



# Reshaping China's sustainable energy strategy

By Changhua Wu  
Greater China Director, The Climate Group

Energy is a critical pillar of any economy. Secure energy supply, clean energy production and consumption, and efficient energy use are among the most important factors to support economic growth. The world's second largest economy, China has to address the energy puzzle well in order to achieve its economic growth ambition, which is by 2020 to achieve another doubling of its economy over the 2010 level and guarantee a doubling of per capita GDP during the same period of time. A country constrained severely by energy resources, which rely heavily on coal, China faces a daunting challenge in sustainable development.

China's economic engine relies on rapid industrialisation and urbanisation and has been fueled by continual increase in energy use. China's economic growth is built upon heavy industries, including chemical industries, which are energy intensive. Industrial sectors in many regions in the country account for nearly three-quarters of local energy consumption. This further increases the burden to secure energy supply. In 2012, China's total energy consumption reached 3.62 billion tons of standard coal equivalent (tce), an increase of nearly 1.5 times from 1.46 billion tce in 2000. And energy consumption per capita reaches 2.68 tce, a level slightly higher than the world average (2.5tce) (Fig.1). China is now the world's largest energy producer and consumer.

Efficiency is one of highest priorities to address the energy security concern. During the period of 2006-2010 (the 11th Five-Year Plan period), China's energy efficiency improved by 19.1 per cent, as the average annual growth rate in total energy consumption remained at 6.6 per cent, and economic growth was in double digits. The recent global financial crisis and weak global economic recovery has hit the Chinese economy very hard. With economic growth dropping to 7.8 per cent in 2012, the annual energy consumption growth dropped to 4 per cent. If this trend holds, China's total energy consumption is expected to exceed 5 billion tce in 2020.

A fossil fuel-dominated energy structure, plus continued high-energy consumption has presented huge environmental concerns and challenges in tackling climate change. Air pollution has been spreading to most of the country, causing serious health concerns and social worries. Water scarcity in the northern part of China poses problems to fossil fuel production.

Great attention has been paid to sustainable energy development in China. While continuing its efforts to enhance energy efficiency and saving, the Chinese government has been setting clear policy targets, signaling to the business

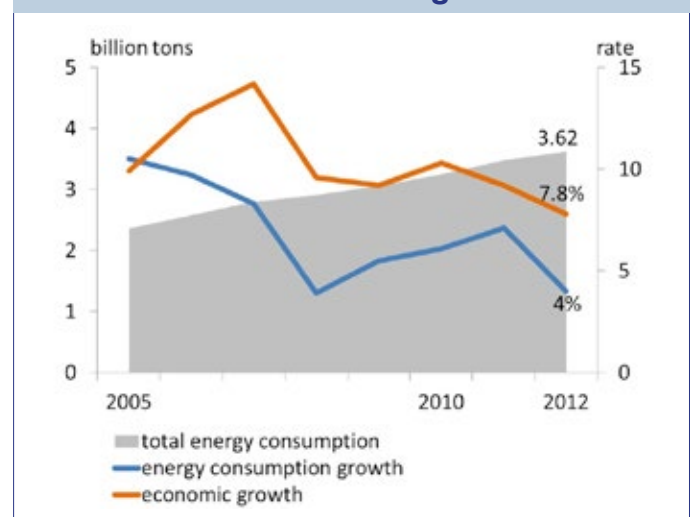
community and society that clean and renewable energy is the future of China's energy development. Strong incentives are given to drive technological innovation and to attract capital flows towards those priority sectors. Energy pricing instruments and energy-efficient labeling are in place to drive market demand for clean energy and environmentally-friendly products and services.

The first decade of the 21st century has witnessed a huge jump of investment in clean energy production and energy efficiency. Over six trillion RMB was invested in China's fixed-assets investment in the energy industry during this decade. And this has resulted in largely improved energy production capacity, outstanding improvement in energy efficiency, clean coal power generation and production of non-fossil energy sources (particularly renewable energy).

## Optimising towards cleaner energy

Reducing reliance on fossil fuels while having a secure energy supply continues to be a national energy strategic priority in China. In 2006, China set mandatory targets to improve energy efficiency and grow alternative energy, particularly renewable energy. A 20 per cent energy efficiency target and a 10 per cent alternative energy target were put in place for this five-year period between 2006 and 2010. In 2011, after reviewing its experience, national government

Figure 1: China's total energy consumption ups and downs in line with its economic growth



Source: National Bureau of Statistics of China

set more ambitious targets to achieve energy efficiency and renewable energy development in the 12th Five-Year Plan (2011-2015), including a 16 per cent energy efficiency target, 17 per cent carbon intensity reduction target by 2015, and 15 per cent renewable energy target by 2020. The outcome has been impressive. The share of natural gas in China's primary energy use rose from 2.2 per cent in 2000 to 5.4 per cent in 2012, a rise of 3.2 percentage points. The share of hydropower and nuclear power rose from 6.4 to 9.6 per cent. The progress of China's energy structure optimisation is significant (Fig.2).

Renewable energy has been progressing, far exceeding the plan. As of the end of 2012, China's installed hydropower capacity stood at 249 million kilowatts, ranking first in the world, and accounting for more than 20 per cent of the world's total. Installed wind power capacity amounted to 62.66 million kilowatts, a quarter of the world's total, also the first in the world. Utilisation of solar thermal energy covers more than 217 million square metres, accounting for three-quarters of the world's total capacity. In addition, utilisation of solar photovoltaic and biomass is also developing rapidly. Driven by solar power feed-in tariff policy in 2011-2012, explosive growth of solar photovoltaic pushed new installations up to 4 million kilowatts in 2012 alone, reaching a cumulative installed capacity of 7 million kilowatts. In the meantime, China's installed biomass power generation capacity reached 8.7 million kilowatts and 50 million rural households have built biogas digesters.

### Capturing the biggest efficiency potential

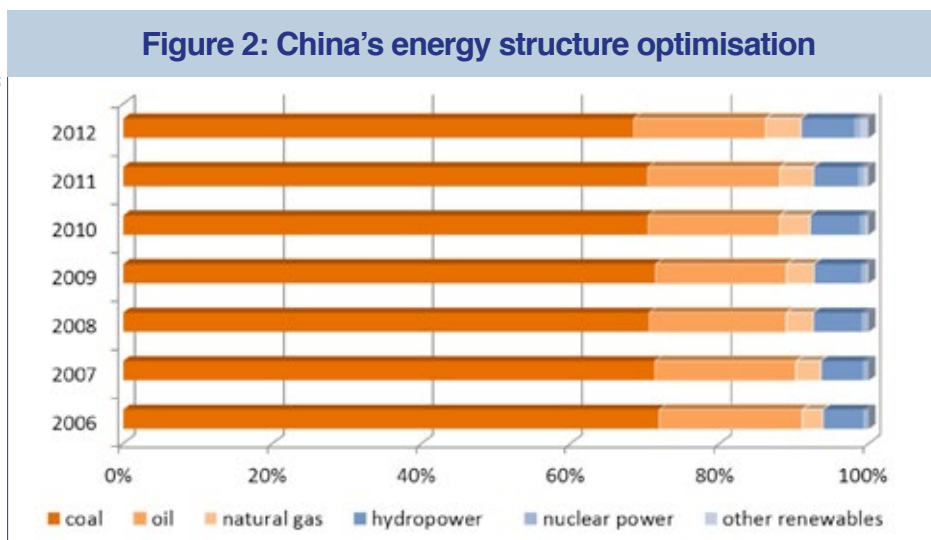
Energy saving and energy efficiency is the most cost-effective solution to energy security in China. How to capture the biggest energy efficiency potential has been a major task for policy makers. Increasingly restrictive laws, regulations and standards are required to regulate the market and give the market a clear policy signal in favour of efficiency and saving. Market-based instruments, including taxation, pricing and trading, are put in place to incentivise the development of the energy efficiency market. Innovation chases after incentives, which attracts investment. All this comes together to drive the scale-up of the deployment of products and services that are labeled as energy-efficient.

China's achievements have been very significant. The energy consumption per unit of GDP in 2012 achieved a drop of 24.2 per cent from the level of 2005, saving about 800 million tce. The implementation of a series of energy policy initiatives has definitely accelerated the shift of China's economic growth pattern. It has also played an important role in economic restructuring and industrial technology advancement. In the meantime, the general public's awareness of energy conservation continues to rise.

China is on track to decouple economic growth and energy consumption. An average annual growth rate of 6.6 per cent in China's energy consumption supported the national annual growth rate of 10.9 per cent during 2006- 2011. The energy consumption elasticity coefficient fell from the highest ratio of 1.6 during the 10th Five-Year Plan period (2001-2005) down to 0.5 in 2012. This trend will continue with further enhanced efforts and policy incentives in this decade.

Restructuring industry continues to be part of the strategy. The government has taken aggressive measures to phase out outdated production capacity that consumes lots of energy while emitting lots of pollution. When new capacity is installed, highly energy-efficient performance is required for power generation and industrial production. At national and local level, strategic emerging industries have been identified to lead China's clean industrial revolution. Energy efficiency and environmental protection, new

Figure 2: China's energy structure optimisation



Source: National Bureau of Statistics of China; BP statistical review of world energy

energy vehicles, and high-end manufacturing are given strong policy and subsidy support.

China today has some of the world's largest energy consuming industrial sectors, such as cement, iron and steel, ethylene and ammonia, besides coal and power generation. China is also the world's workshop in manufacturing low-end consumer products. Today, China has narrowed the gap in energy efficiency compared with that in some industrialised countries.

Continued improvement of energy efficiency and an increasingly cleaner energy structure has generated co-benefits in urban air quality and public health. It is well recognised that technological advance and innovation are key to improving energy efficiency. And we have witnessed a continuous progress in energy technology in China, especially in clean coal technologies, such as supercritical and ultra-supercritical power generation equipment, to the extent that China has started to lead in some clean coal technological areas.

China's dependence on imported energy resources has been increasing over the last two decades. This has caused considerable concern about energy security. To feed its fast-spinning economic engine, China has extended its reach to international markets for energy supply. More than 60 per cent of China's oil comes from international markets, and gradually dependence on natural gas imports is stepping up too. How to create an international context to improve China's energy security has become a major topic for decision-makers to figure out.

### Challenges to sustainable energy development

Despite impressive achievements in security of energy supply, improvement of energy efficiency and development of renewable energy, China still faces a series of challenges to overcome. These can be highlighted as follows:

- The clean energy revolution has so far not been able to catch up with the continued rapid growth of energy demand fueled by the growth agenda. As a result, coal or fossil fuels continue to be the dominant source of energy in China;
- Environmental pollution from fossil fuel burning has worsened, causing increasing public health and social concerns in large parts of the country;
- Carbon dioxide emissions continue to grow and have made China the largest emitter in the world. Emissions per capita are also growing too, resulting in increasing pressure for emission reduction from the international community;

- Increasing reliance on oil and gas imports presents a severe challenge to energy security;
- China lags behind in core energy technologies, requiring further enhanced capability and capacity in innovation;
- China needs to overcome the barriers that slow down the widespread deployment of renewable energy.

### Identifying opportunities for sustainable energy development

Policy incentives, if set well, create opportunities. In the past decade, the Chinese government has integrated energy reduction into its national five-year Plan and long-term development strategy. China has revised its "Energy Conservation Law", issued a "Renewable Energy Law", revised the regulatory system, developed a series of departmental regulations, and introduced pricing, taxation and other supporting policies. China has also made a commitment to the international community that by 2020 its carbon dioxide emissions per unit of GDP will be reduced by 40-45 per cent below that of 2005, and the proportion of non-fossil fuels in total primary energy consumption will reach up to 15 per cent.

Learning by doing has been the mode of policy experimentation in China. A wealth of experience is generated from a large number of pilot and demonstration projects to explore how to develop an energy system in a sustainable manner. A total of 178 nationwide projects, spread across 28 provinces, cities and regions, have been carried out. In 2009, China conducted energy-saving and new energy vehicle pilot projects in Beijing, Shanghai, Chongqing and 13 other cities. In 2010, China launched national low-carbon provincial and city pilot projects in eight selected cities and five provinces. Carbon trading piloting under cap-and-trade schemes is now carried out in two provinces and five cities. In addition, China is constructing solar thermal power generation pilot projects in appropriate areas such as Inner Mongolia, Gansu, Qinghai, Xinjiang, and Tibet provinces.

All these efforts and policy experimentation have increased the level of experience and confidence among policy-makers in China, continuing its journey towards a cleaner and sustainable energy future. It has also laid a solid foundation for China to set more ambitious targets towards capping its total coal consumption and greenhouse gas emissions in the coming decade. □

*Article co-written by Yi Wang (Deputy Director-General of the Institute of Policy and Management of the Chinese Academy of Sciences), Handuo Cai (Research Manager, The Climate Group).*