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**Reforming China's Power Sector:
In the Middle of the River**

by

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REFORMING CHINA'S POWER SECTOR: IN THE MIDDLE OF THE RIVER

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Abstract

China's power sector has experienced unprecedented growth during the past three decades. This paper examines three major phases of reform from 1985 to 2008 that contributed to this growth. Before 1980, electricity was largely considered a social service. Investments were fully funded through budget allocations and the sector was administratively controlled by the government. Economic reforms in 1978, however, fueled GDP growth which, in turn, induced a surge in electricity demand that the power sector struggled to meet. The first wave of electricity reforms in the mid-1980s were designed gradually to mobilize investment funds to alleviate power shortages. These reforms included a shift from funding the development of the sector through budget allocations to equity and debt obligations incurred directly by power companies and experimentation with foreign investment through joint ventures.

A new phase of reforms commenced in 1996 with the adoption of the Electricity Law. The law, which was designed to reconfigure the power sector with a socialist market economy and to protect consumers, defined the rights and responsibilities of power enterprises and established provincial power companies as "single buyers". Though these reforms increased the commercial orientation and corporatization of provincial and regional enterprises, many companies engaged in discriminatory dispatch to favor their own often less-efficient generating units. Such abuses triggered a third wave of reforms in 2002 designed to break the monopolistic structure of the industry and gradually expand competition. To this end, a State Electricity Regulatory Commission (SERC) was established to ensure fair competition in competitive segments of the industry and protect consumers' interests in noncompetitive segments.

Though these three phases of reforms have resulted in momentous progress towards a competitive market structure, a comprehensive rationalization of Chinese policy on energy pricing is still needed to ensure progress continues. Currently, prices continue to be administratively managed, which hinders progress towards a competitive market. Deregulation of coal prices and the increase of world energy prices are driving up generation costs but final consumers are shielded from pass-through. Unless a new framework that allows market pricing to incorporate the costs of externalities is implemented, inefficiencies could lead to serious financial problems for some market participants and serious disruption of the sector.

Keywords: China; power sector; reform.

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Units of Measure

GW	gigawatt
km	kilometer
kW	kilowatt
kWh	kilowatt-hour
kV	kilovolt
TWh	terawatt-hour

Acronyms and Abbreviations

GDP	Gross domestic product
MOEP	Ministry of Electric Power
NDRC	National Development and Reform Commission
PPP GDP	Purchasing power parity gross domestic product
SERC	State Electricity Regulatory Agency
SETC	State Economy and Trade Commission
TVE	Township and village enterprise
VAT	Value added tax

Reforming China's Power Sector: In the Middle of the River

Noureddine Berrah

In the space of three decades, China went from being an underdeveloped country to being a major international economic power. The annual growth rate of the economy exceeded 9 percent for the best part of 30 years, a phenomenal performance. This would have been impossible without the astonishing concurrent growth and transformation of the electricity sector. (See box 1 for a synopsis of how the electric industry functions.)

Momentous Growth

China's power sector experienced tremendous and unprecedented growth during the last three decades (see Table 1). Installed capacity grew at more than 9 percent on average, booming from 5.6 percent during 1980–85, to 9.5 percent during 1990–95 and 12.0 percent during 2000–08. The yearly capacity additions, which amounted to about 4 GW in the late 1970s and early 1980s, reached the unprecedented levels of 90–100 GW during 2004–08. By comparison, the largest yearly increase reached in the United States during the early 1970s was about 45 GW. The access to electricity is almost universal, and average annual electricity consumption per capita increased from about 250 kWh in to about 2,600 kWh. The length of the 220 kV and 330 kV lines extended by more than tenfold, and higher-voltage levels have been introduced to facilitate the transfer of electricity from the west, which is well endowed with energy resources, to the fast-growing load centers of the east.

Table 1: China's Power Sector at a Glance

	1978	2008	Growth (%)
1. Installed capacity (GW)	57.1	792.5	9.2
2. Electricity generation (TWh)	256.6	3433.4	9.0
3. Length of transmission system (km)			
• 220 kV	22,672.0	236,712.0	8.1
• 330 kV	535.0	17,906.0	12.4
• 500 kV	0.0	109,642.0	n.a.
• 750 kV	0.0	536.0	n.a.

n.a. denotes "not applicable."

Box 1: Functions of the Electricity Industry

There are four traditional physical functions in the electricity industry: generation (production), transmission, system operations, and distribution. Traditionally—throughout the world until the 1980s—generation, transmission, and distribution were vertically integrated, and the entire industry operated as an area-wide monopoly under prices determined by governments or regulators. The reforms of the 1980s and onward have separated these functions in different ways.

Generation (production) generally accounts for about 35–50 percent of the final cost of delivered electricity. Electric power plants can run on many fuels — oil, gas, coal, falling water, wind, and tides — but they turn them all into exactly the same product. It is totally standardized; it must be or electric appliances would not run properly. Generation always used to be integrated with the rest of the industry, but virtually all reforms everywhere have aimed to get more players into this end of the business — more capital, more technical progress, and less political interference. In a way, China became a world leader in pursuing this objective with its reforms of 1985.

Transmission (transportation) generally accounts for about 15 percent or so of the final cost. The standardized electricity is transported over a network of copper or aluminum wires called the transmission system, on poles or towers, or sometimes underground or underwater. The electricity is then delivered to local distribution systems, and from there to customers. The transmission system is quite fragile—if it overloads, it becomes unstable and can cause widespread blackouts, such as the famous 1965 blackout of the northeastern United States. It requires the constant attention of a *system operator* to integrate the operation of the generating plants with the transmission system on a second-by-second basis. Transmission also must be expanded one for one with expansion of generation—it can't take traffic jams and bottlenecks.

System operation is the function that coordinates the generating plants with the demand. The instant the electricity is produced, it leaves the generating plant, travels at the speed of light and is consumed within a millisecond. The moment a customer throws a switch, something happens in a generating plant somewhere. The generating plants must be controlled to meet the demand at all times, while keeping the transmission system physics within strictly defined limits. This is the job of the system operator and his staff, which is peculiar to electricity. It cannot be competitive; it is the irreducible monopoly element of the system.

The distribution function generally accounts for about 30–50 percent of the final cost of electricity. Its basic job is transporting electricity from the transmission system to customers. It is usually associated with metering, billing and retail sales. Transmission and distribution are both transport functions; transmission is like major highways while distribution is like local roads.

There are also two *merchant functions*—retailing and wholesaling. Retailing is fairly obvious—sales to final consumers. Wholesaling is the sale of the power by the power plant. This is not necessary in a vertically integrated industry. As reforms, restructuring, and competition have spread throughout the world, wholesale selling has become the norm. *The big question has been, to whom do generators sell their power, at what price, and how do these sales get coordinated by the system operator for delivery to final customers? This paper explores how China has met this challenge.*

Source: Sally Hunt, Power Sector Restructuring Expert. For more about the subject see [1], chapter 2.

The Chinese electricity sector is characterized by the predominance of coal at almost 80 percent of installed capacity and generated electricity, followed by hydropower, which fluctuates around 20 percent. The power sector consumed about 1.3 billion tons of coal in 2007 and was responsible for about 50 percent of sulfur dioxide emissions, despite major efficiency gains during the period. Nuclear, gas, and lately wind contribute marginally to this mix. The three accounted for about 2 percent of the total installed capacity in 2007.

This reliance on large coal-fired units was economically justified. Multiple studies carried out for several provinces by multi- and bi-lateral agencies during the late 1980s and early 1990s showed that state-of-the-art 300 MW, 600 MW and, recently, 900 MW supercritical coal-fired generation units were part of the least-cost generation mix, even taking into account externality costs stemming from local and global environmental impacts.¹ However, the important surge in coal-based electricity generation during the last five years and the ensuing considerable environmental damage indicate that a sustainable development of the sector requires resolving the inherent tensions between securing the electricity needs of the country and protecting the environment. This tension is illustrated in the title of a recently released MIT report: “Greener Plants, Grayer Skies?” [2]

Unmatched Structural Change

This unprecedented growth would not have taken place without the major reforms initiated by the government in the mid-1980s. Up to the late 1970s, electricity was considered a social service. Investments were fully funded through budget allocations, and the sector was administratively controlled by the government. The service was provided through central administrative units with bureaus at the regional, provincial, municipal, and county levels—the latter focusing mainly on the operation of power plants decided on and financed by the central-level administrative unit. Prices were fully controlled by the government and barely covered the operating costs of the system. Private ownership of power assets was illegal.

By 2008, more than 4,000 companies were operating in the generation segment of the industry: five generation groups with 45 GW or more totaling 50 percent of installed capacity, 30 generation companies with more than 2 GW owned by central and regional governments, private investors and thousands of small companies owned by counties and/or private investors.² Several large companies were partially listed on international stock markets, and more than 60 companies were listed on domestic stock markets.

Two regional monopolies — the State Grid Corporation of China and China Southern Power Grid Co. Ltd. — manage, respectively, the northern transmission grid covering 26 provinces (80 percent of the national transmission system) and the southern transmission grid covering 5

¹ Given the paucity of information available at that time on the cost of pollution to the Chinese economy, reliable studies carried out for other countries were used as a reference and their results transferred to China using both nominal GDP and PPP GDP.

² The five generation companies are China Power Investment, China Guodian, China Huaneng, China Huadian, and China Datang.

provinces (20 percent of the national transmission system) through their regional and/or provincial subsidiary companies.

The setup of power distribution is complicated. More than 1,000 urban areas and large centers are supplied by companies or supply bureaus affiliated with the provincial power companies. More than 2,200 prefecture and county-level power enterprises are in charge of distributing power to secondary urban and rural areas.

“Crossing the River by Feeling the Stones”: The Gradual and Orderly Transition to Competition

The start of the economic reforms in 1978 spurred the development of thousands of township and village enterprises (TVEs), and China’s GDP began to grow by at least 8–9 percent per year. This sustained growth induced a surge in electricity demand that the power sector — fossilized by more than four decades of “command and control” and administrative management, and faced with major investment constraints — failed to meet.

To address these constraints, the government initiated several incremental changes in the late 1970s and early 1980s, which paved the way for reform of the sector. Table 2 lists the major State Council and State Planning Commission decrees and regulations aimed at modernizing and commercializing the sector and improving the coordination between the different ministries to “reduce bureaucracy” and improve efficiency.^{3,4}

Table 2: Preparatory Regulations for Power Sector reforms

<i>Date</i>	<i>Decrees (State Council) or Regulations (State Planning Commission and Ministries)</i>
2/1979	This State Council Decree separated the Ministry of Water Resources and Electric Power into two ministries: The Ministry of Electric Power and the Ministry of Water Resources.
5/1979	State Council Decree on the “Principle of Power Sector Development: Adaptation, Reform, Consolidation and Improvement.” The decree identifies the power sector development as a “prerequisite” for economic development and affirmed its vertical and centralized management.
3/1982	Merger of the Ministry of Electric Power and Ministry of Water Resource into Ministry of Water Resources and Electric Power. The stated purpose of this institutional change was to “improve management efficiency and overcome bureaucracy.”
9/1983	End of the “one investor” model. This State Council Decree launched the “joint investment” approach in the sector. The central government reduced budget investment allocations. It encouraged regions, provinces, and industrial consumers to invest in the power sector to speed up its development.

³ The State Planning Commission was renamed the National Development and Reform Commission (NDRC) at a later stage.

⁴ The feuds between the Ministry of Power and the Ministry of Water Resources at that time hampered a coordinated development of the sector.

12/1984	The Ministry of Water Resources and Electric Power issued the regulation on “Simplification and Decentralization of Administration Procedures in the Power Sector” to encourage investment from multiple sources.
12/1984	The State Planning Commission issued “temporary provisions to change budget allocations to loans for all infrastructure projects.”

These actions clearly indicate the tentative and ad hoc approach that the government employed to substitute loans and equity investments for budget allocations, to increase supply and meet the soaring demand, and to reduce government interference in the sector. They brought about some changes, but did not trigger the investment growth the government expected, in particular because tariff issues were neglected. By the mid-1980s, power shortages peaked and led to power rationing that severely constrained economic growth. The government responded by embarking on a pragmatic reform program that evolved as the priorities of the sector changed.

The First Wave (1985–95): Mobilizing Investment Needed for Rapid Growth

The reforms of the first wave consisted of a series of incremental (gradual) adjustments focusing mainly on the need to mobilize investment funds to alleviate power shortages and enable the power sector to meet fast-growing demand. The major initiatives taken during this period are outlined in table 3. They included the following:

- Progressive transformation of the power bureaus at the provincial and regional levels to power corporations or companies by (a) separating government and enterprise functions (respectively, bureau and company) within “one entity with two nameplates”; (b) making the power companies responsible for their profits and losses after the enactment of the Law on Industrial Enterprises Owned by the Whole People; and (c) corporatizing them after the enactment of the Company Law in 1993.
- A deliberate shift from funding the development of the sector through budget allocations to equity and debt obligations incurred directly by power companies.
- Issuance of the “new plant/new price” policy, which allowed for electricity generated by “new plants” to be sold to provincial power companies at “debt repayment prices” that were to be passed on to final consumers and retailers through a complicated “in-plan,” “out of plan” and “above quota” system.⁵
- Experimentation with foreign investment through “pilot” joint ventures, including Build Own Transfer (BOT) and even public offering, before the Electricity Law legalized private ownership of power assets.

⁵ The Provincial Regulations on Encouraging Joint-Investment Power Development and Implementation of Multiple Power Prices were approved by the State Council in May 1985.

Table 3: Decrees and Regulations of the First Wave of Reforms

<i>Date</i>	<i>Decrees (State Council) or Regulations (State Planning Commission and Ministries)</i>
5/1985	The State Council issued “temporary provisions to attract multiple financial sources in power sector investment and applying multiple types of electricity tariff.” “The investors get paid” principle was applied and different types of tariff were adopted for different types of power projects.
9/1987	The State Council issued the power reform principle of “separation of administration from enterprises function, enhancement of provincial level enterprise bodies, unification of provincial power grids, unification of power dispatch, and multisource for power investment” and “adaptation to the specification situation of each region and power grid.”
12/1987	The State Council issued the temporary provisions to collect a fen/kWh power construction fee collected by provincial power companies mainly for grid development.
4/1988	The State Council Decree eliminating several ministries, including the Ministry of Water Resources and Electric Power, and establishing the Ministry of Energy. Establishment of China Electricity Council (in December 1988).
10/1988	The State Council issued the “Institutional Management Reform of Electric Power Sector” authorizing the Ministry of Energy to pilot the decided measures in East China in 1988.
/1988	<i>Enactment of the Law of the People’s Republic of China on Industrial Enterprises Owned by the Whole People introducing the concept of semi-independent management and allowing more operational autonomy.</i>
3/1993	The State Council Decree eliminating the Ministry of Energy and establishing the Ministry of Electric Power (MOEP) and the Ministry of Coal Industry.
4/1993	<i>Enactment of China’s first Company Law.</i>
1993.9	MOEP and other government agencies issued the “Reform of National Power Enterprises” allowing equity investment in generation enterprises.
12/1995	<i>Approval of the “Electric Power Law,” with effectiveness on April 1, 1996.</i>

These adjustments triggered a rush to joint investment projects at the provincial and lower administrative levels, which progressively eased power shortages. By the mid-1990s, supply matched and even exceeded demand in some regions of China. The sector has become much more decentralized and less vertically integrated. The power companies have become more commercially oriented and sensitive to market needs and price signals. They were subjected to stricter financial discipline because they had the obligation to service their debts and were made responsible for their profits and losses.

Among the adjustments of this first phase, the dual- (or even triple-) track pricing system was characteristic of the Chinese policy makers’ pragmatic approach to resolving thorny issues. In theory, this approach goes against a cardinal principle of power economics and marginal cost pricing that “a kWh is always new.” In practice, however, (a) it allowed the exposure of new consumers to the marginal cost of power, leading them to optimally allocate their resources; and (b) it gave time to existing state-owned enterprises to adapt to higher power prices. The

generation assets financed by budget allocations prior to the reform were used to subsidize consumers' demand up to their 1985 level, but they were exposed to marginal prices for any additional consumption; and (c) it limited household price increases to socially acceptable levels. With the rapid growth experienced by the sector, the "old electricity" became marginal relatively quickly, and old and new prices were unified in 2004. Currently prices, on average, compare well to and even exceed marginal and average incremental costs in most regions of China. *China's pragmatic approach addressed, without social disruption, one of the thorniest issues that derailed reforms in several developing countries.*

However, the contractual arrangements linked to the joint investment policy have been based on a single energy (kWh) price without a capacity (kW) charge, a common feature of international power purchase contracts. Generator revenues were guaranteed by a contractual number of hours of operation, generally between 4,500 and 5,500 hours annually. This approach, a unique feature of China's power sector even before the reform, hindered (and still hinders) economic dispatch and led (and still leads) to inefficient use of resources and excessive coal use. Inefficient power plants must be operated even when more efficient plants are available to earn their contractual revenues. Purchasing agencies had no incentive to buy more power after meeting their contractual obligations and, before the separation of generation from transmission and distribution, they preferred to run their own power plants.⁶

This phase culminated with the approval in late December 1995 of the first Electricity Law of the country by the National People's Congress, which opened the door to the second wave of reforms.

The Second Wave (1996–2002): The Limits of the Single Buyer Model

A new phase commenced with the promulgation of the Electricity Law in early 1996. The law was a major step toward reforming the legal framework and adapting it to the needs of a power sector that has been dramatically changed by the incremental adjustments of the first wave. The Ministry of Electric Power, which drafted the law, defined its purposes as "(a) introducing the social market economy into the power sector; (b) ending the 'command and control' regulation in the power sector; and (c) protecting consumers." The law covered in nine parts most aspects of developing, constructing, operating, and managing the power sector. The four items most relevant to the reform process were:

- The clarification of the role of the government, defining the responsibilities and the rights of power enterprises and providing for full separation of power enterprises from power bureaus.

⁶ China is currently experimenting the so called "Energy Saving Dispatch (ESD)" system in five provinces. This complicated system based on dispatching power plants based on their efficiency rather than the number of contractual hours and compensate the losers through a complex mechanisms. Some progress has been achieved but the system is still far from achieving economic dispatch.

- The specification of the general pricing principles paving the way for the unification of multi-track tariffs. Tariffs prepared by power companies and submitted for provincial and central government approvals would be based on costs-plus taxes and a “reasonable” profit.
- The permission for private participation in the development of the power sector.
- The establishment of the provincial power companies as “single buyers.”

The following major initiatives taken during this period are provided in table 4.

Table 4: Decrees and Regulations of the Second Wave of Reforms

<i>Date</i>	<i>Decrees (State Council) or Regulations (State Planning Commission and Ministries)</i>
4/1996	The State Council issued the “Electric Power Supply and Utilization Decree” followed by five MOEP implementation regulations.
12/1996	Establishment of the State Power Corporation of China (SPC) by the State Council.
3/1998	Elimination of the Ministry of Electric Power by the State Council and allocation of the functions as follows: <ul style="list-style-type: none"> • The government regulation functions were allocated to the State Economy and Trade Commission (SETC). • The sector coordination function was transferred to the China Electricity Council. • Operation and commercial functions were transferred to the SPC.
10/1998	The State Council issued the “Notification to retrofit rural power network, reform rural power institutional management, and realize a uniform tariff in rural and urban area.”
12/1998	The State Council issued “Opinions to deepen the institutional reform in power sector by SETC” focusing on (a) the separation of the power grid from generation, introduction of competition and establishment of a sound power market; (b) the continuation of “separation of government functions from enterprises, deepening the reform of provincial power companies and improving their management capabilities”; (c) strengthening the interconnection of the national power network to optimize the utilization of regional resources; and (d) speeding up reform of the rural power sector to reduce rural electricity prices and promote economic development in rural areas.
1/1999	The State Council issued several decrees to accelerate rural power sector reform
10/2000	The State Council issued the “Notification on Power Sector Reform Issues.” A Power Sector Coordination Group was established under the leadership of NDRC.

To reduce government interference in the management of the sector, the State Council abolished the Ministry of Electric Power (Document 1997, No. 48) and established the State Power Corporation of China to hold the state’s ownership rights in the provincial and regional companies. The policy functions of the ministry were transferred to a newly created energy bureau in the National Development and Reform Commission (NDRC, formerly the State Planning Commission).

In hindsight, this move contributed to increasing the commercial orientation and corporatization of the provincial and regional enterprises, but it had two unintended drawbacks. First, it was detrimental to policy making given the limited staff capacity of the Energy Bureau that had recently been upgraded to a National Energy Administration to address this weakness. Second, faced with regulated end user prices and a high “debt repayment” basis for generation prices, the provincial power companies engaged in discriminatory dispatch against nonutility generators in favor of their own, often less-efficient, generating units. These discriminatory practices increased during the East Asia financial crisis when the electricity demand lessened and led to the issuance of the first State Council directive (1998/No. 146) to separate generation from transmission and distribution.

In 1999, six provinces were selected to pilot competitive power markets. Among these, a World Bank project introduced a hybrid model in Zhejiang province that was dubbed “Mandatory Pool with Single Buyer.” In this model was referred to as the “Chinese Model” by Sally Hunt in *Making Competition Work in Electricity*[1], generators are dispatched based on a bidding system in a common market-clearing pool operated by the “single buyer.” The market clearing price is paid to all generators and their contractual revenues are guaranteed by contracts for differences with the “single buyer.” The model increased competitive pressure on generators without breaching the single buyer concept of the 1995 Law. A review of the market after one year of operation found that the experience was useful (a) to introduce competition in an environment constrained by law, (b) to develop and test market rules, and (c) to allow power sector operators to gain experience in operating in a competitive environment. However, the review concluded that such a model should be considered only part of a transition toward competitive markets. It also noted that administratively set prices, the lack of demand response, and the absence of an independent market regulator were major hindrances to competition in the power sector.

The directive 1998/No 146 was not implemented; as the California crisis developed it triggered a debate about the reliability and integrity of deregulated power systems. In 2001, monopsony power abuses and “provincialism”⁷ overflowed from expert circles to the public domain [3]. The “single buyer” model and “provincialism” were discredited, and the move toward competition gained momentum.

The Third Wave: Transition toward Regional Power Markets (2002+)

In April 2002, after approval by the highest authorities in China, the State Council released a comprehensive reform program (Document 2002/No. 5), which was a major step forward in the gradual process of reforming the power industry in China. The document

- Outlined a long-term vision of expanding competition starting with generation.

⁷ “Provincialism” refers to a common practice of provincial power companies in giving preference to generation units within their own administrative areas over power imports from more efficient and cleaner sources outside the province. To be fair, this practice is primarily a result of the fiscal disincentives of the VAT system in China.

- Called for initiating, in the areas where conditions permit, regional market trials.
- Established a State Electricity Regulatory Agency (SERC) to ensure fair competition in the competitive segments of the industry and protection of consumers from monopoly abuses in the noncompetitive segments.

It clearly stated that the objectives of the reform of the power sector in China are to continue the breakup of the monopolistic structure of the industry and gradually to expand competition to improve the allocation and productive efficiencies of the sector. It stressed that the reforms should ultimately provide the customers with the best service quality at the lower possible cost. Furthermore, it detailed these objectives in eight points: breaking up the monopolies, introducing competition, increasing efficiency, improving pricing mechanisms (including environmental externalities), optimizing resource allocation, developing the power sector and industry, forming a national grid over the long term, and establishing an electricity market. These objectives would strengthen the achievements of the first two waves: separation of government functions from enterprise functions, fair competition, an open and orderly market, and support to sustained development.

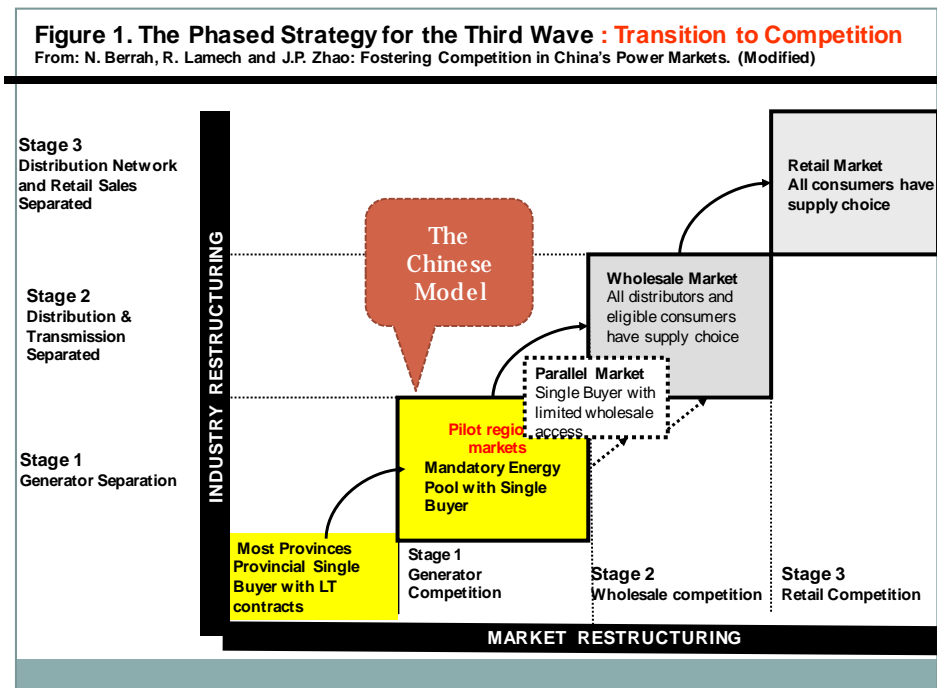


Figure 1 schematically displays the progress envisaged by the third wave of power sector reforms in China [4]. The approach included three stages:

- Establishment of pilot regional mandatory pools (Northeast and East China) with “single buyer” (the so-called Chinese model). Limited direct access of generators to large consumers was also to be considered during this first stage.

- Development of wholesale competition providing large consumers and distributors direct access to generators.
- Introduction of retail competition allowing all consumers to choose their electricity provider.

The major tasks included in the 10th Five-Year Plan (2001–05) were:

- Separating network from generation, and restructuring of both generation and network businesses.
- Establishing competitive, open regional markets in the Northeast and East China grid by dispatching of generators according to bidding procedures and the development of electricity market codes.
- Establishing new pricing mechanisms, including environmental protection mechanisms.
- Developing an efficient pricing mechanism for all parts of the electricity chain, including generation, transmission, distribution and retail tariffs.

Table 5 provides the major decrees and regulations issued from 2002 to date (2008).

Table 5: Decrees and Regulations of the Third Wave of Reforms

<i>Date</i>	<i>Decrees (State Council) or Regulations (State Planning Commission and Ministries)</i>
2002.2	<i>The State Council issued Decree No. 5, “Implementation of Power Sector Reform.”</i>
2002.12	The State Council Decree restructured the State Power Corporation to form 11 independent companies — 2 grid companies, 5 generation companies, and 4 auxiliary service companies.
2003.3	<i>The State Council established the State Electricity Regulation Commission (SERC).</i>
2003.6	The SERC issued decrees to pilot the regional competitive power markets in Northeast China and East China.
2003.7	The State Council issued the “Scheme of Electric Tariff Reform” to establish a normative and transparent tariff regulation system in which (a) tariffs were classified as on-grid, transmission, distribution, and end-user sales tariffs; (b) the on-grid tariffs were defined as the clearing prices of competitive markets; and (c) the transmission tariff and distribution tariffs were to be regulated by the government.
2004.7	The State Council issued the “Decision on Investment Institutional Reform”—a clearance procedure replaced the “approval” procedure for power projects.
2005.2	SERC issued the “Electric Power Regulation Decree.” <i>Approval of the “Renewable Energy Law.”</i>
2005.3	The NDRC issued implementation decrees of electricity tariff reform, including on-grid, transmission and distribution, and end-user tariffs.
2005.4	The NDRC issued an implementation decree to adjust the electricity tariff in response to a change in the price of coal.
2005.12	The SERC issued a “Power Business Certification Management Decree,” “Power Market Operation Rules,” and a “Power Market Regulation Decree.”

2006.4	The NDRC and other government agencies issued a “notification to speed up the restructuring and promote the healthy development in power sector.” It mentioned the structure change, optimal generation dispatch (energy savings, environmentally friendly, and economic dispatch), and close-down of small thermal power plants.
2006.11	The State Council issued “Implementation Decree of Power Sector Reform during the 11 th Five-Year Plan.”
2008.3	Establishment of the National Energy Administration.

To date, these tasks have been achieved only partially. The majority of state generation assets owned by the State Power Corporation (about half of the installed capacity in 2003) were separated from the network and shared among the five major generation groups, which were not allowed to own more than 20 percent of generation assets in provincial and regional markets to limit their market power.⁸ The remaining assets of the State Power Corporation, mainly transmission and distribution assets, and generation assets vital for the integrity of the system were shared among the State Grid Corporation of China, covering 26 provinces of the north of the country, and the South Grid Power Corporation, Ltd., covering 5 provinces of the south of the country. The Northeast and East China power markets were developed and are functioning even if with important constraints on competition because of the very limited access of large consumers to generators and the prevailing administrative pricing system.

Finally, the establishment of SERC in 2003 was a mold-breaking initiative in improving power sector governance in China. In its 2003 work program, the SERC set out the following general guidelines: “(a) *adhere to Deng Xiaoping Theory and the important ideas of Three Represents; fully implement the requirement of the 16th Party Congress and the Central Economic Working Conference; highly focus on the Central Government’s overall requirement on power industry development and power sector reform; complete institutional restructuring; look into and establish legal and institutional systems for power regulation; steadily advance power industry reform and power market development; (b) carry out regulatory activities proactively in order to realize a steady transition, lay a good basis and focus on the key assignments; attach importance to capacity building of SERC and create good images for the public society; try every effort to realize a good start in power regulation.*”[5]

Regulating the Chinese Power Sector: A Work in Progress

The State Council Document No. 5 and the Electricity Regulatory Provisions indicate that the SERC is “empowered by the State Council to perform administrative and regulatory duties with regard to the national electric power sector in accordance with laws and regulations”...and “set up the regional regulatory organization and its branches.”

The Electricity Regulatory Provisions define the SERC’s main responsibilities as follows: “(a) formulate regulatory rules for the sector and establish rules for electricity market operations; (b)

⁸ See footnote 6 for the five major generation groups.

propose development plans for electricity markets and market designs for regional power markets; (c) monitor electricity market operations, ensure orderly and fair competition in the market, regulate transmission, distribution and noncompetitive generation businesses; (d) *participate in stipulation and enforcement of safety and technical standards*, quantitative and qualitative codes for electricity industry; (e) issue and maintain business licenses; (f) enforce environmental laws, regulations and standards for the sector in coordination with relevant environmental protection agencies; (g) *propose tariffs and adjustments to government pricing authority* on the basis of market conditions, review tariff levels, and regulate fees and charges for ancillary services; (h) investigate possible violations of laws and regulations by market participants, and resolve disputes among them; (i) organize the implementation of universal service provisions policy; propose revisions to such policy, provide statistics and information of electricity market; and (k) assume any other duties delegated by the State Council.”

These provisions failed to assign to the SERC full responsibility over *economic regulation*. The SERC was giving full responsibility over new regulatory tasks, such as oversight and monitoring of electricity markets, issuance of business licenses, and investigation of possible violations of laws and regulations by market participants. However, formulations relating to responsibilities over regulatory tasks carried out by existing agencies are vague and subject to interpretation.

The major hurdle to efficient economic regulation is the SERC’s lack of authority on pricing. *This characteristic is unique to China*. In countries that adopted regulation, this function figures, *at least theoretically*, in the principal function of regulators. The issue is so divisive that it is stalling the revision of the 1995 Electricity Law to reflect the new direction of the power sector reforms initiated by the State Council Document No. 5 in 2002. Consensus has been achieved over all revisions, except the responsibility over price regulation. Two versions of the revised law were prepared — one leaving authority over pricing to NDRC and the second shifting it to the SERC. To date (end 2008), a final decision has not been made by concerned authorities.

The SERC’s effectiveness is also hampered by its inability to access the financial accounts of regulated companies. Its attempts to revise the regulations defining its responsibilities and gain access to financial data of regulated companies have remained unsuccessful. Finally, the SERC would be unable to provide efficient regulatory services in a timely and effective manner even if granted full responsibility over economic regulation. By international standards, it is understaffed, it lacks the required skills and behavioral code, and it is inadequately funded effectively to regulate a power sector of the size and complexity of China’s.

Although it is difficult for the SERC to fare well without authority on pricing and investment, the agency has worked hard since its creation to exercise its regulatory functions and establish its credibility as the “watchdog” of the power industry. It has established six regional offices with 20–30 people per office, and 10 city offices with an average staff size of about 10 per office. It has played a major role in developing the two pilot regional power markets in Northeast and East

China. And it has issued several decrees on power regulation and licensing, and rules for operating power markets.

More importantly, in 2008 it initiated the publication of supervision reports on power supply and the business situation. These reports cover the conditions of power supply; the implementation of pricing, environmental and renewable energy policies; and the quality of supply, including consumer safety. These general and specialized reviews by an independent body from the power industry are valuable because they increase the transparency of sector management, provide the basis for greater accountability of the operators with respect to potential breaches of the environmental and pricing rules, and provide feedback on the appropriateness and effectiveness of sector policies.

Conclusion

After more than two decades of momentous progress in reforming China's power sector, the reforms seem to have stalled. Divergent interpretations of the rules and regulations have emerged and "vested interests" are blocking further reform. Gradualism might have reached its limits in reforming the power sector.

"Crossing the river by feeling the stones" was wise...

The gradual approach followed by the Chinese government for more than two decades achieved considerable, and internationally recognized, progress in transforming and modernizing the country's power sector. This transformation is by far the most extensive change experienced by the power sector of any country since World War II. And progress has been achieved without major disruption, while sustaining unprecedented economic growth, despite the periodic recurrence of power shortages.

...but the middle of the river is no place to be when the flood comes.

All of which notwithstanding, China's position currently is quite similar to California's prior to its power crisis in 2000. According to the Chinese government's vision, competition is the main driver of future reforms, but prices are still administratively managed, which hinders progress toward competitive market. The deregulation of coal prices and the important increase of world energy prices are driving up generation costs, but – just as in California -- final consumers are shielded from pass-through. The ensuing lack of demand response dissipates efficiencies and wastes resources; it could lead to serious financial problems for some market participants and serious disruption of the sector.

In the absence of fundamental, comprehensive rationalization of Chinese policy on energy pricing (not necessarily implying higher average prices), satisfactory progress toward competitive markets is impossible.⁹ The task is not easy, but efficient pricing, at this juncture, is the most urgent task to sustain the development of the sector. Market pricing incorporating the

⁹ In fact, in many regions of China, consumers are faced with high prices because of the weakness of regulation.

costs of externalities (such as the impacts of pollution) and social measures to mitigate any negative impacts on the poor would ensure efficient use of capital, labor, and scarce resources, and help achieve the “well-off society.” Completing the legal framework, clarifying the responsibilities of the concerned government agencies, and empowering the SERC by providing it with the resources needed to discharge its mandate would help put reform back on track.

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