

China Renewable Energy and Sustainable Development Report

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 37000 MW of installed capacity. With wind-power investment of \$600 million dollars U.S. in 2006 and total installed capacity of 2300 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 20000 MW of wind power by 2020. 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 120000 MW's of renewable energy by the year 2020; this would account for 12% of China's total installed energy producing capacity. 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, tradeshow, exhibitions and 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. For more information about China Strategies, LLC, please visit us at www.chinastrategiesllc.com.

China's Solar Power Industry

China is experiencing a rapid growth in polycrystalline silicon manufacturing capacity. With the plants that are now under construction and those that are being planned, total capacity to produce polycrystalline silicon will shortly exceed 20,000 tpy. Among the new capacity is the 1.2 billion Yuan, 1500 tpy polycrystalline silicon facility that will be constructed by a subsidiary of the [Dongfang \(Eastern\) Electrical Group](#) in [Chengdu, Sichuan Province](#). The Eastern Electrical Group's 1500 tpy facility is the first phase of a 3x1500tpy solar energy class polycrystalline silicon project that should be in place within the next several years. Other polycrystalline silicon plants in Sichuan province include the 1000 tpy Leshan New Solar Silicon Industry Company's plant, which was completed four months ahead of schedule and which will soon be followed by a stage two, 3000 tpy project. Sichuan Province is also home to [Tongwei Group](#), which is building a 5000-tpy polycrystalline silicon facility in Leshan city for 3 billion Yuan. [Jiangsu Solar](#), which recently entered into a letter of intent with the Ningxia Eastern Non-Ferrous Metals Group and the Ningxia Yinglite Power Group to build a 3.5 billion Yuan, 4000-tpy polycrystalline silicon project is another new entrant in this rapidly growing industry. At present there are upwards of 400 photovoltaic solar companies operating in China and there are 12 publicly traded companies that are engaged in the polycrystalline silicon segment of the photovoltaic solar power industry. Demand for polycrystalline silicon in China outstrips domestic supply by some 3000 MT. Presently Chinese companies produce only approximately 400 tpy of polycrystalline silicon, including the 200 tpy that the [Emei Semiconductor Materials Plant](#) produces. In December 2006 the State Development and Reform Commission approved a total of seven projects. In addition to Sichuan Province, there are other provinces that are pursuing polycrystalline silicon projects; if all of the planned and contemplated projects are realized China's total capacity to produce polycrystalline silicon will be approximately 60,000 tpy, a quantity that would exceed total production capacity worldwide. The risk is that this industry, like so many other Chinese industries will experience gross oversupply. And despite the capacity growth, the Chinese polycrystalline silicon industry hasn't yet mastered the technology like the U.S., German and Japanese have.

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[Deli Solar USA, Inc.](#) and the Shenzhen City Hongre Solar Energy Co., Ltd. have entered into an agreement to jointly invest 150 million Yuan in two stages to establish a solar energy research and development center and production facility in [Shenzhen, Guangdong Province](#).

To further its goal of creating a "Solar City", the city of [Baoding in Heibei Province](#) (south of Beijing) has instituted new policies that will enable government departments to purchase solar power photovoltaic products that companies produce

China's Wind Power Industry

In early March the first phase 400 million Yuan, 50 MW Chang Mountaintop wind power plant at the Hongsibao Development District in [Wuzhong City, Ningxia Province](#) (south of Yinchuan), was connected to the power grid and began generating electricity. Long-term plans are for the developer—the Ningxia Yinyi Wind Power Generating Co., Ltd.----to invest a total of 5.6 billion Yuan in wind power in the Hongsibao Development District.

Construction of the first stage, 58-turbine wind farm is complete and connected to the

power grid. The Datang Taonan Wind Farm, which is located in [Taonan city, Jilin Province](#) (south of Baicheng near the border with Inner Mongolia), is a venture of the Datang Jilin Power Generating Co., Ltd. and the Jilin Mingmen Wind Power Generation LLC. The owners are expected to begin construction on the second stage 50 MW wind power project this year.

Surveys indicate that China's potential land-based wind power output is 3.226 million MW.

According to Ningxia Province's wind power development plan, Ningxia will develop a total of 9 mid to large-scale wind farms, including the Helangshan (Holland Mountain), Qingtongxia, Hongsibao, Chang Shantou (Chang Mountaintop) (see above) and the Ningdong (East Ningxia) wind farms. According to the Ningxia wind power development plan, installed capacity of wind power in Ningxia Province in 2010 will exceed 1000 MW by 2010 and 2000 MW by 2020. Ningxia Province's wind power development plan also has spurred the development of wind power machinery manufacturing. In December 2005 the Ningxia Power Generating Group, Germany's Nordex Co. and the Ningxia Tianjin Group established the Ende (Yinchuan) Wind Power Equipment Manufacturing Co., Ltd. in Yinchuan city, Ningxia; by November 2006 the Ende Wind Power Equipment Manufacturing Co., Ltd. had produced its first wind turbine and it is now able to produce 200 wind turbines per year.

The Tianjin Economic-Technological Development Area (TEDA) is now home to two significant wind power companies. In 2006, the Chinese subsidiary of the Danish company [Vestas Group](#)---the Vestas Wind Power Equipment (China) Co., Ltd.--- invested \$30 million dollars U.S. in a new plant that has the capacity to produce up to 600 39-metre blades turbine blades per year for the V80-2.0MW wind turbines. By September 2007 the first phase development of the Tianjin Dongqi Wind Energy Blades Engineering Company, a joint venture of the Dongfang (Eastern) Qilunji (Gas Turbine) Co, Ltd. and the Tianjin Power Engine Joint Stock Group, will be designing and manufacturing wind power turbine systems and MW-class wind power blades.

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China's Hydropower Industry

On April 5-8, 2007 an eight member delegation from the China Engineering Institute's Renewable Energy Strategy and Research Hydropower Team that conducted a research visit to the [Wujiang \(Wu River\) Hydropower project](#) in [Guizhou Province](#), concluded that the Wujiang Step Hydropower Development created an harmonious relationship between man and nature and that the experience of this project should be brought to bear on other Chinese hydroelectric power projects. The inspection team, which was comprised of members from the China Engineering Institute, the China Institute of Science, the Ministry of Water Conservancy, the Three Gorges Company, the China Hydropower Generation Institute and other water conservation and hydropower specialists, visited the Wujiang Crossing Power Plant, the Suofengying Power Plant, both of which are operating and the Goupitan Hydropower Plant, which is under construction. Cumulatively the Wujiang Crossing, Dongfeng (Eastern Wind), Hongjia Crossing and Suofengying power plants have produced 93.8 billion Kwh of power and have saved 35.6 million MT of coal equivalents. Through the end of 2006 the Wujiang Project has infused more than 15 billion Yuan into the Guizhou economy.

Laws and Policies Governing Renewable Energy and Sustainable Development in China

On March 16, 2007 the [State Development and Reform Commission](#) issued the *{Notice Concerning Reporting 2006 Renewable Energy Output and Power Price Surcharges and other related Materials}*, which formally initiates the work of adjusting additional income attributable to renewable energy power prices for 2006. The Notice requires the competent departments in charge of prices for the provinces, directly administered cities and autonomous regions to conduct a statistical census of renewable energy producing companies, province-level power grid companies and public renewable energy independent power systems operating companies to count the amount of renewable energy which entered the power network in 2006, the cost of the power to access the network and total power cost of the renewable energy so as to ascertain supplemental levies on power prices attributable to renewable energy. This work is a product of the *{Renewable Energy Law}* which took effect as of January 1, 2006 and which recognized that the cost of generating power from renewable energy sources was higher than from traditional sources. The *{Renewable Energy Law}* provided that the difference in price paid by the power networks (between the cost of traditionally produced power and renewable energy) would be added to the price charged by the power grid companies for power and would be shared among purchasers of power. In mid 2006 the relevant departments of the government issued *{Implementing Measures for the Management of the Sharing of Costs and Prices of Renewable Energy Production}* and *{Provisional Measures for the Allocation of Additional Income from Renewable Energy Prices}*. According to the *{Mid to Long Term Renewable Energy Development Plan}* issued by the State Development and Reform Commission, China intends to increase renewable energy supply as a percentage of total energy supply from 7% at present to 15%.

The provincial government of [Sichuan Province](#) has developed objectives for further renewable energy development through the *{Sichuan Province 11th Five Year Plan and 2020 Energy Development Plan}* which it recently issued. According to the goals of Sichuan's energy development plan, by 2010 installed capacity of wind power should reach 100 MW, bio-mass energy (primarily from crop stalks) energy capacity should reach 50 MW, there should be an additional 40 solar energy generating facilities, Sichuan Province should be producing 100,000 tpy of bio-fuels and 5 million farm households should be using methane gas. Surveys indicate that Sichuan Province crop waste (stalks, etc.) totals 49.7 million tpy, which is equivalent to 24.6 million MT of coal. Sichuan now has two crop-to-energy plants located in Mianyang and Neijiang. Based on a November 2006 framework agreement between the government of Sichuan Province and China Oil and Gas Joint Stock Co., Ltd. the parties will develop a 100,000 tpy bio-fuels capability based on the manioc tree, which is abundant in Sichuan.

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

On March 27, 2007 the 4th training session of the China—United Nations Development Program Minority Nationality Region Green Energy and Poverty Reduction Project was held in [Guiyang](#).

[Guizhou Province](#). In November 2007 the China—United Nations Development Program Minority Nationality Region Green Energy and Poverty Reduction Project was officially commenced in Beijing. The project, which covers minority nationalities in Guizhou, [Yunnan](#) and [Sichuan Provinces](#), aims to reduce poverty and develop the ecology of these regions by training technical, commercial and management personnel in developing a bio-fuels industry based on such bio-materials as the small [tung oil tree](#). Previously training sessions were held in Beijing, Sichuan and Yunnan Provinces.

Business Opportunities in China's Renewable Energy Industry

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.

The Business Promotion Bureau of [Linze County, Zhangye City, Gansu Province](#) (located approximately halfway 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.

Construction and Sustainable Development

The city of [Tianjin](#) has a program called the “Three No Outstanding Bills” (no outstanding environmental bills, no outstanding resource bills and no outstanding housing quality bills) whose aim is to develop housing that is in keeping with energy conservation, environmental protection and quality housing goals. The near term objective of the city is to develop 20 million square meters of housing which uses solar energy, geo-thermal pumps, water heat pumps, waste water heat pumps and other renewable energy resources for heating, cooling and hot water use in housing that achieves a 65% reduction in energy consumption. Presently Tianjin has 73.49 million square meters of housing, accounting for 47.8% of all housing that is in some way “energy efficient”; of that total approximately 35.04 million square meters of housing, which was constructed from 1992-2000 has achieved a 30% reduction in energy consumption. Another 23.45 million square meters that was built from 2001 through 2005 has achieved a 50% reduction in energy consumption. From 2005 through the present another 15 million square meters of housing was constructed having a reduction in energy consumption of 65%.

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Renewable Energy and Sustainable Development Conferences

The [3rd Annual China Power & Alternative Energy Summit 2007](#) will be held May 16, 2007 through May 20, 2007 at the Swissotel, Beijing.

The [2nd China Renewable Energy and Energy Conservation Products and Technology Exhibition](#) will be held June 1-3, 2007 in Beijing at the National Agricultural Exhibition Hall.

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.

Developments in Environmental Protection and Energy Conservation in China

Though the United States continues to be the largest emitter of carbon dioxide, China is number one in terms of increases in carbon dioxide discharges. In 2006, China consumed in excess of 1.2 billion MT of coal to produce electricity; this was one-half of total coal consumption in China in 2006. China's discharge of sulfur dioxide accounts for 54% of the world's total discharge of sulfur dioxide; 50% of China's sulfur dioxide emissions are from power plants. China's power plants account for 1/3rd of China's total power consumption and of the 622,000 MW of power plants in China more than 20% or 115,000 MW are small coal fired plants whose consumption of coal for the same amount of electricity generated is 30-50% higher and whose discharge of sulfur dioxide is 1/3rd of total sulfur dioxide emissions for all power plants in China. The failure of the Chinese government to more aggressively close small power plants is one of the significant reasons why Beijing failed in its goal for the first year of the 11th Five Year Plan Period to reduce energy consumption and pollution discharges per unit of GDP. The various provinces and principal power companies and the State Development and Reform Commission already have entered into "letters of responsibility" concerning their plans to close small power plants during the 11th Five Year Plan Period.

The [Aluminum Company of China \(Chalco\)](#) released its **2006 Sustainable Development Report** on April 10, 2007 in which it reported that the company had realized energy savings of 1.2 million MT of coal equivalents in 2006. Among other things in the 2006 Sustainable Development Report was that 80% of Chalco's alumina producing companies had realized complete recycling of wastewater, which now totals 33.77 million MT of discharge.

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China's Energy Consumption

At the [MIT Energy Forum China](#) that was held on April 3rd and 4th, 2007, Xu Dingming, the deputy chairman of the [State Energy Leadership Group](#) said that China would be unable to duplicate the energy consumption of the U.S. as it continues to develop its economy. Xu Dingming explained that per capita consumption of crude oil in the U.S. is now approximately 3 MT/person/year; if China were to have the per capita levels of oil consumption of the U.S., by 2020, China would have a total demand of 4.5 billion MT of crude oil. This level of consumption is virtually impossible as total supply of crude oil at present is only 4 billion tpy. According to the State Statistical Bureau China had approximately 50 million vehicles, of which total approximately 30 million vehicles are private cars of Chinese citizens. This is a cause for concern, says Xu Dingming, as each vehicle consumes approximately 2 MT of crude oil/annum. Based on the growth in ownership of vehicles in China of approximately 20%/annum,

transportation will become an ever increasing contributor of energy consumption in China. The solution for China is to develop a higher efficiency and sustainable energy policy that includes an increasing proportion of energy in renewable energy. By 2020 China's goal is to have 16% of its total energy requirements met through a combination of renewable energy sources, including hydropower (which will increase from 180000 MW of installed capacity in 2010 to 300,000 MW of installed capacity by 2020), wind power (which will increase from 5000 MW of installed capacity in 2010 to 30000 MW of installed capacity by 2020), solar power (which will increase from 300 MW of installed capacity in 2010 to 1800 MW of installed capacity in 2020) and other renewable energy sources, such as methane, ethanol and other bio-fuels and bio-mass energy.

According to the ***“Mid to Long-Term Development Plan for Renewable Energy”*** China will become the world's largest market for renewable energy. Because China's coal, natural gas and oil reserves are limited and its energy demands continue to grow at double-digit rates, China will become even more dependent on imported oil. By 2020 China's reliance on imported oil will rise to 60% or more of total consumption; by 2020 China's demand for energy will have exceeded 4 billion MT of coal equivalents. Consequently China's leaders, including prominently President Hu Jintao and Premier Wen Jiabao, agree that renewable energy must play a large part in satisfying China's growing demand for energy. The ***Mid to Long-Term Development Plan for Renewable Energy*** has a target of 16% of total energy consumption being satisfied by renewable energy in China by 2020.

On April 10, 2007 the [State Development and Reform Commission](#) issued the ***11th Five Year Plan Period Energy Development Plan***. The Plan sets a goal of total energy consumption in 2010 at 2.7 billion MT of coal equivalents, a 4%/annum increase over 2006 consumption; of this total coal will account for 66.1% of all non-renewable energy consumption, three percentage points lower than 2005. In 2010 crude oil, natural gas, nuclear power, hydropower and “other renewable energy sources” will account for, respectively, 20%, 5.3%, 0.9%, 6.8% and 0.4% of total energy consumption. The Plan also sets out the objective of total energy output in China of 2.446 million MT of coal equivalents, a 3.5%/annum increase over the beginning of the 11th Five Year Plan Period in 2006; of this total coal, crude oil, natural gas, nuclear, hydropower and “other renewable energy sources” will account for, respectively, 74.7%, 11.3%, 5.0%, 1.0%, 7.5% and 0.5% of total energy output. In 2005 non-renewable energy production totaled 2.06 billion MT of coal equivalents and total consumption that year was 2.25 billion MT of coal equivalents, which was, respectively, 13.7% of the world's total non-renewable energy output and 14.8% of the world's total consumption of energy. China's consumption of coal is 42% larger than the world's average consumption of coal, which contributes to the environmental and social problems that China faces. With respect to the renewable energy sector in China, the 11th Five Year Plan Period Energy Development Plan states that the central government will put in place a quota system, improve the preferential pricing system for renewable energy and implement tax policies that are conducive to the use of more renewable energy. In order to achieve the goals of energy conservation and environmental protection, Beijing will place emphasis on developing a recycling economy, nurturing the development of high technology industries, expanding the percentage of the service industry's contribution to GDP and improve the structure of Chinese industry.

A national natural gas utilization policy is in the last stages of development by the State Development and Reform Commission and should be released to the public within two months. In recent years China's natural gas market has developed rapidly and supplies of natural gas have lagged behind demand, resulting in certain regions of the country experiencing shortages of natural

gas supply. The national natural gas utilization policy will likely institute a regime of “encouraged, permitted, restricted and prohibited” uses of natural gas. Among the “encouraged” uses will be natural gas powered vehicles, especially buses and taxis; among the “restricted” and “prohibited” uses will be the use of natural gas by the chemical industry in the production of synthetic ammonia and methyl alcohol. It is also expected that there will be an upward adjustment in the price of natural gas. Natural gas output rose at the annual rate of 12.63% during the 10th Five Year Plan; in 2000 output of natural gas in China totaled 27.2 cubic meters and by 2005 output of natural gas had reached 49.3 cubic meters.