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China Everbright Investors Roundtable 2008: Renewable Energy in China

China Everbright held its inaugural roundtable on renewable energy in China on Wednesday, December 3. The event, organized in collaboration with *The Asset*, the leading voice of Asia's financial community, brought together China's top and promising renewable energy firms and international institutional investors to forge a constructive dialogue on the issues, challenges and opportunities in the alternative energy sector in mainland China.

China has become one of world's leading renewable energy producers. At present, 8% of the energy consumed in China is from renewables. The current five-year plan calls for renewables to account for 10% of the country's energy consumption by 2010 and 15% by 2020. In terms of installed capacity of renewable energy China led the world in 2007 with 152 GW. Excluding the investment in large hydropower projects, investment in renewable energy in China in 2007 amounted to US$10.8 billion, up 91% over the year before, and second only to Germany.

Joining the roundtable discussion were Fan Yan Hok, general manager of China Everbright International, Hsu You Yuan, executive director of Solargiga Energy Holdings Ltd, Luo Maofeng, vice president of China WindPower and Chen Zuotao, chairman of the board of China Energy Conservation (HK) Co. Ltd. Also present were David Luo, chief financial officer of Chun Wo Development Holdings as well as Zhou Jiangbo, head of investor relations at GCL-Poly Energy Holdings.

The investor side was represented by, amongst others, China Construction Bank, Bank of China, DBS, Société Générale, China Merchants Securities, CITIC United Asia Investments, Deloitte, GE Commercial Finance and Sun Hung Kai Financial.

Chen Shuang, executive director and CEO of China Everbright Limited, believed such business would "not only keep safe our natural surroundings for future generations but also demonstrate that good development sense can, and should, go hand in hand with good investment." In other words, engaging in renewables not only benefits the green industry but also provides a platform for investors to generate profits. Echoing the bullish sentiment on renewables in China felt by many present at the Island Shangri-La function, Chen enthused: "We are excited to see where the road ahead takes us."

THE Asset 財資

EVERBRIGHT INVESTORS ROUNDTABLE 2008

Renewable Energy in China

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CHINA'S RENEWABLE SECTOR FACES BRIGHT PROSPECTS

Blue skies and green pastures

China's ambitious goals for clean energy and its growing influence in the global renewable energy production have created ample investment opportunities in the country's renewable energy sector

THE Asset 財資 FORUM

In association with

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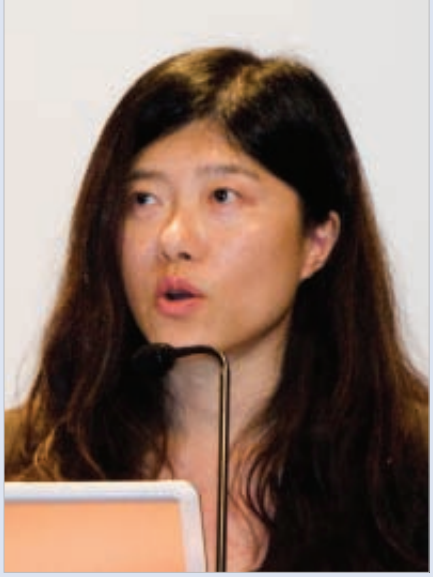
Speakers at the Everbright-The Asset Investors Roundtable on December 3 2008 agreed that despite the uncertain global environment, the prospects of China's renewable energy sector remain strong, as the country continues to push for the development of its clean energy sector to reduce its dependency on fossil fuel and to become a leading global exporter of green technology.

Since the renewable sector is highly capital-intensive, the current credit crisis and prevalent risk aversion among lenders have raised concerns about the sector's global growth outlook. In China though, the government's long-term policy view and evident commitment towards the development of clean energy has helped the sector remain relatively shielded from the credit crunch.

Barbara Hon, senior research analyst at China Everbright Ltd, says the renewable energy sector remained resilient in terms of attracting capital investment in the first three quarters of 2008 in spite of the credit crisis. "We expect capital spending in the Chinese renewable energy sector to maintain its impressive momentum in the long run given the government's goal of making renewable energy one of the key sources of energy in the coming decades," Hon says.

"Supporting the sustainable development of renewable energy are strong non-financial fundamental factors, including the challenges of climate change, political calls for energy security and the narrowing cost gap between renewables and fossil fuel."



Hon: *We expect capital spending in the Chinese renewable energy sector to maintain its impressive momentum in the long run*

Fan: *Because new landfill sites are difficult to secure, especially in prosperous cities, the trend is to build incineration capacity to manage solid waste*

Hsu: *China could provide incentives to the sector, just like the developed markets do, so as to improve the PV installation market, which is very limited in China*

China has seen a strong investment flow in clean energy projects in recent years, with the majority of the investments falling in windfarms, biomass and waste-to-energy (WTE) projects, and photovoltaic cell and module manufacturing. In 2007, the nation ranked second in the world in terms of drawing investment in renewable energy projects, with US$12 billion investment, lagging behind only Germany. Experts project China will require around US$400 billion of further capital investment to meet its future renewable energy goals.

China's goals for renewables

China has aggressively set a series of targets for the development of clean energy. In its latest five-year plan, the Asian giant formulated a policy to have renewable energy account for 10% of its total energy consumption by 2010 and 15% by 2020, up from 8% at present. It also aims to increase the share of non-hydro renewable energy to 3% in 2010 and 8% in 2020.

To encourage the renewable energy sector, the government passed legislation in early 2006 which requires power companies to buy electricity generation from approved renewable energy projects. China has ordered its 15 large state-owned power companies to participate in renewable projects by requiring them to source 1% of their electricity generation from non-hydro renewables by 2010, and 3% by 2030 so as to reduce China's dependence on foreign oil and polluting coal as energy sources.

Being a coal-rich country, China depends heavily on coal to meet its energy needs, fulfilling 70% of the country's total energy demand and 90% of its electricity demand with coal. At present, China is the second largest energy consuming country in the world. It is projected that more than 40% of the world's energy demand growth will come from China through the year 2030. Because of the heavy use of coal, China has already overtaken the United States as the largest carbon emitting country in the world, and by 2030, it is projected that China will be responsible for about 27% of the world's total carbon emissions. China's limited supply of oil has forced it to import most of it from foreign suppliers, and the oil gap is likely to rise in the years ahead. All these reasons have forced the country, as other major economies in the world, to look for alternative sources of energy.

Apart from looking to expand its domestic use of renewable energy, China is also eyeing to be the world leader in renewable energy technology. It has aggressively invested in the development of clean energy research and technology industries for local use and for export.

The country is currently the world's largest renewable energy producer in terms of installed renewable capacity, with the largest hydro-electric fleet and fifth largest wind power fleet in the world. It is now the world's largest photovoltaic cell producer accounting for nearly 30% of world's production. According to the Chinese Renewable Energy Industries Association (CREIA), China produced 1.7 GW of PV panels in 2007, nearly half of the world's production of 3.8 GW. In wind turbine manufacturing China leads the world, having captured 50% of the domestic market and 40% of the global market.

Investment opportunities in China's renewable sectors

***Wind*:** As the second most cost-effective renewable energy, wind power has seen a rapid expansion in China in recent years. The country's wind power installed capacity enjoyed an average annual growth rate of over 100% from 2002 to 2007, bringing the total installed capacity to nearly 6 GW in 2007, exceeding the Chinese government target of 5 GW by 2010. This prompted the National Development and Reform Commission (NDRC) to revise the 2010 target upwards to 10 GW. The NDRC now plans to have 30 GW of wind power capacity by 2020.

But Luo Maofeng, vicepresident of China WindPower, a Hong Kong-listed wind power enterprise, is optimistic that growth will be stronger than the government's targets. Luo predicts China's total wind power installed capacity will reach 20 GW by the end of 2009, and could reach 100 GW by 2020.

GCL-Poly: Unlike traditional plants, its cogeneration plant in Suzhou does not waste the heat that is a byproduct of electricity generation

"Everyone is talking about the economic recession, but this is one industry which will not be facing recession. In the next 10 years, the growth of China's wind power industry will still be strong," says Luo. China WindPower has investment in 10 wind power projects in the country, with an aggregate generating capacity of 448 MW.

China's potential for the exploitation of wind energy is vast, as the country is blessed with windy locations in the grasslands and deserts in the west and north, and offshore in the coastal regions. Provinces of Inner Mongolia, Heilongjing, Gansu are areas with the greatest exploitable wind energy potential. Experts estimate that China's wind resource offers the potential for generating 1,000 GW of wind energy.

"An issue for wind power in China is that the supply is plentiful in Inner Mongolia, yet there is not enough transmission capacity to transfer the power to other provinces. That has created a temporary roadblock until the government builds an easier transmission system," says Sam Wong (黃植良), senior vice-president of Hong Kong Energy Holdings (HKE), in an interview with *The Asset*. HKE owns six wind power projects in China and has nine wind farm projects in the pipeline, with a total capacity of 861 MW electricity upon completion in 2011.

In order to increase the wind power capacity, the Chinese government may consider building a more extensive power grid. After the May 12 2008 earthquake in Sichuan province that disrupted many power transmission lines, Beijing has allocated more resources to building transmission lines.

"Many people are worried about the impact of the financial crisis on our industry," say Luo. "But I am glad to report that, from a global perspective, wind power industry is an extremely popular source of renewable energy. In the area of financing, we may see a short supply this year, but at the same time many countries including the United States have announced policies encouraging the development of wind power. So the growth will still be there."

"As for China, I think we are in the most opportune time ever. In the past, the interest rates were higher, and supply of machinery equipment was always critical. With the financial crisis, we are seeing a fall in interest rates. The government has announced a stimulus package and I believe a lot of money will be invested in the power industry in the next two years. The supply situation has improved for machinery components such as blades, gearboxes and generators. I think major manufacturers are operating without a hitch. I'm optimistic about the outlook."

Luo says China's wind manufacturing capacity will soon be able to meet domestic demand so that China will no longer have to import certain components.

Due to an influx of capital investment in the sector, turbine manufacturing capacity has grown rapidly lately, helping to bring down the prices of wind turbines.

Wong believes the decline in prices will continue, given the expected increase in supply over the next 18 to 24 months and technological advancements. "That's because a lot of capacity is coming in, exceeding that of installation, so the government is giving 17% value-added tax rebates to buyers of domestically produced turbines to encourage their uptake," Wong says.

According to Luo, capital investment in China's wind power can enjoy a real return rate of 10% to 15%. "This is a rather high investment return compared to other industries. The potential market is huge, and this industry is going to be a promising industry for China," adds Luo.

In order to install a wind farm of production capacity of up to 19.5 GW, companies in China can do with an approval from local governments, and above 19.5 GW, central government approval is needed.

Wong notes that foreign investors will have to do a lot of preparatory work before winning bids. "Most of the wind power is generated by independent power producers such as China Power and Huaneng. Many large European names are absent in China," Wong points out, "because with power gaining traction everywhere in the world, such com-

panies prefer to work at home in a more familiar regulatory environment.

***Solar*:** China benefits from an abundant supply of daily solar radiation and flat lands for developing solar energy. The average daily solar radiation in China is over 4 kilowatt-hour (kWh) per square meter, which is 50% greater than that of Germany, a leading market for PV cells. China is also rich in silicon supply, a key material for making PV cells.

Although China is the world leader in manufacturing of solar PV products, the domestic market for solar electricity remains at a nascent stage as the high cost of polysilicon has prevented its large-scale utilization. More than 90% of solar PV products produced in China are currently exported to countries like Germany and the US.

"Solar energy sector is benefiting from a good manufacturing foundation in China," says Hsu You Yuan (許祐淵), chief executive officer and executive director of Solargiga Energy Holdings. "But just like the developed markets, China could provide incentives to the sector to improve the PV installation market, which is very limited in China. Then there would be unlimited opportunities for this sector," he says.

"If a part of the government's 4 trillion renminbi stimulus package is used to support the solar energy sector, I believe solar energy will be fully competitive as a conventional energy source within the next two to three years. The government just needs to give it a little boost, a little nudge," he says.

Countries like Germany, Spain, Japan and the United States have supported solar PV installation by using incentives like preferential feed-in tariff laws which require power companies to purchase a certain amount of solar-generated electricity at above-market rates.

The higher cost of polysilicon has been a major barrier for the large-scale utilization of solar energy in China and in other parts of the world, Hsu argues. "The potential of solar energy is huge in the long run, and once the cost is lowered to the level of traditional energy, the utilization rate will shoot up," Hsu says. The present cost is high due to a shortage in polycrystalline silicon (or polysilicon, poly-Si) and low efficiency.

The production cost for polysilicon is normally US$30 per kilogram but it is selling at US$400 per kilogram because of the shortage. Polysilicon now accounts for 50% of total manufacturing cost of a module. "If the price can be lowered to US$100, the cost for solar energy could be halved." Hsu believes it will take around five years for China to fill the shortage gap in polysilicon and for solar energy to meet a mature level.

Hsu believes solar electricity can reach parity with traditional energy when the current conversion efficiency level of 16% to 22% can increase to around 25%. "And once the grid parity is reached, the PV industry will be competitive and will no longer need government support to grow. Optimistically speaking, the solar energy sector may be able to do without government subsidies in three years. In the worst case scenario, we can be free of government subsidies

BATTERY MAKER AIMS TO LIFT CAPACITY BY 30%

Tianneng Power

Tianneng Power International (天能動力國際有限公司) is the largest manufacturer and supplier of motive batteries in China. It supplies electric bike makers and – through distributors – serves the dealers or repair shops of electric bikes. Its main products are lead-acid motive batteries and their accessories since these are the batteries which electric bike manufacturers in China prefer because of their cost efficiency. All its lead-acid motive battery products produced are rechargeable and can be recharged for around 500 times. Though electric bikes are becoming more popular in China, they are far from being widely adopted due to their higher retail price. Still, 80% of Tianneng's lead-acid motive batteries are for electric bikes that are sold and distributed in China while the remainder are for electric motorcycles and electric cars, reflecting market demand in China.

In 2007, Tianneng had a capacity to produce around 20 million lead-acid motive batteries. Such batteries sell for around 100 renminbi for the smaller ones and around 1000 to 2000 renminbi for larger ones. The company plans to lift capacity by 30% and – by employing economies of scale – Zhang Tianren (張天任), president of Tianneng Group, expects the price of batteries to go down by the second half of 2009. As of the end of 2007, 49% of Tianneng's turnover came from first-time users, Tianneng's primary market. With rising prosperity levels in China, more consumers are making the switch to conventional cars. Zhang points out that such a trend is not a threat to the company's revenue because of the increased importance of the secondary market (in which consumers buy new batteries for an existing car). Whereas demand from the secondary market accounted for 46% of total turnover in 2007, the company plans to increase that contribution to 70% by 2010.

In line with the national policy encouraging the use of natural renewable energy and energy saving, Tianneng launched a renewable energy project Zhejiang Tianneng Battery Jiangsu New Energy Co Ltd (浙江天能電池江蘇新能源有限公司) in Shuyang County (沭陽縣), Jiangsu Province in September 2007. The project involves producing storage batteries relating to solar energy and wind energy. The project is expected to commence production in early 2009.

Being a government-encouraged industry, Tianneng has received over 10 million renminbi in grants from an industrialization fund set up by the government in 2008, in addition to standard incentives such as VAT refunds. Capital commitment for the company as of the end of June 2008 was 106,496 million renminbi. Tianneng Power has over 5,000 employees and was listed on the Hong Kong Stock Exchange on June 11 2007.

Luo: ***Capital investment in China's wind power can enjoy a real return rate of 10% to 15%, which is rather high compared to other industries***

Wang: ***As the power is generated as the by-product of industrial processes, the raw material cost of a cogeneration plant is much lower than conventional modes of power generation***

within next eight years," he adds.

Solargiga, which is one of the largest manufacturers of monocrystalline silicon ingots and wafers in China, saw its cost of sales for the first six months of 2008 jump by 47.7% year-on-year, as the shortage of polysilicon translated into higher material cost. However, Hsu expects the company's margin to remain stable in the coming years because a higher global demand for solar ingots and wafers has meant the company has been able to pass the increasing price pressure of polysilicon on to downstream companies. Solargiga for the first half of 2008 recorded a turnover of 1.2 billion renminbi, an increase of 67.7% from a year ago.

***Waste-to-Energy (WTE)*:** China is the second largest producer of municipal solid waste in the world. It produces more than 150 million tonnes of urban solid waste every year, just behind the United States which produces over 230 million tonnes. Given that the amount of solid waste produced is vast, that the current waste treatment ratio is a modest 52% and that landfill capacities are shrinking, waste-to-energy projects are naturally gaining appeal.

"Because new landfill sites are difficult to secure, especially in prosperous cities – where land is expensive and controlled by a quota system – the trend is to build incineration capacity to manage solid waste" says Philip Fan Yan Hok, general manager at China Everbright International, a Hong Kong-listed company that focusses on environmental protection business, including in WTE projects. Whereas landfills, if not properly managed, can cause secondary pollution later on, the WTE process, which involves processing collected garbage through incineration in order to generate power, does not run this risk. Fan says any city with a population of over half a million can use one incineration plant. China has about 200 cities with a population of over one million and aims to raise its incineration rate to 30% by 2030, from 5% currently.

China's ambition creates plenty of investment opportunities in this sector. "To achieve the goal of 30% incineration rate by 2030, China needs to attract major investment in the sector in the coming decade," notes Hon. WTE projects in China can enjoy two income streams: (i) a processing fee for each tonne of processed waste, paid by the local governments; (ii) for electricity generated from a WTE project: tariffs that are 70% higher (or 0.25 renminbi per kWh more) than what thermal power plants receive. China Everbright International, which operates WTE projects primarily in Jiangsu province, every year processes 1.5 million tonnes of municipal solid waste and, as by-product of the waste management, generates 400 kWh of electricity.

"400 kWh is not exactly a large amount, but it does represent a significant development in Chinese renewable energy industry as the production of electricity is only a by-product of solid waste management," explains Fan. In Europe and Japan, incineration rates are around 70%. The incineration rate is 13% in the United States, where 2.72 GW of electricity, or 0.4% of total power generation, is through incineration.

***Cogeneration through the use of waste heat*:** Cogeneration, or combined heat and power (CHP), involves converting waste heat of an industrial process into electricity. Typically, energy use efficiency of China's industrial sector is 40% to 50%, which means only 40% to 50% of thermal energy is utilized in industry processes, and the rest is disposed off as hot water, steam or smoke. Unrecycled waste heat not only causes wastage of energy, but also is highly polluting.

The potential for expanding the use of cogeneration in China's electricity generation is immense given the continued growth in industrial demand for energy and a desire by companies to use more energy-efficient technologies as a way to reduce their expenditure on energy, say Hon.

By 2020, China plans to increase total cogeneration installed capacity to 200 GW, or 22% of the nation's total power generation installed capacity, generating 25% of the nation's total electricity generation.

The capacity growth will represent a compound annual growth rate of 7% from 2005 to 2020. In 2005, cogeneration's

Hong Kong Energy windmills

installed capacity was 70 GW, or 18% of the nation's total power capacity, while 13% of electricity produced in 2005 came from cogeneration.

"Because the electricity is generated as the by-product of industrial processes, the raw material cost is much lower than conventional modes of power generation," says Warren Wang, CFO of China Energy Conservation (Hong Kong) Co. Ltd. China Energy Conservation (CEC) focusses on the development, investment, construction, operation and management of waste heat power generation for various industries and power plants in China. Currently, the company invests primarily in waste heat power generation projects and biomass power generation projects for industries such as cement, glass, steel, and has investment capacity of over US$200 million.

Like other renewable energy industries in China, cogeneration projects enjoy various incentives and preferential tax treatments from the Chinese government. For example, cogeneration plants are given priority in connection to power grid, exemption from grid connection fees applicable to small thermal plants, and priority in electricity purchases.

Other incentives include higher on-grid tariffs (around 7 *fen* (0.07 renminbi) higher than coal-fired plants); higher utilization hours (7,000 hours a year as compared to 5,000 hours); higher dispatch priority (unlimited although the full load of 8,760 hours a year cannot be reached due to regular equipment checking); exclusive rights to sell steam within the service areas of the cogeneration plants and preferential tax rates (tax exemptions from customs duties for certain imported equipment and import-level value-added tax).

Although foreign-owned cogeneration projects receive equal treatment and subsidies as local operators, it is hard for them to enter foreign markets, says Samuel Tong (湯以銘), executive director and chief financial officer of GCL-Poly, in an earlier interview with *The Asset*. GCL-Poly one of the largest foreign-owned independent cogeneration plant operators in China. "Since power is a strategic industry, foreign companies would do better to invest in the form of equity," he points out. Tong adds that many foreign power generators have left the country because they were losing money in China after not being able to get planned coal, supplied by the government at costs only half of the price of market coal.

GCL-Poly mostly uses planned coal but also some market coal. The company has a contract for 3 million tonnes planned coal with the government each year. Currently, even with planned coal supplied by the government, it is hard for GCL-Poly to beat the margin of large power plants whose electricity price is much lower, according to Tong.

"Cost for cogenerators is 20% to 30% lower than coal-fired power plants on the same small scale because we produce two products, power and steam, rather than just power. So our average cost is lower. But to power plants which produce 10 GW for an area of a few 10 square kilometres the average cost is lower."

GCL has a total installed capacity of 732 MW and a steam extraction capacity of 1,671 tonnes per hour . It owns 19 power plants, 18 of which are cogeneration (or CHP) plants, which do not emit the heat that is produced as a by-product of electricity generation but capture it for heating purposes. While the thermal efficiency of a traditional coal-fired power plant is only 30% to 40%, a cogeneration plant under 50MW can achieve efficiencies of 45% to 90%.

While the current crisis will have an impact on the renewable energy sector, the sector globally is expected to be the least affected by the crisis and the impact will only be temporary. "Major economies in the world are increasingly investing in renewable energy. Governments around the world are aiming to reduce their reliance on fossil fuels. That is why we are seeing renewable energy technology is being upgraded and generating energy efficiency is being upgraded," says Hsu. China's renewable energy sector will benefit from the country's expansion of the domestic renewable energy market as well as from a higher global demand for renewable energy applications.

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