

## **China: The Dilemma of Climate Change and Energy Supply**

*Dr. Richard Hardiman  
July 2010*

Before entering into the topic of this article, certain basic aspects about China should be understood first. As much as we believe that we know and understand China, we in fact know very little. Data and information is extremely limited and any information that is released to the world at large and to the Chinese public is carefully considered by relevant bureaus and authorities before it is made public.

Moreover, in some cases similar data from different sources is inconsistent, depending upon which bureau releases the information. For example the level water pollution from data from the Ministry of Environment, which is responsible for monitoring industrial and municipal emissions is much lower than that of the Ministry of Water Resources that does not share that responsibility. In each case self and national interest lies at the base of the information provided and this should always be taken into account when assessing information provided from official sources in China.

China was clearly not happy when, in July 2008, the Netherlands Environmental Assessment Agency announced that China had overtaken the U.S.A. in CO<sub>2</sub> emissions and had become the largest Green House Gas (GHG) emitter on the planet. In accord 2006 data China's annual CO<sub>2</sub> emissions rose to 6.2 billion metric tons compared with U.S. emissions of 5.8 billion metric tons. It should be added that not all CO<sub>2</sub> emission was due to energy production. In China 550 million tons CO<sub>2</sub> was from the cement industry to drive its massive construction industry, whereas in the U.S. only 50 million tons was from cement. Similarly 17% of total CO<sub>2</sub> emissions in China come from agriculture.

This aside, China has the ill-gained reputation of being the 'great polluter' and, together with the United States, makes up 43% of the total global emission of CO<sub>2</sub> from fossil fuels. Therefore China is sparing no effort to demonstrate to the rest of the world that it is indeed doing its utmost to reduce emissions and maximize use of non-polluting energy sources. This is particularly significant in the light of the up-and-coming UN Climate Summit set to take place in December 2010 in Can Cun Mexico when crucial decisions will hopefully be made concerning the future agreement between developed (Annex 1) nations such as the U.S.A. and developing (non-Annex 1) nations such as China.

This summit will hopefully result in a crucial decision between developed and developing nations to replace those made at the landmark Kyoto Summit in 1997. It was at the Kyoto Summit when the *Clean Development Mechanism* (CDM) was introduced and which took effect in 2005 for the period 2007-2012. CDM provides for developed nations (Annex I) to implement projects that reduce GHG emissions in developing nations (non-Annex I nations) in return for Certified Emission Reductions (CERs) which allow the developed nations to emit GHGs above their defined quota. China, as a non-Annex I nation gained significant advantage under this mechanism, justified by its soaring demand for energy and resulted in substantial funding for clean energy projects such as dam construction and wind farms under CDM. This has raised some criticism amongst climate change advocates and justifiably so since GHG emissions have risen by 41% since 1990 and the CDM approach seems to have had little impact to reduce CO<sub>2</sub> emissions.

Clearly a new approach needs to be agreed upon between Annex 1 and Non-Annex 1 countries. The UN Climate Summit in Can Cun will likely be another show-down between the two GHG giants – U.S.A and China.

### **New Approach**

As in the past, China will certainly use the arguments that: (i) its per capita emission from fossil fuels are only 5.1 tons CO<sub>2</sub> equivalent per year are thus dwarfed by the United States' outrageous 19.4 tons and the EU-15 at 8.6 tons per capita per annum); (ii) 30% of China's GHGs are a result of manufacturing products that are exported mainly to developed nations, therefore, they should take responsibility for providing assistance to reduce these emissions – in particular by providing their technologies without restriction; and (iii) China's one-child policy has effectively reduced the global population by 300 million people - the equivalent of 1.3 billion tons of CO<sub>2</sub> equivalent as of 2005.

Moreover, China has introduced, or is introducing, policies and strategies far beyond those of other developing nations and even those of developed nations, including: (i) establishment of a National Climate Change office under the National Development and Reform Commission (the first developing country to establish such an office), (ii) policies to measure local officials' performance not only on economic performance but also on 'green' energy performance, (iii) policies committing energy companies to invest in renewable energy, (iv) provision of massive investment funds in renewable energy projects and (v) subsidized rates for purchase of renewable energy for the national grid allowing electricity from wind energy to be part of the national grid.

Using data from 2007, China used about 3.2 trillion kwh (kilowatt hours) power per year. Of this, about 83% is generated from coal, 15% from hydropower and only 1.9% from nuclear and 0.17% from wind power. (In comparison, in the United States, 50% of power is derived from coal and 20% from nuclear power).

Recent news media is flushed with reports that China is initiating a massive campaign to increase the installation of clean and renewable energy sources and in the latest target data for 2020:

- Wind power has surpassed previous targets and is set to reach 100-120 GW a four to five fold increase above 2009 wind power capacity at 25.9 GW<sup>1</sup>.
- Solar energy is set to reach 20 GW - also a 10-fold increase from today's 1.8 GW, and;
- Nuclear power is to increase from 9.1 GW (2008) to reach 60-70 GW, which is 5% of the anticipated total requirement of 1200-1400 GW power.
- Hydro-power will increase slowly but is reaching its limit with a capacity of 150 GW as the most attractive dam sites have already been taken.

It is anticipated that by 2020, 30-35% of energy could come from clean energy sources in comparison to 17% today.

In order to put these figures into proportion, one should take into account that between 2007 and 2008, an average of 2 coal-fired power stations were being constructed per week - each with an average capacity of 1 GW. In 2009, this has been reduced to the construction of about one coal-fired power station per week, which is not insignificant, and by no means reduces the air pollution in China. As a result China power generation capacity has increased from 713 GW (Gigawatt)<sup>2</sup> in 2007 to 950 GW by the end of 2010 – an average of 80 GW/year and bearing in mind the total power capacity of the UK is only about 110 GW.

### **Why Clean Energy?**

---

<sup>1</sup> Extreme caution must be given to quoting figures of 'capacity' vs. actual output. Wind farms operate at about 35% of their capacity at best. If the wind farms are not well-maintained and subject to sand-storms and corrosion such as is likely in remote desert conditions where they are installed, their output could drop to 5 or 10% of their capacity. Similarly access to transmission line is critical and presently many wind farms do not have connection to The Grid and the power generated is wasted.

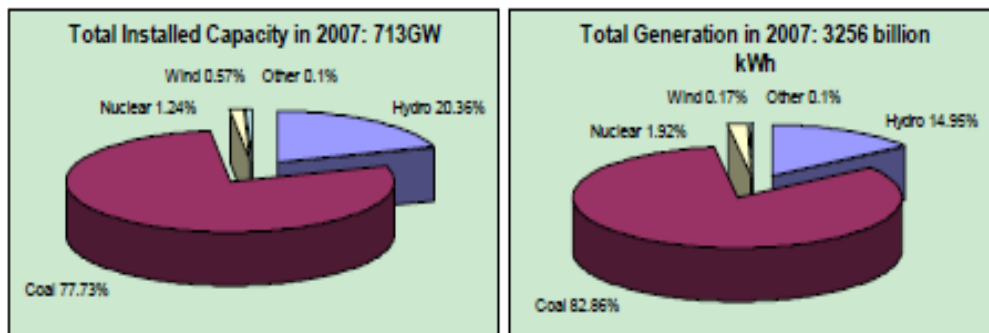
A similar argument may be applied to hydro-electric dams and recent evidence suggests that declining flows in rivers, possibly as a result of climate change is causing hydro- electric dams to periodically cease operation.

<sup>2</sup> 1 Giga Watt = 10 million kilo watt

The question then arises – why is China interested to promote use of clean energy resources when coal is in ample supply and so much cheaper?

Social stability is of crucial importance to the Chinese government in order that it can retain power as proven by past history and dynasties. From the beginning of the era of reform in 1978 until recently, this has been achieved largely through economic growth which has maintained a steady average increase of about 8% GDP per year continuously over 10 years, allowing more jobs, higher salaries and larger purchasing power. Hence, when a person has a job and money in his pocket, he is less likely to revolt. It is said that if the GDP drops below 8%, then unemployment and instability is likely to result.

Cheap energy has been the key driving force to steady economic growth and is largely provided through the coal fired power stations which provide 83% of China's electricity of which 80% goes to the industrial sector. Coal is the cheapest form of energy costing 4-5 US cents per Kilo watt hour (kwh) and with its vast coal reserves, which, at the current rate of utilization, could provide China with energy for the next 41 years. This aside – China's neighbor, Australia has an additional 72 billion tones reserves enough for the next 180 years. Wind power costs at least two times this at 10 US cents per kwh, while solar energy is even more expensive at 22-27 US cents/kwh.



GW = gigawatt, kWh = kilowatt-hour.

Source: China Electricity Council, Express Report of National Electricity Industry 2007.

The operational cost of hydro-electric dams is half that of coal powered plants, but with enormous costs in both time and investment during the construction phase, (a similar argument can be said of construction of nuclear power plants).

To date, dam construction projects in China have reaped substantial financial benefit from the Kyoto Protocol CDM initiative. However, today most of the most attractive hydro-projects have already been realized and additional hydro-power sites are becoming fewer. Moreover the UN Climate Change Committee is reluctant to approve more China's massive hydro-electric dam and wind farms under the CDM program.

Dams are not without peripheral consequences. The re-location of people and villages and occupation of prime agricultural land is the subject of violent riots at dam construction sites. Indeed, it is said that of the 16 million people relocated as a result of dam construction, 10 million are living in poverty. There are additional dangers of land slides and earthquakes – particularly alongside larger dams - and bearing in mind that most damable rivers lie in the west of China, which is both mountainous and prone to earthquakes. Since many of China's rivers flow off the Himalayan Plateau and into neighboring South Asia countries there is increasing pressure on China from India, Laos and Thailand to stop its dam construction which are affecting people's livelihoods and fisheries downstream.

However, the question remains as to why China is increasing its proportion of power from clean and renewable energy sources since higher costs will reduce its competitiveness in the global market and impact upon national incomes.

As China developed a reputation of being home to 20 of the 30 most polluted cities in the world, the pressure to produce clean energy is not only coming from outside China but also from within. Residents of these cities have been keen to vent their feelings and pollution riots and



demonstrations are not uncommon - albeit largely vented against specific polluting enterprises than the Chinese government. Moreover, Beijing, the pampered one-child of China, was voted fairly low on the list of attractive cities to live in China due to its poor pollution rating.

People are demanding a higher quality of life not only through financial gains, but also through the environment and the air they breathe. The World Health Organization estimates that due to premature deaths, air pollution is costing 1.16% of the GDP based on earning capacity, and if a individual is valued at 1 million RMB (US\$146,286), that is equivalent to 3.8% of GDP.

Acid rain from industrial pollution causes 30 billion RMB in crop damages and 7 billion RMB in material damage. Most of the pollution is from coal fired power plants and which could be reduced substantially by fitting Flue Gas Desulphurisation (FGD) filters to the coal power station flues. At present only 15% of coal fired power plants in China have these installed and even fewer are used claiming that it would reduce efficiency of 4-8% and would increase electricity costs by 15-20%. The fact is that this increase on 4-5 U.S. cents/kwh is substantially less than the cost of wind and solar power and would significantly reduce the harmful effects of air pollution.

### **Clean Energy: A Strategic Approach toward the UN Climate Summit**

It would therefore indicate that China's recent increase in investment in clean energy projects is strategic in preparation for the UN Climate Summit in December and not only to reduce dependence on fossil fuels. At the summit, as in previous meetings, there will be a stand-off between the developed and developing nations with China in the right hand corner and the U.S.A. in the left. There will be tremendous pressure from China on the developed nations to reduce GHG emissions further, to hand over clean energy technologies and to allow the developing nations to benefit from industrial growth as have the industrialized nations in the last century.

China has 21% of the global population. Each Chinese person wishes to have - and has the right to have - the same standard of living as people in industrialized countries. The pressure upon global resources and upon global environmental sustainability is severe. Both the West and China have to re-think their of model consumerism to a model of sustainability.

*Dr. Richard Hardiman is a fellow at the Harry S. Truman Research Institute for the Advancement of Peace at the Hebrew University of Jerusalem, a visiting scientist at the Weizmann Institute of Science and a member of the Israel-Asia Center's advisory board. He was formerly a project manager of the Environment Sector at the European Commission Delegation to China and Mongolia.*