



RAP

Energy solutions
for a changing world

Power Sector Policy in China: Next Steps



December 2012

Power Sector Policy in China: Next Steps

December 2012

Executive Summary

Over the past fifteen years, China has implemented a series of power sector reforms that have greatly expanded the availability of power and improved the efficiency, reliability, and environmental performance of the power sector. But serious old challenges remain and new challenges have arisen. They include rising electricity costs, questions about reliability and security, high rates of demand growth, and continued environmental damage and threats to human health. More important, China's government has adopted high priority and aggressive energy efficiency and emission reduction goals. To meet these goals will require that they become an explicit part of China's power sector reform plans. Significant and innovative power sector reforms will be needed to address these challenges.

RAP has been an international advisor to leaders in China's power sector since the 1990s. Our role has been to provide advice based on international experience. Governments around the world are trying different approaches to address reliability concerns, improve end-use energy efficiency, expand the use of renewables, and integrate renewables in grid operations. While China's power sector differs from most around the world, international experience can help China choose good options and avoid problems.

Drawing on international experience and best practice, this paper offers recommendations for near-term power sector reforms. Our suggested reforms cover six key areas: (1) planning and competition, (2) generation, (3) coal quality, (4), retail prices (5) grid companies, (6) institutions and governance. We begin with suggested policy reforms that address the largest challenges facing China's power sector. We then discuss institutional and organizational reforms aimed at supporting the suggested policy reforms.

1. Planning and Competition

Key challenges:

- *China continues to experience cycles of power shortage and surplus that can be addressed through better planning and direct linkage to investment.*
- *China's government has successfully increased investment in wind generation and other renewables, but challenges remain with integrating these renewables onto the grid.*
- *China's current government planning and pricing practice means generating companies are underinvesting in gas-fired generation and in generation with operational attributes needed to integrate renewables and meet reliability needs in a least-cost manner.*
- *China's power sector planning process is not comprehensive and is not effectively identifying the optimal mix of power sector resources. In particular, power sector planners in China still do not treat investment in energy savings as a "resource" for meeting demand.*
- *China lacks a clear and transparent link between power system planning and investment.*
- *China lacks an efficient or competitive mechanism for procuring power sector resources.*

We recommend both improved planning and greater use of competition. There is no contradiction between the concepts of “planning” and “competition.” Indeed, recent decisions by the US Federal Energy Regulatory Commission relating to oversight of regional power markets requires a public planning process that fully reflects public policies. Power sector development has two repeating steps: 1) government, power sector firms, and others develop sophisticated least-cost power sector plans to meet reliability and environmental goals; and 2) governments and regulators design some kind of competitive mechanism to procure the resources identified in the plans. The competitive mechanism can take a number of forms – some use competitive wholesale markets, others use competitive bidding for long-term contracts.

Better planning can address a number of pressing problems in China’s electricity sector. For instance, by better understanding peak demand drivers and the demand- and supply-side resources available to meet peak demand, electricity planning agencies can minimize or eliminate the cycles of regional power shortage and surplus that have plagued China for the past three decades. Better planning will also:

- help to avoid conflicts between thermal generation and renewables,
- coordinate transmission expansion and renewable development,
- integrate energy efficiency into the generation and transmission and distribution (T&D) investment planning process, and
- reveal how gas-fired generation, distributed generation, and combined heat and power (CHP) can lower total costs and reduce emissions.

China has had some success in coordinating energy and environmental policies, but still more can be done. Improved planning will show how clean energy strategies can help to meet both energy and environmental goals. China is developing aggressive caps on coal consumption, emissions trading schemes, and regional air quality management plans all aimed at using energy policies to improve environmental conditions. Joint energy and environmental planning will lead to better and lower cost results, and will avoid many of the unintended consequences that come from uncoordinated policies.

Finally, the linkage between power sector planning and investment should be strong and transparent. This will give generating companies and others clear information that will allow them to plan their own investment. A proven competitive mechanism can provide the link between power sector planning and investment.

Competition can increase transparency, reduce costs, and promote innovation in power generation in China. Fully competitive generation markets require significant regulatory oversight and are not a practical option for China in the near term. But there are well established, proven ways that China’s government can increase competition in the power sector without creating wholesale electricity markets. One such mechanism is competitive procurement for new conventional fossil generation. With this mechanism, the amount and type of new conventional fossil generation identified in the planning process is put out to bid. Generating companies compete for the right to build and to sell capacity and energy to grid companies under long-term contracts.

Competitive generation procurement would not require significant changes to the status quo and it can be an important, relatively low risk starting point for introducing market mechanisms into the power sector. This approach to competitive generation will encourage new entrants to the generation market, reveal the cost of generation in a transparent manner, and provide a practical way to link planning to investment.

The transparency in generation costs created by competitive generation procurement will also help to better assess the avoided costs of generation and evaluate investments in energy efficiency, distributed generation, and transmission.

Recommended reforms:

- *Use improved planning methods to identify the optimal mix of various resource options – demand-side (i.e., end-use energy efficiency and customer-sited clean distributed generation) as well as supply-side.*
- *Use planning methods that coordinate clean energy and environmental goals.*
- *Connect planning to licensing and investment with a competitive procurement process for new conventional fossil generation, based on long-term contracts.*

2. Generation Reforms

Key challenges:

- *China's power plant dispatch and renewable generation procurement policies are not economically or environmentally optimal.*
- *China's generation pricing practices lead to inefficient use of existing generation and impedes investment in gas-fired and other generation that would lower costs and increase efficiency.*
- *Pricing and interconnection regulations and practices lead to under-investment in cost-effective and clean distributed generation.*

The current structure of generation pricing results in distorted and inefficient investment in new generation, especially investment in much-needed and cost-effective gas-fired facilities. This is because current pricing does not adequately compensate generation that is used for only a small number of hours in a year (system peaks). In addition, China has never had active policies to encourage cost-effective and clean distributed generation.

Current generation pricing and dispatch policies and the absence of policies supporting clean distributed generation are increasingly a hindrance to the development of a more cost-effective, reliable, and environmentally sustainable power sector. Reforms in these areas will bring China more in line with international best practice.

While new dispatch, generation pricing, and distributed generation policies are being considered, there are near-term steps to take. These include adopting special separate capacity and energy prices for gas-fired generation, ancillary service prices to promote flexible generation and demand, and incentives for interprovincial trades.

Recommended reforms:

- *Transition to a more economically efficient system of dispatch and renewable procurement, where thermal units are dispatched in order of marginal cost (including environmental costs) and grid companies have adequate incentives to minimize renewable curtailment.*
- *Explore the opportunities and challenges of sub-hourly scheduling for generators to improve dispatch and help integrate variable renewables.*
- *Begin pilots for two-part pricing with a capacity price (yuan/kW) based on availability and an energy price (yuan/kWh) based on generation.*
- *Adopt near term pricing reforms for gas-fired and flexible generation and demand.*
- *Extend pricing incentives, and remove barriers, to clean distributed generation; provide grid companies with incentives for interconnecting distributed generators based on avoided economic and environmental costs.*

3. Coal Quality Reforms

Key challenges:

- *The use of low-quality, unwashed coal contributes to low generation efficiency, increased generator maintenance, increased power plant emissions, and increased strain on China's transportation systems.*

On average, the raw coal delivered to power plants in China is over 20% waste and contains a significant amount of sulfur and other pollutants, such as mercury. Coal washing and preparation can greatly reduce the amount of waste and improve the quality of coal. Improving the quality of coal used for power generation can be achieved through a combination of reforms in the coal industry. In the near term, China's government could require more coal washing and test the efficacy of linking generation pricing to the quality of coal burned. For instance, this link might be through the coal price adjustment mechanism, so that coal generators are not able to pass through higher coal prices that result from using lower quality coal on to customers.

Recommended reform:

- *Require increased coal washing for coal used in power generation and test the efficacy of alternative pricing approaches in driving suppliers to deliver higher quality coal.*

4. Retail Price Reforms

Key challenges:

- *Under current policies, the generators and grid companies have limited ability to pass cost increases, such as rising coal costs or the higher cost of renewable energy, through to customers; this forces generators and grid companies to absorb costs and weakens their incentive to comply with policy goals.*

Some types of retail pricing reforms are aimed at improving transparency and giving customers improved (i.e., more economically efficient) price signals. Other types of retail price reforms provide incentives for generation and grid companies to act in particular ways. For instance, grid companies are unlikely to actively interconnect renewables or distributed generation if they cannot recover their incremental costs by passing these on to customers. While pricing reforms of both types are needed, our recommended reforms here are limited to those needed to support our other policy suggestions.

Recommended reforms:

- *Create workable adjustment mechanisms for generation and transmission costs that allow reasonable cost changes relating to specified policy reforms to be passed on to customers.*
- *Protect small customers and the most efficient large customers by recovering cost increases through existing mechanisms, such as the last block of the inclining block rate structure for residential customers and differential prices for inefficient large consumers.*

5. Grid Company Reforms

Key challenges:

- *Under current pricing, accounting, and regulatory practices, grid companies have little or no incentive to support national goals, including those for end-use energy efficiency, emissions reductions, and renewable energy. As a result, grid companies are not enthusiastic and innovative supporters of efforts to meet these goals.*
- *Interprovincial trading and better integration of variable renewable generation into grid operations are impeded by grid company organizational structure.*
- *Grid company costs and plans are not transparent, which leads to a lack of public trust and difficulties in advancing goals for the sector.*

International experience has shown that grid companies must play an important role in meeting national power sector goals. However, to encourage grid companies to play this role, grid companies need the right mix of rewards and sanctions. How the government decides grid companies are structured and how grid companies and their leaders are rewarded or sanctioned are primary determinants of their behavior, and thus determines whether they are “part of the problem or part of the solution.”

Many people in China call for breaking up the grid companies. The reasons vary but consistent themes include frustration with grid company pursuit of their own interests (as opposed to enthusiastically advancing implementation of government policy) and their use of monopoly power to suppress competition and markets.

Many of our proposed policy reforms, such as the use of transparent competitive bidding on contracts for new generation, policies to support increased investment in distributed generation and CHP, and more efficient dispatch, will require committed grid company implementation. Consequently, our suggested grid company reforms are aimed at making grid companies effective partners in meeting China’s energy efficiency and emission reduction goals. Our recommendations are the same regardless whether the grid companies remain intact or are broken up.

Recommended reforms:

- *Redefine the role of grid companies to (1) include investment in end-use energy efficiency and (2) address questions of long-term, least-cost system planning, including transmission planning, demand-side management, generation procurement, dispatch, regional transmission, and renewable integration (e.g., wind and solar forecasting, grid codes, etc.).*
- *Reform pricing, accounting, and regulatory practices for grid companies so actions that are consistent with least-cost system planning and national energy efficiency, emissions reduction, and clean energy goals and are profitable parts of their business.*
- *Redefine standards for how the State-Owned Assets Supervision and Administration Commission assesses overall grid company performance to include assessment of grid company efforts to increase end-use energy efficiency, reduce emissions, and integrate new renewables.*

6. Institutions and Governance Reforms

Key challenges:

- *Power sector regulation is now divided among many different agencies.*
- *Achieving power sector goals will require significant inter-agency coordination.*

Increased coordination between agencies is always desirable. In our experience, coordination is not always as effective as institutional organization.

Oversight and regulation of China's power sector is currently divided among NDRC, SERC, and SASAC. This division weakens regulatory authority and creates policy coordination challenges. For instance, SERC is charged with overseeing grid company costs but has no authority to approve transmission and distribution rates. Many of the reforms described above require a strong, sound, and coherent regulatory presence across the entire power sector. A second example is power sector planning where supply planning and planning of demand-side (end-use energy efficiency) are done separately. International experience clearly demonstrates that planning for these resources needs to be integrated.

Integration of energy and environmental planning and policy also needs more than informal coordination. Environmental planning and policy are related to, and have direct impacts on, energy policy and electricity policy. The reverse is also true. Concepts such as emissions co-control, climate friendly regional air quality management, coal caps, carbon cap-and-trade, and multi-pollutant regulation are all environmental control strategies that relate directly to power sector plans, operation, and costs. Meeting long-term energy, energy efficiency, and environmental goals means that power sector and environmental planning should be consolidated or, at least, performed jointly. The improved planning tools recommended earlier have this capability.

Recommended reforms:

- *Consolidate power sector oversight and regulation, including electricity pricing, preferably under a single agency.*
- *Consolidate demand, supply, and power sector related environmental planning.*
- *In the near term, energy and environmental planners should conduct joint planning aimed at minimizing total economic and environmental cost.*

Conclusion

Power sector reform in China has been underway for many years. Many of the challenges are significant but easily addressed by the well-proven policy reforms we suggest. Others such as addressing China's dangerously degraded environment, reducing China's contribution to greenhouse gas emissions, and making China a global leader in clean energy need bolder, committed, and sustained reforms. The reforms proposed in this paper are a practical set of next steps, which will provide a solid foundation for progress.

See www.raponline.org for the forthcoming report.



HOME OFFICE

50 State Street, Suite 3
Montpelier, Vermont 05602
802-223-8199

www.raonline.org