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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.

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 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

In China there now are six factories producing at least 2 MW/year each of mono-crystalline, poly-crystalline and non-crystalline photovoltaic batteries. These factories include the Wuxi Suntech Solar Energy Co., Ltd., which produces approximately 50 MW/year of solar `batteries and photovoltaic modules; the Yunnan Semi-conductor Parts Plant, which manufactures approximately 2 MW/year of mono-crystalline batteries; the Baoding Yingli Solar Energy Modules Plant, which manufactures approximately 6 MW/year of poly-crystalline batteries and modules; the Shanghai Jiaoda Guofei Solar Energy Battery Factory, which produces approximately 1 MW/year of modules; and the Shanghai PV Science and Technology Co., Ltd., which produces approximately 5 MW/year of modules.

A recent article in the Chinese renewable energy press enumerates some of the obstacles to further development of the Chinese solar energy sector that China faces. These obstacles include the lack of a nationwide comprehensive PV plan, the lack of updated facilities and sufficient financial resources to support PV research at research institutes, the lack of sufficient facilities and resources at companies manufacturing PV products, the failure of companies to be able to produce high quality, reliable and low cost PV products and the relatively weak educational and training opportunities in China for PV science and technology.

China's Wind Power Industry

Suzlon Energy (Tianjin) Co, Ltd., a Chinese subsidiary of Suzlon, the Indian wind power generation design, construction, equipment manufacturing and consulting company, held a ceremony at the Tianjin New Technology Industries District marking the beginning of construction of a factory there. Suzlon Energy (Tianjin), which was established in 2006, is investing $60 million U.S.D. to construct a factory to manufacture wind power generating equipment, including blades, engine room outer shells, turbo generators, etc. Total installed capacity is 600 MW.

According to reports from the 2007 China (Shanghai) International Wind Energy Exhibition held on April 10, 2007 at the Shanghai New International Exhibition Center, by 2010, 5% of Shanghai's energy needs will be generated from wind power. Shanghai's first domestically produced wind farm will locate in Lingang New Town; the 7 MW wind farm will begin generating power in early 2008 and the power generated from this wind farm will be connected to the Huadong (Eastern China) Power Grid. Over the past several years new wind farms have been built in Shanghai, including the Nanhui Wind Farm, the Qinjian Bay Wind Farm and the Chongming Dongtan (Eastern Beaches) Wind Farm. Together these three wind farms have 18 windmills with a total of 24.4 MW. Because land based wind farms require a large amount of land, Shanghai is pursuing ocean-based wind farms; the first ocean based wind farm which Shanghai is constructing is the "Juwuba" East China Sea Bridge 100 MW wind farm. When completed the Juwaba East China Sea Bridge wind farm will produce 260 million kwh/annum; based on average power consumption of 1200 kwh/annum/household in Shanghai, the sea based wind farm would be able to supply the power needs of 170,000 households in Shanghai.

In 2006 the Shanghai Power Company purchased 64.485 million kwh of green energy (primarily from wind farms), yet the amount of renewable energy which was subscribed by customers from Shanghai Power Company was only 23% of that total. In 2006 there were just 6482 households in Shanghai that subscribed to renewable energy in part because the cost of wind power is 0.53 Yuan/kwh higher than power produced from coal plants; in 2007 total output of wind farms in Shanghai will total

100 million kwh, which is sufficient to power 120,000 households. Though there were 22 entities that purchased renewable energy in Shanghai, though with the exception of 1/3rd of that total being state-owned enterprises, the remainder were foreign invested enterprises. Shanghai's city government did not purchase any renewable energy. Of the top ten power customers in Shanghai, only Bao Steel purchased renewable energy; in 2006 Bao Steel entered into an agreement to purchase 1.2 million kwh over three years.

The China National Offshore Oil Corporation (CNOOC), aiming to diversify from its core oil and gas business, will be seeking international companies interested in cooperating with them to develop offshore wind farms, said CNNOOC president Fu Chengyu at a conference in Hainan Province on April 22, 2007.

Installed capacity of wind power in China increased 1040 MW or 82.5% from the end of 2005 to the end of 2006. Of the total of 80 wind farms presently operating in China, the China Longyuan Electric Power Group Corp. operates 32 wind farms in China; these 32 wind farms are comprised of 952 windmills that cumulatively have installed capacity of 780MW, or approximately 30% of total wind generating capacity in China..

China's Hydropower Industry

On April 6, 2007 the Gansu Dang River Hydropower Project was registered as a Clean Development Mechanism (CDM) project in accordance with the requirements of Kyotol Protocol to the United Nations Framework Convention on Climate Control. The project consists of the construction and operation of eight run-of-river hydropower plants providing total capacity of 35.4MW, which will generate an average of 224,040 MWh/annum. The power generated by the project, which is located in Dang Town, Subei Mongolian Autonomous County, Gansu Province, China, and which was certified by the National Development and Reform Commission (NDRC) to be in compliance with the Measures for the Operation and Management of Clean Development Mechanism Projects in China, will[3] be sold to the Gansu power grid which is part of the China Northwest Regional Power Grid (NWPG), thereby displacing equivalent amounts of electricity generated by the current mix of power sold to the NWPG. The developer of the Gansu Dang River Hydropower Project, which started construction on November 1, 2004, is the Jiayuguan City Tongyuan Hydropower Co., Ltd. The Letter of Approval of the NDRC permits the Jiayuguan City Tongyuan Hydropower Co., Ltd. to transfer to Japan Carbon Finance, Ltd., an entity approved by the government of Japan no more than 1.2 million MT of carbon dioxide emissions in total Certified Emission Reductions (CERs) over the seven year period beginning on May 1, 2007 and ending on April 30, 2014.

In 2006 there was 10,000 MW of installed hydropower capacity that went into operation in China. The National Development and Reform Commission also approved 13 additional hydropower projects in 2006, which cumulatively will have 19,511 MW of power generating capacity. New hydropower projects that were approved and began construction in 2006 include the Jinsha River Xiangjia Dam (6000 MW), the Yalong River Mianpi (Second Phase) (4800 MW), the Lancang River Jinghong (1750 MW), the Beipan River Guangzhao (1040 MW) and the Wu River Silin (1000 MW). In 2005 the following hydroelectric power projects were approved by the NDRC and began construction: the Jinsha River Xiluo Crossing (12600 MW); the Yellow River Laxiwa (4200 MW and the Yalong River Mianpi (First Phase) (3600 MW).

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

China emerged as the world's third largest producer of ethanol bio-fuels (after the U.S. and Brazil) as of the end of the 10th Five Year Plan Period in 2005 and at present ethanol accounts for 20% of total automotive fuel consumption in China. In the 11th Five Year Plan period (2006 through 2010) China plans to develop 6 million tpy of fuel ethanol capacity, which is expected to grow to 15 million tpy by 2020. Despite this level of production, experts say that there will be no threat to food security, though there will be an increasing number of farmers who will be "farming oil" if the price of crude oil continues to increase. Based on planned ethanol projects in some provinces in China, the output of corn would be insufficient to provide the raw material for those plants in those provinces. In the recently published {World Economic Outlook}, the International Monetary Fund expressed concern that there would be increasing competition worldwide between bio-fuels and food consumption for agricultural products and that that competition likely would continue to result in increases in prices of crops.

Work has begun on the 250 million Yuan Kaiyou Green Energy Biomass (Rice Husks) Power Generating project located in the Suqian City (Jiangsu Province) Economic Development Zone in Suqian City, Jiangsu Province. The Kaiyou Green Energy Biomass Power project will generate 144 million kwh/year and use 200,000 tpy of crop waste as inputs.

Laws and Policies Governing Renewable Energy and Sustainable Development in China

Several provisions in relevant Chinese laws and regulations address the development of methane gas in rural China. These provisions include Article 54 of the *Agriculture Law of the People's Republic of China*, Articles 4 and 11 of the *Energy Conservation Law of the People's Republic of China*, Article 18 of the *Renewable Energy Law of the People's Republic of China* and Article 12 of the *Regulations of the People's Republic of China Concerning Restoring Farmland to Forest*.

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.

CDM Projects in China

According to the United Nations Framework Convention on Climate Change, of a total of more than 600 registered CDM Projects worldwide through mid-April 2007, there are now 70 registered CDM projects in China. The pace of Chinese CDM project registration is accelerating; prior to the beginning of 2007 China had a total of 34 registered CDM projects, yet to date in 2007 another 36 Chinese CDM projects have been registered.

Companies

The Shanghai Power Transmission and Distribution Joint Stock Company, a subsidiary of the Shanghai Electric and Gas Group Joint Stock Company entered into a joint venture agreement with Canada's Xantrex Technology, Inc, to build a factory to design, manufacture and sell solar and wind power electric and gas electronics products. The new company is in the final stages of the approval process.

According to Theo Ramborst, the General Manager and CEO of Bosch Rexroth (China) Ltd., a subsidiary of the Bosch Group AG, a world leader in controls, transmission and machine hydraulics manufacturing, Bosch Rexroth (China) Ltd. contracted120 million Euros in wind turbo generator business in China in 2006, a 66% increase y-o-y. Responding to the increase in wind energy business in China, Bosch Rexroth (China) Ltd. invested 280 million Yuan in October 2006 in plant expansions in Beijing and Changzhou, Jiangsu Province. Earlier in 2006 Bosch Rexroth started up its Shanghai Jinqiao (Golden Bridge) factory, which is involved in the manufacture, installation, distribution and service of transmission and control parts and systems; the Shanghai facility will also serve as Bosch's principal center for technology, personnel and distribution in China.

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.

On April 20, 2007 the Environment and Resources Committee of the National Peoples Congress and the National Development and Reform Commission convened a conference on the occasion of the first anniversary of the {Renewable Energy Law}. There were approximately 250 people who attended the conference from the Ministry of Finance, the Ministry of Science and Technology, the Ministry of Agriculture, the Ministry of Construction, the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), the National Bureau of Forestry, the National Power Network Company, science and technology institutes, oil companies, large energy investment

companies, companies manufacturing renewable energy equipment, etc.

Developments in Environmental Protection and Energy Conservation in China

According to a Chinese "Energy Blue Paper" recently written by the Chinese Academy of Social Sciences, the average rate of recovery of coal from mining in China is only 30%, less than one-half the rate of recovery throughout the world; the rate of recovery of coal resources in the U.S., Australia, Germany and Canada is ~80%. The rate of recovery of coal from mining in Shanxi Province, China's largest source of coal is approximately 40%, though the rate of recovery of village and township coal mines in Shanxi Province is only 10%-20%. Cumulatively over the course of the past 20 years (1980-2000) China has wasted upwards of 28 billion MT of coal. The same causes for a low rate of recovery in coal mining---that extraction methods are backwards---lead to safety problems in China's coal mining sector. Another reason for the low rate of recovery is that the majority of extraction comes from small scale mining; of the 346.9 billion MT of coal extracted by China, only 98 billion MT has come from large or mid-sized mines while 250 billion MT are extracted from small mines. Based on coal production in 2005 of 2.19 billion MT and a current rate of recovery of 30%, if China were able to double its rate of recovery it would save approximately 3.5 billion MT of coal.

On April 11-13, 2007, the Department of Science, Technology and Education of the Chinese Ministry of Agriculture hosted the Asian regional workshop on adaptation to climate change organized by the United Nations Framework Convention on Climate Change (UNFCCC). Climate change will affect Asian countries in different but consistently negative ways. Temperate regions will experience changes in boreal forest cover, while vanishing mountain glaciers will cause problems such as water shortages and increased risks of glacial lake flooding. Coastal zones are under increasing risk from sea level rises as well as pollution and over-exploitation of natural resources. In 2006 in China storms, floods, heat and drought killed more than 2700 people; effects ranged from drought in the southwest of China, which were the worst since records began to be kept in the late 19th century, to floods and typhoons in central and southeastern China. The weather events in China in 2006 were seen to be a prelude to weather patterns likely to become more common due to global warming. Topics discussed by representatives of Asian countries and developed countries, international organizations and non-governmental organizations, included vulnerability assessments, implementing adaptation actions in various sectors of the economy and in specific geographical areas, such as coastal and mountainous regions.

Based on a recently completed survey, the Standardization Administration of China plans to further develop and improve standards for conservation and comprehensive utilization of natural resources in the following areas: energy, water, wood and land conservation, development of renewable energy, the comprehensive utilization of mine resources, recovery and reuse of scrap materials and clean production.

China's Energy Production and Consumption

Chinese energy experts are estimating that by 2050 the percentage of China's energy requirements that are satisfied by coal fired plants will have declined to 30-50% of total energy

consumption and that the remaining 50-70% will be provided by a combination of oil, natural gas, hydropower, nuclear power, bio-mass and other renewable energy sources.

Since June 2006 when Chinese Premier Wen Jiabao visited the Shenhua Group's 'coal to oil' project and expressed that 'coal to oil' production was one important part of China's energy security, there have been many new 'coal to oil' projects announced by many large coal producing provinces and cities. As of the end of 2006 there will 88 methyl alcohol projects planned; the total capacity of these projects is 48.5 million tpy. If all of these projects are built, by 2010 output of methyl alcohol will reach 60 million tpy. This "Great Leap Forward"-like rush to build coal to oil projects is giving rise to concerns about a new round of wasteful development and the unintended consequences of such rapid development; these include wasteful extraction of coal, excessive use of water (this process requires 10 MT of water for every MT of oil produced), likely increases in the price of coal, etc.

According to a study conducted by the Energy Research Institute of the National Development and Reform Commission on the economic circumstances of China's crude oil and chemical industry as of 2007, in recent years China has wasted an average of 400 million MT of coal equivalents per year. In 2006 China consumed a total of 2.46 billion MT coal equivalents, up from 1.4 billion MT of coal equivalents consumed nationwide in 2000. With energy consumption increasing at the rate of 10%/year, in the last 5 years total energy consumption has exceeded the combined amount of energy consumption over the previous 20 years. According to Dai Yande, the chairman of the Energy Research Institute of the NDRC, while continued high consumption of energy is unavoidable, China must take steps to change the form of its economic growth and increase substantially the energy efficiency of Chinese industry and society generally. Among other things China should find new points of economic development that moves China away from being the "World's Factory" and improves energy efficiency. China also must avoid unnecessary waste, foster a sustainable economy and encourage renewable energy sources to reduce China's reliance on petrochemical energy resources.

In 2006 a total of 2.8344 trillion kwh of electricity was generated in China from an installed base of 622000 MW of power generating capacity; in 2006 alone an additional 105000 MW of installed capacity came on line in China. Experts estimate that another 100,000 MW of newly installed electric power generating capacity will again come on-line in 2007, but that 2006 probably was the high water mark for electric power capacity development in China.

China and Russia are in talks to link their electric power networks so that China can purchase power from Russia's far east region to supply China's northeast (Manchuria). The benefits for China of importing power from neighboring countries include conserving domestic resources, lowering energy consumption, lessening China's dependence on imported oil (80%-90% of which must be shipped through unsafe waters) and reducing pollution discharge. China already has begun to build a 1000 Kv high-tension demonstration project and a 800 Kv direct power transmission project and after 2010 China will have a long distance high tension, high capacity transmission line for international transmission of electric power. China also is considering connecting its power transmission lines with Mongolia and other former Soviet states that border China and specialists predict that by the year 2020 more than 4 trillion kwh of power will be transmitted into China from neighboring states. In that year China is expected to produce 250 million MT of crude oil and be required to import approximately 350 million MT of crude oil, a reliance on exports of 60%. If China is able to import 620 billion kwh of power from neighbors,

it will be able to reduce crude oil imports by 100 million MT. By importing electric from four or five neighboring countries China will not only reduce its dependence on imported crude oil, but also will enhance energy security by diversifying its foreign energy sources, making China less vulnerable to disruptions in supply.

Presently transportation's share of crude oil consumption in China is approximately 35%, but that by 2020 consumption of crude oil for transportation purposes will have increased to 50% of total crude oil consumption.