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## Renewable Energy Development in Emerging Markets

The year 2008 was another milestone for investment in renewable energy. A total of \$155 billion was invested in companies and projects globally, a more than four-fold increase on 2004. As compared with 2007, however, investment growth was only 5%, in stark contrast to the growth rates of over 50% in previous year. It was mainly due to the global financial crisis. However, global leaders realize that the clean energy sector is likely to help their economies revive, as it has the potential to create hundreds of thousands of jobs. An estimated \$185 billion of support (as at March 2009) for sustainable energy in the major fiscal stimulus packages around the world suggests that the political will to secure renewable energy supplies and reduce energy-related carbon emission has never been greater.

With reference to UNEP's report "Global Trends in Sustainable Energy Investment 2009", NDRC's "Medium and Long-Term Development Plan for Renewable Energy in China", this article provide a summary for the development plan for renewable energy in China and other emerging markets.

### China

According to the National Development and Reform Commission (NDRC), the overall objectives for China's renewable energy development in the coming 15 years are: to increase the proportion of renewable energy in total energy consumption, to resolve the problem of lack of electricity of people living in remote off-grid areas and the shortage of fuel for daily life needs in rural areas, to stimulate the utilization of organic wastes for energy, and to promote the development of renewable energy. By 2020, China will aim to raise the share of renewable energy in total primary energy consumption to 15%. This will be achieved by fully utilizing, to the extent possible, technologically mature and economically feasible renewable energy sources, such as hydropower, biogas, solar thermal and geothermal, as well as by promoting the development of the wind power, biomass power, and solar PV industries. China will also actively promote the development of renewable energy technologies and industries, building up a renewable energy technology innovation system. By 2020, local manufacturing capability based mainly on home-grown Intellectual Property Right (IPR) will be achieved.

**Hydropower** According to the results of the 2003 National Hydropower Resource Assessment, China's total potential capacity of technically exploitable hydropower is 540GW, with an annual power generation potential of 2470TWh. The total potential capacity of economically feasible hydropower is 400GW, with an annual power generation potential of 1750 TWh. These hydropower resources are distributed mainly in the nation's western regions, with 70% of the total located in Southwest China. In 2008, the nation's installed hydropower capacity reached 172GW. By 2020, the capacity will reach 300GW.

**Wind Energy** By 2008, China was the world's second largest wind market by newly installed capacity and the fourth largest by overall installed capacity. China's wind capacity demonstrates the country's continued strong demand for wind energy, even as markets in Europe and the United States began to slow. Between 5GW and 6.5GW of new capacity was installed and commissioned in 2008, bringing total capacity to 11GW to 12.5GW. By 2020, the total installed grid-connected wind capacity in China will be 30GW. But the nation's exploitable potential onshore wind capacity is 300GW. Together with offshore wind resources, the total potential wind capacity is about 1,000GW.

**Biomass Energy** China's biomass energy resources include mainly straw and other agricultural wastes, waste from forestry and forest product processing, animal manure, energy crops and plantations, organic effluents from industry, municipal wastewater, municipal solid waste, etc. By 2020, the installed capacity of biomass power will reach 30GW. The development of biofuels in China has all but ground to a halt, mostly due to high feedstock costs and lack of or ambiguous government support. While domestic demand for biomass pellets increased as exports overseas fell, the government has not released any direct support for pellet producers or technology in line with its long term target of 50m tonnes of pellets produced by 2020.

**Solar Energy** Two-thirds of China's territory enjoys over 2,200 hours of sunshine annually, with total solar radiation per unit area of over 5,000MJ per meters square. These regions have favorable conditions for solar energy development, with extremely favorable conditions found in West China. In 2008, New Energy Finance estimated China to have installed 40MW of new solar PV plants, bringing total installed capacity up to 140MW. On July 21, Chinese government has launched an unprecedented and long-awaited plan to offer subsidies for utility-scale solar power projects. The Ministry of Finance said the government will subsidize 50% of investment for solar power projects as well as relevant power transmission and distribution system that connect to grid networks. For independent photovoltaic power generating systems in remote regions that have no power supply, the subsidy will rise to 70%. By 2020, the total capacity of solar power in China will be 1.85GW.

## **Brazil**

Brazil is the world's largest renewable energy market, thanks to hydropower and its long-established ethanol sector which has thrived alongside the country's sugarcane industry. 46% of the country's energy comes from renewable sources, and 85% of its power generation capacity. Large hydro provides four-fifths of the country's electricity. 90% of Brazil's new cars run on both ethanol and petrol (all of which is blended with around 25% ethanol) and by the end of 2008, ethanol accounted for more than 52% of fuel consumption by light vehicles. Ethanol consumption is expected to rise to 53 billion litres by 2017.

Brazil was the world's largest producer of ethanol until 2006, when it was overtaken by the booming US ethanol market. Almost 80% of Brazil's ethanol is consumed domestically. Brazil's ethanol exports rose by 46% from 3.5 billion litres in 2007 to a record 5.1 billion litres in 2008, mainly to the US and Europe. However, Brazil's ethanol exports are held back by tariffs and subsidies that developed countries have put in place to protect their own industries. The surge in 2008 exports was mainly due to floods in the US, which resulted in much US ethanol capacity being temporarily shut down. Biofuels have thrived in Brazil thanks to its large areas of arable land, abundant water resources, solid government support, expanding working age population and a cost advantage over competing fuels. However, lack of transport infrastructure, a policy emphasis on social rather than commercial goals and increasing awareness of sustainability concerns in export markets such as the EU may hamper the industry's growth.

Wind remains a secondary source of energy in Brazil, in spite of the government's PROINFA programme, established in 2002 to encourage wind, biomass and mini-hydro projects by guaranteeing developers power purchase agreements at favorable rates. Brazil's wind potential is estimated to be 143GW and to date 1.4GW has been contracted by PROINFA. However, by the end of 2008 only 359 MW of capacity had actually been installed. A strong pipeline of wind projects has been built-up since the government relaxed restrictions on foreign turbine components, particularly in the country's north-east which is estimated to have half the country's wind resource. But it is taking time for plans to translate into installed capacity, especially since shipping turbines from Europe pushes installation costs up by as much as 20%.

## **Mexico**

Mexico has a non-mandatory target to source 8% of its energy consumption from renewable sources by 2012. However, on 28 October 2008, Mexico's president signed into effect a decree stipulating that the country will have in place a national renewable energy plan by 30 June 2009, which could double the country's renewable energy target to 16%. The legislation also includes a \$230 million fund that will start to invest in projects next year.

## **India**

In 2008, India generated 813TWh of electricity, 5.2% of which came from new renewable, compared to 66% from coal, 14% from large hydro, and 3% from nuclear. However, the country faces an electricity shortfall of 16% at peak demand and the grid infrastructure is woefully overloaded. The power sector is faced with increasing demand from both growing industry and the rapidly developing middle class, as well as trying to connect several hundred million Indians who do not have access to electricity.

The government is under intense pressure to increase electricity production and has put strong incentives in place to spur investment into renewable energy from both domestic and foreign investors. The Indian government has set targets for each clean energy sector in its 11<sup>th</sup> Five Year Plan, to be met by 2012. Wind power continues to dominate renewable energy, both in installed capacity and manufacturing. It will need to grow by 2.5GW in each of the next three years to meet the goal of 17.5GW by 2012. Small hydro grew by 300MW in 2008 and has an additional 1.1GW to be commissioned to meet the 3.4GW target. There were no grid-connected solar projects commissioned in 2008, but a pipeline of 222MW of solar projects was announced in 2008. Biomass grew only 400MW in 2008 and needs to double to reach the 3.5GW target for 2012.

## Philippines

In late 2008, the Philippine government signed a new Renewable Energy Law, offering specific incentives (mainly tax breaks) for renewable generation. It is the first country in Southeast Asia with such comprehensive renewable energy legislation, and there are hopes that it may become a blueprint for other countries in the region. The Philippines already has high renewable energy capacity, deriving 33% of its energy from modern biomass, geothermal and hydro. The government aims to increase renewable energy capacity from 33% to 60% by 2013, equivalent to 4GW, with 1.2GW from geothermal sources.

The Philippine Department of Energy has other targets: to be the largest geothermal producer in the world; the leading wind energy producer in Southeast Asia; and to install up to 250MW of capacity from biomass, solar and marine. The country is already the world's second largest producer of geothermal, after the US. Its geothermal capacity is 1.9GW currently, providing 20% of the country's electricity. High untapped geothermal resource, estimated at 7GW, and typically large project size should enable the Philippines to scale up rapidly.

## Indonesia, Thailand & Vietnam

Geothermal in Indonesia is also poised to grow. A tender for 15 geothermal plants totaling 1.5GW has been issued and is expected to attract \$4.5billion of investment. The country has enormous geothermal potential, estimated to be 27GW, but so far only 1GW has been exploited.

Most investment in Thailand in 2008 were concentrated on bioethanol and biodiesel. However, its biofuels sector was affected by the fall in oil prices, soaring feedstock price and supply storage. The Thai government is setting aside \$440 million budget in its master plan for renewable energy development through to 2022.

Wind, mini-hydro and biofuels are the three sectors that have seen most investment activity in Vietnam in 2008, with foreign companies looking to tap the market potential and low manufacturing costs there. The Vietnam government also aims for at least 10% of all its energy to come from renewable energy sources by 2015.

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**Arcadia Financial Services (Asia) Ltd  
Arcadia Asset Management (Asia) Ltd  
Room 1404 & 06, Leighton Centre, 77 Leighton Road, Causeway Bay, Hong Kong  
Tel: (852) 2114 8488 Fax: (852) 2111 0777**