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Environment

Opportunities in China's Green-Tech Sector

Regulatory reform has paved the way for green-tech opportunities, but economics will determine what succeeds.

by Edward Barlow

Three decades of torrential economic growth have created significant opportunities for green technology in

China. Green technology is a new and imprecisely defined term that is often applied to production, distribution, disposal, and products. Products and processes that use green tech are energy efficient, have a low environmental impact, and are consistent with best practices in environmental monitoring and management standards.

Quick Glance

- PRC leaders and the public have grown increasingly concerned about China's environmental problems—concerns that are reflected in recent policies, investment, and consumer habits.
- With proper planning, foreign companies can play a significant role in China's green-tech boom.

The scale of China's environmental damage, and the burgeoning awareness and commitment to rectify it, will drive demand for commercial solutions for years to come. But with an intense focus on short-term profit, most buyers respond primarily to the price and speed with which technology can deliver value, instead of its environmental impact.

The fact that green tech is in play shows that environmental concerns are widespread. Recognizing that China's development cannot be sustained without environmental reform, senior PRC leaders tasked with boosting the country's technological development, infrastructure, and employment are also promoting plans for industrial scalability, efficiency, and quality. Identifying and understanding specific investment opportunities and their pros and cons will enable foreign-invested enterprises (FIEs) to play a significant role in China's green-tech boom, mapping out long-term strategies in a country that rewards long-term commitments.

Regulatory and investment environment

Enforcement of PRC laws often falls to local-level officials. They may interpret a law differently than central-level officials, who tend to understand the law and its intended effects better. Proper implementation of national-level laws at the provincial or county level, where environmental damage is most severe, thus takes time. Last year the PRC State Council elevated the State Environmental Protection Administration to ministerial status to emphasize the importance of environmental issues and give the new ministry the power to codify and enforce environmental regulations. But the Ministry of Environmental Protection's power is still relatively weak, especially in the face of established pro-growth policies and the resulting mindset of local officials who tend to prioritize economic growth.



To boost green-tech sales, the PRC government has offered subsidies to consumers who buy electric cars. (China Foto Press)

Green objectives have long been a part of China's economic plans. But it was not until the 11th Five-Year Plan (FYP, 2006-10) that China set targets for the energy intensity rate at which resources are converted to gross domestic product, resource dependency, and pollution. Though China will fall far short of its energy intensity targets, renewable energy capacity will meet and perhaps exceed targets (see **Figure 1**). (China aimed to reduce its energy consumption per unit of GDP by 20 percent over the five-year period but has reported annual reductions of about 3 percent.) NDRC announced in May that it would invest ¥3 trillion (\$439.2 billion) in renewable energy, electric cars, energy-saving construction materials, and other green technologies between now and 2020.

The government's emphasis and encouragement has made green tech desirable in many industries. Industry is in many instances keen to toe the line and win favor by demonstrating energy efficiency and reducing pollution. The greening of a company has become synonymous with its maturity, and in some sectors "green" is marketed as high status. The government is also using its stimulus package to encourage the use of green tech. Of the State Council's ¥4 trillion (\$585.2 billion) stimulus package, ¥210 billion (\$30 billion) has been earmarked for "energy efficiency, emissions reduction, and eco-construction projects." The package, which reportedly advances the 12th Five-Year Plan for Energy (2010-15) by a year, makes separate provisions for green tech in water conservancy, a smart grid, and the development of transportation, healthcare, and education. Airports, hospitals, and schools will incorporate green building materials under the plan. Thus, green-tech interests could be directly and indirectly served in up to 50 percent of the stimulus.

Investment opportunities

Conventional power

China's greatest source of energy inefficiency and poor environmental management lies in the power sector—namely, the roughly 2,500 fossil fuel power plants constructed since the chronic brownouts of the early 1980s. In 2007, coal made up 76.6 percent of China's total power production, while hydro, nuclear, and wind power made up the remainder, according to the 2008 *China Statistical Yearbook*. Power-sector capacity has now caught up with, and in places surpassed, overall economic expansion, so the sector's focus has shifted from quantity to quality.

Poor design, maintenance, monitoring, and management means that a substantial amount of energy is wasted at nearly every stage of power production and transmission. The PRC government, China's "Big Five" partially state-owned power generation conglomerates, other owner-operators, and grid companies are all searching for solutions to make power generation and transmission more efficient.

Foreign companies have helped by retrofitting plants with more efficient technology, such as pulverizers and boilers, and offering maintenance programs, monitoring systems, and nitrogen and sulphur-oxide filters. Much of this technology is being sold to the plants via Chinese engineering companies or system integrators, and it is via these channels that most foreign suppliers operate.

Alternative energy

Around 20 percent of China's power comes from non-fossil and non-nuclear sources, which is one of the highest rates in the world and exceeds the United States' 7 percent. But the overwhelming majority of China's alternative energy is generated by hydroelectric power plants. Wind, waste-to-energy, and solar energy made up about 1 percent of all generating capacity in 2008, according to the China Electricity Council.

China has been pursuing ambitious targets for wind and solar power to be achieved by 2020. In 2007, it set the wind and solar targets at 30 GW and 1.8 GW, respectively, and has passed measures to boost alternative energy use. For instance, Article 14 of the 2005 Renewable Energy Law states that grids must connect with, and buy alternative energy from, licensed renewable power plants in their coverage area. Further, the government has announced feed-in subsidies for wind and solar plants to help alternative energy production reach grid parity and capacity subsidies for certain projects.

According to recent press reports, China will soon release a new alternative energy stimulus plan that will boost its

alternative energy targets significantly. Meanwhile, the PRC government continues to propose new targets. In May, it suggested raising China's 2020 wind energy target from 30 GW to 100 GW. Press reports have suggested that the new alternative energy stimulus plan may raise the 2020 wind energy target to 150 GW.

Though China is the world's largest producer of solar panels, most Chinese companies lack the ability to produce solar-grade polysilicon. Opportunities lie in bringing this capability into the domestic supply chain, which will lower production costs and make solar power more affordable. Despite opaque and protracted state-bidding procedures and the tendency for PRC government subsidies to be conditional on high local-content requirements, FIEs are winning contracts and forming partnerships with local companies. In June, US-based Evergreen Solar, Inc. signed a multi-million dollar deal with Jiawei Solarchina Co., Ltd. to become an upstream supplier of silicon wafers to Jiawei's Wuhan-based subsidiary. Last year, Swiss manufacturing conglomerate ABB was contracted to supply electrical systems, equipment, and related engineering and project management services to LDK Solar Co. Ltd.'s Xinyu, Jiangxi, plant, which will be the biggest polysilicon plant in Asia by capacity when completed at the end of 2009.

In wind power, equipment such as bearings, control systems, and long-distance power cables is needed. Though FIEs in China's wind power sector also face many bidding and local-content requirement problems (see the *CBR*, July-August 2006, **Green Energy Invites Investment**), FIEs are active and, in some cases, they dominate the market for sub-products such as bearings and transformers.

Transmission

China's grid consists of two state-owned companies. The State Grid Corp. of China routes roughly 80 percent of China's electricity, and China Southern Power Grid Co. Ltd. accounts for the remaining 20 percent. Both companies aim to roll out a smart grid over the next 20 years that will improve the monitoring and quality of electricity and its distribution. Currently, the companies are investing in high- and ultra-high-voltage transmission, automated substations, and more advanced load balancing. Opportunities at this stage exist for suppliers of software, analysis technology, instrumentation, process controllers, and supervisory control and data acquisition computer systems. Given the extent of state ownership, medium-sized firms' sales to the grid companies are best made through system integrators, while larger firms may be better placed to lobby decisionmakers directly.

Construction and materials

Green-tech in building construction is booming, particularly in high-intensity materials, such as steel and cement, and materials needed to strengthen a building's thermal envelope, such as expanded polystyrene. The reasons are three-fold: First, because China will not meet the 11th FYP's energy efficiency targets, the government will likely place greater regulatory pressure on construction. Second, green-building materials and equipment have become popular among the public. Third, overcapacity and a slump in the export market have made green building materials more affordable in China.

Currently, there is widespread demand for heat pumps and variable frequency drives, which are modular and pay for themselves in a relatively short time. Other construction materials such as polymer-insulation and aerated concrete also sell well, but the sheer number of suppliers in these markets is squeezing profits. Because of its low costs, China is a production platform for more exotic materials like photovoltaic roofing membrane and carbon-neutral drywall, which FIEs dominate. After production costs fall sufficiently, the multi-billion dollar domestic market can expect to see a large quantity of these materials for sale, and FIEs that have been producing in China will do well (see **The Retrofit Market and EMCO Issues**).

Water treatment

Water is wasted in the South and scarce in the North, and leaks, aging equipment, and poor management plague the entire country. To ensure that water is clean, available, and used efficiently, the government is buying significant amounts of chemicals and equipment for large projects such as the South-to-North Water Diversion Project, which will eventually move nearly 45 billion m³ of water a year to northern China. Water treatment technologies—such as advanced membranes—and resource management expertise are in demand.

The biggest constraint to opportunities in this sector is that the central-, provincial-, and local-level governments are the only customers. This means that buying tends to be centralized, decisionmaking slow, and decisionmakers highly risk averse. Foreign companies entering China must spend time and money to gain access to, and the trust of, the right decisionmakers.

Transportation

The key buzzword for green-tech transportation this year is "storage." Battery technology will improve to have longer cycles, higher densities, and shorter charging times as demand soars in China, which may already have more people using electric bikes than any other country in the world. At the end of 2008, roughly 75 million battery-powered bikes glided along China's roads, and auto companies are racing to get the first affordable electric car on the market.

If trends in electric bikes are anything to go by, mass marketization of electrical autos is a closer reality in China than in the United States. Compared to their US counterparts, Chinese drivers make shorter journeys. This will limit the amount of investment needed for charging stations and out-of-town support infrastructure. The government has promised to give tax credit or subsidies to buyers of hybrid or electric vehicles. For example, a consumer buying a hybrid car will receive a ¥4,000 to ¥50,000 (\$585-\$7,318) subsidy, depending on the energy savings, while a buyer of a purely electric car will receive a ¥60,000 (\$8,782) subsidy. In addition, manufacturers of key components such as car batteries must design their products to work for at least three years or 150,000 km (whichever comes first). This policy favors FIEs that already produce high-end parts and components for electrical vehicle manufacturers by putting pressure on their rivals that make lower-quality products.

Consumer products

In general, Chinese consumers are thrifty, debt free, and plan for the long term. But in recent years, people have become more willing to pay extra for safe decorative coatings, cleaning products, and food. China's periodic safety scares—such as last year's melamine-tainted milk scare—have and will continue to generate demand for quality.

Offering information and raising public awareness about green tech in daily living may also offer business opportunities. Much information is publicly available in Europe and North America on how to live in a greener environment (everything from architecture and design to lifestyle), but only a tiny fraction of that is available in Chinese. A Chinese-language magazine on green living would appeal to high-income earners and concerned consumers.

The future of green tech in China

In the past 10-15 years, the United States and Europe carried out much of their research at home, while outsourcing development to China. More research is being done in China now as China's technical capabilities catch up with the West and as the country seeks customized domestic solutions. Chinese companies are also increasingly active, as evidenced by the growing number of local innovations in China. These include inventions in building materials and heating, ventilation, air conditioning, and refrigeration equipment. But moving research and development facilities to China remains risky for foreign companies. Some companies have experienced difficulties protecting their intellectual property in China, which is a serious disincentive to doing research there (see the *CBR*, March-April 2008, **Bringing R&D to China**).

The growth trajectory for much of the existing green tech in China will rely on the extent to which it can be commercialized.

Most of the opportunities in the green-tech sector involve existing technologies but often require companies to share proprietary information with state-owned enterprises. Every facet of greening China has challenges, however, and it is from these that opportunities are emerging. The current growth trajectory for much of the existing green tech in China will rely on the extent to which it can be commercialized. Currently, green construction products and materials, electrochemical storage, and waste management technology are closest to commercialization.

Ultimately, many of the opportunities in China's green-tech sector will grow as China gains experience and moves to international levels in engineering, training, standards, and best practices. As international trade in green tech grows, China and the West will benefit.

The Retrofit Market and EMCO Issues

China's construction boom began about 10 years ago when the government relaxed restrictions on urban land ownership. Materials and equipment in these buildings are still, for the most part, operating in their designed lifespan. The retrofit market is small but has the potential to grow exponentially once buildings begin to age.

Energy-services companies (ESCOs), or energy management companies (EMCOs), as they are often called in China, are commercial companies that design, install, maintain, or finance projects to improve a building's energy efficiency. The projects generally include a billing system in which the consumer and company share the energy cost savings. The business model has yet to take off in China, however, in part because installing equipment and deriving income from the money a client saves on its energy bill is hard to measure and prove outside of industrial applications. Other constraints that ESCOs/EMCOs face are the same as those of the green construction industry as a whole: a lack of regulatory support and precedent, low demand for retrofit, and the fact that buyers of building materials are typically not the same people that pay the energy bills. Investors interested in these types of opportunities should watch first-movers like Honeywell International Inc. or Trane Inc., who have been in this field in China for years. Such companies may require suppliers for parts of their energy management systems.

—Edward Barlow

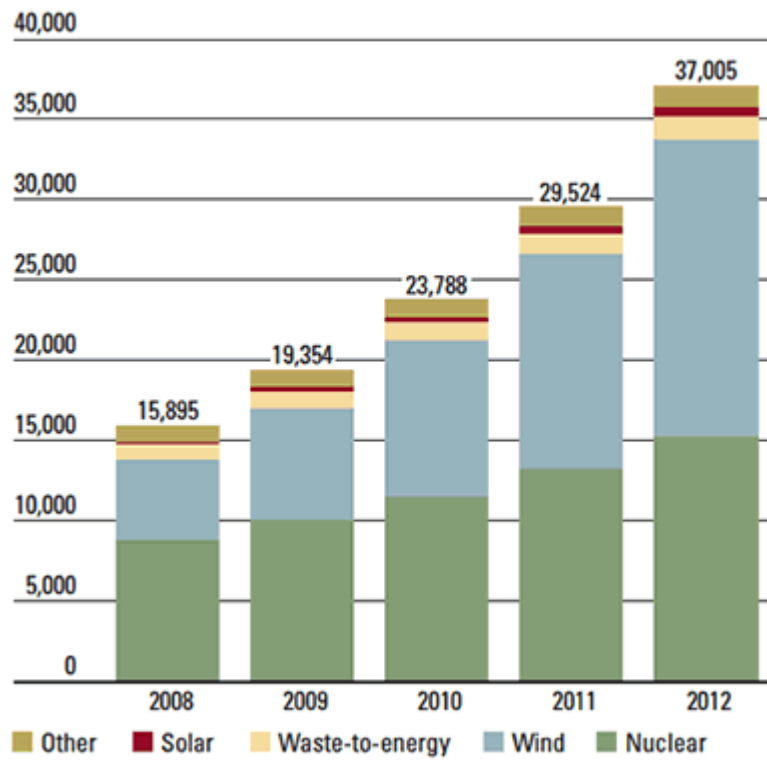
New Markets: Energy Recovery

China now has a market for the recovery and conversion of heat, a byproduct in most industrial applications, into electricity. Companies such as China Energy Recovery, Inc. sell or lease equipment to a plant that allows it to capture emissions or gas by-products and use thermal energy to power a rotor/dynamo set. Depending on which business model the customer chooses, the electricity is either sold to the grid or recycled into production. Although this is a new market (in which business buyers often demand proof in the form of case studies that they will benefit significantly from the technology), recognition is growing among the power plants, refineries, and factories that energy recovery can generate revenue. For example, Sinochem Corp. installed a 30 MW heat recovery system in its sulphuric acid production plant in Chongqing, and it intends to sell electricity generated from the system back to the grid.

On a smaller scale, growing numbers of HVAC systems are using energy recovery wheels, which transfer energy in the exhaust air to the intake air, heating or cooling as necessary.

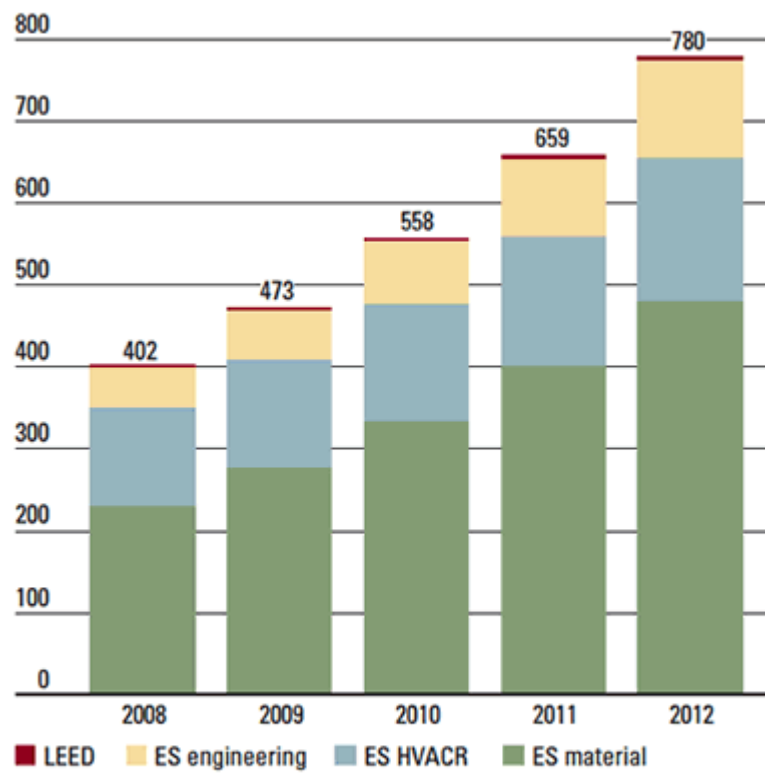
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Figure 1: China's Projected Alternative Energy Installed Capacity, 2008–12 (MW)



Note: Figure excludes China's large hydropower capacity.
Source: GCIS

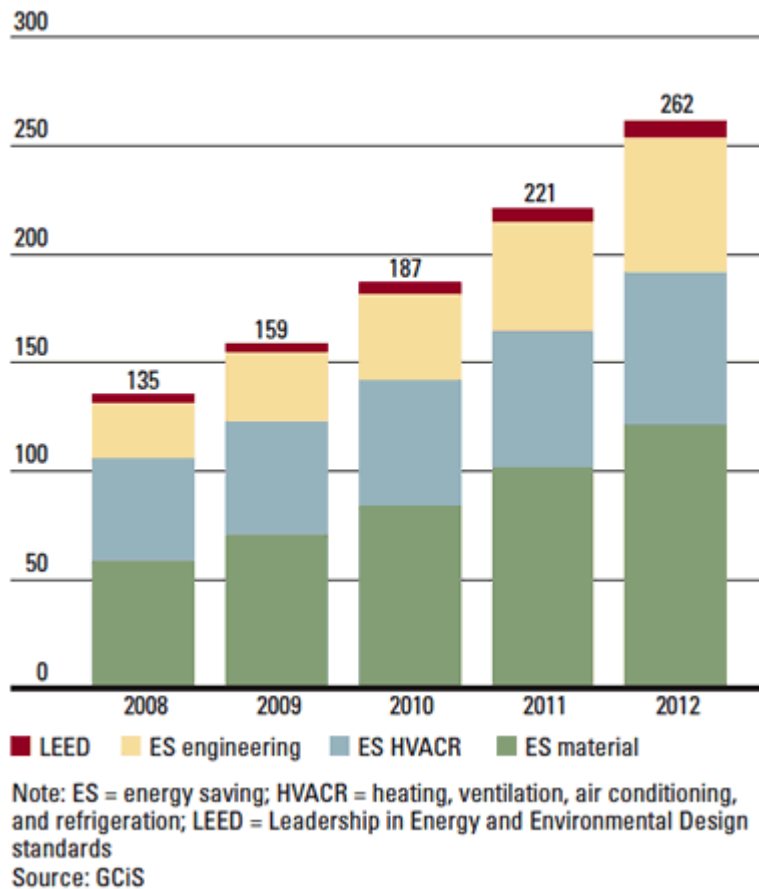
Figure 2: Estimates of Green Materials Usage for Chinese Residential Buildings, 2008–12 (million m²)



Note: ES = energy saving; HVACR = heating, ventilation, air conditioning, and refrigeration; LEED = Leadership in Energy and Environmental Design standards

Source: GCIS

Figure 3: Estimates of Green Materials Usage for Chinese Commercial Buildings, 2008–12 (million m²)



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Further Reading

- [Green Energy Invites Investment](#)
- [Green Investment: Opportunity Knocks](#)
- [Cleantech Boom... or Bust?](#)
- [Who's Cleaning Up This Mess?](#)
- [China's "New" Energy Administration](#)
- [The Greening of China's Building Industry](#)

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