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CHINA'S RENEWAL

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Hungry for fuel, it emerges as a leader in alternative energy

BEIJING--At first glance, the Tian Pu factory looks like a typical warehouse on the outskirts of Beijing. The bright sun glints off the building's blue-tiled facade, and the surrounding fields are reflected in the smoky glass windows. But upon closer inspection, it becomes apparent that this is a vision of the future. Each tile is actually a solar panel, generating 50 watts of power. The windows up top are covered with higher-capacity panels, a darker, muted blue. Farther down, thick metallic tubes lean at an angle against the building. This factory, which produces solar water heaters, is a pilot project of China's Academy of Sciences--a fully self-sufficient facility run entirely on solar power.

While China is most commonly known as a voracious consumer of energy with a spotty environmental record, the emerging industrial giant is quietly becoming a world leader in developing renewable energy sources and technology. With its energy needs growing exponentially and the price of oil near record highs, Beijing is using every possible means to eke out extra kilowatts--and this means not only cutting oil deals with rogue regimes and building nuclear reactors but also putting into place some of the most aggressive renewable-energy policies in the world. A new Renewable Energy Law took effect January 1, and the government announced a goal of having 10 percent of the country's gross energy consumption be renewable by 2020--a huge increase from the current 1 percent. Renewable energies such as wind, solar, and biofuels are expected to grow into a $100 billion market over the next 15 years in China, making it a global powerhouse in renewables. "China is rapidly moving into a world leadership position in the industry," says William Wallace, an adviser to the United Nations Development Program in Beijing. "The government knows the limited oil supply is a situation it needs to pay attention to, from both an energy security and a development point of view. Its goals for the next five and 15 years are very aggressive."

The need for new energy sources is apparent everywhere in China. The streets of its major cities are crammed with cars driven by the new middle class. Gasoline shortages prompted massive lines at the pumps in the southern province of Guangdong late last year. More than two thirds of the country's provinces were hit by blackouts in 2004 because of disruptions in the supply of coal, which now generates 70 percent of China's energy. The country's economy has expanded at an average annual pace of almost 10 percent for nearly three decades. While 20 years ago China was East Asia's largest oil exporter, today it is the world's second-largest importer--accounting for 31 percent of the growth in the world's demand for oil. "China is taking the growth that the U.S. had over the past 100 years and compressing it into 20," says Mike Eckhart, president of the American Council on Renewable Energy. "It is adding cars at such a rate that by 2030, it will have the same number of cars as the United States. Twenty-five years from now, the country will be in a real serious situation."

Boosting output. In response, the government has pursued diplomatic relationships with oil-rich countries in Africa, the Middle East, and Latin America. It has funded railways in Nigeria and sold weapons to Iran for the right to buy oil from these regimes. Domestically, China just

completed construction of the main wall of the Three Gorges, the world's largest hydroelectric dam (whose output is not counted toward the renewable-energy goals). It has also been drilling oil wells, developing coal-fired power plants, and building nuclear reactors along the coast.

The new emphasis on renewables, by contrast, is a relief for those who worry about the environmental impact of China's energy consumption. The country is already the world's second-largest emitter of greenhouse gases, and some Chinese cities have been called "invisible" because they cannot be seen on satellite images. According to the World Bank, China contains 16 of the world's 20 most polluted cities. But the Kyoto Protocol came into effect for China last year, aiming to control greenhouse gas emissions. The country's new renewable-energy law specifies tariffs that favor nonfossil energy sources such as wind, water, and solar power. Beijing has promulgated building codes mandating that all new construction dramatically improve energy efficiency. "We need everything--natural gas, nuclear, coal, renewable energy," says Li Junfeng, secretary general of the Chinese Renewable Energy Industries Association. "But for the long term, renewable is still the most important."

China began tapping into renewable energy in the late 1980s because of worries that pollution and associated health and environmental issues caused by industrialization could cause popular unrest. In 2004, an estimated $5.5 billion was invested in renewable energy in China. The rest of the world spent a total of $30 billion. "There is no renewable-energy law in the U.S.," says Eckhart. "We fund research and development, and give incentives. China is giving directives--getting right to the point."

Small solar panels can already be seen across the rooftops of major Chinese cities like Beijing. These supply power to solar water-heating systems, of which China is already both the largest producer and consumer in the world. At least 10 percent of all households in China (that's 30 million households) have them--and the market is growing by 20 percent to 25 percent a year, according to Eric Martinot, a leading researcher on renewable energy at Beijing's Qinghua University. This is partly because the relative cost of systems is so much less than in other markets. Someone in China can buy a solar water heating system for less than $200, a fraction of the cost of a comparable system in Europe. In the Chinese countryside, farmers whose houses are not connected to an electricity grid will pump water up to their roofs from their own wells to heat using solar power. "At first, in the countryside, they just had barrels that they painted black and put in the courtyard," says Cao Zhifeng, an engineer with the science academy. "But over time the systems became more sophisticated, and now ... they use insulated pipes."

In a country that is still largely agrarian, one obvious strategy is making biofuels and biogas out of the vast amount of agricultural and animal wastes, which can be used as a substitute for imported oil. In the past, farmers would burn corn or rice stalks directly, or decompose them into a gas that could be used as a substitute for natural gas in boilers or generators. Now China is looking at industrial-scale production of biogas, using agricultural, forestry, and municipal wastes. One biogas project on the outskirts of Beijing takes the waste from the 60,000 pigs on a farm and converts it into methane by adding anaerobic bacteria. Alcohol factories that once made China's famous fiery rice wine, or baijiu, are now shifting to making ethanol for use in cars.

China's ambitious renewable-energy projects are about to gain a higher profile. The Summer Olympics, to be held in Beijing in 2008, are on track to be the greenest games ever. The main venue, Beijing's Bird's Nest stadium, will be fitted with a 130-kilowatt solar energy system installed by Suntech Power, a Chinese solar company that listed on the New York Stock Exchange in December. The Beijing government has also pledged to build 160 geothermal wells in the city by 2008 to provide space heating for the games, and at least 20 percent of the electricity needs of Olympic Park will be supplied by wind power.

Off the grid. In the most remote areas, the government has harnessed wind and solar energy for the Township Electrification Project, which aims to provide electricity to tens of millions who live in the 29,000 villages that are not hooked up to the national grid. The plan is to build a huge solar photovoltaic station in the desert as well as smaller stations.

Across the plains of Inner Mongolia, new wind farms dot the landscape. Though the country currently ranks behind the United States and Europe in using wind energy, the only other developing country that uses more is India.

An important benefit to using renewables instead of coal-fired power is that it increases employment by relying on manufacturing rather than China's notoriously dangerous mines. China is on track to be the world leader in making and exporting renewable-energy equipment, making wind turbines, solar cells, solar water heaters, and hydro turbines.

Still, as in the West, renewable energy costs more in China than traditional energy sources do. In Germany, Japan, and the United States, government subsidies have helped make renewable energy affordable, through tax credits and favorable pricing for users of renewable power. China's new law follows suit by requiring utilities to purchase power from approved renewable-energy facilities at a set price and spreads the cost differential across all grid customers. It also offers tax incentives and discounted loans for developing renewable-energy projects and imposes penalties for failing to meet production targets.

Back at the Tian Pu factory, engineer Cao shows a visitor the wall of converters that enable the solar power to be connected to the city's power grid. Cao used to work on control systems for computers, but in the past few years he changed jobs to focus on solar photovoltaic systems. "I thought it was a better career move," he says. "After all, this is the wave of the future!"