

# Country Paper: People's Republic of China (PRC)

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PRC's energy efficiency and renewable energy

## 1. MOST PROMISING RENEWABLE ENERGY SOURCES IN PRC

Many kinds of renewable resources in PRC such as hydropower, solar energy, wind energy and biomass energy etc. are abundant. At the end of 2006, annual utilization quantity of PRC renewable energy, excluding biomass traditionally utilized, is totally 200 million tons coal equivalent (tce), which occupies about 8% of total consumption of PRC primary energy, increasing by 0.5 percentage point than that in 2005. About 16 percent of PRC's electricity came from renewable sources in 2006. PRC has rapidly moved along the path of renewable energy development.

### 1.1 Wind energy

PRC's wind energy potential is over 3 billion kW, with primary estimation of available for exploration and utilization being 1 billion kW around, and technically available offshore resource quantity being about 400-500 million kW.

PRC has identified wind power as a key growth component of the country's economy. The initial future wind power target set by the Chinese government was 10 GW by 2010, but estimates suggest that by 2010 the total installed capacity for wind power generation in PRC will reach 20 GW.

At the end of 2008, wind power capacity in PRC accounted for 12.2 GW, which made PRC the fourth largest producer of wind power, after the United States, Germany, and Spain. And at least 15 Chinese companies were commercially producing wind turbines and several dozen more were producing components. Turbine sizes of 1.5 MW and 2 MW became common.

### 1.2 Solar energy

Regions with abundant solar energy occupy 2/3 of Chinese national territory area, annual radiation quantity is over 6000MJ/m<sup>2</sup>, and solar energy absorbed by land surface is approximately equal to 1.7 trillion tce. Solar water heating is used extensively in PRC. One

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in 10 Chinese households use solar thermal water heaters. PRC had deployed 40 million solar water heaters in 2007—two-thirds of the global market share.

But, the amount of electricity generated with solar power within PRC is so far comparatively small: by the end of 2008, the solar power capacity attached to the national grid (i.e., excluding autonomous systems) was under 100 MW, i.e. merely 0.01% of the nation's power generation capacity.

However, rapid expansion was emerging. In 2008, About 50 MW of installed solar capacity was added, more than double the 20 MW in 2007. And thanks to new solar incentives announced that cut the cost of purchase and installation by as much as half in 2009, PRC's domestic solar market is on the cusp of experiencing a boom. According to some studies, the demand in PRC for new solar modules could be as high as 232 MW each year from now on until 2012.

PRC was the world's largest manufacturer of solar photovoltaic panels. In 2007 PRC produced 1700 MW of solar panels, nearly half of the world production of 3800 MW, although 99% was exported.

### **1.3 Biomass energy**

Biomass energy in PRC includes straw, firewood, energy-plants, organic waste and industrial organic waste etc. At present, biomass energy of all kinds of crop-straws and residue of both agriculture and forestry industries is estimated to 350 million tce; potential area feasible for planting both oil and energy plants is to the extent of being able to fulfill the demand of 50 million tons liquid bio-fuel; and municipal solid waste and other organic wastes have become important resource of biomass energy.

With "Biomass Energy Program" being implemented, by 2005, yearly methane production was about 8 billion cubic meters by rural residential methane ponds, methane projects in livestock farms and industrial factories; accumulated installed capacity of biomass power plants was 2000 Mega Watt.

PRC emerged as the world's third largest producer of ethanol bio-fuels (after the U.S. and Brazil), with ethanol fuel's productive capacity reaching 1 million tons as of the end of the 10th Five Year Plan Period in 2005. In the 11th Five Year Plan period (2006 through 2010) PRC plans to develop 6 million tons per year (tpy) of fuel ethanol capacity, which is expected to grow to 15 million tpy by 2020.

### **1.4 Hydropower**

PRC has the world's largest installed capacity of water energy and annual hydropower generation. In 2006 there is 10,000 MW of installed hydropower capacity that went into operation in PRC. The National Development and Reform Commission (NDRC) also approved 13 additional hydropower projects in 2006, which cumulatively will have 19,511 MW of power generating capacity. Through 2007, total installations of hydropower reached 145,000 MW.

## **2. PUBLIC POLICIES FOR ENERGY EFFICIENCY IMPROVEMENT AND RENEWABLE ENERGY UPTAKE**

In the 11th Five-Year Plan (2005-2010), the government has pledged to reduce energy consumption by 20% per unit of GDP by 2010 from 2005 levels; and chemical oxygen demand (COD) a key index of water pollution and emissions of sulfur dioxide (SO<sub>2</sub>) a main air pollutant by 10 percent from 2006 to 2010. To seriously achieve the ambitious target, PRC has adopted a series of policies for energy efficiency improvement and renewable energy uptake.

### **2.1 Energy efficiency**

Energy efficiency is PRC's primary energy priority. In 2008, PRC revised "*Energy Conservation Law*" to declare that it "implements an energy strategy of promoting conservation and development concurrently while giving top priority to conservation". This emphasis runs through many of PRC's policies.

For the energy intensity target of 20% reduction above mentioned, each province and provincial-level city has been assigned an energy intensity reduction target ranging between 12 percent and 30 percent, and the respective governors or mayors are held accountable to such targets. Their success is part of the basis for their evaluation for promotion. PRC has made steady progress toward reaching this goal, achieving a 10-percent reduction of energy intensity by the end of 2008.

As the world's largest producer of electronic and home appliances, PRC developed mandatory energy efficiency standards and labels for a range of such products in 2005. These standards are coupled with the adoption of green procurement policies for government offices and state-owned enterprises.

In 2006, the Top 1,000 Energy-Consuming Enterprises Program was launched, which sets energy efficiency benchmarks for the top 1,000 energy-consuming enterprises across nine sectors of heavy industry. These 1,000 enterprises constituted 33 percent of PRC's overall energy consumption and 47 percent of industrial energy consumption in 2004. Data suggests that the program is on target to achieve its goal of saving 100 million tce.

On building energy efficiency, it is required that governmental offices set thermostats at no lower than 26 degrees Celsius in the summer and no higher than 20 degrees Celsius in the winter, while encouraging the general public to do the same. And in 2006 a new building code that requires new buildings to halve their energy consumption levels compared to the current average, though enforcement remains a difficult challenge. And PRC has recently launched the Three Star green building evaluation standard, a voluntary set of standards aimed at encouraging green building development with performance standards above and beyond what the building code requires.

In April 2008, the Green Lighting Program was launched to subsidize the purchase of energy efficient light bulbs by 30 percent on wholesale purchases and 50 percent on retail sales. Some local governments provide an additional subsidy of up to 40 percent. PRC subsidized 62 million bulbs by the end of January 2009, which can help save 3.2 billion kilowatt hours of electricity annually. PRC announced plans earlier this year to double the size of the program to subsidize 100 million bulbs in 2009.

## 2.2 Renewable energy

To promote the development of renewable energy, PRC promulgated “*Law of Renewable Energy*”, which took into effect on January 1, 2006. The Law displays the key role of renewable energy to the sustainable socio-economic development, regulates such aspects related to renewable energy as exploration, planning, research, industrialization, investment, price and tax, etc, and defines the responsibilities, rights and obligations of government, enterprise and consumer respectively. With the guidance of the Law, PRC has formulated “*Mid- and Long-term Development Plan of Renewable Energy*”, and put forward in the Plan targets, layout and policies measures of renewable energy development in the following 15 years.

Through putting the development key-points on wind power, solar energy, biomass and hydro power, PRC will improve greatly the proportion of electricity from renewable energy sources reach 10% by 2010, and 15% by 2020, will solve the problems of rural electricity and living energy shortages, and will renewable energy technology innovation and industrialization.

- PRC tripled the 2020 target for installed wind capacity from 20 GW to 100 GW.
- It is planned by 2020 30% of its households have installed solar water heaters. And PRC’s 2020 target of building 1.8 GW installed solar power capacity is expected to be increased at least fivefold to 10 GW.
- PRC implemented a feed-in tariff for biomass power generation at the rate of 3.2 cents per kwh. This means that PRC essentially provides a preferential electricity tariff to biomass power producers of 3.2 cents per kwh over the tariff for conventional fossil fuels. It plans to install 30 GW of biomass power capacity by 2020.
- PRC aims to use 10 million tons of bioethanol and 2 million tons of biodiesel by 2020, replacing 10 million tons of petroleum-based fuel annually. And
- PRC has a target for 300 GW of installed hydropower by 2020, which is twice what it has now.

To realize the targets, a series policy measures will be adopted as: establishing sustained and steady market of renewable energy, putting into effect the policy of discount electricity tariff and cost burdens, increasing financial input, taking more preferential tax rate, setting up service system for renewable energy technology development and industrialization, and enhancing international cooperation, etc.

## 3. DOMESTIC INVESTMENT AND FDI IN CLEAN TECHNOLOGIES IN PRC

Investment in renewable energies have been part of PRC's economic stimulus strategy and placed PRC among the world leaders in solar, wind, electric vehicle, rail, and grid technologies. From 2006 and 2008, PRC distributed \$435 million in subsidies to encourage the use of renewable energy. In addition, PRC plans to increase forest area coverage to 20 percent by 2010, spending \$9 billion a year to hit the target.

According to PRC Daily’s report on May 25, 2009, PRC plans to draft extensive and unprecedented stimulus package—in the range of 2 trillion to 3 trillion yuan—dedicated solely to alternative energy industry from 2006 to 2020, including generous investments in wind, solar, and hydropower. If those expectations are fulfilled, PRC could emerge as the unquestioned global leader in clean-energy production, significantly increasing its chances to wean its energy appetite off coal, and at the same time ushering in an era of sustainable economic growth.

Doubtless, PRC is emerging as fertile ground for green investment, with the government encouragement and support. Increased amounts of investment in renewable energy technologies and installations have increased markedly throughout the 2000s in PRC. According to the Climate Group, in 2007 PRC ranked second in the world in terms of the absolute dollar amount invested in renewable energy with \$12 billion, which is just behind Germany's \$14 billion.

In 2008, the global financial crisis has not dampened private equity and venture capital interest in clean technology in PRC and more funds look poised to enter this growth area. There were a lot of private-sector investments in the last two years in solar and wind. In addition to specialist funds, more generalists were increasing their investments in clean technology, some up to 50% of their portfolio.

Venture capital (VC) and private equity (PE) investment in clean technology in PRC surged 120% year-on-year to US\$1.3 billion in 2008, according to a report released by research firm "Zero2IPO Group". Domestic and overseas VC and PE companies in 2008 invested in 55 deals in clean technology, up 175% from 2007. Between 2006 and 2008, VC and PE companies raised capital worth \$2.36 billion for clean technology investments, 60% of which was in solar power. Water treatment was another significant investment target, garnering \$287 million in 12 deals. While these anchor industries, there were growing interest in other sectors, such as sustainable agriculture, carbon projects, smart grid and electric vehicles.

According to a new report from Zero2IPO Group, PRC's venture capital market experienced an upsurge in fundraising and investments in the first half of 2009, signaling growing confidence in PRC's economy, backed by governmental 4 trillion yuan fiscal stimulus and policies designed to encourage investment. In the second quarter of 2009, 17 funds were established, among which newly raised funds available for investment in PRC's mainland totaled \$1.37 billion, and 99 Chinese enterprises attracted venture capital investments, including 77 that reported investments totaling \$567.89 million. The number of deals increased by 46, or 86.8 percent, and the amount involved increased from \$319.68 million in the first quarter to \$567.89 million.

## **4. IMPACTS OF INTERNATIONAL FINANCIAL CRISIS**

### **4.1 Impact on environmental**

According to the results of discussion on "The Environmental Impact of the Financial Crisis", chaired by Carnegie Beijing Senior Research Associate, Zhang Shiqiu, the environmental impacts of the financial crisis to PRC have both negative and positive sides.

The negative impact of the crisis on the environment is more obvious: First, it is feared that the momentum in the global environmental movement has been diverted amid the economic crisis. As attention is elsewhere, government policies will prioritize quick economic development and employment fixes. Second, there is the fear that approved policies will be shelved because of cost. Third, although the effect of the regime's stimulus investment in major industries has yet to be measured, it is predicted that heavy pollution, heavy energy consumption and weak regulatory oversight would likely occur. This would be disastrous and a step back for PRC's environmental progress. Last, the strengthening of government intervention and the weakening of the market will give rise to further administrative problems with individual or factional interests trumping national ones. This includes local promotion of environmentally

damaging enterprises that harm locals and national environmental goals.

The positive side is that the crisis provides short-term and long-term opportunities for PRC. In the short-term, factory bankruptcy, as well as a reduction in consumption of resources and technologies that emit or discharge pollution can provide immediate relief to the environment. Additionally, the drop in exports provides an opportunity to use new energy technologies domestically. That way, local environmental conditions can be improved. In the long-term, the crisis has accelerated economic restructuring. The Chinese Government can use the recent factory closings and enterprise bankruptcies to develop a cleaner, high-technology industrial sector. And both in the short and long-term, the government can use the increasing need and demand for clean technology to become a global leader in green technology and renewable energy investment.

#### **4.2 Impact on poor income group**

Since 2008, the global financial crisis has sharply reduced the import and export of PRC. Thousands of export-oriented factories were forced to close down. Thus the labor markets have been seriously affected, a lot of workers lost their jobs, most of whom are poor farmers from less developed provinces. Furthermore, the Chinese Government has to create not less than 10 million new jobs every year for newly-graduated students. The most important way for PRC to create new jobs is to attract foreign direct investment and to develop export-oriented and labor intensive industry. The reduction of foreign investment and export have caused a lot of workers lose their jobs and has brought difficulties for the newly-graduated students to find their jobs.

## **5. PRC'S STIMULUS PACKAGE: ENERGY & ENVIRONMENT**

In November 2008, PRC announced a 4 trillion yuan (US\$586 billion) stimulus package to be pumped into the economy through 2010. The money will come from the central government (1.18 trillion of total), local government and state-owned enterprises. Among the \$586 billion stimulus package, \$221 billion of has green features, including renewable energies, energy conservation, emission control, environmental protection projects, rail and electricity grid, making it the largest green stimulus package in the world, according to HSBC estimates. The US has the second largest green stimulus package at \$112 billion, and Republic of Korea has the third largest green stimulus package at \$31 billion.

Accord to NDRC, of the 230 billion yuan the central government has approved on stimulus over the 4<sup>th</sup> quarter of 2008 and the 1<sup>st</sup> quarter of 2009, 10 percent went toward energy conservation, emission control and environmental protection projects. The figures show the central government wants to strike a balance between growth and economic restructuring.

Here's how the 230 billion yuan is to be spent:

- 38 billion yuan on housing for low-income earners
- 34 billion on rural infrastructure projects
- 31.5 billion yuan for public facilities, such as electricity, water and road construction in rural areas
- 30 billion yuan for health and education sectors and cultural projects
- 27.5 billion yuan to unspecified big infrastructure projects
- 25 billion on large infrastructure projects such as railways, roads and airports

- 15 billion to economic restructuring
- 12 billion on energy conservation and environment protection projects, and
- 6 billion on innovation and industrial restructuring.

Except to the above 12 billion on energy conservation and environment protection projects, it is reported that some of the electricity infrastructure projects are being spent on renewable power, and that some of the rural infrastructure projects or “big infrastructure projects” include some water and wastewater treatment plants.

In addition, a 280 billion yuan (US\$41 billion) program to improve sewage treatment in 90 percent of PRC’s counties is being billed as part of the economic stimulus package, but this program was already in the works, so it seems unlikely that the majority of funds constitute new money.

According to National Bureau of Statistics (NBS) of PRC, the stimulus package has benefited energy conservation and emission controls with energy used to generate growth dropping further. In the first quarter of 2009, overall energy consumption grew only 3.04 percent of 2009 while the economy expanded 6.1 percent, and energy intensity or the amount of energy needed to generate per unit of GDP dropped 2.89 percent, comparing with a drop of 2.62 percent in the first quarter of 2008.

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