



GRAINNE RYDER • PERSPECTIVE

Centralized planning has delivered a series of large, centralized hydro electric energy projects to China, many of which have proved to be a serious mismatch to the power problems they were meant to solve. Here, [Grainne Ryder](#) argues that consumer-oriented markets ought to guide investment decisions in the future, and that these would aid decentralized energy projects.

Big hydro in the red

the drive for DE-friendly reform in China

In the next 15 years, China plans to double its power system capacity with more of what it knows best: central power stations with coal as the dominant fuel source. Two or three nuclear reactors are to be built annually, increasing nuclear generating capacity from 8700 MW to 40,000 MW. Natural gas-fired capacity is also expected to increase from 10,700 MW to 60,000 MW as new gas supplies become available. In 2005, China added more new generating capacity than ever before, as power companies rushed to build new plants to meet soaring demand for electricity. According to the China Electricity Council, total installed capacity rose 15% last year to 508,410 MW.

One of the more controversial priorities for supply expansion is large hydropower, part of the government's West-East economic development strategy whereby power from giant hydro dams in the mountainous south-western provinces gets delivered via long-distance transmission lines to consumers in the industrialized coastal provinces. Despite high-level political backing, the

proposed projects have been openly criticized and discussed inside China. Farmers resent being flooded off their land in return for a pittance in compensation. Beijing conservationists oppose the destruction of the country's last unspoiled river valleys.

At 3.8 US cents per kilowatt-hour, some economists argue the price of south-west hydro is too low given the dams' high social and environmental

Provincial and municipal governments have shown a preference for locally built power plants

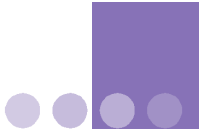
costs, not to mention the cost of getting the power to the coast. Southern Power Grid, the smaller of China's two state-run grid companies, plans to spend US\$29 billion in the next five years to connect dams in Yunnan province with coastal areas, and beyond to neighbouring Vietnam and Thailand. Also, scientists warn that recurring drought will hurt the reliability (and profitability) of more dams. Just last year, the threat of lower-than-expected water levels in the Yangtze

River prompted the company operating the Three Gorges dam to diversify into coal and wind power investments.

DECENTRALIZED ALTERNATIVE

Another serious threat to China's big hydro builders, and one that has received far less public attention inside China to date, is the process of decentralization. Although the central government still

controls investment decisions made by the big state generators and grid companies, provincial and local governments also have authority to finance and build their own power plants, with or without foreign investors. What's encouraging for advocates of decentralized power is that provincial and municipal governments have demonstrated a preference for locally built power plants rather than relying on remote (and centrally funded) power stations.



In coastal Guangdong province, for example, energy planners worry about excessive reliance on inland hydro stations that are vulnerable to extreme weather conditions and grid failure. Under central government directive, one-quarter of Guangdong's power supply comes from south-western hydro projects. But according to experts at the Guangdong Techno-Economic Research Development Center, the province would prefer to use market mechanisms to secure future power and gas supplies. About 35% of Guangdong's current supply comes from dirty and expensive oil-fired plants with installed capacities of 50 MW or smaller.

Rather than being ordered by central government to shut plants down, the province views competition as the best

But when Ertan was completed in 1998, there was virtually no demand for its power in either jurisdiction. Many state-owned factories were shutting down at that time, which caused electricity demand to drop sharply. More importantly, Ertan's two biggest prospective customers had become its competitors. In the decade it took to build the giant dam, Sichuan and Chongqing had financed and built their own smaller hydro and coal-fired plants (ranging from 50 to 700 MW capacity) and didn't need power from Ertan. As a result, the centrally backed Ertan Hydropower Development Corporation, which received more than \$1 billion in loans and loan guarantees from the World Bank, 'suffered serious financial losses in terms of forgone revenues at a time when its debt service bur-

The Ertan dam is not generating enough cash flow to mobilize capital for expansion

way to weed out inefficient producers, promote economical retrofits, attract new investments in cleaner generating technologies, and bring down electricity prices. Guangdong's rates are the highest in the country under the prevailing cost plus pricing mechanism.

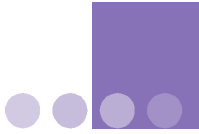
'SERIOUS FINANCIAL LOSSES' AT ERTAN

The near-bankruptcy of China's second-largest hydropower project is another illustration of the central-versus-local tension, and the growing financial risk in building huge-scale plants in a market undergoing decentralization. The \$2.2 billion World Bank-funded Ertan dam (with its six General Electric Canada turbines) was designed to generate 17 billion kilowatt-hours of electricity per year – equivalent to about one-third of Sichuan province's current annual power consumption. The dam's output was to be delivered via high-voltage transmission lines (which cost an additional \$1 billion and were also partly financed by the World Bank) to Chengdu, the capital of Sichuan province, and to Chongqing, a newly created municipality of 30 million people at the upper end of the Three Gorges dam reservoir.

den was very high', according to the World Bank's performance assessment of Ertan released last year.

By 2003, Ertan had to be bailed out by the Bank of China to avoid defaulting on its debt payments to commercial lenders and the World Bank. Since the bailout, Ertan's finances have improved somewhat due to increased electricity sales and lower interest charges on its outstanding debts. However, earnings are still nowhere near the Bank's target of 15% return on assets. The company is losing more than \$15 million a year by selling power below cost to industrial customers. Its debt-to-equity ratio is 'unsatisfactory and will limit its future borrowing capacity', according to last year's World Bank assessment. Its central government shareholders have not yet paid in their full 20% of the initial project investment equity.

Overall, the dam is not generating enough cash flow to mobilize capital for expansion nor does the Bank expect the central government to raise Ertan's selling price anytime soon. (Surprisingly, the World Bank gave its client a 'satisfactory' performance rating and a few months later, the central government announced \$3.7 billion for the Ertan Corporation to build a second and even larger hydro dam further upstream.)



Financial losses suffered by the Ertan large hydropower project shows that the Chinese Government and investment banks need to listen to consumer demands and shift focus to smaller-scale localized energy projects

SURPLUS TO REQUIREMENTS

The central government's initial response to Ertan's difficulties was to ban construction of all new power plants from 2000 to 2001 – a disastrous move which led to huge capacity shortfalls and power shortages through 2003 and 2004. (According to the World Bank, the ban wasn't entirely motivated by Ertan's problems. There were also high-level concerns that the much larger Three Gorges dam wouldn't have a big enough market for its output when its first turbines came on line in 2003.)

Now the World Bank warns that other state power companies bringing large power plants on line in the next few years could face losses similar to Ertan. With about 300,000 MW of new generating capacity under construction across China, the Bank warns that 'a significant portion of this new capacity ... is likely to be surplus to requirements even if rapid economic growth continues. ... Many [new power] projects may run at low levels of capacity utilization and their promoters may have difficulty generating sufficient cash flows to service their loans.'

This surplus capacity has 'serious implications for the Chinese banking system since the major portion of the loans are from state-owned banks to state-owned generating companies,' the Bank adds. 'Formal defaults are unlikely, but loan rescheduling on a large scale would

be needed to avoid adding to the stock of the [state] banks' non-performing assets.'

In addition to loan rescheduling, the Bank recommends a series of measures to ensure that state power companies cannot fail – an approach unlikely to sit well with

The problem is central planning – state power companies building power plants to meet government targets rather than actual market demand

Chinese power consumers or local power producers, if only they knew. Instead of letting money-losing companies fold, the Bank advises a market by government fiat: rate increases to cover uncompetitive costs, more investment in long-distance transmission, and closure of local power plants to create new markets for centrally planned power plants.

BLACKOUTS, RATIONING AND RATE HIKES

Chinese power consumers would be hard hit by such measures, and this after three years of blackouts, power rationing, and rate hikes. In all, 24 of China's 31 provinces and municipalities have suffered repeated outages since 2002, creating havoc for local economies and millions of consumers. When the central power system failed them, thousands of businesses and factories were forced to shut down several days a week,

sometimes longer. Some shifted their operations to off-peak hours. Others bought their own generators: in the booming coastal city of Shenzhen, companies imported more than 5000 generators between 2004 and 2005.

In Shanghai, a city of 20 million people, power theft has become rampant: an estimated 11 million kilowatt-hours of power was stolen from the city's grid in the first half of last year. In August, the city's power department sent out more than 1000 inspectors with local police to crackdown on small restaurants and hair-dressers caught tampering with their power meters in residential buildings.

But consumers aren't to blame for China's electricity crisis any more than local power producers caused Ertan's failure. The problem is central planning – state power companies building power plants to meet government targets rather than actual market demand – and China's leading economists and energy experts know it. Last May, dozens of experts submitted detailed reports to China's State Council recommending bold market

reforms to end the policy-driven electricity crisis. For advocates of decentralized power this is an exciting development.

CENTRAL PLANNING CAN NO LONGER SERVE

Here's how economists with Guangdong's Techno-Economic Research Development Center explain the problem: 'The traditional practice of central planning can no longer serve as a mechanism to determine who among different investors should be awarded new projects.' With companies from all over the world vying to enter China's power market, a new competitive market separating government and business is needed 'so that investment opportunities can be awarded to the best suitors on the commercial basis with minimal political interference.'

Another team of industrial economists, also advising State Council, writes:



Some village residents unwilling to move to the resettlement areas returned to their former lands and set up temporary housing. Many continued to work their fields until they would be forced to relocate again (Three Gorges Probe)



Beijing has its own strategy for supplying clean and efficient energy systems, such as a trigeneration system here at the Beijing Gas Group (Beijing Energy-net De Co Ltd)

‘China has made only partial progress in shattering the monopoly [structure] and lags behind seriously in privatization reform and change of government functions.’ They point to the ‘vast regulatory vacuum’ and the semi-planned/semi-market-driven state of the industry as ‘the most adverse state.’ They recommend complete separation of power companies from the government, and unbundling of generation from transmission, which has been underway since 2002. And they want the new industry regulator, State Electricity Regulatory Commission, to be given the legal and organizational back-up from the central government to introduce competitive pricing and establish rules for non-discriminatory access to the power grid.

A third influential group, US and Chinese power experts affiliated with the Lawrence Berkeley National Laboratory, has made similar recommendations under three themes: competitive pricing, strengthened institutions, and prioritized investment in cleaner coal technology and industrial energy efficiency to reduce the need for central supply expansion and help reduce air emissions. They note that combined heat and power systems would benefit most from reforms promoting rate competition among suppliers, standard grid interconnection procedures and, most importantly, rules that allow direct sale of electricity to end-users, with power producers paying only for the service of using the grid infrastructure. Currently,

power producers are required to sell only to the grid.

While recognizing that market reform is still relatively uncharted territory for the Chinese government, except for brief trial runs in eastern and north-eastern China, regulatory officials are confident they can make rapid progress with reform now that the gap between power supply and demand is closing. In

Multilateral development banks’ core business is financing state projects that are inherently uncompetitive

a statement earlier this year, Chang Jianping, director of the State Electricity Regulatory Commission, said foreign investors should expect the transition to a regulated and competitive power market to be completed within the next five years.

CLEAN ENERGY INITIATIVES

Beijing, meanwhile, has developed its own strategy for a ‘market-based quality energy supply system’ that will transform the city into an ‘energy-efficient, clean and beautiful international metropolis’ in time for the 2008 Olympics. To reduce coal consumption and improve air quality, the city is encouraging investment in clean energy initiatives – from fuel-switching to micropower and solar lighting systems. Four district gas-

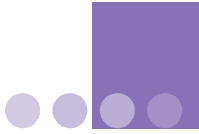
fired cogeneration projects are already under construction, each one replacing dozens of conventional coal-fired boilers, to provide heating and power to residential buildings.

Nationwide, the government has set ambitious targets for investments in coal-fired generation, clean coal technologies, and renewables. Once competitive pricing of electricity and gas is

introduced, and provided that the rules and standards for grid interconnections are worked out, millions of Chinese power consumers can begin to benefit from new investments in small-scale cogeneration, on-site power production, and energy-recycling projects (such as landfill waste-to-energy).

As for extending service to rural consumers, the Lawrence Berkeley team notes that China has already successfully demonstrated the feasibility of solar and wind power to electrify remote areas, without the higher costs of grid extension or diesel generation. With market reform, domestic and foreign investors will be well placed to help the government meet its goal of bringing renewable electricity to 23 million off-grid users by 2010.

Whether or not multilateral development banks can play a constructive role



Construction of large dams not only incur environmental but also social costs. Flooding of the Yangtze River by the Three Gorges dam has forced residents of the city of Hongxian to desert their homes in the old city and relocate to a new one built above (Three Gorges Probe)



Residents of the city of Wanzhou will have to desert their homes to escape the Three Gorges flood water, which is scheduled to rise to the 177-metre mark in 2008 or 2009 (Three Gorges Probe)

in China's transition to a competitive power market is debatable, particularly in light of the World Bank's defence of Ertan and other money-losing state companies. Multilateral development banks' core business is financing state projects that are inherently uncompetitive. In China, they would do best not to distract the central government from the task of market reform and democratic regulation by offering loan guarantees and other subsidies for generation and transmission projects in the pipeline.

The banks might be well advised to refrain from financing carbon credit schemes, such as the World Bank's 100 MW wind farm in Inner Mongolia. Such projects only serve to relegate renewables as subsidy-dependent supplements to central power rather than encouraging them as viable competitors. If the goal is to help China develop competitive markets for decentralized energy

technologies, then drumming up DE subsidies from the development banks may prove counter-productive in the long-term.

NO SHORTAGE OF WILLING INVESTORS

With market reform, there will be no shortage of willing commercial investors. A number of capital funds have already been set up to fund new and competitive generating technologies in China, including the Beijing-based China Environment Fund, the Tsinghua Venture Capital Management Company, the Small Enterprise Assistance Fund and the Sichuan Fund.

China's electricity future is consumer-oriented markets deciding who generates, where, on what scale, using which fuels, which technologies, and at what price – not central planners, Western govern-

ments or multilateral development banks. With market reform, millions of Chinese consumers and entrepreneurs could be helping drive the DE revolution at home and around the world. There's no time to waste.

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