green technology will dominate the 21st-century economy. This extension of 20th-century Cold War thinking relies on the gimmickry of rhetoric and protectionist ideals that stir crowds but achieve no desired results. The mirage of self-sufficiency in energy neglects the reality of our ability to harness competitive advantages that would help attain goals more quickly. ■