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Finding the True Cost of China's West-East Hydro: SERC should step in

5.24.06 *Grainne Ryder, Policy Director, Probe International*

5 Comments

Just outside Kunming, the capital of southwest China's Yunnan province, a giant billboard advertises Hydrolancang on a blue-sky background. You wouldn't know it from the billboard, but Hydrolancang is the company building two of the world's tallest and most controversial hydro dams on the Lancang River just a

few hundred kilometres to the south.

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When completed in 2012, Xiaowan will be the world's tallest arch dam, with a height (292 metres) equivalent to the 71-storey SEG Plaza in the coastal city of Shenzhen.2 Next under way is the 254-metre (or 52-storey-high) Nuozhadu dam, which is expected to start generating power in 2017. Hydrolancang, officially the Yunnan Huaneng Lancang River Hydropower Company, a subsidiary of one of China's "big five" power generating companies, already has two large hydro dams operating on the Lancang, and three under construction.

Hydrolancang is not the only company building skyscraper-high dams in Yunnan province.

- The Yunnan Huadian Nu River Hydropower Development Company has plans for 13 high dams along the Nu River, one of only two major rivers in China that remain free-flowing. The tallest of the planned dams, located in Tibet, would stand 307 metres high and have an installed capacity of 4200 MW.
- Further east along the border with Sichuan province, the Three Gorges Corporation is pushing ahead with the 278-metre-high Xiluodu dam. With an installed capacity of 12,600 MW, Xiluodu is part of a nine-dam cascade on the upper Yangtze (Jinsha), which, if completed, would produce three times as much power as the Three Gorges dam, the world's largest hydro generation project.

The pace and scale of this dam-building spree has alarmed China's scientific and environmental communities. One immediate concern is the frequency with which Yunnan is hit by earthquakes, rock falls and landslides. Experts have warned that the extra weight of the high dams and reservoirs could add stress to existing faults, triggering more earthquakes in a province devastated by a string of major quakes over the past decade.

Another concern is the ecological damage. The Nu River, which flows parallel to the Lancang and Jinsha, forms part of Yunnan's Three Parallel Rivers National Park, an area so biologically and culturally diverse UNESCO designated it a World Heritage Site in 2003. The projects would also require the forced resettlement of ethnic minorities living along the rivers. At least 50,000 people will be displaced by Hydrolancang's Xiaowan and Nuozhadu dams alone. Earlier this year, environmentalists, joined by scientists and engineers, urged the country's top environmental regulator, the State Environmental Protection Administration, to disclose the dam builders' plans and hold public hearings, starting with the Nu River scheme. Certainly, SEPA has the legal authority to intervene, in accordance with the country's new laws on environmental impact assessment and public participation in decision making. The agency also appears to have high-level support for a careful review of the plans. In 2004, Premier Wen Jiabao announced that the Nu River project should be "seriously reviewed and decided scientifically." And He Shaoling, a senior engineer at the China Institute of Water Resources and Hydropower Research, was quoted as saying: "The Nu River dam project must go through an independent and authoritative investigation before any decision on its future should be made." Whether or not SEPA will be able to hold the dam builders to public account, however, is open to speculation.

Dam building is centrally mandated

Dam building in the southwest is central to Beijing's western development campaign and its plan for tripling the country's hydropower production by 2020. To meet that target, the State Council granted three state power companies exclusive development rights in 2002:

- Hydrolancang, majority owned by China Huaneng, the largest of the big five state

generating companies, holds development rights to the Lancang River;

- Yunnan Huadian Nu River Hydropower Development Company, majority owned by Huadian, another one of the big five state generating companies, holds rights to the Nu River; and
- The Three Gorges Corporation, which is responsible for the Three Gorges dam, holds rights to the upper Yangtze (Jinsha) River.

With monopoly privileges in hand, each company is now racing to meet Beijing's production targets, financed mostly with cheap capital from the central banks. Each parent company has at least one subsidiary listed on the Chinese stock market in order to raise additional capital for expansion. With an eye to the capital markets, the new dam-building subsidiaries now claim to be market-oriented, promising high returns for would-be investors and low-cost power for consumers.

But as state-owned power companies, the dam builders remain fundamentally policy-driven, not market-driven, unhinged from market signals and shielded by the central government from many of the financial risks and environmental liabilities associated with large dams. As such, the dam builders' multibillion-dollar hydro schemes are themselves a huge financial liability for the central government. As Chen Guojie of the Chinese Academy of Sciences puts it: "Driven by the profit motive, the dam builders are racing ahead with scant regard for environmental safety in the river valleys or possible changes in the power market. Such shortsighted and unchecked development could lead to endless trouble in the future."

In a further carve-up, not only of the nation's hydropower resources but of its power markets, the central government has decreed that the bulk of the Yunnan dams' output will be sold to the rapidly industrializing eastern province of Guangdong, and the balance to neighbouring Vietnam and Thailand. All this was laid out in Beijing's 10th Five Year Plan (2001-05): Guangdong would import about one-quarter of its power supply from the southwest by 2005. Additional targets were set for hydro exports to Vietnam and Thailand. Under Beijing's 11th Five Year Plan (2006-10), China Southern Power Grid, the

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state-owned transmission company responsible for transmission in the five southern provinces, plans to spend US$29 billion on infrastructure to increase west-east power transfers.

Guangdong province

Meanwhile, one of the designated power purchasers, Guangdong province, has raised objections to increasing its reliance on hydro imports from the southwest. According to senior power sector planners and economists at the Guangdong Techno-Economic Research Development Centre, centrally mandated hydro imports are "worrisome" to the provincial government for a number of reasons.

In their 2004 report on Guangdong's power industry, the team, led by Zeng Leming and Zhang Chi, writes: "While the central government has been turning down [approval of] new power plants in Guangdong and mandates the Province to import southwestern hydropower instead, Guangdong fears that the imports are insufficient to either meet the level of market demand or match the load curve." Between 2001 and 2005, the Guangdong team reports, the central government banned construction of power plants in Guangdong in order to make room for western hydro imports - a directive that contributed to severe power shortages and discouraged private investment in new generating capacity just when the province needed it most.

Although the price of hydro imports is "competitive" at the government-fixed price of 3.8 US cents per kilowatt-hour, reliability is the biggest concern. The Guangdong team notes "uncertainty and reliability issues associated with southwestern electricity imports such as seasonality of southwestern hydropower, compatibility with planned dispatch and Guangdong load curve, and increase in power demand within western areas."12 In particular, water shortages have "not been considered by central government planners when they decide how much Guangdong's demand will be set aside for southwestern hydro imports." Instead of increasing hydro imports under Beijing's directive, and thereby increasing the risk of future power disruptions and shortages, the Guangdong experts argue for abolishing what they call "political dispatch." They call for a new system of economic dispatch and market rules to promote investment in power plants within Guangdong, and without political

interference.

SERC should step in

Guangdong's concerns warrant urgent attention from the new industry regulator, the State Electricity Regulatory Commission, as they affect power consumers and the future of the country's power industry. Set up by the State Council in 2002, SERC is responsible for regulating state power companies and introducing competition in power generation. Together with the country's top planner, the National Development and Reform Commission, SERC is a driving force behind the State Council's 2002 plan to restructure the state power industry for competition and develop a new system of regulation.

As the industry regulator, SERC is responsible for:

1. Enforcing environmental laws, regulations and standards in co-ordination with relevant environmental protection agencies;

2. Issuing licences to power producers;

3. Ensuring orderly and fair competition in the market;

4. Regulating the non-competitive parts of the generation business;

5. Reviewing electricity tariffs;

6. Proposing changes to government pricing authorities;

7. Investigating possible violation of laws and regulations by market participants, and resolving disputes among them; and

8. Organizing implementation of reforms and proposing options for further reform.

Clearly, SERC has the mandate to assist the State Environmental Protection Administration with a review of the dam builders' costs of compliance with environmental regulations and standards. In addition to a full-cost review, however, SERC is the right agency to investigate Guangdong's concerns about

the reliability of hydro imports from Yunnan and the broader economic implications of centrally mandated hydro development.

Finding the true cost of west-east hydro

Proponents claim that large hydro dams in Yunnan will generate high returns for investors and low-cost power for distant consumers. SERC's first job as regulator should be to test the economic validity of the proponents' claims.

Essentially there are four questions SERC should ask on behalf of ratepayers and potential investors:

1. **What are the real costs of west-east hydro exports?**

Dam builders in China typically underestimate and shift certain costs onto other government sectors, thereby inflating the profitability of their proposals at public expense. Guangdong, for example, buys hydropower from the southwest for 3.8 US cents per kilowatt-hour, which is set just less than the average price of power from coal-fired stations but does not reflect the total cost.

Prior to 2002, profitability was not an issue for hydro developers. The price of their output was set by the central government and bore no relation to actual costs. Today's dam-building companies, however, are promising high returns to attract commercial investors. The regulator's responsibility is to check that profits have not been inflated at public expense by underestimating costs or externalizing costs onto riparian communities and power consumers. Take the Three Gorges Corporation's listed subsidiary, Yangtze Power Company, for example, which reported a 2005 profit of US$417.51 million. The company is selling hydropower from the Three Gorges and Gezhouba dams for 3 US cents per kilowatt-hour but this price does not include the full cost of dam construction, resettlement or environmental damages. As such, its profits warrant economic scrutiny from the regulator.

West-east transmission costs also warrant scrutiny. Without long-distance transmission lines, the dam builders in Yunnan would not have access to a big enough market to absorb their dams' massive output. Yet the high cost of long-distance transmission, if included in the price of hydro imports, could

render their hydro-dam investments uncompetitive compared with smaller-scale modern power plants built in Guangdong, close to where power is needed. The regulator should establish what China Southern Power Grid Company's actual costs and projected profits from west-east power transmission are; how the company plans to recover its costs; and from ratepayers in which jurisdictions. Under the new market rules, all costs should be accurately assessed and disclosed to both regulators (SERC and SEPA) for public review prior to investment decisions.

2. **How will the dam builders' costs (and profits) affect future electricity rates?**

Not much information is available to potential investors or ratepayers beyond the dam builders' preliminary cost estimates. The regulator should insist upon financial transparency from the dam builders and transmission-grid owners in order to determine how the proposed projects would affect future electricity rates.

3. **Who will assume financial responsibility for the hydro dams when things go wrong?**

The regulator should call for disclosure on which parties will be held financially responsible if the proposed hydro dams cannot recover costs from ratepayers (for example, due to inadequate demand for their output, drought, or other natural disasters that either cripple production or render the dams inoperable). Under the old system of centrally mandated investments, state companies expected the central government to protect them from financial failure at any cost.

But in China's increasingly competitive and decentralized (and soon-to-be-oversupplied) power market, this assumption may no longer be prudent. The near-bankruptcy of the centrally financed Ertan Hydropower Development Corporation is a strong indication that the central government, while still prone to interference, may be far less willing or able to shield its dam builders from future competition from provincial and municipal power producers. To deter costly investment mistakes, the regulator should review these emerging

financial risks and their potential impact on the cost of service.

4. **Are the dam builders' costs justified? Or would power consumers be better served by market reform that promotes investment in commercially viable generating technologies?**

Here, the regulator should seek input from Guangdong's power industry experts, as well as would-be competitors, consumers in affected jurisdictions, and other parties concerned about the economic and environmental impacts of large hydro dams. A full-cost review is not enough. SERC should exercise its mandate and confront the prevailing monopoly structure that is driving investment in high-risk, high-cost dams at public expense.

The fundamental policy question is this: should China's power consumers and citizens be forced to pay the true cost of hydro dams in Yunnan, plus the high cost of long-distance transmission? Or, would consumers be better served by market reform in terms of reliability and cost of service? And finally, SERC should address the impact of centrally mandated hydro investments and power transfers on the development of competitive power markets.

Is SERC up to the job?

Some analysts doubt SERC has the independence to hold state power companies publicly accountable. They note that SERC chairman Chai Songyue is a long-time supporter of former premier Li Peng, whose son runs Huaneng, the majority owner of Hydrolancang and lead dam builder in Yunnan.

Also, SERC staff are mostly former employees of the State Power Corporation, without the proper economic training to advance a rules-based approach to electricity regulation. The World Bank, a leading financier of China's large hydro dams, reports little progress in regulating state power companies since SERC's creation in 2002. "SERC is still struggling to establish its authority in the face of fuzzy 'ground rules' set by the State Council and the counterveiling authority of long-established and more powerful bodies such as the NDRC [National Development and Reform Commission], which still has the final word on electricity tariffs. Lines of responsibility between SERC and NDRC are not yet

clearly demarcated, with the latter seemingly reluctant to surrender any of its regulatory powers over the sector, even though it is overstretched. SERC has little autonomy and still depends upon a budgetary allocation from the Ministry of Finance to cover its operating costs," the Bank reports.

Yet SERC has made progress. It has established regional offices for supervising provincial markets. It has announced a new certificate system for power producers, which, if implemented, would oblige power companies to submit their business plans, financial reports and environmental performance records for assessment by SERC in order to be certified for operation. And last year, it ran a trial market in southern China, in which power producers bid against one another to supply the grid. According to SERC's director of power market regulation, Chang Jianping, investors should expect the new rules for competition in generation to be finalized within the next five years.

In the meantime, however, SERC has warned the State Council that stalled market reform is impeding investment and economic growth. The separation of state-owned generation from state-owned transmission, which began in 2002 (as a prerequisite for competition), is far from complete. The State Power Grid Corporation, the country's largest transmission operator, still controls more than 36,000 MW of generating capacity and routinely dispatches its own generators before rival power producers, which has created conflict with private power producers. Counter to the industry reform plan, the two state grid companies, China Southern Power Grid and its larger rival, the State Power Grid Corporation, are busy entrenching their monopoly buyer and distributor positions by building super high-voltage power lines (1000-kV AC), which are designed to accommodate huge volumes of power over long distances.

SERC should confront the power monopolists. Dissatisfied investors and the central governments' own advisers are openly calling for market reform as the best way to deliver reliable and affordable power to consumers while alleviating financial pressure on the central government. Last year, even the government's department of industrial economists warned that "the most severe problem" in China's power industry is "the government overstepping its role and disturbing the market mechanism by allocating resources. As a result, [state power]

enterprises are still in a compulsory 'bind', with market supply and demand signals blocked or cut off."

By undertaking an open and impartial economic review of Beijing's west-east hydro policy, SERC would bring much-needed financial transparency to the dam builders' plans for Yunnan before any more investment decisions are made. It would also help refocus the government's attention on market reform versus more centrally planned expansion. As the Guangdong experts write, "a new reform approach is badly needed to solve problems the industry faces."

Power consumers stand to benefit from SERC's initiative. If consumers in Guangdong province or elsewhere don't want or need to rely on remote and drought-prone hydro dams in Yunnan, proponents have no valid economic rationale for building them or expecting ratepayers across the country to pay their costs. If power consumers would prefer cheaper, more reliable, and less environmentally damaging generating options, the new market rules should be introduced to encourage such investments without further delay. (About one-third of Guangdong's existing generating capacity is oil-fired units under 50 MW, which are inefficient and polluting, and could be replaced with cleaner and commercially proven generating technologies, such as cogeneration and combined-cycle plants.

SERC should exercise its regulatory mandate and assist its environmental counterpart, SEPA, with a public review of the hydro developers' costs for the environment's sake. China's power consumers and the economy would also be well served by SERC's review of west-east hydro development as it affects power consumers and the modernization of China's power industry.

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Readers Comments

Date	Comment
Len Gould *5.24.06*	Are we to understand that you prefer natural gas-fired generation in china to hydro power? "compared with smaller-scale modern power plants built in Guangdong, close to where power is needed." Your dark intimations of future financial woes for hydro generation seem baseless. Stop worrying so much. I cannot think of a single operable hydro project in the world which is unable to sell it's output. Certainly with the rate of demand increase likely to be the norm in China for the forseeable future, this seems an extremely questionable basis for your (extremely questionable) thesis.
mauk mcamuk *5.26.06*	An excellent article. Many people point at "renewables" as better alternatives than coal, natural gas, and nuclear. While hydropower is almost certainly better than coal and natural gas, there are definate costs involved with rampant hydro development. China used to have the worlds largest undeveloped hydro potential. As this article makes clear, that won't be the case for too much longer. Even worse, once the resource for hydro is exploited, that's it, there isn't any more unless extremely high costs become bearable in the future. Given the giant growth potential of China and India's economies, it is very obvious that every possible resource is going to get used. Hang onto your socks folks, it's geting interesting. :D

Ferdinand E. Banks *5.27.06*	The "rampant hydro development" that Mr Mcamuk is so worried about has bought China record economic growth. As I interpret the statistics, somewhere between 7.5 and 10 percent per year over the near past, and the same is expected over at least the near future. In addition, Chinese exports have grown from 400 billion dollars in 2003 to an expected 1300 billion next year. Fortunately their imports have not grown so rapidly, because if they had they wouldn't have been able to buy the financial assets that they apparently are purchasing, and somebody's interest rates might be much higher. Moreover, something is seriously wrong with the logic in Mr Mcamuk's comment. What he doesn't seem to understand is that "Hydro development" isn't like a chocolate cake that, when consumed, is gone forever. When "the resource for hydro is exploited", it provides power for 'X' years. Suppose, for example, that Sweden and Norway hadn't exploited their hydro resources. As for the future, "once the resource for hydro is exploited" that's NOT it, because then - for good or otherwise - they will probably set a new record for (nuclear) reactor construction. In fact they might not even wait for the exhaustion of hydro resources before starting this program. Why should they? Arn't nuclear plants a better investment than low yield bonds denominated in a depreciating currency.
rick clement *5.30.06*	I live in Manitoba Canada. We have manitoba hydro a crown corporation controlled by our (currently socialist) provincial government. The government mandates that we pay 30% less for power than Hydro can charge on exports at market rates. These dams are profitable and as Ferdiand pointed out they produce power for x years. We do not have to worry about LNG and middle east shortages here in manitoba. Your obviously anti-communist rhetoric is the kind of de-regulated thinking about the power industry that got america into her current crises. What could possibly be a better bet for power in the next century than daming rivers? Once the natural gas fad wears off and it's realized that wind and tidal power suck then you can go back to steam power, coal and uranium, now that's progress! Meanwhile us socialists will be watching the power roll in, from the skies, and charging out the ass for exports. kudos
Ferdinand E. Banks *5.31.06*	Great comment, Rick! Beautiful - and I mean it. Just the kind of anti-globalism talk that makes my day. Here in Sweden they work the other side of the street: we pay high (and increasing) rates for electricity, and the generators take the profits and invest outside the country. If I don't forget it - which unfortunately is

possible - I will definitely cite in my new energy economics textbook your mention of the arrangement where your governments charges Manitoba residents 30% less for power than foreign buyers are charged. I hope that the voters in your state are smart enough to keep that system.

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