

Clean energy special: Eastern promise

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DRIVING out through the suburbs of Shanghai, you get a sense of the breakneck pace of economic development in China. Ten years ago this was all farmland. Now apartment blocks fight each other for space to grow into the smog. Pneumatic drills compete with the traffic noise as they pummel the ground into submission for more haphazard skyscrapers, roads and shopping malls. Just as the landscape has changed beyond recognition, so has China's demand for energy. China is both the world's second largest consumer of energy and the second biggest emitter of greenhouse gases, behind the US.

And the only way is up. By 2020, according to projections by the International Energy Agency, China will be consuming more energy than the US does today, and its greenhouse gas emissions will have more than doubled (see Diagram). That's a giant headache for the world. China has signed up to the Kyoto protocol, but as a developing country it is not legally bound by any targets. That's unlikely to change after the Kyoto review in Montreal this November. And although use of renewables is growing, their contribution to the dragon's insatiable appetite for energy is minuscule compared with the country's primary fuel: coal. Chinese coal is abundant, accessible and cheap. It provides two-thirds of China's energy, and it is the major contributor to the country's CO₂ emissions, which are in excess of three billion tonnes per year.

It is not an encouraging picture, and I fully expected to encounter indifference to the problem in a country where the consumer is becoming king. But I was pleasantly surprised by what I found.

An hour's drive from Shanghai, on a broad coastal plain close to the airport, is the Nanhui wind farm. There is a constant drone of aircraft as we pull into the construction site, where a lone 1.5-megawatt wind turbine towers overhead. Ten more machines are work in progress, recently shipped from Europe. Even laid flat on the ground, their blades tower over Zhou Xinfu, the project's deputy chief engineer. "Shanghai is a good place to build a wind farm," he says. "It has a long coastline and strong winds. This one will be by far the biggest in China when it's completed. It will generate 0.1 per cent of Shanghai's power, and in 10 years we hope to generate up to 200 megawatts from wind power." That's about 1 per cent of Shanghai's needs.

Wind farms are springing up all over China, trickling renewable electricity into the power grid. Solar power is making steady progress too, through projects such as the 8-megawatt facility in the Gobi desert of Gansu province.

Meanwhile, personalised versions of both technologies are also making inroads. "This 1-kilowatt wind turbine is sufficient for two families to use for lighting, TV and a small refrigerator," says Ma Shenghong, gesturing to the impressive range of experimental turbines and photovoltaic arrays on the roof of the Jikedian Renewable Energy Development Centre in Beijing. "In the cities we have photovoltaic integrated building schemes, like the '100,000 roofs' project in Shanghai, and plans for solar street lights. And photovoltaic application in the rural sector will be a big player in China. Many pilot projects have been implemented here."

Ma and his colleagues are preparing the energy strategy for the Chinese government's next five-year plan, which starts in 2006. The focus of his research is rural electrification - providing electricity to 30 million people who live in the 29,000 villages that are not hooked up to the national grid, but who increasingly demand the consumer lifestyle that has become the norm for the urban middle class.

At present these villages rely largely on burning wood and animal waste, which are classed as renewable sources even though they are often net emitters of CO₂. According to Nicoletta Marigo of the environmental policy and management group at Imperial College London, about 16 per cent of China's primary energy supply comes from such sources. Ma's challenge is to replace this with clean electricity. "What we're talking about is industrialised renewable technologies - wind, solar, geothermal and ocean energy," he says. "I believe that solar energy will be the future energy resource for human beings and that by the middle of this century it will account for 20 to 30 per cent of energy generation."

Although China is investing in renewable technologies, coal remains king. So a key challenge is to clean up coal's act. Ni Weidou leads research into coal gasification at the BP Clean Energy Centre in Beijing. "In order to modernise utilisation of coal, my opinion is that gasification is the way forward," says Ni. "By 2020,

20 per cent of coal for power generation should be gasified, and by 2050 maybe half or more."

It is obvious from discussions with Ni and Ma that both are passionate about clean and renewable technologies. But what of the government? Again, the signs are better than I had hoped. Liu Yanhua, vice-minister of science and technology, is upbeat about China's energy position, despite immense economic growth. "This kind of development is characterised by high consumption of energy and resources. So now we're attaching more importance to environmental and clean energy issues, and these are now at the top of the Chinese government's agenda."

And it seems that the government is turning talk into action. In March it passed a renewable energy law that comes into effect in 2006. The legislation sets goals for renewables and obliges power grid operators to purchase power produced from renewable sources. Disappointingly though, the goals are less stringent than they were in the draft bill, and there are no penalties to enforce compliance.

One promising aspect of the new law, however, is a small levy to support renewable energy development in rural areas. Electricity consumers across China will pay a little more - an extra 0.2 per cent - to subsidise the provision of photovoltaic technology to rural users. Without that helping hand, the cost of photovoltaic electricity would be prohibitive. And the government will contribute to the scheme by funding the capital expenditure. The details have yet to be finalised, but if successful, other renewable technologies will receive similar subsidies.

The wind of change seems to be blowing in the right direction. But not all of the government's projects to save the environment please environmentalists. The government has big expansion plans for nuclear energy, which provides less than 0.2 per cent of China's energy. And of course there is the Three Gorges Dam, which will be the largest hydroelectric plant in the world, generating an impressive 19.2 gigawatts. In this case, the price paid for saving the atmospheric environment is met by the land and the people who used to live there. Thousands of hectares are being flooded and millions of people displaced.

Despite these controversies, it is hard not to conclude that, overall, China's intentions are good. So what can the new Asia-Pacific Partnership bring to the table? "I think the Chinese government is already well aware of the challenge," says Marigo. "It is already taking steps to develop its own renewable energy industry, but the pact will help."

Ian Fells, chairman of the New and Renewable Energy Centre in Northumberland, UK, is even more upbeat. "I don't often agree with George Bush, but in this case he's right. Climate change will be combated by new technology, not by changing hearts and minds. But in China, this must be via the carbon sequestration route, which opens up a whole new vista for coal." And with China's carbon sequestration research lagging behind Australian and US efforts, this is arguably one area where the pact could make inroads.

Fells does have some concerns about the new Asia-Pacific energy pact. "It may mean that developing countries like China won't sign up to enforceable targets in the next round of Kyoto in 2012. It legitimises their current position and effectively splits the world into two camps."

Perhaps more worryingly, the pact doesn't seem to have made much impression in China. I spoke to Ma shortly after it was announced: he hadn't even heard of it.

On my last day in China I decided to take the maglev train from Shanghai to Pudong airport. It is an experience not to be missed - travelling at 430 kilometres an hour while levitating above magnetic rails. But I expected it to speed up my transfer to the airport by avoiding Shanghai's notorious traffic jams. I was wrong. The maglev is fantastic technology, but it stops a long way short of practical reality. Since the railway starts on the outskirts of the city, you have to take a long, unpleasant taxi ride to reach it. Once you get there, the concourse is eerily quiet. The station stops abruptly, seemingly suspended in mid-air. You can see where the extension into the city centre would go - straight through a very tall, densely populated apartment block, followed by another one, and another.

It struck me that there are parallels between the maglev and China's renewable energy story. Both are founded on great concepts, new technologies and passionate people. But both stop well short of achieving their objectives. To make them successful, someone, somewhere will have to make hard decisions, change mindsets - and inject bucketfuls of cash.