

## **China Renewable Energy and Sustainable Development Report<sup>1</sup>**

China's extraordinary economic growth and heavy reliance on increasingly expensive foreign oil, the vast environmental toll that is one of the most apparent costs of China's economic success, persistent rural poverty in China and periodic power shortages all have impressed upon Beijing that renewable energy must be a large part of China's economy if China is to both complete its economic transformation and achieve "energy security".

China rapidly has moved along the path of renewable energy development. In 2005 China had the world's largest total investment in renewable energy sources (excluding large scale hydropower plants) with expenditures of \$6 billion dollars U.S. and the largest installed capacity of renewable energy with 37,000 MW of installed capacity. With wind-power investment of \$600 million dollars U.S. in 2006 and total installed capacity now approaching 5,000 MW, China is now the eighth largest wind-power producer in the world; Chinese analysts estimate that the total potential wind power generating capacity in China is in excess of 1 million MW, equal to the power generating capacity of 50 Three Gorges Projects and Chinese policymakers have set an ambitious goal of putting in place 30,000 MW of wind power by 2020. With an additional 3,000-5,000 MW of new wind capacity to be built in China during the 11<sup>th</sup> Five Year Plan period, China will be well along to that goal by 2010; in those five years investment in wind power capacity development will exceed 10 billion Yuan/year. Biomass energy from agricultural waste, straw and waste from cities alone may exceed 500 million MT of coal equivalents. In the near-term China plans to develop 120,000 MW of renewable energy by the year 2020; this would account for 12% to 16% of China's total installed energy producing capacity that year. China's ambitious growth target for renewable energy production will require an investment of approximately 800 billion Yuan (~\$100 billion U.S.D.) by 2020. In the long-term China has set an objective of having 30% or more of its total energy requirements satisfied by renewable sources by 2050.

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Our goal at the *China Renewable Energy and Sustainable Development Report* is to provide authoritative, timely, informative and useful information about the emerging renewable energy and sustainable development sectors in China for global companies who have products and services to sell to or buy from China's rapidly growing renewable energy and sustainable development sectors and other policy makers, NGOs and interested parties. Drawing from original Chinese language materials of Chinese companies, industry associations, central and local government agencies and non-governmental organizations, the *China Renewable Energy and Sustainable Development Report* will cover developments in China's solar, wind, bio-fuel, bio-mass, small hydroelectric and other renewable energy sectors, including regular features on investment, growth, local and national laws and regulations, leading Chinese companies, industry meetings, tradeshows, exhibitions and

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conferences and business opportunities. For more information about subscribing to the *China Renewable Energy and Sustainable Development Report*, please contact us at [lou@chinastrategiesllc.com](mailto:lou@chinastrategiesllc.com). For more information about China Strategies, LLC, please visit us at [www.chinastrategiesllc.com](http://www.chinastrategiesllc.com).

### *China's Solar Power Industry*

With the May 18, 2007 IPO of [China Sunergy](#) on the NASDAQ ([CSUN](#)), there are now five Chinese solar energy companies that have successfully listed their shares on foreign markets that are located in China's [Jiangsu Province](#); to complete the IPO, China Sunergy sold 8.5 million ADSs for \$11/share and raised a total of \$93.5 million U.S.D. The other four Chinese solar energy companies that have successfully listed their shares on foreign securities markets are [Suntech Power](#), listed under the symbol [STP](#) and located in [Wuxi, Jiangsu Province](#); [CSI Solar Technologies, Inc.](#), located in [Suzhou, Jiangsu Province](#); [Changzhou Trina Solar Energy Limited](#), located in [Changzhou, Jiangsu Province](#); and [Solarfun](#), located in [Qidong, Jiangsu Province](#). Because more than 95% of raw materials that Chinese solar energy companies source and more than 95% of Chinese solar energy companies' markets are outside China, obtaining financing through public offerings overseas is often crucial to the success of Chinese solar energy companies. China Sunergy, which is headquartered in [Nanjing, the capital of Jiangsu Province](#), presently has 6 solar battery production lines, with a cumulative total capacity of 192MW; this is the second largest capacity among solar energy companies in China. In early June a sixth Chinese solar energy company---Yingli Green Energy Holding---had an IPO in New York; Yingli Green Energy Holding is based in Hebei Province.

On May 21, 2007 [Conergy AG](#) of Germany, which is the world's largest solar energy company, established a branch office in Shanghai. Conergy AG has branches in more than 25 countries and employs more than 2000 people. The new Chinese branch is part of the Conergy AG strategy to have the company derive 50% of its revenues from Asia by 2008. Conergy AG considers the market for building integrated photovoltaic (BIPV) to be especially appealing in China.

On June 18, 2007 the Brilliance Silicon Energy Resources (Zhenjiang) Co., Ltd. was officially established in [Yangzhong, Jiangsu Province](#). The ceremony to establish the new company, which is a joint venture of the Hong Kong Brilliance Silicon Science and Technology Co., Ltd. and three other foreign companies, was attended by various city officials and private individuals, including Shi Zhengrong, the chairman of [Suntech Power](#), which will work together with Brilliance Silicon to expand the solar power supply chain. The new company will build a facility to produce 900MW solar energy silicon wafers using imported polycrystalline furnaces and 650 sets of wafer slicing equipment. When fully operational the new facility will be able to produce more than 450 million polycrystalline silicon wafers/year; annual projected sales are more than 20 billion Yuan.

## *China's Wind Power Industry*

Li Junfeng, the deputy director of the Energy Research Institute of the [National Development and Reform Commission](#) said recently that China's plan to develop 5000 MW of wind power by 2010 will be exceeded by the end of 2007 or the first half of 2008 and that the NDRC now has a new goal of having 8000 to 10,000 MW of wind power operating in China as of the end of the 11<sup>th</sup> Five Year Plan period in 2010. The revised amount of wind power that will be in place by 2010 will be 60% to 100% greater than the original goal and well on the way to Beijing's goal of 20,000 MW of wind power generating capacity as of 2020.

According to the *{Shanghai City Wind Power Electric Generation '11<sup>th</sup> Five Year' Plan and 2020 Long-Term Objectives}*, during the 11<sup>th</sup> Five Year Plan period electric generated by wind power will increase 12.7 times and by 2020 Shanghai will have installed capacity to produce wind power totaling 1900 MW. Wind farms have been or will be constructed 13 districts in Shanghai, including the following land and offshore locations: Nanhui, Qinjin, Congming, Changxing, Hengsha and East China Sea Bridge.

## *China's Hydropower Industry*

During the 11<sup>th</sup> Five Year Plan period, small hydroelectric power output in [Heilongjiang Province](#) will increase by 156MW to a total of 386.5MW; by 2010 Heilongjiang will have developed just 12.3% of the province's total hydropower resources. By the end of 2010 there will be an additional 20 rural hydroelectric power plants built in Heilongjiang Province. Through the end of 2005 Heilongjiang Province already had constructed a total of 64 hydroelectric plants with a total installed capacity of 210MW, or 6.7% of total hydropower resources in Heilongjiang, estimated to be 3130MW. There is another 20.5MW of hydroelectric power under construction.

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## *China's Geothermal Industry*

According to Shi Dinghuai, the director of the China Renewable Energy Institute, China presently uses 445 million cubic meters of geo-thermal energy, which is the largest of any nation in the world. China's utilization of geo-thermal energy is growing at the rate of 10%/annum, say Mr. Shi. Statistics from the State Land Resources Ministry indicate that China's useable underground hot water resources are approximately 6.7 billion cubic meters/year, equal to approximately 32.83 million MT of coal equivalents. The geo-thermal resources that China has available for power generation principally are concentrated in the Hengduan Mountain area of the Yunnan Province and Tibet border region; presently 88% of China's installed capacity to produce geo-thermal electric power is concentrated in Tibet, including the Yangbajing magma geo-thermal power plant which has been operating for nearly 30 years. The Yangyi village geo-thermal power plant is expected to be under construction soon. Installation and use of geo-thermal heat pumps is growing in China; at present the building area utilizing geo-thermal heat pumps already exceeds 30 million square meters. China's market for geo-thermal heat pumps already exceeds sales of 100 million Yuan/annum and is growing at the rate of 20%/year.

## China's Bio-Mass Energy and Bio-Fuels Industries

For many years the Jiangxin wastewater treatment plant in [Nanjing, Jiangsu Province](#) produced more than 200 MT/day of sludge, all of which was buried. The Xiexin Household Sludge Power Plant uses advanced technologies to incinerate the sludge (together with coal slurry), which enables the plant to produce 2.1 million kwh of power per day. By the end of the year the plant will expand to be able to handle 300 tpd of sludge, but based on its design the Xiexin power plant will eventually be able to handle 6 million tpd, completely handling all of the sludge generated by the entire city of Nanjing. Because of this, Nanjing has slowed the development of an 80 million Yuan expansion of the Jiangxin Zhou Sludge Treatment Plan.

China's Ministry of Finance and other relevant ministries are now developing measures for providing subsidies to sources of the raw materials for bio-energy (i.e., ethanol, bio-diesel, methane, electric power, etc., etc.; this effort is an outgrowth of provisions in the *{Implementing Opinion on Financial and Tax Support Policies For the Development of Bio-Energy and Bio-Chemicals}* which was issued by the Ministry of Finance in 2006. In part due to a paucity of arable land in China and other factors, shortages of bio-energy raw materials have arisen in recent years. For example, China primarily has used edible oils as the raw material to manufacture bio-diesel. In 2005, China's output of edible oils was about 100,000 MT, though by 2006 China's output of bio-diesel had grown to 500,000 tpy, resulting in a large increase in the price of edible oil from 1800 Yuan/MT to 3000 Yuan/MT in 2006. The principal that is applied is that there should be no competition between sources of raw materials for bio-energy and food sources. Energy crops used to produce fuel ethanol principally include cassava, sugar cane, sweet potatoes, beets, etc. Raw materials for bio-diesel include the tung tree (tung oil), Chinese pistache, the shiny leaf yellow horn and the tallow tree.

## Waste to Energy Industry

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Over the past year it has been operating, the Shenzhen ([Guangdong Province](#)) Zhonglian Environmental and Renewable Energy Co., Ltd. has received a total of 4.7 million Yuan in tax rebates from the Longgang District State Tax Bureau, Pinghu Tax Bureau Branch in connection with the company's operation of a household waste to energy project. The Longgang District Pinghu Waste Incineration Power Generation Plant, which was built by the Shenzhen Zhonglian Environmental and Renewable Energy Co., Ltd., went into operation last year. In the first year of operation, the company handled more than 260,000 MT of household waste and produced more than 75 million kwh of electricity, earning more than 47 million Yuan from the sale of electricity and the receipt of waste subsidies.

## China's Construction Industry and Sustainable Development

In remarks at the 2007 China (Jinan) International Solar Energy Heating Conference, Chen Deming, a vice-chairman of the National Development and Reform Commission said that Beijing is contemplating formulating compulsory regulations for the installation of solar hot water apparatuses. The new regulations will be an outgrowth of the *{Implementing Plan for Promoting Nation-wide Solar Power Heating}*, which was issued by the NDRC.

According to a spokesperson for the Building Committee of the [City of Beijing](#), Beijing

will be releasing a plan in the June-August 2007 period to address the approximately 160 million square meters of buildings that will require energy conservation upgrades in the future. These buildings include buildings housing government agencies, building with heavy energy consumption and residential buildings. Based on an estimated cost of 200 Yuan/square meter, the total amount that will be expended to carry out this scale of energy conservation renovations will total approximately 32 billion Yuan. By 2010 Beijing anticipates completing some 40.3 million square meters of upgrades, including 1.3 million square meters of government buildings, 10 million square meters of large public buildings, another 25 million square meters of public buildings and 4 million square meters of residential buildings. According to Beijing's 11<sup>th</sup> Five Year Plan, energy expenditure for heating per square meter should be 17% less than what it was in 2003, including a 23% decrease for residential buildings and a 14.5% decrease for public buildings. Beijing's plan also calls for renewable energy to account for 4% of total building energy consumption by 2010, including having 1 million square meters of solar powered heat and another 15 million square meters of geo-thermal and bio-mass heat supply for buildings.

### *Laws and Policies Governing Renewable Energy and Sustainable Development in China*

Since 1995 when the National People's Congress (NPC) passed the [{Electric Power Law of the People's Republic of China}](#), law making with respect to energy matters has been steady and prolific. In 1996 the NPC passed the [{Coal Law}](#) and in 1997 the [{Energy Conservation Law}](#). Since the beginning of the 21<sup>st</sup> century, China has increasingly emphasized the importance of sustainable energy development and this emphasis has been reflected in law making; in 2005 the NPC passed the [{Renewable Energy Law}](#). After more than a decade of experience, it is now clear that these key energy laws are in need of revision. Revisions are necessary for a number of reasons, including that they are not fully compatible with the principals of the WTO, which China acceded to in 2000, there are a number of matters that are not addressed in the earlier legislation, which is more general in nature and because of the growing conflicts among Chinese energy related laws and regulations. Beijing is working on drafting the {Energy Law} to address these contradictions, to clarify the overall strategy for China's energy development, to sort out the roles of various actors in China's energy industry, to enshrine short and long term planning of energy matters as a legal mandate, etc. In January 2006 a drafting committee designated by the State Council was established to begin work on drafting the {Energy Law} and by March 2007 an initial draft of the {Energy Law} had been drafted and opinions solicited. It is anticipated that by the end of 2007 or the beginning of 2008 the work of drafting an initial draft of the {Energy Law} will be complete.

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In mid-June 2007 Chen Ming, the vice-chairman of the Renewable Energy Development Center of the Energy Research Institute of the National Development and Reform Commission said that China's central government soon would release preferential tax policies for the renewable energy industry. The policy basis for the expected preferential tax policies for the renewable energy sector in China is the {Mid to Long Term Development Plan for Renewable Energy}, which among other things, established the principal of implementing preferential tax policies and expanding financial support for the renewable energy sector by Beijing.



## *Business Opportunities in China's Renewable Energy Industry*

The [Asian Development Bank](#) has initiated an Advisory and Operational Technical Assistance ([AOTA: PRC 40637-01](#)) to assist in the utilization of biomass energy resources in rural areas of the poorer western, central and northeastern provinces of China. The technical assistance will analyze the optimal utilization of existing biomass technologies in two to three targeted provinces. A fact-finding mission was begun in May 2007, after which the requirements for consulting services will be completed. The amount of the technical assistance is \$600,000 U.S.D. and the project officer is Anthony Maxwell of the Energy Division of the ADB. He can be reached at [amaxwell@adb.org](mailto:amaxwell@adb.org).

The Foreign Economic and Trade Bureau of [Zhang Wu County, Liaoning Province](#) (northwest of Liaoyang) seeks a foreign investor to build a 2 billion Yuan (~\$270 million dollars U.S.) wind farm. The contact person is Chen Shukui whose e-mail address is [zw-csk@163.com](mailto:zw-csk@163.com).

The Business Promotion Bureau of [Linze County, Zhangye City, Gansu Province](#) (located approximately midway between Wuwei and Yumen) seeks an investment of 250 million Yuan (\$33.7 million dollars U.S.) in the form of a cooperative or equity joint venture or a wholly foreign owned enterprise (WFOE) to build a 25 MW power plant fueled by 150,000-200,000 tpy of corn stalks and other agricultural waste. The contact person is Du Jianyong whose phone is (86) (936) 552-4285.

## *CDM Projects and Other Foreign Participation in China's Renewable Energy Sector*

On June 12, 2007 in Beijing the [China Guangdong Nuclear Power Group Wind Power Generating Co., Ltd.](#) entered into a CDM CER (certified emissions reduction) agreement with France's Electricite de France (EDF), whereby the French company purchased a total of 3.6 million MT of carbon dioxide emissions reductions from the Chinese company. The China Guangdong Nuclear Power Group Wind Power Generating Co., Ltd. already has three wind farms operating in China with total installed capacity of 400MW; through 2012 these wind farms will account for a total reduction in carbon dioxide emissions of 3.6 million MT. According to the president of France's EDF, France's largest electric power generation company, the European Union will purchase as much as 100 million MT of CER credits, including a significant amount from China.

On June 9, 2007, June 10, 2007 and June 17, 2007 another three Chinese CDM projects were registered with the CDM executive board, bringing the total of registered Chinese CDM projects to 88. The three latest CDM projects are the [Qixia Tangshanpeng Windfarm project](#), the [Huasheng Tianya Cement Co. 6.5MW Surplus Heat Power Generation Project](#) and the [Gansu Jingtie Mountain Hydropower Plant](#). The Qixia Tangshanpeng Windfarm project, which is a development of the Qixia City Ruilin Wind Power Generation Co. Ltd. and Britain's Carbon Asset Management Co., Ltd., is expected to generate 37,641 MT in carbon dioxide emissions reductions. The Huasheng Tianya Cement Co. project is a joint venture of the Sanya Huasheng Tianya Concrete Co., Ltd. and Sweden's Carbon Assets Management Company; this project is expected to generate 38,400 MT of carbon emissions reductions. The Gansu Jingtie Mountain Hydropower Plant Project, which is a joint venture of the Gansu Jiaquan City Sanyuan Hydropower Development Co., Ltd. and Spain's Endesa

Company, will produce 116,000 tpy in certified emissions reductions allowances. According to the [UN Framework Convention on Climate Change CDM](#) executive board, China presently has a total of 88 CDM projects which have been registered; these 88 projects account for yearly carbon dioxide emissions reductions in excess of 64,771,757 MT, which in turn accounts for approximately 43.04% of the yearly total of reductions of all registered CDM projects.

### *Renewable Energy and Sustainable Development Conferences*

The [2007 China International Solar Energy and Photovoltaic Engineering Exhibition](#) will be held at the Beijing International Exhibition Center June 25-29, 2007. The sponsors of the exhibition include the Asia Renewable Energy Association, the China Energy Enterprises Management Association and the China Foreign Trade and Economic Cooperation Enterprise Association.

The 2007 Bio-energy Technologies Seminar and Project Promotion Conference will be held from June 29, 2007 through July 2, 2007 in Qingdao, Shandong Province. For more information contact the China Bio-Energy Technologies Development Center at 011-86-10-8812-0866.

The [2007 Fourth China \(Nanjing\) Solar Energy Products, Photovoltaic Products and Renewable Energy Exhibition](#) will be held from September 23 through September 25, 2007 at the Nanjing International Exhibition Center in Nanjing, Jiangsu Province. The sponsors of the exhibition include the State Solar Energy Hot Water Appliances Quality Inspection Center (Wuhan) and the editorial board of the China Renewable Energy Institute's {Solar Energy} magazine.

### *Developments in Environmental Protection and Energy Conservation in China*

On June 24, 2007 the Standing Committee of the National People's Congress reviewed the latest draft of the amended {Energy Conservation Law}, which in revised paragraph four more forcefully elevates energy conservation as a basic policy of the government. The {Energy Conservation Law} originally was adopted by the National People's Congress in 1997 and has been in effect since January 1998.

Beginning June 1, 2007 China is increasing export tariffs on products whose production are characterized by excessive energy consumption, heavy pollution and resource intensiveness. Increases in export tariffs are the latest policy initiatives of China's central government to restrain exports of such products; previously Beijing has put in place a series of other measures, including differential power pricing, eliminating VAT rebates and increasing oversight over local preferential policies that encouraged the "blind" investment in such energy, resource and pollution intensive industries.

In a report issued on June 13, 2007, Zhou Dadi, the director of the Energy Research Bureau of the NDRC said that China has not achieved its goal of reducing per unit of GDP energy consumption in the first five months of 2007. Beijing's goal for the 11<sup>th</sup> Five Year Plan period is a 20% reduction in per unit of GDP energy consumption or 4% per year; in the first year of the 11<sup>th</sup> Five Year Plan China failed to realize its goal of a 4% reduction in energy consumption (achieving a savings of only 1.4%) and so far in 2007 it has also failed to realize this goal. Zhou

Dadi attributed the failure to achieve reductions in energy consumption primarily to the continued growth in heavy industry in China; in the first four months of 2007 heavy industry grew at a rate exceeding 19% (steel and concrete industry growth exceeded 20%). According to Zhou Dadi, the key to energy conservation is structural changes in the Chinese economy because energy conservation measures that are technology based will only account for 30% to 40% of the desired savings and the remaining 60% must be achieved through structural changes to the Chinese economy. While agreeing that structural changes in the Chinese economy are key to achieving the per unit of GDP energy savings, [Xie Zhenhua, a vice chairman of the NDRC](#) also attributed the failure to a lack of investment in energy conservation technologies and the fact that key financial, tax, pricing and other policies to address energy conservation and pollution reduction have not been formalized into regulations yet. Xie Zhenhua pointed out that last year was a turning point with respect to energy consumption with the cessation of years of steady increases in energy consumption per unit of GDP; this in itself is an 'extraordinary achievement', said Xie Zhenhua.

### *China's Energy Production and Consumption*

The Bureau on the Operation of the Economy of the National Development and Reform Commission recently issued a report which said that supply and demand of electric power throughout China in the first quarter of 2007 were basically in balance. There were, however, some regions of China where there was tightness in power supply in the first quarter of 2007. In Q1 2007 power generation increased in China by 15.5% to a total of 701.17 billion kwh. For a number of factors, including arid conditions leading to a reduction in hydropower availability, rapid increases in demand for power and constraints on the power grid, the power grids of fourteen province-level administrative regions, including Beijing, Tianjin, Tangshan, Shanxi, Jiangsu, Zhejiang, Henan and Hubei Provinces, experienced seasonal and periodic tightness in electric power supply.

In the first quarter of 2007 China became a net importer of coal as the policies of the NDRC aimed at restricting exports and encouraging imports of coal have taken effect. In Q1 2007 China had net imports of coal totaling 2.89 million MT; this compares to net exports of coal in the first quarter of 2006 totaling 7.89 million MT.

In the first five months of 2007 China's net imports of crude oil totaled 65.83 million MT, an 11.5% increase over the same period of a year ago. Chinese domestic crude oil production in the first five months of 2007 totaled 77.51 MT, a 1.7% increase y-o-y. Since an export tax of 5% was instituted in November 2006, there has been a quick drop off in exports of crude oil from China; in the first five months of this year a total of 1.6 million MT of crude oil was exported from China, a 36.6% decrease y-o-y.