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Institutional Framework of the Chinese Power Sector

**Background and overview paper on the status quo
and reforms of the Chinese power sector**

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Abstract

The Chinese power sector is currently undergoing significant structural changes. This report describes the current developments of the institutional framework of the Chinese power sector and the emerging Chinese electricity market. It is intended as a background information paper for foreign consultants and others that grapple with the complicated and fast changing structure of the Chinese power sector.

The scope of this report is limited to grid-connected power. The paper starts with a brief introduction to the structure of the Chinese Government and then describes the main changes that have occurred in the Chinese power sector since 1978. Early power sector reforms consisted of decentralisation of decision making power to lower government levels, deregulation of investment and price control, and corporatization of the operational and business parts of the state electricity activities. The increasing inefficiencies of an ever more complicated and bureaucratic government, the non-transparency of policies, regulations and pricing, and the confused ownership and management structure of utility assets called for further reforms.

In 1997 an episode of further institutional and market reforms was initiated aiming to achieve a fully competitive wholesale power market by 2010. The reforms started with the further separation of government and business functions that were previously combined in the same government units. Most notably the State Power Corporation (SP) was established while the former Ministry Of Electric Power (MOEP) was dissolved. The government responsibilities of MOEP were turned over to the State Economic and Trade Commission (SETC).

Near-term power sector reforms will concentrate on consolidating network functions in State Power Corporation or its branches and subsidiary corporations, while separating generation from transmission and distribution activities. A competitive power generation market will be established based on the single buyer concept. The Provincial Electric Power Corporations will act as the single buyer. This single buyer system is to gradually transform to a fully competitive wholesale power market, with the appropriate regulatory and pricing mechanisms by 2010.

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1 INTRODUCTION

This report describes the current developments of the institutional framework of the Chinese power sector and the emerging Chinese electricity market. This report is intended as a background information paper for foreign consultants and others that grapple with the complicated and fast changing structure of the Chinese power sector. Step by step the reader is familiarised with the key institutions and policies that shape the architecture of China's vast electricity sector. The scope of this report is limited to grid-connected power. The paper starts with a brief introduction to the structure of the Chinese Government in Chapter 2. It is important to keep the relationships between the various government bodies in mind when considering sector specific policies and developments such as those in the power sector. The Chinese power sector is currently undergoing significant structural changes. Chapter 3 first explains the institutional framework of the Chinese power sector before the inception of its most recent round of reforms in 1997. The responsibilities and authorities of each of the relevant government units and other actors that were involved in the power sector are outlined in Sections 3.1 through 3.2. Sections 3.3 and 3.4 respectively describe the physical transmission and distribution grid infrastructure and the ownership and management structure before 1997. Chapter 4 considers the institutional and market reforms in the Chinese power sector from 1997 to date. The main drivers for change are identified in Section 4.1. Section 4.2 proceeds to describe in broad lines the nature and time schedule of current and future reforms in the sector. Chapter 5 then zooms in on the status quo of the administrative and market structure of the Chinese power sector. Chapters 6 and 7 consequently consider the near- and long-term power sector reforms that lie ahead. This report is primarily based on information derived from Chengzhang et. al. (1999), World Bank (1999), The Netherlands Embassy in Peking (1998), and Yi'an (1999). These sources are supplemented with proceedings from recent electricity policy workshops of Chinese electricity administrators to give an up-to-date view on the most current developments in the Chinese power sector.

2 CHINESE GOVERNMENT STRUCTURE

2.1 Legislative Structure

According to the Chinese Constitution, the National People's Congress (NPC) is the highest political power in China. The NPC elects the President and approves the appointment of the central government administration, the State Council, as well as its executives, the Premier and Members of the Cabinet. Furthermore, the NPC approves national legislation and policies, such as institutional reforms, that are developed by the State Council or the Commissions and Ministries operating under the State Council. The NPC is also authorised to issue legislation itself. Within the NPC several Committees review laws and regulations put forth by the State Council, and issue their own laws and regulations.

2.2 Administrative Structure

Territorial Levels

The Chinese Government is divided into six territorial levels of administration. These are in order of hierarchy and increasing in number: the centre, the provinces and regions (31), cities and municipalities (600), counties (2000), townships (100,000), and the villages (1,000,000).

Functional Systems

Alongside the territorial division of government authority the Government is divided in broad functional systems, such as environment and energy. Within a functional system Ministries sit atop the hierarchy of functional government offices that exist at each territorial level. For instance, before 1997 the Ministry Of Electric Power (MOEP) was in charge of the Chinese power sector. At the each territorial level (provincial, municipal, county, etc.) MOEP was represented by respectively the Provincial, Municipal and County Electric Power Bureau. The County Electric Power Bureau was under jurisdiction of the Municipal Electric Power Bureau, which was under jurisdiction of the Provincial Electric Power Bureau, which in turn was under jurisdiction of MOEP. In turn the Ministries are placed under a State Commission.

Hierarchy

Every government unit has a rank, both within the functional system and within a territorial level. At each territorial level there are several government units with different ranks. For example, at the provincial level a Provincial Government was ranked higher than a Provincial Electric Power Bureau. Government authority is thus structured according to territory, function, and rank.

The National People's Congress (NPC) and the State Council (SC) at the central government level are the highest ranked government organs. The SC is the executive branch of the government, formulating national development strategies, key regulations and policies. Directly below the SC are several State Commissions that are responsible for the country's long term socio-economic planning. Since 1998, there are two of these State Commissions, the State Development Planning Commission and the State Economic and Trade Commission. In the past there have been several more State Commissions. The State Commissions consist of various Departments with specific sectoral policy and regulatory authorities. Also directly below the State Council, but at a lower rank than the State Commissions, are the Ministries. Ministries are responsible for policy development and implementation within a functional system. The Ministries themselves are subdivided into several Agencies, Bureaus, Departments and Offices. At each territorial level there is an Agency, Bureau or Office that represents the respective Ministry at that level.

Governance

Several rules and ‘governance understandings’ define the relationships between the various government units. We present the most important ones. To start with, government institutions of the same rank cannot issue binding orders to each other. In this respect it is important to note that government institutions at different territorial levels and in different functional systems may have the same rank. For example, Ministries have the same rank as Provincial Governments. Therefore Ministries cannot issue orders to Provincial Governments. The same applies to functional offices at the provincial level and municipal governments, and so on. This results in a need for consensus building between equally ranked government institutions at various territorial levels and functional systems in order to operate effectively. Furthermore, it means that each specialised institution is subject to orders from at least two potential authorities:

1. The government at the institution’s own territorial level (horizontal line of authority, *kuai*).
2. The office in the same functional system one level up the territorial hierarchy (vertical line of authority, *tiao*).

This fragmented structure of authority implies that no single official body has command authority over each of the important parties involved in a policy process. Furthermore, conflicts may arise between the horizontal and vertical lines of authority. Since the 1970s it has become common practice to give the horizontal line precedence over the vertical line. Territorial governments have thus become more powerful, while central level functional government agencies have lost some power. In particular the Provincial Governments are gaining more power.

Each territorial level of government is permitted to issue binding orders to the territorial governments within its jurisdiction one level down the national hierarchy. Top down communications go through each territorial level in the national hierarchy of government institutions until they reach their target level. They do not normally skip a level. Figure 2.1 gives a conceptual representation of the Chinese Government structure.

There is an uncodified political-economic deal that each level of government will grant the level just below it sufficient flexibility to enable the lower level to grow its economy rapidly enough to maintain social and political stability. In practice this means that lower Governments can negotiate extra flexibility in the implementation of policies as long as they maintain a high rate of economic growth. Because at all territorial levels the Government is strongly involved in the economy (township government funding is even largely dependent on township enterprise profits), the above political-economic understanding provided a powerful entrepreneurial incentive to local Government Officials. Key Officials regard themselves as both Government Administrators and entrepreneurs.

The strong government involvement in the economy also causes that enterprises enjoy few secure property rights that protect them from government intervention. Moreover, at each territorial level officials retain enormous ability to interfere with the affairs of lower territorial Governments. However, the balance between top-down rigidity and local flexibility is in general not decisively defined.

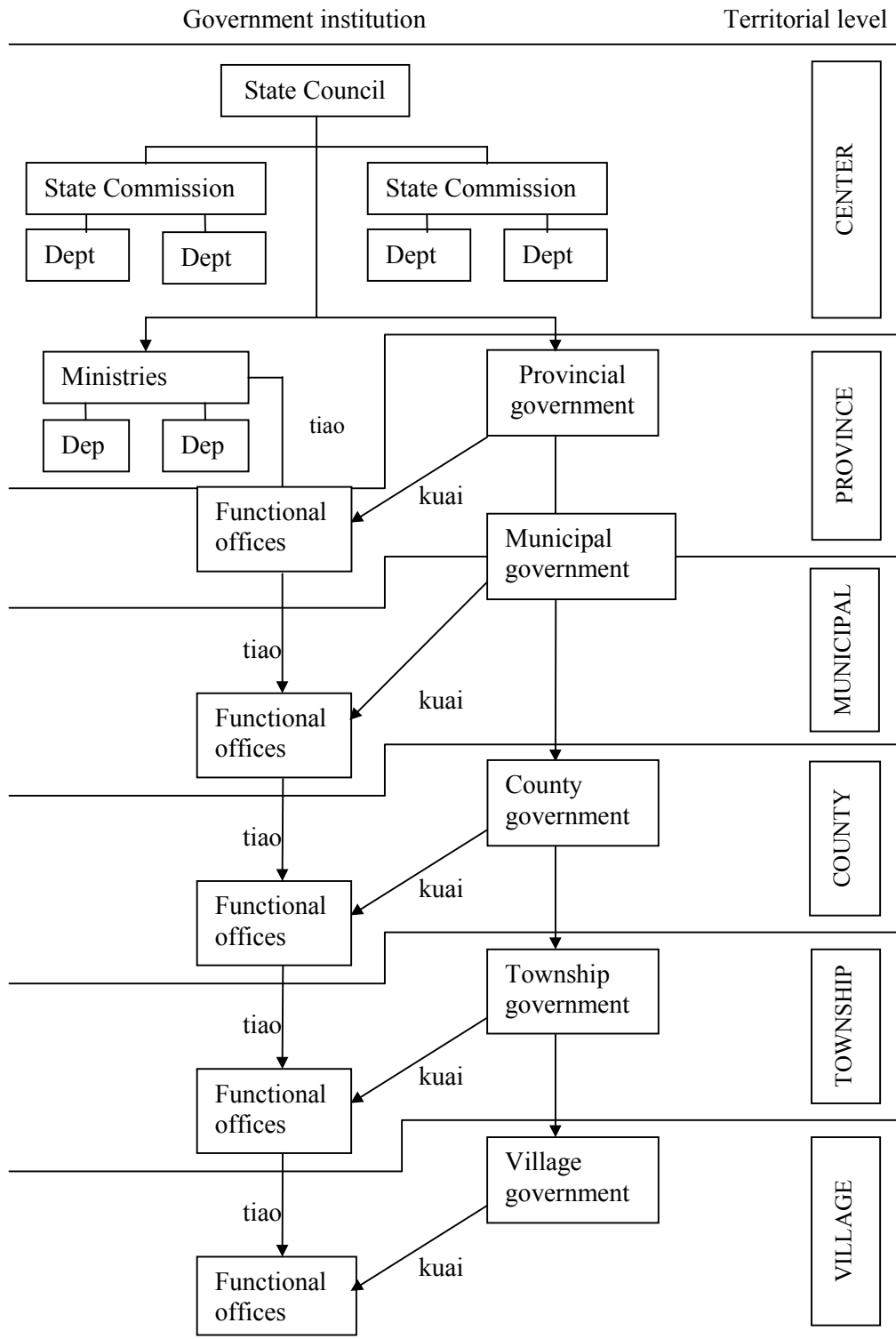


Figure 2.1 *Conceptual representation of the Chinese Government structure*

3 THE CHINESE POWER SECTOR BEFORE 1997

In 1997 the Government started a staged transition towards a fully competitive wholesale power market by the year 2010. To understand the changes that are effected during this transition, as well as the factors that drive this transition, this chapter describes the institutional framework of the Chinese power sector just before the inception of the reforms in 1997.

3.1 Early Reforms from 1978 to 1997

As a consequence of broader government and market reforms, as well as sector specific reforms, the institutional framework of the Chinese power sector is subject to continuous change since 1978. Since 1985 three types of power sector reforms, decentralisation, deregulation and corporatization, were effected more or less in parallel to each other. Before 1985 all power generation, transmission, and distribution was owned and controlled by the Chinese Government. Furthermore the Central Government controlled investment allocation, project approval, siting selection, grid distribution and tariff setting. All power plants were owned and managed either by the Ministry Of Electric Power and Water Resources Utilisation (MOEPWRU), at the central government level, and by the Electric Power and Water Resources Utilisation Bureaus at the provincial level, or by other local Agencies. Government functions in the power sector, such as regulation and taxing, and business management of generation, transmission and distribution were combined into the same administrative units. In 1988 MOEPWRU was split up in the Ministry Of Electric Power (MOEP) and the Ministry of Water Resources Utilisation (MOWRU). MOEP thereby became the responsible ministry for the power sector.

Decentralisation

The vast bureaucracy of this top-down central government control impeded the rapid expansion of the power sector needed to sustain China's high rate of economic growth. It was therefore decided to decentralise much of the decision-making authority concerning power development to lower Governments and Offices. As explained in Chapter 2 these lower Governments had strong incentives to rapidly expand their economy and the concomitant power infrastructure. Furthermore, decentralisation yielded more flexibility in policy implementation. Indeed, decentralisation yielded a quick expansion of the Chinese power sector.

Deregulation

Limited deregulation of several aspects of the power sector was to provide further economic incentives to stimulate fast expansion of the sector. Deregulation affected raw material and fuel supply, investment, and prices and tariffs for IPP power contracts. The most important consequence of this deregulation was that the power market was opened to foreign investors, and that these foreign investors could earn profitable returns on their investments due to the deregulated electricity prices. Electricity prices for an IPP were negotiated between utility and the IPP. The State Planning Commission and the Price Control Bureau at the Local Government acted as intermediaries. A 15% rate of return was typically used as a starting point for the price determination. This invited significant foreign direct investment in IPP development.

Corporatization

As of 1985, it was increasingly recognised that the combination of government and business management functions in the same government unit did not lead to efficient and effective implementation of electric power policies. Separation of government functions from business management was required. From 1988 onwards the Government started the institutional separation of government and business management functions by gradually establishing Regional and Provincial Electric Power Companies alongside the Regional and Provincial Electric Power

Boards. Although institutional separation was thereby achieved, *de facto* functional separation of resources, responsibilities and personnel dramatically lagged behind.

Through decentralisation and deregulation, resulting in diversification of investment and ownership in generation, the government has gradually relinquished its monopolistic control on the generation side of the sector. However, until 1997, government-run and owned power plants still dominated the generation market, and the Chinese Government continued to control the transmission, distribution and retailing of electricity through various government agencies and state-run corporations.

3.2 The Administrative Structure of the Power Sector in 1997

3.2.1 Central Government Level

State Planning Commission

At the top of China's institutional hierarchy, operating directly below the State Council, the State Planning Commission (SPC) was in charge of medium and long-term integrated economic planning, for example through the 5 and 10-year plans. Together with the Ministry Of Electric Power (MOEP) the SPC formulated electricity development strategies and conducted long-term planning for the power sector. The SPC was also responsible for the approval of large-scale power projects. Furthermore, the SPC planned the total amount of capital investment in the power sector, consisting of central government appropriations and loans. This capital allotment was consequently dispensed to MOEP through various financial institutions. MOEP in turn allocated these funds, augmented with bank loans, international funds, and internal investment to specific power and grid projects.

Within the SPC several departments were involved in power sector planning and regulation. The Department of Transportation and Energy was responsible for development planning and general policy formulation for the power sector. The Department of Transportation and Energy had various divisions, such as the Division of Electric Power and the Division of Renewable Energy and Energy Conservation. The latter was responsible for cogeneration and renewable energy development. Other Departments involved in power sector development were the Department of Investment, Department of Price Control, and the Department of Policy and Regulations.

State Science and Technology Commission

The State Science and Technology Commission (SSTC) served to provide expert assistance for technology development. Under the SSTC the Department of Industry and Energy was responsible for the allocation of funds for RD&D, commercialisation and promotion of nuclear, conventional fossil, and renewable energy technologies.

State Economic and Trade Commission

The State Economic and Trade Commission (SETC) was in charge of annual production control and near-term (2-3 years) capacity and production planning. Within the SETC the Department of Resource Conservation and Comprehensive Utilisation was responsible for energy technology upgrading, efficient utilisation of raw materials, utilisation of waste materials, capacity expansions, and renewable energy project development.

Ministry Of Electric Power

At a lower rank than the State Commissions several Ministries were involved power sector policy. The principle ministry involved was the Ministry Of Electric Power (MOEP). MOEP was responsible for:

- Formulating and implementing electric power development strategies.

- Developing policies and legislation in the power industry.
- Drawing long-term plans.
- Managing annual production.
- Electricity price regulation: through Regional or Provincial Electric Power Bureaus, in co-ordination with local Price Control Bureaus.
- Monopolistic management of electricity grid.
- MOEP, SPC and SETC co-ordinated the approval of large-scale power and grid projects.
- Allocation of funds to specific power projects: MOEP received funds from central government appropriations, the China Development Bank, and international and other sources. MOEP had final jurisdiction regarding the policies and approval for power projects that involved foreign investment.

Utilities were basically owned by MOEP (through the Regional and Provincial Electric Power Bureaus). In the co-ordination of tasks between the SPC and MOEP for determining the long-term plans and policies for the power sector, it was the task of the SPC to define the broad policy goals and directions. MOEP, having a more executive function, complemented the task of the SPC by bringing forth realistic targets, based on its institutional experience on how top-down policies trickle down to the lower government levels, and the interference of the horizontal and vertical lines of authority.

Ministry Of Water Resources Utilisation

The Ministry of Water Resources Utilisation (MOWRU) had been separated from the former Ministry Of Electric Power and Water Resources Utilisation (MOEPWRU) in 1988. MOWRU managed and operated small and medium hydropower stations and small grids in about 600 counties, as well as small renewables installations such as solar home systems (SHS). Furthermore, MOWRU managed and allocated national appropriations and internal funds for small hydropower project development.

State Environmental Protection Administration

The State Environmental Protection Administration (SEPA) was responsible for the protection of the environment by issuing regulations, policies, and mandatory standards, as well as penalties in case of violation of these. Formally SEPA or its lower level representatives had the power to block the approval of a power project if the project did not meet the environmental requirements. Despite of this formal power, SEPA or its territorial offices were subject to the same institutional practices as any other government office, leading to more negotiated outcomes than SEPA's mandate may suggest.

Nuclear Industry

In close co-ordination with MOEP the China National Nuclear Industry Corporation Group (CNNICG) conducted business in nuclear power project development, construction of nuclear islands, and nuclear waste disposal. CNNICG was funded through national investment funds and internal funds.

Independent Power Production

In 1987 the China Huaneng Group (CHNG) was established under direct supervision of MOEP and under guidance of the SPC. CHNG was a government subsidiary company that owned and managed power generation capacity, similar to Independent Power Producers (IPPs) elsewhere in the world.

Power Sector Consulting

The China Electric Power Enterprises Union (CEPEU) provided management guidelines and services to the power sector. CEPEU's staff consists of senior utility experts and retired senior power sector officials. Their reports and analyses are therefore very influential in policy and decision making by the various administrations. Several other institutes are also involved in power

sector consulting, e.g. the Energy Research Institute (ERI), and the Economic Research Center for Electric Power.

3.2.2 Local Government Levels

The institutional structures in charge of the power sector at the provincial and lower government levels strongly resemble that of the central government level. Representing MOEP in the regions, provinces, municipalities and counties along the vertical line of authority (*tiao*) are respectively the Regional, Provincial, Municipal and County Electric Power Bureaus. These territorial electric power bureaus developed and implemented their own policies at their own territorial level along the plans and policy lines set out by MOEP. Each of these electric power bureaus, however, is also subject to the horizontal line of command (*kuai*) from its local government. To illustrate the intermingling of the horizontal and vertical lines of command consider the following. Under the authority of the Provincial Planning Commission or the Provincial Economic and Trade Commission, Provincial Electric Power Bureaus could make decisions on investment in generation capacity. These investment decisions also had to be approved by the Regional Electric Power Bureau and had to be reported to MOEP. Similarly, Municipal and County Electric Power Bureaus operated under the authority of the Municipal Planning Commission or the Municipal Economic and Trade Commission, as well as the Provincial Electric Power Bureau.

Regional Electric Power Bureaus

The Regional Electric Power Bureaus (REPB) were in charge of intra-provincial networks, regional key power plants and electric power management in the region. They vertically controlled power generation, transmission and distribution.

Provincial Electric Power Bureaus

Provincial Electric Power Bureaus (PEPB) were in charge of provincial networks, power plants, electric power industrial management in the provinces, and decision-making regarding generation investments. As indicated above the business management functions of the REPBs and PEPBs were officially divested to Regional and Provincial Electric Power Corporations. In practice, however, the functional separation of government from business management functions lagged far behind this institutional separation that had already taken place.

Municipal Electric Power Bureaus

Municipal Electric Power Bureaus (MEPB) were in charge of electric power industrial management, supply and services. MEPBs did not control power generation and distribution in their territories, but were in charge of power distribution and supply within their territories. This involved reliable operation of low-voltage local distribution networks, maintenance of 10-35 KV lines and transformer stations, customer connections, and collection of electricity tariffs.

County Electric Power Bureaus

County Electric Power (Supply) Bureaus (CEPB) and lower level power supply bureaus mainly supplied electricity to consumers. Some CEPBs were in charge of small hydropower stations. However, many off-grid and remote installations were under the management of the county Bureaus of MOEPWRU.

3.3 Physical Grid Structure

The physical structure of the Chinese electricity grid can be distinguished in five regional electric grids, one interconnected grid, and eight independent provincial grids, three independent grids of autonomous regions and one city independent grid. The Chinese electricity grid is not entirely physically interconnected.

3.3.1 Regional Electric Grids

The five regional electric grids are (the provinces and regions they comprise are listed between brackets):

- Northern China (Beijing, Tianjin, Hebei, Shanxi, western Inner Mongolia).
- North-eastern China (Liaoning, Jilin, Heilongjiang, eastern Inner Mongolia).
- North-western China (Shaanxi, Gansu, Qinghai, Ningxia Autonomous Region).
- Central China (Henan, Hubei, Hunan, Jiangxi).
- Eastern China (Shanghai, Jiangsu, Zhejiang, Anhui).

3.3.2 The Southern Interconnected Grid

The interconnected grid is the Southern Interconnected Grid. The interconnection consists of the independent provincial grids of the Guangdong, Guangxi, Guizhou, and Yunnan provinces. Rather than a complete and physically independent grid, the South Electric Power Interconnected Company that manages the interconnection is a co-operative union for inter-province electricity transmission. It optimises the operation of thermal and hydropower plants and transmission from hydropower sources in the west to the eastern consumption centres.

3.3.3 Provincial Grids

Each province has its own independent grid. Operation and management of these grids is usually co-ordinated by a Regional Electric Power Bureau that managed the regional electric grid. However, eight independent provincial grids, and the grids of three autonomous regions plus one city do not fall under a regional electric grid. There is no completed distribution system across Tibet.

The independent provincial grids are:

- Shandong
- Sichuan
- Fujian
- Chongqing
- Hainan
- Guangdong
- Yunnan
- Guizhou.

The independent grids of the autonomous regions are:

- Guangxi
- Xizang (Tibet)
- Xinjiang.

The independent city grid is:

- Hong Kong.

Voltage Levels

The voltages of provincial transmission grids are 500 KV and 220 KV. However, in the north-western regional grid transmission voltages are 300 KV and 200 KV. The main voltage for inter-province transmission is 500 KV. Electricity from the Three Gorges hydropower project will be transmitted to central China with 500 KV alternate current lines, and to eastern China with 500 KV alternate and direct current lines. The southern interconnected grid transmits electricity through both direct and alternate 500 KV lines. Future large-scale hydropower projects along the Yellow River, the Yangzi River and rivers in the south-west may require higher voltages in the range of 750 KV-1000 KV to transmit large volumes of power over very long distances.

Consolidation of high-voltage transmission grids

The State Power Corporation (SP) that was established in 1997 seeks to strengthen the nation's transmission and distribution networks. By 2010 it aims to have established three national grids, the north, central and south grids. These three grids will support each other and facilitate cross-country power transmission through 220 KV and 500 KV interconnections.

3.4 Generation, Grid Management and Ownership Structure before 1997

Before 1985 government functions and business management in the power sector were combined in the electric power bureaus under MOEP at every territorial level. After 1985, market reforms required separation of government functions from business management. As a first step, Regional and Provincial Electric Power Corporations were separated from their respective Electric Power Bureaus. Later the lower administrative levels would follow. Although Electric Power Corporations and Bureaus were thereby institutionally separated, in practice they were often still the combined, sharing the same office and the same personnel. Because the business management was separated from the administrative structure that was already in place, the management structure of the Chinese power sector was (and to a large extent is) very similar to its administrative structure. At the regional and provincial level the grid management structure also closely matches the physical grid infrastructure. Table 1 summarises the physical, ownership, management and administrative structure of the Chinese power sector as explained below.

3.4.1 Regional Electric Power Groups

Five Regional Electric Power Groups were formed based on the existing five regional transmission grids. These five Regional Electric Power Groups performed operational functions on behalf of the independent provincial grids within its territory, specifically where it concerned inter-province transmission and generation co-ordination. The Regional Electric Power Groups represented MOEP in the regions. They were not separate legal entities, with an independent financial and management status. They can be seen as an operational extension of MOEP in the regions without a clear institutional position.

3.4.2 Southern Interconnected grid

The Southern Interconnected grid interconnects several independent provincial grids in the south of China that are not part of a Regional Electric Power Group. The regional transmission lines within the interconnection and two large-scale hydropower stations (Tianshengjiao I and II) were owned and operated by the South Electric Power Interconnected Company. This company was independent, and under jurisdiction of MOEP.

3.4.3 Provincial Electric Power Corporations

Provincial Electric Power Corporations managed and operated the provincial transmission and distribution grids, and the power plants connected to the provincial grids. Furthermore, the Provincial Electric Power Bureaus collect all the electricity tariffs that were collected from the end customers by the lower level Electricity Supply Bureaus and Companies. Each province or autonomous region has its own 'provincial' electric power corporation (PEPC). These PEPCs can have three types of relationships with MOEP:

1. *Branches*: A PEPC could be a branch of MOEP. The PEPC, including all its assets, is then both owned by and under direct control of MOEP (Heilongjiang, Jilin, Liaoning, Beijing, Tianjin).
2. *Subsidiary corporations*: The PEPC could be an independent subsidiary corporation of MOEP. In this case MOEP still owns the company and everything in it, but the management

of the company is independent of MOEP. The majority of PEPCs are independent subsidiary corporations of MOEP.

3. *Independent corporations*: Several PEPCs were completely independent from MOEP in ownership and management. Nevertheless they do fall under direct jurisdiction of MOEP and are obliged to follow MOEP guidelines and policies. Two ownership and management situations can occur for independent PEPCs:
 - A. The corporation is independent in management and operations, and is owned by the Provincial Government (Shandong, Sichuan, Fujian, Yunnan, Guizhou, Guangxi).
 - B. The corporation is owned by and under direct management and operational control of the Provincial Government (Guandong, Hainan, Xizang (Tibet) Autonomous Region, Inner Mongolia Autonomous Region).

There is no direct relation between the relationship with MOEP and participation in a Regional Electric Power Group. Several independent PEPCs are part of a Regional Electric Power Group or the Southern Interconnected Grid.

3.4.4 Municipal Electric Power Companies

Municipal Electric Power (Supply) Companies (MEPCs) were financially independent. Although on paper MEPCs are separated from Municipal Electric Power Bureaus, in practice their functions were still combined.

3.4.5 County Electric Power Companies

County Electric Power Companies (CEPCs) were in charge of local electricity supply and retail. There were 2400 CEPCs in China which, like the PEPCs, can be classified into three groups based on management control and ownership. The three groups are:

1. Management and asset ownership with Provincial Electric Power Companies (760).
2. Management by Provincial Electric Power Companies, but assets belong to the local Government, which can be either the County (540) or the Provincial Government (500).
3. Management and asset ownership with the local Government (600).

The third group mostly consisted of localities that were supplied by small hydropower plants through small grids that were managed, operated and administrated by the County Water Resources Utilisation Bureaus. They were outside the control of the State Power Corporation. In addition there were rural power stations that were managed by villages and townships according to a policy of 'self-construction, self-management, and self-use'. The electricity these rural power stations produced was supplied to the end users by the CEPC.

3.4.6 Generation Ownership Structure

MOEP owned over 50% of the country's power plants. The rest of the power plants are IPPs with diversified ownership. Most medium and large-scale hydropower stations were managed by PEPCs, or the Huaneng Power Group. Large hydropower stations built to prevent flooding and provide irrigation were managed by the Electric Power Corporations of the Ministry of Water Resources Utilisation (MOWRU). More than 65% of cogeneration plants are owned and managed by companies in other industries, such as the metallurgical, chemical and petroleum industries, as well as joint ventures of these.

3.4.7 Plant Dispatch

The dispatch of power plants is regulated by the Electricity Law and the Regulation of Electric Grid Dispatch Management. All power generation enterprises and plants should operate according to the dispatch curve issued by their dispatch centre. Furthermore, they should partici-

pate in peak-load regulation and frequency and voltage control as ordered by the dispatch centres.

The Dispatch Centre of the State Power Corporation (DCSPC) has the highest authority in dispatching and is in charge of the dispatching of national key power plants and the operation of the regional grids. Dispatch Centre of the Regional Power Corporation (DCRPC) is in charge of the key power plants in its region other than those that are directly dispatched by the Dispatch Centre of the State Power Corporation. The Dispatch Centre of the Regional Power Corporation is also responsible for inter-provincial dispatching. The Dispatch Centre of the Provincial Power Corporation (DCPPC) is in charge of the key power plants that are not directly dispatched by the Dispatch Centre of the State or Regional Power Corporation. The same hierarchy applies to the dispatch centres at the municipal and county level. Only in emergency situations can a higher-level dispatch centre directly send the dispatching orders to a lower level dispatch centre.

Table 3.1 *Overview of the physical, administrative, management and ownership structure of the Chinese power sector (Data: Chengzhang et. al., 1999)*

<i>Physical Grid Entity</i>	<i>Owner</i>	<i>Management</i>	<i>Administrator</i>
<i>Northern China Regional Electric Grid</i>	N/A	Northern China Regional Electric Power Group	Northern China Regional Electric Power Board
Beijing	PEPC, branch of MOEP	PEPC/MOEP	PEPB
Tianjin	PEPC, branch of MOEP	PEPC/MOEP	PEPB
Hebei	MOEP	PEPC	PEPB
Shanxi	MOEP	PEPC	PEPB
Western Inner Mongolia	MOEP	PEPC	PEPB
<i>North eastern China Regional Electric Grid</i>	N/A	North-eastern China Regional Electric Power Group	North-eastern China Regional Electric Power Board
Liaoning	PEPC, branch of MOEP	PEPC/MOEP	PEPB
Jilin	PEPC, branch of MOEP	PEPC/MOEP	PEPB
Heilongjiang	PEPC, branch of MOEP	PEPC/MOEP	PEPB
Eastern Inner Mongolia	MOEP	PEPC	PEPB
<i>North western China Regional Electric Grid</i>	N/A	North-western China Regional Electric Power Group	North-western China Regional Electric Power Board
Shaanxi	MOEP	PEPC	PEPB
Gansu	MOEP	PEPC	PEPB
Qinghai	MOEP	PEPC	PEPB
Ningxia Autonomous Region	MOEP	PEPC	PEPB
<i>Central China Regional Electric Grid</i>	N/A	Central China Regional Electric Power Group	Central China Regional Electric Power Board
Henan	MOEP	PEPC	PEPB
Hubei	MOEP	PEPC	PEPB
Hunan	MOEP	PEPC	PEPB
Jiangxi	MOEP	PEPC	PEPB
<i>Eastern China Regional Electric Grid</i>	N/A	Eastern China Regional Electric Power Group	Eastern China Regional Electric Power Board
Shanghai	MOEP	PEPC	PEPB
Jiansu	MOEP	PEPC	PEPB
Zhejiang	MOEP	PEPC	PEPB
Anhui	MOEP	PEPC	PEPB
<i>Independent Provincial Grids</i>			
Shangdong	Provincial government	PEPC	MOEP
Sichuan	Provincial government	PEPC	MOEP
Fujian	Provincial government	PEPC	MOEP
Chongqing	Provincial government	PEPC	MOEP
Hainan	Provincial government	PEPC/Provincial government	MOEP
Guangdong	Provincial government	PEPC/Provincial government	MOEP
Yunnan	Provincial government	PEPC	MOEP
Guizhou	Provincial government	PEPC	MOEP
Guangxi	Provincial government	Guangxi PEPC	MOEP
Xizang (Tibet)	Provincial government	Xizang EPC	MOEP
Xinjiang	Provincial government	Xinjiang EPC	MOEP
Hong Kong	Provincial government	Hong Kong EPC	MOEP

4 REFORMS IN THE CHINESE POWER SECTOR SINCE 1997

As indicated before, the institutional framework of the Chinese power sector is continuously changing as a consequence of broader government and market reforms. The previous section described the outcome of early reforms in the power sector until 1997, such as decentralisation, deregulation and corporatization. During the National People's Congress of April 1998 the Chinese Government instigated a new round of reforms for the power sector. First the reasons for these further reforms are discussed. Then the time schedule of future targeted reforms is indicated. The next chapter describes the status quo and near-term reforms of the Chinese power sector.

4.1 Background of Reforms

Although China's power sector has made unprecedented development progress over the past five decades, the sector suffered many operational, managerial, and infrastructure flaws. These flaws to a large degree emanated from the complex institutional framework of the sector that obstructed effective policies and infrastructural development. The main barriers to effective policy and development in the power sector prior to the 1998 reforms can be characterised as follows (Chengzhang et. al., 1999).

Conflicts of Interest

The continued combination of government functions and business management in local Electric Power Bureaus caused that these local Electric Power Bureaus were not only government authorities, but also profit-driven enterprises. The conflict of interest arising from fulfilling both roles blunted effective power sector regulation and policy implementation.

Complicated Government Structure

The complicated government structure made it very difficult for the relevant Agencies to co-ordinate their efforts, and to formulate consistent policies and regulations. Several Agencies were in charge of utility issues at different levels of Government. Lack of co-ordination between these Agencies often led to inconsistent and contradictory policies and regulations issued by different administrative bodies. Furthermore, the tedious bureaucratic procedures involved were very time consuming. This specifically applied to power project approval and electricity pricing.

Lack of Comprehensive and Transparent Legal System

The power sector lacked a comprehensive and transparent legal system. Instead, Government Agencies regulated the power sector through administrative orders and direct control of power corporations. This resulted in little legal security for power corporations and little consistency in regulations from one locality to the other. This could be damaging for attracting foreign capital and stimulating IPP development in long-term.

Project Approval Procedures Not Transparent

Project approval procedures were not transparent. Large-scale power project approval by MOEP and the SPC depended on medium and long-term government planning and macro investment control, rather than on market mechanisms. Furthermore, approval procedures were very time-consuming. Many developers found it easier to get planning approval and a construction permit for small power projects. This caused an over-development of small (mainly coal-fired) power plants, resulting in low system energy efficiency and a higher environmental burden.

Non-Transparent Electricity Pricing

Electricity pricing was not transparent. Many Price Control Bureaus at different levels of Government were involved in determining the prices of electricity. As a consequence, many different pricing systems were used across the country. The situation was further complicated by the various taxes and subsidies that applied to the power sector and end user electricity consumption. The confused pricing systems particularly damaged sectoral development, energy efficiency improvement, and renewable energy development.

Confused Ownership and Management Structure of Utility Assets

Ownership and management of utility assets were unclearly divided. As described in the previous section ownership and management of assets in the power sector were divided among various administrations and corporations between the central government and the township level. Diversified investment and fundraising further complicated matters.

Lack of Long-Term Strategy for the Power Sector

There were no specific long-term strategies for institutional and systematic reforms of the power sector. The power sector therefore lagged behind the reform of the overall economy.

By 1997, the Chinese Government realised that further structural changes were needed to separate business management from the administrative functions of government institutions. To prepare for further reform of the power sector the State Power Corporation (SP) was established within MOEP in February of 1997. Following further institutional reforms approved by the National People's Congress at the end of 1998, MOEP was disbanded. Its government and business functions were turned over to the State Economic and Trade Commission (SETC) and SP, respectively. At the same time the number of State Commissions was reduced to two, the State Economic and Trade Commission (SETC) and the State Development Planning Commission (SDPC).

4.2 Time Schedule of Reforms

During the National People's Congress of April 1998 the Chinese Government passed a new round of reforms for the power sector. These reforms will take place in four stages. Table 4.1 provides an overview of the main tasks to be carried out in each of the four stages of reform. The first stage, from 1997 to 1998, was the institutional reform separating government functions and business management of MOEP, and establishing the State Power Corporation (SP). The second stage, from 1998 to 2000, aims to complete the institutional reform in provincial and local power administrations at the lower government levels, strengthen enterprise ownership, and create a competitive power generation market based on a single buyer system. In a single buyer system independent generators compete to construct and operate their plant and sell their electricity to a single buyer, usually the system operator. To establish the right conditions for a competitive generation market the Government will stimulate IPP development, start the step-wise separation of generation from transmission and distribution utilities, and launch price reforms. This stage should also lead to further corporatization of Provincial Electric Power Bureaus and establishment of the corporate (governance) structure of SP and management reform for rural electricity development. In the third stage, from 2001 to 2010, national transmission grids will be established. Generation will be completely separated from transmission and distribution activities, and a competitive generation market will be operated by the single buyer based on a pool pricing system. Investment in generation will be open to all investors. Once the pool pricing mechanisms are in place the transition towards a competitive wholesale electricity market can be started. After 2010, in stage four, the Chinese power market is to be compatible with competitive electricity markets around the world. A fully operational competitive wholesale power market will be established and the feasibility of the introduction of retail competition will be assessed.

Table 4.1 *Overview of the main tasks of Chinese power sector reform in four stages (Based on: Chengzhang et. al., 1999 and Yi'an, 1999)*

<i>Stage</i>	<i>Time frame</i>	<i>Tasks</i>
I. Institutional Reform	1997-1998	<ol style="list-style-type: none"> 1. Establishing the State Power Corporation (SP) under MOEP. 2. Divesting business functions from MOEP to the SP. 3. Divesting business functions from Regional and Provincial Electric Power Bureaus to the Regional and Provincial Electric Power Corporations.
II. Market Reform	1998-2000	<ol style="list-style-type: none"> 1. Transferring government functions of MOEP to the SETC and disbanding MOEP. 2. Separating government functions and business management at the lower government levels. 3. Restructure Regional Electric Power Corporations to become branches of SP. REPCs will be in charge of operation, co-ordination and management of regional transmission. 4. Restructure Provincial Electric Power Companies to wholly owned subsidiaries of SP. PEPCs will be the provincial market and transmission system operators. 5. Start opening the power generation market to competition 6. Conduct pilot programs for competitive generation markets in six provinces. 7. Separating power generation from transmission and distribution activities. 8. Start establishment of competitive pricing systems based on pool pricing mechanisms. 9. Eliminate unauthorised surcharges on electricity prices 10. Optimise/restructure SP generation investment plan: <ul style="list-style-type: none"> • Forced de-commissioning of small low-efficiency units (2.8 GW in 1998 and 1.8 GW in 1999). • Postpone investment in conventional thermal generation projects. • Enhance investment in environmentally friendly (generation) technology. 11. Upgrade rural and urban distribution systems.
III. Single Buyer System	2000-2010	<ol style="list-style-type: none"> 1. Further development of a competitive power generation market 2. Gradual transition to 'unbundled' tariff structure 3. Building up national transmission grids
IV. Wholesale Competition	> 2010	<ol style="list-style-type: none"> 1. Further adjustment of the electricity market structure to match international developments. 2. Assessment on possible separation of distribution from transmission, and the possible introduction of retail competition.

The reforms indicated in Table 4.1 have not yet been laid down in any comprehensive legal act. The Electricity Law of 1996 provides sufficient scope and mandate to the State Council to carry through most of the initial reforms of stage I and II. However, as the power market moves towards wholesale competition new pricing mechanisms and ownership structures will be established that require adaptations in legislation. For instance, the law will have to provide for a regulatory institution to regulate the operation of provincial power markets.

The reform plans of stage III and IV in Table 4.1 are less specified than the first two stages. This is because the transition path to a single buyer system, and from a single buyer system to a

competitive wholesale market is still relatively undefined and uncertain. Plans are gradually elaborated for the implementation of the reforms in these stages. Outlines of these plans can be found in the proceedings of recent workshops for Chinese electricity policy makers (May 1999 and October 2000). In subsequent chapters we provide an overview of the transition that is outlined in these proceedings.

5 THE CURRENT INSTITUTIONAL FRAMEWORK OF THE CHINESE POWER SECTOR

As indicated before, the National People's Congress of 1998 instigated dramatic changes in the Chinese government structure. The number of State Commissions was reduced to two, the State Economic and Trade Commission (SETC) and the State Development Planning Commission (SDPC). Furthermore, MOEP was dissolved. Its government and business functions were turned over to the SETC and the State Power Corporation (SP) respectively. This had great consequences for the scope and distribution of authorities of many government institutions. Below the results of these recent government and power sector reforms are presented. Figure 5.1 presents a schematic overview of the current institutional framework of the Chinese power sector.

The State Economic and Trade Commission (SETC)

The SETC is one of the two State Commissions (SDPC is the other) left after the restructuring of the Chinese Government that was instigated by the National People's Congress. The SETC is charged with the national industrial policy, specifically where it concerns restructuring and modernising of state industries. At the last government restructuring several ministries have been abolished. The regulatory authorities of these Ministries have been ceded to the SETC, which has consequently gained somewhat more regulatory authority. Among the Ministries that were disbanded was the MOEP. Within the SETC the Department of Electric Power has taken over most of the government functions of the former MOEP, and is responsible for:

- analysing and formulating sectoral planning, regulations, economic, and technical policies in the electric power sector (including hydropower),
- organising and establishing sectoral provisions, codes, and technical standards,
- executing sectoral administration and overseeing implementation of policies and programs;
- providing recommendations for electricity and heat price policies,
- directing rural electrification and planning for small-scale electric grid construction.

Comparing the scope of responsibilities of the former MOEP with those of the Department of Electric Power, the latter turns out to have less authority than the former MOEP.

The Department of Resource Conservation and Comprehensive Utilisation at the SETC is in charge of energy and material savings, renewable energy development and environmental protection in industrial sectors. This Department co-ordinates with the Department of Electric Power to promote energy efficiency, utility-scale renewable energy and environmental protection in the utility sector.

State Development Planning Commission (SDPC)

The SDPC (former State Planning Commission) is responsible for medium and long-term planning and formulating national social-economic policy strategies, such as the five-year plans. In establishing the national strategies the SDPC integrates all policy plans of all other Departments. Within the SDPC the Department of Infrastructure, Industries and Development is responsible for:

- drawing up development strategies for the utility sector,
- co-ordinating and balancing sectoral planning and policy among the energy sectors,
- proposing strategic development for specific key programs in the utility sector,
- overseeing and analysing development and construction in the utility sector,
- building domestic capability in manufacturing nuclear power equipment.

Under the Department of Infrastructure, Industries and Development the Division of Electric Power is continuously involved in specific government routines in the utility sector regulation.

The Division of Renewable Energy and Energy Conservation is concerned with cogeneration and renewable energy development.

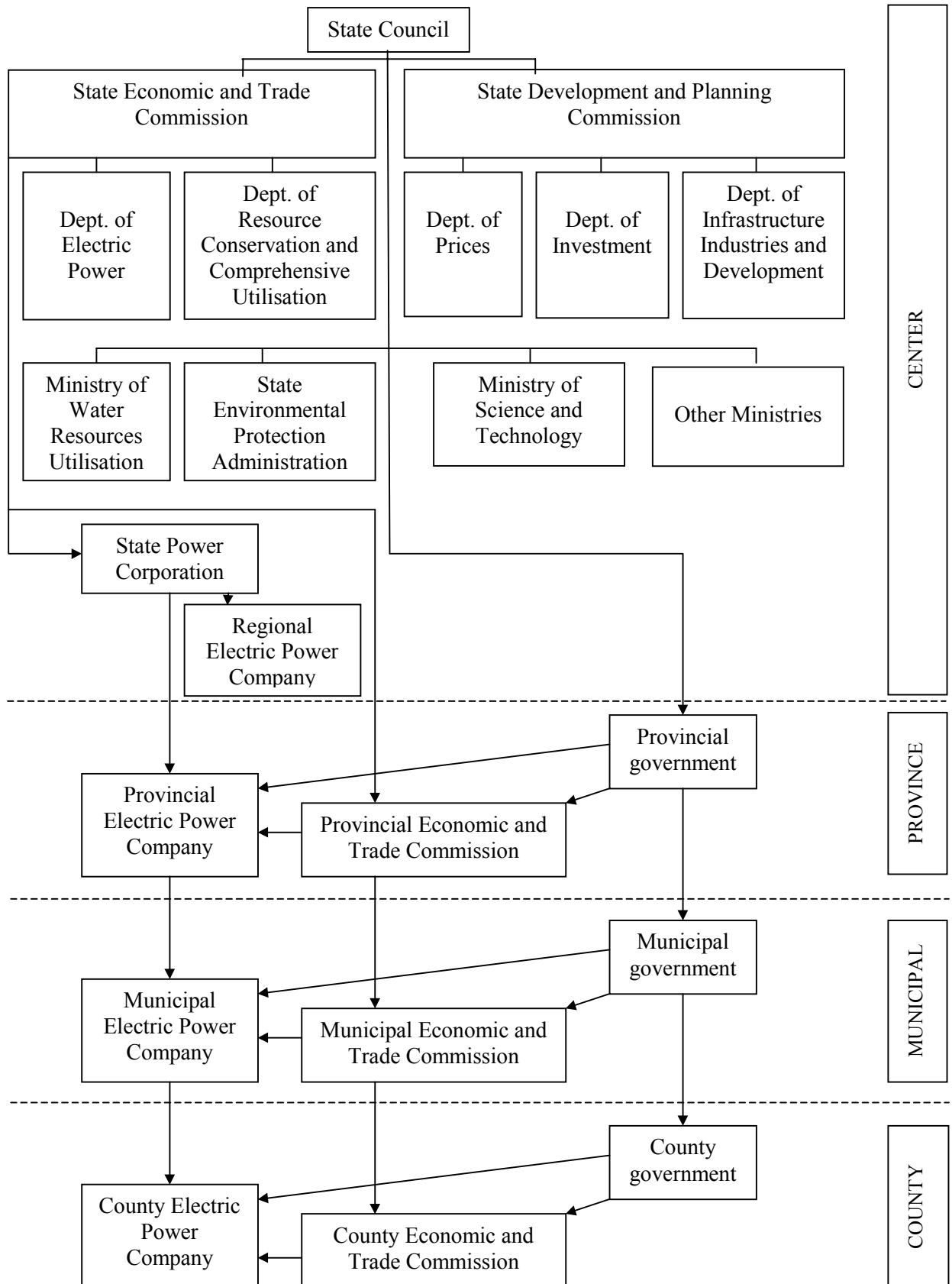


Figure 5.1 Institutional framework of the Chinese power sector in 2000

The Department of Investment under the SDPC is involved in the budgetary appropriation and allocation for structural utility investment, as well as individual large-scale power projects. Furthermore, the Department of Prices is in charge of price policy, pricing systems, price adjustments, and price monitoring for electricity and other major controlled commodities.

The lines of responsibility are not always clearly drawn between the SETC and SDPC, or the departments within these Commissions. Table 5.1 provides an overview of the roles of the SETC and the SDPC in various policy issues regarding the power sector.

Table 5.1 *Overview of the roles of the SETC and the SDPC in various policy issues regarding the power sector (Chengzhang et. al., 1999)*

<i>Policy Issue</i>	<i>Leading Role</i>	<i>Supportive Role</i>
Long-term strategy, planning and policy	SDPC Dept. of Infrastructure, Industries and Development	SETC Dept. of Electric Power
Power sector policy and regulation	SETC Dept. of Electric Power	SDPC Dept. of Infrastructure, Industries and Development
Systematic reforms of the power sector	SETC Dept. of Electric Power	SDPC Dept. of Infrastructure, Industries and Development
Environmental pollution control	SETC Dept. of Resource Conservation and Comprehensive Utilisation	SETC Dept. of Electric Power
Energy efficiency and conservation	SETC Dept. of Resource Conservation and Comprehensive Utilisation	SDPC Dept. of Infrastructure, Industries and Development
Renewable energy development	SDPC Dept. of Infrastructure, Industries and Development	SETC Dept. of Resource Conservation and Comprehensive Utilisation
Pricing systems and price control	SDPC Dept. of Prices Dept. of Infrastructure, Industries and Development	SETC Dept. of Electric Power
Power sector investment	SDPC Dept. of Investment Dept. of Infrastructure, Industries and Development	SETC Dept. of Electric Power

State Environmental Protection Administration (SEPA)

SEPA was promoted from Bureau to the ministerial level during the reforms of 1998, and thereby gained administrative power. With this promotion SEPA has gained considerable power. Within SEPA the Department of Science, Technology, and Standards is responsible for formulating various standards. The Department of Pollution Control is responsible for treating and reducing pollution by means of economic, technical, legal and market measures.

Ministry of Science and Technology (MOST)

The State Science and Technology Commission was downgraded to a ministry and is now called the Ministry of Science and Technology (MOST). Within MOST the Department of High Technology Development and Industrialisation is responsible for the allocation of funds for technology R&D, and for the formulation of policies regarding the commercialisation and promotion of nuclear power, conventional power, and renewable energy technologies.

Ministry of Water Resources Utilisation (MOWRU)

MOWRU has given up the ownership, management and operation of small- and medium-scale hydropower stations and small distribution grids in approximately 600 counties. MOWRU no longer issues utility policies and regulations within its jurisdiction. This authority has been ceded to the SETC. Nor will MOWRU invest in small-scale hydropower project development from internal funds.

Other Ministries

Other related ministries still own, manage and invest in industrial park power plants, mostly co-generation. Some large companies are starting to pressure the utilities to allow them to transmit power from one site to their industrial plants at another site. It is conceivable that in the future these industrial companies might also want to sell their excess electricity directly to other industrial customers on the grid. They thereby create an important driver for the separation of generation from transmission and distribution, and for the evolution towards competitive wholesale electricity markets. Many cogeneration plants are also operated and owned by County Governments, in which case power and heat is supplied to local industry.

State Power Corporation (SP)

One of the most significant power sector reforms in China in the recent years has been the establishment of the State Power Corporation (SP) as a landmark step to separate government functions and business management in the power sector. With the disbanding of MOEP in 1998 the SP took over all the business management functions of the former MOEP. The SP became an independent state-owned corporation that operates under administrative guidance and supervision of the SETC. Its 'mandate to operate', invest in power assets, and act as the 'owner' of state power assets derives directly from the State Council. The SP is thereby responsible for management of state assets in the utility sector, the operation of electric power enterprises and inter-provincial power transmission, as well as the management of national transmission grids. The state utility assets, as defined by the State Council, are the five Regional Electric Power Corporations and nine Provincial Electric Power Corporations that were previously owned by or under administrative control of MOEP. SP currently owns about 57% of China's power generation capacity (Chengzhang, 1999).

SP's key missions for the coming years is to develop a smoothly working corporate structure, determine medium and long-term strategies for the physical development of national transmission and distribution networks, co-ordinate the construction of new power plants, and co-ordinate safety, reliability and economic based operation of national and local grids, and dispatch of power plants.

Local level power sector reforms

Institutional separation of government and business activities in regional, provincial and local power administrative bodies had already started since 1988. Following the institutional reforms in the Central Government, further institutional reforms at the regional, provincial and lower government levels started in the second half of 1999 (Chengzhang, 1999). Like MOEP, the Regional, Provincial and local Electric Power Bureaus were disbanded, and their government functions have been transferred to the Economic and Trade Commissions at the provincial and local levels.

5.1 Pricing Policy

The Department of Prices under the SDPC is the primary institution responsible for price policy and pricing mechanisms. This section explains the types of prices that are calculated in the Chinese electricity sector and the principles on which they are established. Furthermore, an overview is provided of the authorities and responsibilities of the various government institutions involved in electricity pricing.

5.1.1 Electricity Prices

In the Chinese Electricity Law of 1997 three electricity prices are distinguished:

1. Power Purchase Price; the price at which the grid companies (regional, provincial or independent) purchase electricity from the generators that are connected to their network.
2. Mutual-Supply Price; the supply price of electricity between two grid companies (regional, provincial or independent).
3. Sale Price; the supply price of electricity from grid companies (regional, provincial or independent) to final customers.

As explained before the Chinese power sector has undergone significant market reforms since the entry into force of the Electricity Law in 1997. Therefore, the above categorisation in three electricity prices may not currently apply in all provinces. However, formally it is still law and it defines the starting point from which power sector reforms are currently undertaken.

5.1.2 Electricity Price Setting Principles

The Chinese Electricity Law stipulates that the above three electricity prices shall be based on the principles of uniform policy and unified pricing, and that they will be regulated at different levels of government. Furthermore, electricity prices should provide a reasonable compensation of cost, provide a reasonable profit, include taxes, fairly distribute cost and promote power project development.

Uniform Policy

The principle of uniform policy dictates that the setting and level of electricity prices should be conform social and macro-economic policy.

Unified Pricing

The unified pricing principle dictates that the structure applied to electricity pricing is equal in equal cases, i.e. in the same customer groups, on the same grid, on the same voltage level.

Differentiated Regulation

Electricity prices are regulated at different government (territorial) levels depending on the geographical size and location of the electricity company(-ies) involved.

Along these principles the State Council has the authority to establish mechanisms to calculate the various prices of electricity, including exceptions to the rules. However, to date the State Council has not established such standard price setting mechanisms. Instead, conform current power sector reforms, market mechanisms will gradually be introduced to determine the prices of electricity. These market reforms and mechanisms are further detailed in Chapters 5, 7 and 8.

5.1.3 Electricity Pricing Mechanisms

The recent practice for setting the power purchase price, the mutual-supply price and the sale price is that proposals are made by the generating companies and grid/supply companies. These proposals are submitted for review and approval to the Department of Prices of the SDPC or other authorised price bureaus (usually at the provincial level). A proposal for the power purchase price is negotiated between grid companies and the generating companies that are connected to the grid company's network. The mutual-supply price is negotiated between the grid companies involved. Proposals for the sale price of electricity shall be submitted by the grid companies that supply electricity to final customers.

5.1.4 Taxes

All tax policies are stipulated by General Tax Bureau of China and are laid down in the Chinese Tax Law. Tax Bureaus at each territorial level implement the tax policies. Utilities pay value-added tax and income tax to the Central Government. Additionally, utilities may pay several local taxes, e.g. for the construction of public facilities, education, housing and vehicle use. The value-added tax on electricity is 17%. In setting the sale price of electricity the Price Bureau includes the value-added tax. After the electricity fees are collected the value-added tax is passed on to the local tax bureau, which in turn pass the taxes on to the Central Government. Depending on the economic status and development in an area the Central Government may partly remit the value-added tax to the local government where the taxes were collected.

6 NEAR-TERM POWER SECTOR REFORMS

Chapter five outlined the time schedule for power sector reforms in China. This chapter describes several current and near-term reforms that are taking place. The State Power Corporation (SP) plays very important role in these near-term reforms. Most SP employees are former officials of MOEP and are very familiar with government policy and regulatory issues. The Department of Electric Power within the SETC, the regulatory counterpart of SP, on the other hand has limited personnel and resources. SP is therefore actively involved in policy research and analysis, and price system reform. Normal government-business relations between the SP and SETC will gradually be established over the course of a couple of years. For the time being, the SP retains considerable influence on the formulation of government policies and regulations regarding the power sector. In the near term the SP will concentrate on establishing the following reforms:

Ownership of Provincial Electric Power Corporations

All Provincial Electric Power Corporations (PEPCs) are to be owned by the SP, except for the power corporations in Guangdong, Hainan, Tibet and Inner Mongolia. At the same time the generation assets of the PEPCs will gradually be divested to Independent Power Producers (IPPs) and Generating Companies (Gencos).

Separation of Generation from Transmission and Distribution

Power sector reforms aim to separate transmission and distribution (T&D) from the generation part of the business. All T&D utilities will eventually have to sell their generation assets. The power generation market will be competitive, while T&D will be a regulated monopoly. SP will concentrate on managing and operating transmission and distribution networks. In the near term we will therefore see a consolidation of the network assets of Regional, Provincial and Municipal Electric Power Companies under the SP umbrella. Focusing on the management, operation and development of T&D networks SP seeks to establish by 2010 three national grids, the north, central and south grids, plus the Tibet regional distribution system. These three grids will be interconnected by 220 KV and 500 KV lines to support each other.

Competition in Generation under a Single Buyer

Six provinces have been chosen for the pilot implementation of competitive power generation markets with competitive electricity pricing systems. The market structure of these competitive power generation markets is based on a single buyer system, with the Provincial Electric Power Companies acting as the single buyers under SP. The pricing system will be based on a pool pricing mechanism with separate prices for energy and capacity. The pilot provinces are Shanghai, Zhejiang, Shandong, Liaoning, Jilin and Heilongjiang.

Regional Electric Power Groups become SP Branches

The five Regional Electric Power Groups will gradually be transformed into regional branches of SP. This, again, is part of the policy to consolidate network operation and management under SP. The regional branches will be responsible for supervising and overseeing strategy development, market analysis, increasing asset values, and operating and dispatching regional T&D networks. The formation of the Northeast regional branch has been completed. The other regional branches will be established by 2005. Note that all pilot provinces are part of the Northeast regional branch.

Southern Interconnected Grid and Huaneng become SP subsidiaries

The Southern Interconnected Grid and the Huaneng Group have been reorganised to subsidiary corporations of the SP. The Southern Interconnected Grid will become a branch of the SP after all its power plants have been sold. The Huaneng Group was established as a State corporation

of independent power producers. As a consequence of the policy to separate government from business functions the Huaneng Group will be restructured to a subsidiary of SP. However, bringing the generation assets of the Huaneng Group under SP is contradictory to the policy of separating generation from transmission and distribution activities. It could therefore be anticipated that in the longer term the Huaneng Group will be divested from SP as an independent Generating Company.

Municipal Electric Power Companies Financially Independent

Municipal Electric Power Companies are under the jurisdiction of the Provincial Electric Power Corporations, but are financially independent.

Restructuring Ownership and Management of County Electric Power Supply

As explained in Paragraph 4.4.5 various management and ownership structures of County Electric Power Companies co-existed before 1997. Since 1997 the principle is that there should be one electric power entity per county. If the electricity in a county is supplied by the Provincial Electric Power Corporation, the County Electricity Supply Company will gradually be reorganised into a subsidiary company of the Provincial Electric Power Corporation. If the county's electricity is bought from a third party, the County Electricity Supply Company will be owned and/or operated by the Provincial Electric Power Corporation, or it will be reorganised to a limited liability or stock holder company. In the case the county generates its own electricity, the County Electric Power Corporation will be reorganised according to either of the above ways.

Rural Electricity Supply Stations

Rural electricity supply stations will become branches of County Electric Power Companies.

Schematic Outline of Near-Term Reforms

The diagrams below capture the developments that are outlined above. In Figure 6.1 the Provincial Electric Power Company (PEPC) is still an integrated electric company involved in generation, transmission, distribution and supply. Its main function is the control of the transmission system, including regional dispatch, and the provincial dispatch of power plants. Besides the PEPC's own generation independent power producers (IPPs) also supply electricity to the grid. The Power Purchase Price for the electricity delivered to the grid by IPPs is negotiated between the PEPC and the IPP. The Provincial Pricing Bureau approves the pricing proposals put forth by the PEPC and the generators/IPPs or other PEPCs.

The ownership and management of distribution and supply companies is currently still highly diversified as explained in Section 4.4. In the near term these diversified distribution and supply entities will to a large extent be consolidated in the PEPCs. The diagram portrays the situation in which all distribution and supply companies have already been brought under the PEPC as Power Supply Bureaus (PSBs). These Power Supply Bureaus are the equivalent of electricity supply companies in Europe and North America. Later in the transition to a competitive wholesale market supply and distribution activities will be made independent again.

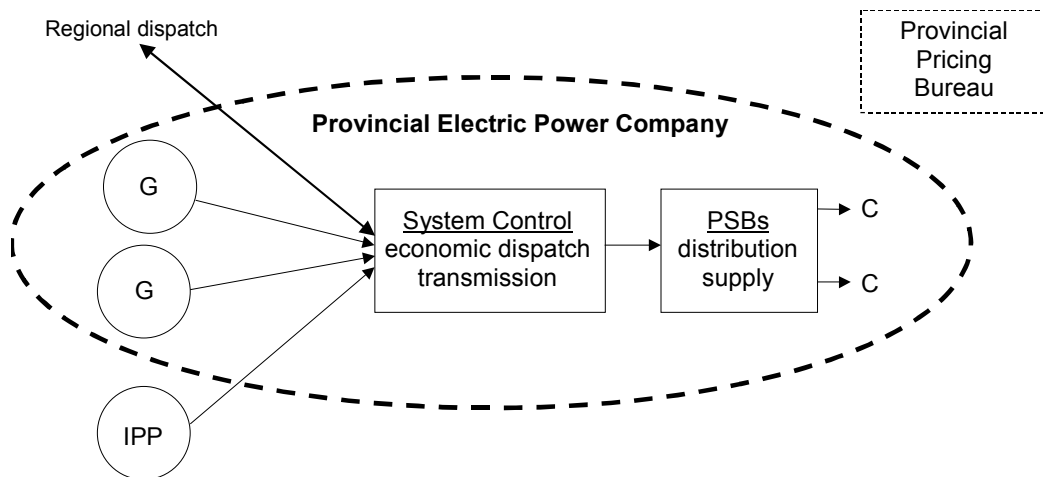


Figure 6.1 *Near-term structure of the power sector on the provincial level: integrated PEPCs*

Figure 6.2 represents the following step in establishing competitive provincial electric power markets. All generation assets are divested from the PEPCs and restructured to Generating Companies (Gencos) and IPPs. These Gencos along with the already existing IPPs will compete for power contracts with the PEPC, which acts as the provincial single buyer. Furthermore, a single buyer office has been established within the PEPC. Moreover, the PEPCs retain their traditional functions in system control through economic dispatch, transmission operation and regional dispatch. Power Supply Bureaus (PSBs) continue to supply electricity to final customers.

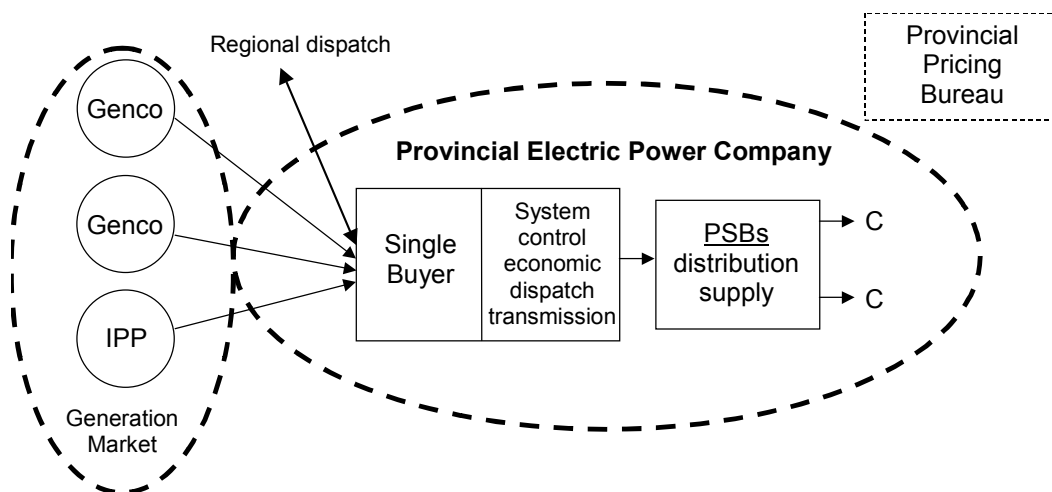


Figure 6.2 *Near-term structure of the power sector on the provincial level: PEPC single buyer of independent generation*

To prepare for the transition towards a competitive wholesale electricity market the single buyer (PEPC) will establish and operate an electricity pool in which pool pricing mechanisms will determine the prices of energy and capacity. Regional trade of electricity will also be determined through the electricity pool. The single buyer unit will be an independent unit within the PEPC. It will operate completely independently from other units responsible for transmission operations and the PSBs. In the longer-term transition to a competitive wholesale electricity market the single buyer will more and more become a market operator that facilitates the trade between various trading parties. Its independent status within the PEPCs is therefore paramount. Furthermore, a Provincial Regulator will be established for the regulation, monitoring and enforcement of the electricity pool. The Provincial Pricing Bureau continues to oversee the pricing of electricity to final customers (supply price). Once the electricity pool is fully operational the

demand side can be opened up to multiple buyers. The buyers will be the Power Supply Bureaus, which will split off the PEPCs. The PEPC will merely serve as the transmission network operator and market operator of the electricity pool. This further transition to a competitive wholesale electricity market is outlined in the following chapter.

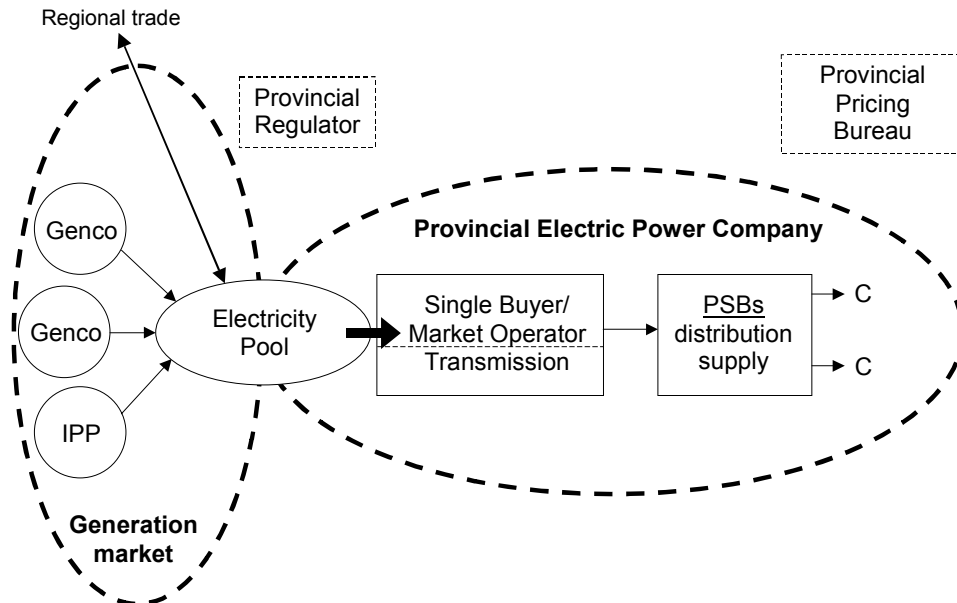


Figure 6.3 *Near-term structure of the power sector on the provincial level: single buyer operates electricity pool*

7 LONG-TERM POWER SECTOR REFORMS

This chapter gives a brief outline of the long-term reforms that are conceived to take place in the Chinese power sector. The previous chapter indicated how a single buyer system based on a pool pricing mechanism will be established on the provincial levels. From this single buyer system the structure of the Chinese power sector will change into a competitive wholesale electricity market in the long run. The diagrams below outline this transition. The reader should be cautioned that the diagrams in this chapter are merely outlines that provide guidance to the still ongoing discussion among Chinese policy makers about the transformation of the Chinese power sector. However, these outlines yield an understanding of the changes that need to be effected in the Chinese power sector to reach competitive wholesale and, potentially, retail electricity markets.

Figure 7.1 represents a scenario for a fully competitive wholesale electricity market. It is the ambition of the Chinese Government to establish a competitive wholesale market by 2010. In the wholesale market generators, in the form of Generating Companies (Genco) and independent power producers (IPP), and Power Supply Bureaus (PSBs) and large industrial consumers (encircled C in the wholesale part of the diagram) trade electricity through an electricity pool. Regional trade in electricity is also determined through the pool. At the provincial level electricity pools were already established and operated by the Provincial Electric Power Companies (PEPCs) as part of the single buyer system described in the previous chapter. In Figure 7.1 the role of the Provincial Electric Power Companies has been reduced to that of a market operator and transmission network operator. The Power Supply Bureaus (PSBs) have been split off as independent distribution and supply companies. The PSBs deliver the electricity they buy in the pool to the final customers (random C in the distribution part of the diagram).

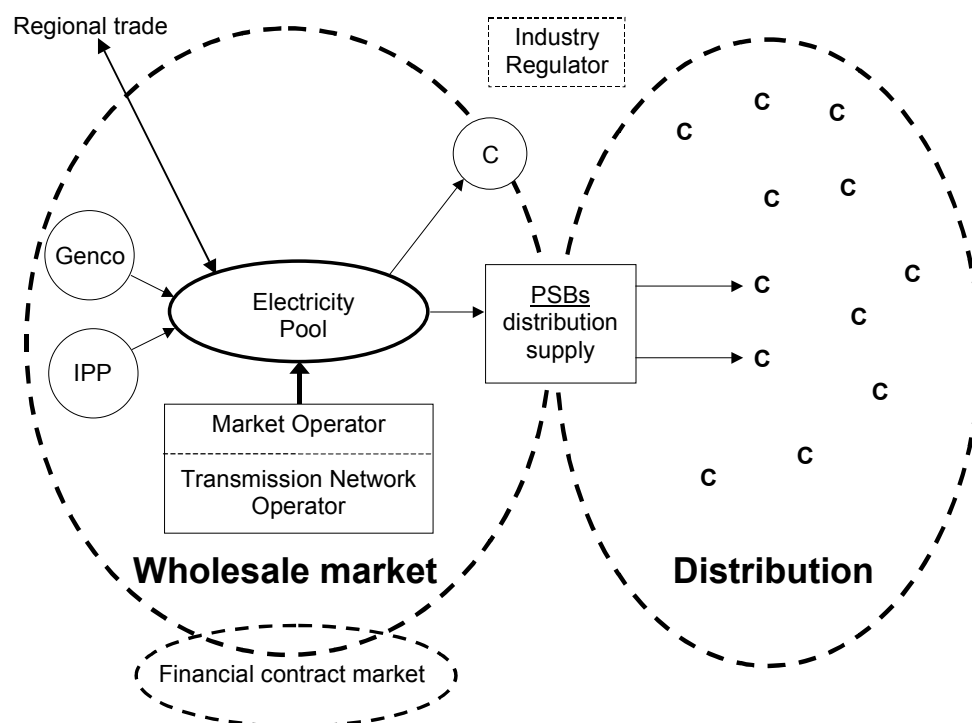


Figure 7.1 *Long-term structure of the power sector on the provincial level: competitive wholesale electricity markets*

Electricity traders can hedge against the risk of fluctuating pool prices with financial contracts such as bilateral contracts, futures, Contracts for Differences (CfD) and options. As the wholesale market matures and the volume traded through the electricity pool is increased, it is anticipated that a financial contract market will arise in parallel to the physical electricity market. Finally, an industry regulator will watch over the functioning of the wholesale market and regulate distribution and supply activities.

Once a fully competitive wholesale electricity market has been established the feasibility of retail competition can be explored. Figure 7.2 illustrates a scenario for competitive wholesale and retail electricity markets at the provincial level. The changes relative to previous diagram (Figure 7.1) are that the Power Supply Bureaus (PSBs) no longer exist. The PSBs have been split up in a retail companies (R) and distribution network operators. The retail companies (R) compete to supply electricity to final customers (random C in the retail part of the diagram). The distribution network operators independently operate local distribution networks and co-ordinate the management and operation of the distribution networks with the provincial transmission network operator.

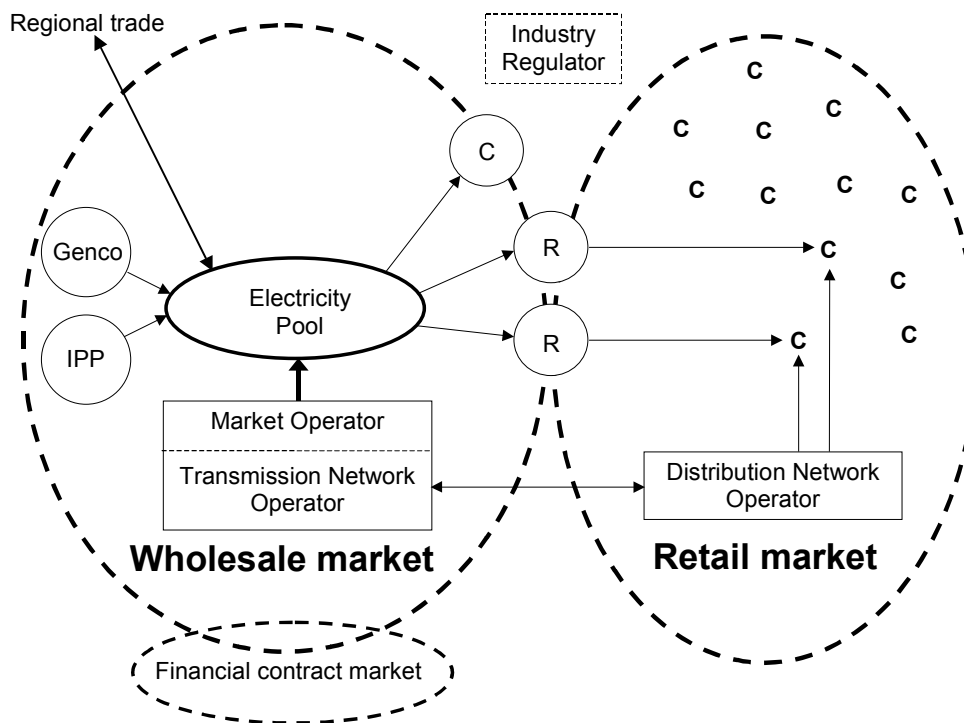


Figure 7.2 Long-term scenario for the power sector on the provincial level: competitive wholesale and retail electricity markets

The above scenario for competitive retail electricity markets is still far ahead in the future. At this stage of electricity market reform it is very uncertain if and when this scenario may be realised. Nevertheless, the diagrams above illustrate the immense challenge the Chinese power sector faces in transforming its power market to a structure that is compatible with international developments in the electricity sector, as is their stated ambition (Chengzhang, 1999; Yi'an, 1999).

8 CONCLUSIONS

This report describes the main changes that have occurred in the Chinese power sector since 1978. After the broader economic and government reforms that started in 1978 power sector reform started around 1985 in order to support the fast growing Chinese economy. These early power sector reforms consisted of decentralisation of decision making power to lower government levels, deregulation of investment and price control, and corporatization of the operational and business parts of the state electricity activities. The Central Government nevertheless maintained strong control over the power sector. The increasing inefficiencies of an ever more complicated and bureaucratic government, the non-transparency of policies, regulations and pricing, and the confused ownership and management structure of utility assets called for further reforms.

In 1997 an episode of further institutional and market reforms was initiated aiming to achieve a fully competitive wholesale power market by 2010. The reforms started with the further separation of government and business functions that were previously combined in the same government units. Most notably the State Power Corporation (SP) was established while the former Ministry Of Electric Power (MOEP) was dissolved. The government responsibilities of MOEP were turned over to the State Economic and Trade Commission (SETC). A similar separation of government and business functions is taking place at the lower territorial levels of government administration.

Currently, at the Central Government level the State Economic and Trade Commission and the State Development Planning Commission share the authority over the power sector. Several other Ministries may be involved in electricity policy and regulation, e.g. when it concerns environmental protection, and research and development.

Near-term power sector reforms will concentrate on consolidating network functions in SP or its branches and subsidiary corporations. Generation assets that are owned by local Electric Power Corporations will be sold off to independent players in order to separate generation from transmission and distribution. A competitive power generation market will be established based on the single buyer concept. The Provincial Electric Power Corporations will act as the single buyer. This single buyer system is to gradually transform to a fully competitive wholesale power market, with the appropriate regulatory and pricing mechanisms by 2010. Once a fully competitive wholesale electricity market has been established the feasibility of retail competition can be explored.

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