

**A Study of the
Environmental Regulatory System
for China's Power Industry:
The Case of Jiangsu Province**

June 2005

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Abstract

The power industry, as an important infrastructure for and an important part of China's national economy, is the largest fixed source of air pollution. With the rapid growth of the power industry, power plant emissions are threatening the sustainability of China's economy and environment. In China's current environmental regulatory system, environmental protection bureaus are the key agencies that execute environmental regulatory power; and local people's governments are responsible for the protection of environmental quality in their administrative areas. This type of regulatory system has some weaknesses; non-compliance and weak enforcement of the laws is common. China is facing a pressing need to improve its environmental regulatory system for the power industry and strengthen power industry pollution control. This thesis takes Jiangsu Province as an example. Through investigations and theoretical analysis using the principal-agent model, the thesis analyzes the institutional barriers to environmental regulation of the power industry in Jiangsu Province.

Jiangsu is an economically developed province in China. It is also a province that consumes vast amounts of electricity. In Jiangsu's power supply structure, thermal power constitutes 99.8%, which has resulted in severe environmental pollution. In recent years, Jiangsu has strengthened its environmental protection work, yet Jiangsu's environmental regulation still faces many difficulties. To identify the barriers, the author interviewed a number of environmental protection officials and experts at both the provincial and national levels. The interviews reveal that significant problems exist in environmental regulation of the power industry. These include: (1) local government leaders intervene in environmental regulation; (2) there is a lack of environmental oversight during the power sector reform; (3) several government agencies have overlapping responsibilities in overseeing the power industry; (4) environmental protection agencies lack regulatory capacities; (5) severe information asymmetry exists between upper-level and lower-level environmental protection agencies; and (6) penalties for environmental law violations are too low.

Based on findings from the interviews and reviewing environmental laws and regulations, the author uses the principal-agent model to analyze the principal-agent relationships existing in Jiangsu's environmental regulation. This analysis covers four aspects: the goals of the principals and the agents; the information asymmetry between the principals and the agents; the supervision and control mechanisms employed by the principals in managing their agents; and the incentives provided by the principals to their agents. The principal-agent analysis reveals that the following institutional barriers have resulted in weak environmental regulation: (1) local environmental law enforcement agencies are dependent on local government leaders; (2) upper-level environmental regulatory agencies have weak controls over and provide few incentives to lower-level agencies; (3) local government leaders are greatly influenced by the current economic growth-based cadre evaluation system and take economic growth as their highest priority; and (4) the principal-agent chain is too long and impacts the information transfer efficiency in the whole environmental regulatory system.

Based on the conclusions of this research and by referring to international best practices, the author makes the following recommendations: (1) reform the environmental regulatory system to guarantee the independence of the law enforcement agency; (2) strengthen the role of the State Electricity Regulatory Commission in power industry pollution control; (3) provide stronger environmental protection incentives to local government leaders; (4) strengthen the capacity building of environmental supervision and monitoring stations; (5) establish a minister-level environment committee; and (6) encourage the participation of citizens and non-governmental organizations in supervising enterprises' emissions.

Keywords: power industry environmental regulation
regulatory system principal-agent

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Chapter 1 Introduction

1.1 Background and significance of the research theme

1.1.1 Background

As an important infrastructure for and an important part of China's national economy, the power industry is the largest fixed source of air pollution in the country. In the past 20 years, the continuous fast growth of the Chinese economy has set the pace for the rapid development of the power industry. Between 2003 and 2004, average annual power production in China grew by over 14%, faster than the national economy. China's power industry is dominated by coal-fired power generation. Each year, vast amounts of sulfur dioxide, nitric oxides, carbon dioxide and inhalable particles are discharged, causing serious damage to human health and the ecological environment. Strengthening pollution control in the power industry is of great significance to the sustainable development of China's economy and environment.

Since 2003, large-scale power shortages have emerged across China. Various localities have rushed into expediting their power infrastructure building. A large number of power plants have been constructed. Meanwhile, projects that breach the environmental protection laws and regulations have also been implemented, resulting in seriously chaotic construction. On January 18, 2005, the State Environmental Protection Administration, under the leadership of and with support from the State Council, staged an "environmental storm", ordering the stoppage of 30 unlawful projects in 13 provinces. 26 of these projects are power plants. Statistics show that in 2005 newly constructed power plants in the country amounted to 150 million KW, 1.5 times more than the approved amount. Among the total of 280 million KW ongoing power plant projects nationwide, those that opened unlawfully by not completing the examination and approval procedure stood at 120 million KW. In addition, the State Environmental Protection Administration planned 137 thermal power plant desulfurization projects for the "Two Control Zones" (acid rain control areas and sulfur dioxide control areas) for the "Tenth Five-Year Plan Period". However, the

number of already completed and ongoing projects is only 91. 46 of these projects have not started yet. These involve 11 large-sized power groups including Huadian, Datang, Huaneng, State Power and CPI, and dozens of power companies. There are also various difficulties in implementing the pollution fee system in China. In 2004, over 20 million tons of sulfur dioxide was discharged nationwide. For a fee rate of 0.42 yuan per kg, the total payment for sulfur dioxide discharge should be over RMB 8.4 billion. However, the actual payment was only around RMB 3.0 billion. It is clear that non-compliance and weak law enforcement are still fairly common with respect to environmental regulation in China. Strengthening environmental regulation in the power industry has therefore become a pressing issue.

Environmental protection is one of China's basic national policies. After more than 20 years of development, the country has formed a rather comprehensive system of laws, regulations and standards on environmental protection. There is also a fairly sound institutional system for environmental protection, which includes environmental impact assessment, "Three Concurrents" for construction projects^①, pollution fee levy, compulsory pollution treatment within a set term, total emission control, and permit for discharge of pollutants. In China's current environmental regulatory system, administrative area-based, level-by-level regulation is adopted. The basis for this is the principle laid down in the *Environmental Protection Law of the People's Republic of China*, namely that local governments shall be responsible for the environmental quality in their administered areas. Under this regulatory model, local environmental law enforcement agencies are under the dual leadership of the local government and upper-level environmental regulatory agencies. The local government has the power of executive leadership over local environmental law enforcement agencies, while the upper-level environmental regulatory agencies offer them professional guidance. In the past 2 years, the State Environmental Protection Administration has stepped up efforts to crack down on unlawful environmental

① "Three Concurrents": The State stipulates that "Environmental protection facilities that need to be built along with construction projects must be designed, constructed and put into operation concurrent with the main project". This provision is known as the "Three Concurrents".

activities. In the process, a large number of unlawful activities have been exposed. Instances of weak law enforcement by local environmental law enforcement agencies have also been revealed. The problems are particularly outstanding in the power industry. At the 2004 Green Forum, Pan Yue, deputy director of the State Environmental Protection Administration noted that “*Some local governments cannot be counted upon to bring environmental pollution under control*”.

In 2002, the State Council reformed and restructured the power industry. After the restructuring, major changes have occurred within the power sector. Some experts have pointed out that if no sound rules and regulatory means are designed for the power market, these changes brought about by power sector reforms will also affect the level of pollutant emissions in power plants. These changes mainly include: (1) Establishing a competitive wholesale power market and implementing competitive bidding for grid connection. In a competitive power market, old power plants with heavy pollution generally cost less and are thus more competitive. Newly established clean power plants and renewable power generation are easily pushed into an unfair position that restricts their competitiveness. (2) Marketizing power generation assets. This is prone to make enterprises only pay attention to short-term effects rather than invest in technology R&D. Reduced investment in improving power generation efficiency will lead to an increase in pollutant discharge for the same power output. (3) Separating power plants from grids. Under the past vertically integrated operational model, State Power Corporation exercised some industry regulatory functions. It was easy to implement the State’s order to shut down small thermal power plants. After plants have been separated from grids, it will be harder to shut down small thermal power plants. This is unfavorable for eradicating small thermal power plants which cause heavy pollution and use backward power generation technologies. During the power sector reform, the government also carried out corresponding institutional reforms. Power bureaus were abolished. The function of regulating power enterprises’ pollutant discharge, which the administrative department for environment used to entrust to the power bureaus to exercise on its behalf, now returns to the administrative department for the environment. However, the administrative department for the environment does not have the true data on power enterprises’

pollutant discharge. Also, it is easy to be kept at bay by local government leaders. Currently, the administrative department for the environment implements fairly weak regulation over the power industry. Moreover, when formulating energy development plans, the planning department gives little consideration to environmental capacity factors. Consequently, the power industry will pose an even greater threat to the environment as power sector reforms deepen.

Jiangsu is an economically developed province in China. Economic prosperity has led to a rapidly increasing demand for power in the province. Because 99.8% of the installed capacity are thermal power generating units, environmental pollution has become a growing problem in Jiangsu. In recent years, the province has stepped up its environmental protection efforts and upgraded the provincial environmental protection bureau as the provincial department of environmental protection, making it a “Level 1 bureau” of the provincial government. It is understood that only Jiangsu and Hainan provinces in China have listed their environmental protection departments as a “Level 1 bureau” of the provincial government. Jiangsu has also piloted a vertical administrative system for the environmental protection institutions at the city level. As for environmental protection policies, the province has also set the lead in the country. It has tried such policy means as generation performance standards and sulfur dioxide emission trading. These efforts have accomplished certain achievements in the past few years. However, environmental regulation in the power industry is still a very difficult issue. For example, in early 2005 the State Environmental Protection Administration ordered 26 power plant construction projects to be stopped on the grounds that they breached the *Environment Impact Assessment Law*, and 7 of these 26 projects are in Jiangsu. In its Tenth Five-Year Environmental Protection Plan, Jiangsu set the target of completing desulfurization reconstruction projects for over 70 old power plants by the end of 2005. But 34 of them have not yet even been started. We have to admit that even though being a province with an active attitude towards environmental protection work in China and being bold to innovate in the environmental protection field, Jiangsu still faces many institutional obstacles to the environmental regulation of its power industry. This has made it difficult to fully implement the environmental protection policies and

systems.

Taking environmental regulation in Jiangsu Province's power industry as the survey and research object, this thesis will examine the environmental protection laws, regulations and policies along with interviews with relevant officials and experts, and employ the principal-agent theory to analyze the current status of environmental regulation in Jiangsu Province's power industry in order to find out institutional causes for weak environmental regulation there. Based on the analysis, and with reference to international experiences, the author will put forward her way of thinking for solving the problems.

1.1.2 Significance

Environmental pollution in the power industry has drawn much concern from people in all walks of life. However, most domestic research on strengthening pollution control in the power industry currently remains at the technical, policy and standard level. There has been little special analysis of how to strengthen power industry pollution control from the angle of improving the regulatory system. Domestic scholars have conducted considerable research on the problem of weak environmental regulation, but subsequent theoretical analysis has rarely been made. The few cases of theoretical analysis mostly relate to economic analysis. Institutional analysis is lacking. Most institutional research is concerned with making suggestions for raising the position and increasing the environmental regulatory functions of the administrative department for environmental protection. There are few discussions regarding the structural problems of the system itself.

Regarding these blank research spots, the author has decided to take environmental regulation in Jiangsu Province's power industry as an example, and through in-depth surveys and research, find out the environmental regulation problems there. Using the principal-agent model in institutional economics, the author will then examine the institutional root causes of weak regulation, particularly with regard to structural defects in the system. With reference to international experiences, policy recommendations are finally made for improving the environmental regulatory system of China's power industry. This research will be of practical value in solving

the problem of weak environmental regulation in China's power industry. At the same time, it will also put forward a new way of thinking in connection with the reform of China's environmental regulatory system.

1.2 Thesis structure

The thesis is divided into 7 chapters.

Chapter 2 presents an introduction to the current status of environmental regulation in China's power industry, and analyzes relevant literature.

Chapter 3 introduces the research methodology, key survey and research contents, the theoretical analysis framework and the selection of survey and research objects.

Chapter 4 presents an introduction to the experiences in several countries with fairly successful environmental regulation, including the current status and development trend of the environmental regulatory systems in the United States, Japan, France and Canada.

Chapter 5 sums up the survey and research findings on environmental regulation in Jiangsu Province's power industry, including the current status of industry development, the status of environmental pollution, the environmental regulatory system, and the main problems to do with environmental regulation.

Chapter 6 uses the principal-agent theory to analyze the problem of weak environmental regulation in Jiangsu Province's power industry, including a description and analysis of the goals of principals and agents, information asymmetry between principals and agents, together with principals' regulatory means and incentive mechanisms for agents.

Chapter 7 makes policy recommendations based on the survey and research analysis along with reference to international experiences.

Chapter 2 Current Status of Environmental Regulation in China's Power Industry and Literature Analysis

2.1 Development of China's power industry and status of environmental pollution

2.1.1 Current development status and trend of China's power industry

The power industry is an important infrastructure for and an important part of China's national economy. In the past 20 years or so, the Chinese economy has grown fast. This has led to the rapid development of the power industry. Installed power generating capacity grew to 391.40 million KW in 2003 from 65.87 million KW in 1980, while installed thermal power generating capacity increased from 45.55 million KW to 290 million KW during the same period. Annual power output also rose to 1.9052 trillion KWh in 2003 from 300.6 billion KWh in 1980. Since 1996, China has firmly gained its place as the second largest power producer in the world. Particularly since 2003, large-scale power shortages have occurred nationwide. Power building has developed at an unprecedented speed ever since. In 2003, China's installed generating capacity grew by 9.77% over 2002, while annual power output was up by 15.17%. In 2004, installed generating capacity rose to 440.70 million KW, up by 12.6% over 2003. Of this, installed thermal power generating capacity reached 324.90 million KW, up by 12.1% over 2003. In 2004, annual power output amounted to 2.187 trillion KWh, up by 14.8% over 2003^①. In other words, China's power industry grew much faster than the national economy during 2003 and 2004.

During the next 20 years China's power industry will continue to maintain its fast rate of growth. Firstly, China's per capita power output level is very low, at only 1,468 KWh, less than half the world's average and only 1/6-1/10 that of developed countries. As people's living standards improve and rural urbanization accelerates, the civilian demand for power will rise further. Secondly, in recent years there has been a notable trend towards heavy industrialization in China's economic development. High

① Source: *Flash Report on Power Production Statistical Indicators in China in 2004*, www.ccc.org.cn.

energy-consuming industries such as metallurgy, building material manufacture and automobile plants are growing fast. This will lead to a big increase in power demand. Thirdly, China's power system reform entered a substantive stage in 2002. Power generation assets have been restructured and a competitive wholesale power market is being established. These reform measures have greatly motivated the power generation market and all major power generation groups have established new power generation facilities. The relevant government department forecasts that by 2020 China's installed generating capacity will reach 1 billion KW, while power output will amount to 4.7 trillion KWh^①.

2.1.2 China's power source structure and the status of environmental pollution

China's power industry is dominated by thermal power, which accounts for 75% of the power source structure. According to the *Flash Report on Power Production Statistics for 2004* released by the China Electricity Council, China's total installed power generating capacity stood at 440.70 million KW in 2004. Of this, thermal power amounted to 324.90 million KW (95% of it coming from coal-fired power), hydropower 108.26 million KW, nuclear power 6.84 million KW and the remainder being power generated by renewable energy other than hydropower^②.

This thermal power-dominated power structure makes the power industry the largest fixed source of air pollution in China. China is the biggest coal consumer and also the biggest emitter of sulfur dioxide in the world. Currently, sulfur dioxide emissions from coal burning account for 85% of China's total sulfur dioxide emissions, while the power industry consumes 52% of China's coal output. In 2003, China's total sulfur dioxide emissions exceeded 20 million tons, of which 8.26 million tons was emitted from the thermal power industry. Nitric oxide emissions in the thermal power industry are also considerable. In 2002, China's nitric oxide emissions totaled 14 million tons, with the thermal power industry contributing 36.1% of it^③. Sulfur dioxide and nitric oxide can to a certain extent form acid rain, causing

① Chinese Academy for Environmental Planning: *GPS-Based Research on the Allocation of Sulfur Dioxide Emission Quotas in the Power Industry*, January 2005, pp:14-15.

② *Flash report on Power Production Statistical Indicators in China in 2004*, www.cec.org.cn.

③ Chinese Academy for Environmental Planning: *Research Report on China's Acid Rain Control Planning*, January 2005, Page 23.

soil and water body acidification, forest and vegetation damage and material corrosion, posing a serious threat to natural resources and ecosystems. Statistics show that every year acid rain causes RMB 110 billion in economic losses in China. The thermal power industry is also a major source of carbon dioxide emissions, accounting for 1/4 of the total carbon dioxide emissions in China's energy industry. In addition, a large amount of smoke is emitted in the thermal power industry. In 2003, total smoke emissions in the industry topped 3 million tons^①.

Starting from the Ninth Five-Year Plan period, a series of measures have been adopted to strengthen pollution control in the power industry. These include: adopting the total emission control system, shutting down small thermal power plants, installing desulfurization facilities and implementing stricter emission control administrative measures. These measures have produced good results, and the emission of pollutants has seen a falling trend, thus improving the urban environment. By 1997, except for a slight rise in sulfur dioxide emissions, all the power plants under the Ministry of Electric Power saw a drop in their emission of all other pollutants: nitric oxide emission amounted to 3.50 million tons, 390,000 tons less than in 1996; smoke to 3.31 million tons, 340,000 tons less than in 1996; sewage to 1.59 billion tons, 1.24 billion tons of which reached the set quality standard, this being 77.6%, a notable rise over 1996. However, as the demand for power continues to grow, the power industry is facing mounting pressures over environmental protection. Because the power industry has been growing so fast since the year 2000, the emission of various pollutants has rebounded. This is particularly true of sulfur dioxide. The World Bank has projected that if China develops thermal power without check, by 2020 it will have to pay \$390 billion for the diseases caused by coal burning, equivalent to some 13% of its GDP. It is clear that pollutant emissions in the power industry have been serious enough to threaten the development of China's national economy, as well as its people's health. If pollutant emissions from thermal power plants cannot be brought under effective control, it will be very difficult for the power industry to achieve sustainable development.

① State Environmental Protection Administration: China Environment Statistics Yearbook 2003, pp: 157-158.

2.2 China's current environmental protection law and regulation system

Environmental protection covers two aspects: One is environmental pollution prevention and control, while the other is natural resources conservation. Since introducing its first environmental protection law in 1979, China has now issued and implemented 7 environmental protection laws, 9 resources management laws, over 30 administrative regulations concerning ecological environment and resources protection, over 30 other laws and administrative regulations related to sustainable development and several hundred national and local environmental standards. Given that environmental regulation in the power industry is the research object of this paper, discussions below will mainly be concerned with the laws and regulations relating to pollutant emissions in the power industry.

2.2.1 Basic law for environmental protection

In 1979, China issued its first law on environmental protection——*the Environmental Protection Law of the People's Republic of China* (trial use). In 1983, the Second National Conference on Environmental Protection specifically established that “Environmental protection is one of China's basic national policies”. In 1989, the Standing Committee of the Seventh National People's Congress revised the law issued in 1979 and adopted *The Environmental Protection Law of the People's Republic of China* (1989) (hereafter called “*The Environmental Protection Law*”). *The Environmental Protection Law* is a basic law on environmental protection in China. In accordance with this Law, China abides by the following basic principles in its environmental protection:

1. The principle of prevention first

This stresses that environmental protection should solve environmental problems at the source, and thus efforts should be made to prevent environmental problems. In line with the prevention first principle, China has included environmental protection within its social and national economic development plans and its overall urban development planning. The concerned department is required to formulate economic and technological policies favorable to environmental protection. Clean production is to be promoted in industry development. Environmental impact assessment and the

“Three Concurrents” policies are to be adopted for construction projects. Ecological and natural reserves are to be established.

2. The principle of specific responsibility

The purpose of environmental protection policies is to encourage the relevant entities to take action to protect the environment. It follows that the responsibilities for environmental protection must be specified first. In this aspect, there are three main specific principles:

One is the principle that local governments shall be responsible for the environmental quality of their administered areas. Governments at all levels are required to adopt measures that ensure rational arrangements for the industrial layout, urban planning, industrial structure, infrastructure and social development in their region, as well as creating social systems that ensure a sound ecological environment. This principle establishes the legal basis for local environmental law enforcement agencies to carry out environmental regulation in their administered areas.

The second is the principle that whoever causes pollution should control it. This requires that all units and individuals that cause environmental pollution and damage should assume responsibility for controlling pollution and compensating for damages. The establishment of this principle has played a vital role in ensuring a stable source of funds for environmental protection. Meanwhile, it also prescribes laws that define enterprises' responsibilities for pollution control. The “system of charges for pollutant discharge” derives from this principle.

The third is the principle that whoever develops protects. This is mainly established with regard to the environmental destruction caused to natural resources by development activities. It means that all units and individuals that develop and utilize natural resources shall be under obligation to protect the natural environment. This principle is reflected mainly in the relevant policies and regulations concerning resources protection.

3. The principle of priority to regulation

The meaning of this principle is that protecting and improving the environment is not just a matter of increasing inputs or improving technology. More importantly, it requires the making of proper policies that change people's behavior, particularly

decision-making conduct with respect to economic development and environmental governance. This is the only way to provide sustained assurance for funds and technology that ensures the desired effect. In line with this principle, China has all along stressed “institutional building” in its environmental protection policies. These policies cover the environmental regulation of enterprises’ production and resources development activities, as well as incentives for public participation, supervision and voluntary activities. As a tangible example of its strengthened regulations, on the one hand China now emphasizes environmental legislation and executive administration in its environmental protection policies. On the other hand, it also pays attention to the building of environmental regulatory institutions, and has as a result set up organizations and institutions at various levels across the country. At the same time it has also strengthened research, monitoring, education and other support services. As well as this, and in order to encourage public participation, it has established “a nationwide system of environmental protection tip-offs”.

2.2.2 Special laws for environmental protection

Apart from the basic environmental protection laws, China has also formulated a series of individual laws and regulations on environmental protection, mainly including *The Law of the People's Republic of China on Air Pollution Prevention and Control* (hereafter called *The Air Pollution Prevention and Control Law*), *The Law of the People's Republic of China on Water Pollution Prevention and Control* (hereafter called *The Water Pollution Prevention and Control Law*), and *The Law of the People's Republic of China on Environmental Impact Assessment* (hereafter called *The Environmental Impact Assessment Law*). A brief introduction will be made to the main contents of these three laws.

The Air Pollution Prevention and Control Law was adopted in 1987 and then revised in both 1995 and 2000. This law stipulates: The State Council and local people's governments at all levels shall include the protection of the atmospheric environment into their social and national economic development plans, rationally plan industrial layouts, strengthen scientific research on air pollution prevention and control, adopt measures to prevent and control air pollution, and protect and improve

the atmospheric environment. The State needs to adopt measures to control or gradually reduce in a planned manner the total amount of major atmospheric pollutants discharged in various localities. Local people's governments at all levels shall be responsible for the quality of the atmospheric environment in their administered area, and for formulating plans and adopting measures to ensure that the quality of the atmospheric environment in their administered area reaches the set standard. The administrative department for environmental protection of the people's government above the county level shall implement unified supervision and administration of air pollution prevention and control. Other competent and concerned departments of the people's government above the county level shall implement supervision and administration of air pollution prevention and control within their respective authorities. The administrative department for environmental protection of the State Council shall formulate the national standard for atmospheric environmental quality, while the people's government of provinces, autonomous regions and municipalities may draw up local standards for those items not prescribed for within the national standard. Based on the national standard for atmospheric environmental quality and the national economic and technical conditions, the administrative department for environmental protection of the State Council shall draw up the national standard for atmospheric pollutant discharge. The people's government of provinces, autonomous regions and municipalities may draw up local standards for those items not prescribed for in the national standard for atmospheric pollutant discharge. For items which have been prescribed for in the national standard for atmospheric pollutant discharge, the people's government of provinces, autonomous regions and municipalities may draw up local discharge standards stricter than the national standard. *The Air Pollution Prevention and Control Law* also stipulates that for acts that discharge pollutants into the atmosphere, "a system of environmental impact assessment for construction projects", "a system of declaration and registration of discharge of pollutants", "a system of charges on discharge of pollutants", "a system of control on the total volume of pollutants discharged into the atmosphere", "a system of permit on discharge of pollutants", "a system of control on over-standard discharge of pollutants within a set time limit", "a system of

atmospheric pollution monitoring” and “a system of regular release of status of atmospheric environmental quality” should be implemented. In the spirit of *The Air Pollution Prevention and Control Law*, the national administrative department for environmental protection has also specifically formulated for the power industry a *Standard for Discharge of Atmospheric Pollutants by Thermal Power Plants*.

The Water Pollution Prevention and Control Law was adopted in 1984 and revised in 1996. The Law stipulates: The concerned department of the State Council and local people's governments at all levels shall include water environmental protection into their plans, and adopt measures and countermeasures to prevent and control water pollution. The environmental protection department of people's governments at all levels is the body to implement unified supervision and administration of water pollution prevention and control. The departments for water resources management, health, geological minerals and municipal administration of people's governments at all levels, as well as the water source protection institutions of important rivers, shall, based on their respective functions, cooperate with the environmental protection department to supervise and administer water pollution prevention and control. The environmental protection department of the State Council shall formulate the national standard for water environment quality, while the people's government of provinces, autonomous regions and municipalities may draw up local supplementary standards for those items not prescribed for in the national standard for water environment quality. Based on the national standard for water environment quality and the national economic and technical conditions, the environmental protection department of the State Council shall formulate a national standard for pollutant discharge. The people's government of provinces, autonomous regions and municipalities may draw up local standards for water pollutant discharge for items not prescribed for in the national standard for water pollutant discharge. For items which have been prescribed for in the national standard for water pollutant discharge, the people's government of provinces, autonomous regions and municipalities may draw up local water pollutant discharge standards stricter than the national standard for water pollutant discharge. *The Water Pollution Prevention and Control Law* also stipulates that for acts that discharge pollutants to water bodies, “a

system of environmental impact assessment for construction projects”, the “Three Concurrents System for Construction Projects”, “a system of declaration and registration of discharge of pollutants”, “a system of charges on discharge of pollutants”, “a system of control on the total volume of pollutant discharge” and “a system of control on over-standard discharge of pollutants within a set time limit” should be implemented.

The Environmental Impact Assessment Law was adopted in 2002 and implemented in September 2003. “The environmental impact assessment system” was first put forward in *The Environmental Protection Law (trial use)* issued in 1979. The Law states general provisions for the environmental impact assessment system. In 1986, the State Environmental Protection Commission, the State Planning Commission and the State Economic Commission jointly released the *Administrative Measures for Environmental Protection in Construction Projects*, setting down the specific requirements and procedures, scope and contents of assessment for the environmental impact assessment of construction projects. The *Environmental Protection Law* revised in 1989 set specific provisions for the environmental impact assessment system in the form of State law. In November 1998, the State Council released the *Administrative Regulations for Environmental Protection in Construction Projects*, stipulating that classified administration should be implemented for the environmental impact assessment for construction projects. The Regulations stipulate: Where a construction project may cause a major impact on the environment, an environment impact report shall be compiled for it. Where a construction project may cause a light impact on the environment, an environment impact table should be compiled for it. Where a construction project may have a very minor impact on the environment and does not require environmental impact assessment, an environmental impact registration form should be completed. *The Environmental Impact Assessment Law*, which was implemented on September 1, 2003, stipulates that apart from construction projects, environmental impact assessment shall also be undertaken for government plans. The Law also stipulates that “The construction unit shall return the environmental impact assessment document for its construction project to the respective administrative department for environmental protection that

has the right of examination and approval, for it to examine and approve in accordance with the provisions of the State Council. Where construction projects have an industry administrative department, they too should examine the environmental impact report or environmental impact form and then report back to the administrative department for environmental protection mentioned above". The Law also stresses that "Where the environmental impact assessment document of a construction project has not been examined by the examination and approval department as stipulated by law, or has failed to get approval after the examination, then the project examination and approval department shall not approve its construction and the construction itself shall not commence". *The Environmental Impact Assessment Law* is a law which, right from the start of decision-making, seeks to prevent environmental pollution and ecological destruction. The enactment of the Law is a major breakthrough in China's environmental impact assessment system. It is also an important milestone in environmental legislation in the country.

Currently, China's environmental protection laws and regulations have basically formed a fairly comprehensive system. However, the establishment and improvement of environmental protection laws and regulations have unfortunately not achieved a very notable role in promoting environmental protection work in China. As the national economy has developed, environmental pollution in the country has continued to intensify, and the ecological environment has therefore continued to deteriorate. Valuable resources have undergone serious destruction. To a great extent, the cause of such a situation lies in the fact that these laws and regulations are not being effectively implemented. On the one hand, this is because China's environmental protection laws and regulations are often too general. Despite their wide coverage, the articles of the laws and regulations are not specific and lack operability. On the other hand, China's *Environmental Protection Law* has established "the principle that local governments should assume responsibility for the environmental quality of their administered areas". According to this principle, China has adopted an "administrative area-based, level-by-level" regulatory system for environmental protection. Some shortcomings of this system itself are an important reason why the environmental protection laws and regulations are difficult to

implement.

2.3 China's current environmental regulatory system

2.3.1 Structure of China's environmental regulatory system

China's environmental regulatory system consists of the environmental protection bureau^① system, the environment and resources protection committee of the people's congress (hereafter known as the "People's Congress-Environment and Resources Committee") and the environmental protection committee of the people's government. This "two committees, one bureau" model runs through four levels, namely the central level, the provincial (autonomous region and municipality directly under the Central Government) level, the prefecture and city level, and the district and county level.

The environmental protection bureau is the administrative department for environmental protection of the Chinese government. It is at the core of China's environmental regulatory system and assumes responsibilities for the formulation and execution of environmental policies, laws, regulations and standards. The predecessor of the State Environmental Protection Administration was the Leading Group on Environmental Protection of the State Council, established in 1974. When the State Council reformed its departments in 1982, it was merged into the Ministry of Urban and Rural Construction and Environmental Protection. As a department-level institution in the ministry, it was renamed the Environmental Protection Bureau. At the end of 1984, the State Council upgraded it into a ministry-administered national bureau. It also became the executive body of the new Environmental Protection Committee of the State Council, newly established in May that year. In 1998, the State Council reformed its departments again and made the National Environmental Protection Bureau independent of the former Ministry of Urban and Rural Construction and Environmental Protection. It then became a bureau directly affiliated to the State Council and was renamed the State Environmental Protection

① Or Environmental Protection Department. For convenience, they are collectively referred to as Environmental Protection Bureau.

Administration. From 1998 to the present, the State Environmental Protection Administration has not changed its position. It is still a department directly affiliated to the State Council, rather than a constituent department of the State Council. At the end of 2003, the State Environmental Protection Administration had a total of 1,673 employees. Among them, 217 were in the headquarters, 37 in the supervision institutes, 94 in monitoring stations, 611 in research institutes and 714 in publicity and education centers, information centers and other departments. Across China, Governments above the district and county level (inclusive) generally have an environmental protection bureau, responsible for environmental administration and law enforcement in their administered areas. The environmental protection bureau system did not extend to the township level. However, a third of the townships in China have administrative personnel for environmental protection. As personnel dispatched from the district and county environmental protection bureau, they perform environmental protection supervision on enterprises which discharge pollutants.

The National People's Congress and people's congresses at all local levels take part in environmental administration mainly through their environment and resources committee. The Environment and Resources Committee of the National People's Congress was established in 1993, while the people's congresses in many localities have since then successively set up their own environment and resources committees. The Environment and Resources Committee of the National People's Congress is mainly responsible for putting forward and adopting resolutions on environmental protection laws and regulations and handling environmental pollution problems reported by the masses. When necessary, it may also arrange special law enforcement inspection to supervise government work in environmental protection.

People's governments at all levels in China also set up their own environmental protection committee. The Environmental Protection Committee of the State Council was established in 1984, headed by a vice-premier and with its members coming from 24 concerned ministries and commissions. The Committee was abolished in the government institutional reform in 1998. However, local people's governments at all levels continue to keep their environmental protection committee, which is

responsible for coordinating the relationship between the environmental protection bureau and other government departments.

China's environmental regulatory system also includes the environmental supervision and monitoring institutions, as well as the education, training, information services and environmental research institutions affiliated to the environmental protection bureaus.

What is worth noting is that, after the power sector reform in 2002, the State Council set up the State Electricity Regulatory Commission (hereafter known as "SERC"), which is responsible for regulating the power industry. In *The Provisions for Institutional and Personnel Setup in the State Electricity Regulatory Commission*, SERC's environmental regulatory functions are mentioned—"Cooperate with the environmental protection department to supervise and inspect the implementation of environmental protection policies, laws and regulations and standards in the power industry". This function is vested in SERC's Price and Financial Supervision Department (Inspection Bureau). However, it is understood that the Department has no special section for environmental problems, nor has it so far carried out any formal work on environmental regulation.

2.3.2 Work mechanisms of China's regulatory system

China's regulatory system is characterized by administrative area-based, level-by-level regulation. This is typical dual administration with vertical and horizontal partition. "The vertical partition" refers to the vertical administrative system of the environmental protection bureau establishment, which extends from the State Environmental Protection Administration to the provincial, prefecture/city and district/county level environmental protection bureaus, while "the horizontal partition" refers to the horizontal administrative system whereby local governments exercise executive leadership over the environmental protection bureaus, while local people's congresses supervise environmental protection. Under this system, the local environmental protection bureau is responsible for the environmental quality of its administered area, and concurrently subjects itself to the dual leadership of the upper-level environmental protection bureau as well as the local governments and the

local people's congress. In practice, the local government is the direct executive leader for the local environmental protection bureau, while the upper-level environmental protection bureau generally only offers professional guidance to the lower-level environmental protection bureau. The local government is the source of funds for the local environmental protection bureau, and appoints its director. The local environmental protection bureau needs to regularly report its work to the local government. The upper-level environmental protection bureau will draw up the annual work plan, as well as the five-year environmental protection plan for the local environmental protection bureau. The local environmental protection bureau will arrange its daily work according to the plans formulated by the upper-level environmental protection bureau, and implement the environmental protection policies and standards established by the upper-level environmental protection bureau. It will therefore undertake the key environmental protection projects planned by the upper-level environmental protection bureau. The local environmental protection bureau will regularly report its work progress to the upper-level environmental protection bureau. The main functions of the environmental protection bureau include: execute the laws and regulations formulated by the upper-level people's congresses and also by the people's congress of the same level; implement the policies, standards and key environmental protection projects planned by the upper-level environmental protection bureau; organize the formulation and implementation of the environmental protection laws, regulations and standards for the local area; supervise and regulate the discharge from local pollution sources; and improve the environmental quality in the local area. The advantage of such an administrative area-based, level-by-level regulatory system is that the environmental protection guidelines and policies formulated by the central government can quickly be passed down through the administrative hierarchy.

The main functions of the environment and resources committee of the people's congress include the formulation of relevant laws and regulations and the investigation of specific tip-offs from the masses and from appeal events. By requiring the environmental protection bureau, the responsible industry department and the people's government to submit annual reports on environmental protection,

and by then deliberating on these reports, the environment and resources committee performs its supervision of the government's environmental protection work. For key environmental protection issues and problems, the committee will also make on-site inspections. Based on such annual report deliberations and on-site inspections, the environment and resources committee each year reports to the people's congress regarding the progress made in environmental protection work, and offers further suggestions.

China's Environmental Protection Law encourages citizens to participate in environmental protection work. Some localities adopt a system of tip-offs and lawsuits over environmental protection matters. However, difficulties in producing evidence, high lawsuit fees and weak public awareness of environmental protection have resulted in very limited public participation in environmental protection.

It can be seen from what is included above that daily environmental supervision and administrative work in China is basically performed by the environmental protection bureaus. Therefore, the thesis will place its focus on analyzing the environmental protection bureau system's environmental regulation in the power industry. The following figure is a schematic diagram of China's regulatory system.

Chapter 2 Current Status of Environmental Regulation in China's Power Industry and Literature Analysis

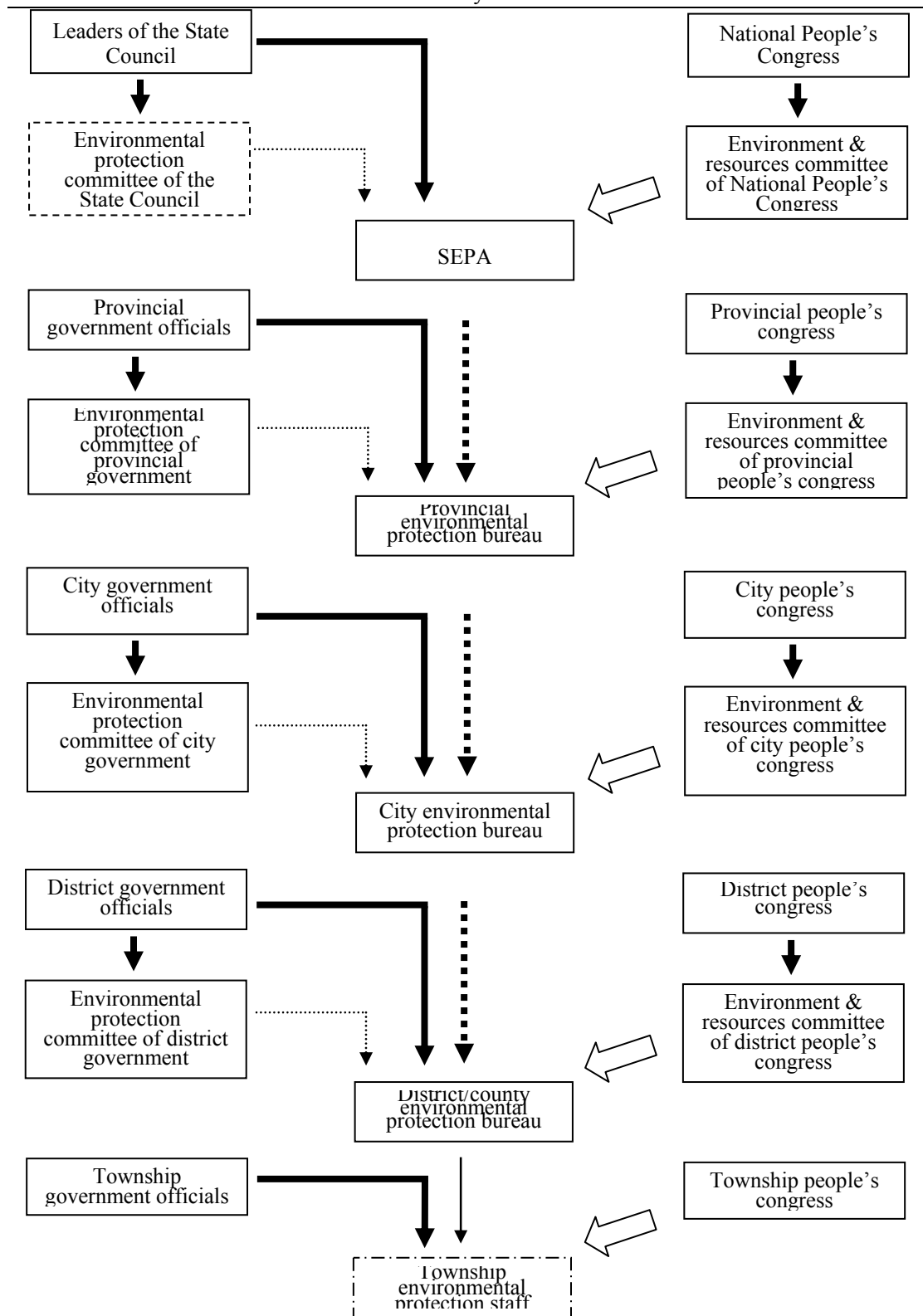
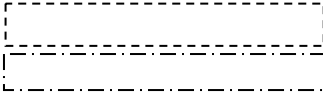



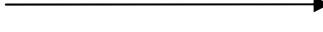
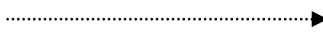
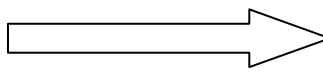


Fig.2.1 Schematic Diagram of China's Regulatory System

LEGEND:

	Institution already abolished
	No Formal institution
	Administrative leadership relationship (horizontal)
	Professional guidance relationship (vertical)
	Relationship of assignment
	Informal leadership within the government
	People's congress' informal leadership over government departments

2.4 Literature analysis

2.4.1 Theoretical views on environmental regulation

Government regulation is divided into two major categories: economic regulation and social regulation. Environmental regulation belongs to the latter. In its *Micro Regulatory Economics*, the Japanese economist Uekusa Masu^① defined social regulation as “Formulating certain standards for product and services quality, and the various kinds of activities which are staged in the process of providing these products and services, along with forbidding and restricting particular acts for the purposes of protecting the safety, health and hygiene of the workers and consumers, as well as for protecting the environment and preventing disasters” The theoretical basis for environmental regulation is the externality theory. The problem of externality was first raised by Marshall in its *Principles of Economics* and was subsequently supplemented and improved by Pigou in its *The Economics of Welfare*. Eventually, the externality theory was formed. According to Pigou, externality refers to those costs or benefits of market transactions which cannot be reflected in price. When externality occurs, a third party other than the buyer and the seller will be affected by the production and consumption of the product^②. In a market economy, the market plays a fundamental role in allocating social resources. The existence of externality

① Uekusa Masu (Japanese): *Micro Regulatory Economics*, China Development Press, 1992

② Quoted in Wang Junhao: *Introduction to the Economics of Government Regulation*, Commercial Press, 2003, pp:49-55.

makes market mechanisms ineffective and causes market malfunction. Government regulation is thus needed. For this, the economist James E Meade believes that it is necessary for the government to adopt intervention and control measures in 8 situations. One situation is when market mechanisms cannot satisfactorily solve important social problems, due to a conflict between personal interests and public interests, such as with regard to environmental pollution, resources exhaustion and population explosion. The solution to all these problems hinge on government control and intervention^①.

2.4.2 Theoretical views on power industry regulation

In his book *Introduction to the Economics of Government Regulation*, Wang Junhao describes the theory for regulating the power industry as: “The power industry is an industry that is inherently monopolistic, with very complicated technical and economic features and having a big impact on society and its economy. This determines that government regulation of the power industry is also abundant”^②. According to his view, the power industry's demand for government regulation is mainly because there are both natural monopoly and externality in it. Natural monopoly requires the government to implement strict regulation over market access and price. Positive externality refers to the close correlation between the power industry as a country's leading industry, other industries in the country, and a country's national economic development. The important task for government regulation is to promote such positive externality in the power industry. Negative externality is mainly due to the environmental costs associated with mineral fuels such as coal, oil and natural gas, nuclear energy, hydropower and wind energy that are needed for power production. Wang Junhao notes: “Though the focus of government regulation is on controlling enterprises' monopolistic behavior, environmental regulation still occupies an important position as far as the power industry is concerned”. “The main aspects of environmental regulation in the power

① Meade, J. E.: *Intelligent Radical's Guide to Economic Policy*: mixed economies, SJPC, Shanghai, 1989, Chinese Edition, pp:2-4.

② Wang Junhao: *Introduction to the Economics of Government Regulation*, Commercial Press, 2003, pp:266~269.

industry are: On the one hand, the government needs to adopt certain incentive mechanisms to encourage enterprises to increase investment in environmental pollution control. On the other hand, and even more importantly, the government needs to offer certain preferential policies that encourage enterprises to use to a greater extent reusable resources and non-mineral fuels that cause less pollution”.

2.4.3 Views on the importance of strengthening environmental regulation in the power industry

In his article entitled *Electric Industry Restructuring and the Environment*, David Moskovitz, former regulator of the Maine State Public Utilities Commission, wrote: “There is an unavoidable link between energy use and the environment. Power plants cause pollution, which affects air quality, lakes, rivers, crop growth, land, animal habitat and human health. Power production has a huge impact on the environment. It affects not only the environment in the local region and the home country but that of the whole world. For many countries, the environmental destruction caused by power production is only second to that caused by the fast-growing transportation sector. Power production is the biggest fixed source of air pollution”^①. In an article entitled *Power Industry Reform and Environmental Protection*, the Chinese environment expert Wang Jinnan gives the following description of the environmental pollution problem in China's power industry: “The power industry has been growing continuously. At the same time, it has also caused a succession of environmental problems. In China's power structure, coal-generated electricity is in the dominant position. Thermal power plants are a major user of fuel coal. In 2000, thermal power plants accounted for 46% of China's total sulfur dioxide emissions, and became the main source of acid rain in the country. Nitric oxides and smoke emission from coal-fired power plants are also a chief source of air pollution in China. Coal-fired power plants account for a quarter of the total carbon dioxide emissions in China's energy industry, and form the main source of greenhouse gas emissions in China”. In the book *China: air, land and water*, the World Bank estimated that the losses caused by urban air pollution and acid rain in China are between \$16.32 billion (human capital method) and \$37.39 billion (payment willingness method)^②. Regarding the

① David Moskovitz: *Electric Industry Restructuring and the Environment* (research report), 2000.

② The World Bank: *China: Air, land and Water, Environmental priorities for a new millennium*, China Finance and Economics Press, 1997.

importance of environmental regulation in China's power industry, Liu Shijin and Feng Fei wrote in the article *China's Power Industry Reform and Sustainable Development*: "In terms of both the quantity of fuel coal currently consumed by thermal power plants and the growth trend of power generation-use coal in the future, controlling the air pollution caused by thermal power plants occupies a very important place in air pollution control in China. Power industry pollution control forms the key to air pollution control in the country. Properly controlling the pollution caused by thermal power plants is of great consequence to China's environmental protection and sustainable development"^①.

2.4.4 Views on the environmental regulatory system of China's power industry

In *China's Environmental Regulatory System Reform Plan* published in 2002, the Chinese Academy for Environmental Planning pointed out: "The State Council's administrative department for environmental protection is the core of China's environmental regulatory system". "From the central government's perspective, the departments with administrative functions for national environmental protection mainly include the State Planning Commission, the State Economic and Trade Commission, the Ministry of Land and Resources, the Ministry of Water Resources, the State Forestry Administration, the Ministry of Construction and the Ministry of Agriculture. Among them, the greatest functional overlap occurs between the national environmental protection department, the water resources department and the forestry department"^②. In the 1997 article *Government and Enterprises: from macro administration to micro regulation*, Yu Hui pointed out that the main means of air pollution regulation in China include establishment of standards, declaration of discharge of pollutants, "Three Concurrents", over-limit pollution fees and prohibiting the discharge of special pollutants. The main regulatory bodies included are the administrative departments at all levels for both environmental protection and economy and trade^③. In the 2001 article *Power Industry Reform and Environmental*

① Liu Shijin and Feng Fei: *China's Power Industry reform and Sustainable Development*, Economic Management Press, 2003.

② Chinese Academy for Environmental Planning: *China's Environmental Protection Administration System Reform Plan*, 2002, p8.

③ Yu Hui: *Government and Enterprises: from macro administration to microregulation*, Fujian People's Publishing House, 1997

Protection, Wang Jinnan summed up the environmental regulatory system of China's power industry. It includes "the environmental impact assessment system", "the Three Concurrents System", "the system of pollution fee levy", "declaration and registration of discharge of pollutants and permit for discharge of pollutants", "the system of total emission control", "the system of compulsory pollution treatment by a set time limit", "the policy of shutting down, suspending and transforming polluting facilities" and so on. Concerning the participation of relevant government departments, Wang Jinnan made the following introduction: "To promote the sustainable development of the power industry, the power regulatory department has formulated and put forward a series of policies for sustainable development and environmental regulation, which have laid the foundation for coordinated development of the economy and the environment in the power industry. These policies mainly include: "Strengthen both power source and industrial restructuring"; "The environmental protection department has laid down requirements in the power industry in some of the environmental regulatory rules which it has formulated, such as environmental impact assessment and the "Three Concurrents" for construction projects. This has strengthened environmental regulation in the power industry"; "The State Environmental Protection Administration has specifically pointed out in its 'Acid Rain and Sulfur Dioxide Pollution Control Regionalization Plan' that work should focus on controlling pollution caused by thermal power plants by reducing total sulfur dioxide emissions"; "Apart from the environmental regulatory rules formulated and implemented for the environmental regulatory department, the power department has also drawn up and put forward some relevant environmental regulatory measures, which are reflected in the following aspects: improve power source structure and increase the use of clean energy; raise coal-fueled power generation efficiency and lower coal consumption; improve the quality of fuel coal; make reasonable arrangements to reduce the impact of environmental pollution; adopt suitable pollutant control technologies, reduce pollutant discharge and improve integrated waste utilization technologies; and develop and adopt advanced coal burning and

conversion technologies”^①.

2.4.5 Evaluation of environmental regulatory effect in China's power industry

In its 2003 research report *Environmentally Friendly Pricing Solution for Coal-fired Power Plants*, the Chinese Research Academy of Environmental Sciences pointed this out: As far as laws, regulations and standards are concerned, there are three weak spots in the work of controlling total pollutant discharge in China. One is that the laws and regulations are lagging behind. The long-awaited *Administrative Regulations for the Control of Total Discharge Volume of Major Pollutants* has not yet been released. The second is that in the process of implementing total volume control, the supplementary rules and standards have yet to be established, which has a bearing on the effect of total volume control. One example is the pollutant discharge permit and emission trading system. The third weak spot is that there is still a lack of standardized methods for verifying the base quantity of total volume control, for formulating the total volume control targets and the assessment and release of the status of total volume implementation. As for economic methods, pollution fee levy has been an important economic leverage for China to control sulfur dioxide pollution. However, the current rate is too low, lower than the cost of pollution control. Moreover, the fee is not yet charged on a large scale. As for supervision and administration, despite the fact that over 70 thermal power plants have installed almost 90 sets of online, continuous smoke monitoring equipment, their operational state has been poor. Lack of accurate emission data has brought pressures on the implementation of total emission control^②. In an article entitled *Adopt Various Measures to Raise Enterprises' Environmental Law Violation Costs*, Liu Xiangmei at the Environmental Supervision Bureau of the State Environmental Protection Administration wrote: “Under China's current economic, social and legal conditions, there is a widespread situation of enterprises having high costs for compliance, yet low penalties for law violations. This is particularly true of environmental protection, and is an important reason why many enterprises currently run against the law and

① Wang Jinan: *Power Industry Reform and Environmental Protection* (research report), 2001.

② Chinese Research Academy for Environmental Sciences: *Environmentally Friendly Pricing Solution for Coal-fired Power Plants* (research report), 2003, p5.

discharge pollutants". In Liu Xiangmei's view, one main cause of this situation is weak government regulation. Lack of a rational and effective environmental regulatory system gives a chance for enterprises to break the law. Liu Xiangmei believes that the main reasons for weak government regulation are: There is serious local protectionism; the department for environmental protection lacks the right to impose administrative sanctions on unlawful pollutant discharge acts; and there is a serious shortage of environmental regulatory personnel, some grassroots law enforcement personnel having yet to attain sufficient professionalism. This has made it difficult to form a strict regulatory network^①. The Chinese Research Academy of Environmental Sciences pointed out in the paper *Environmental Law Enforcement Capacity Building in China* that "It should be kept in mind that, despite its progress, the environmental regulatory force still has a wide gap to bridge between the environmental protection development needs and the actual needs of environmental regulatory work". The paper also noted that "the gap" is mainly reflected in: a serious lack of personnel funds, a considerable lack of law enforcement equipment and a very backward means of law enforcement. It also observed that the State Environmental Protection Administration has a very weak environmental regulatory force^②.

2.4.6 Theoretical analysis of inadequate environmental regulation in China

Most research on the problem of weak environmental regulation in China is of a positivist nature, there being very little theoretical analysis. The only few articles on theoretical analysis are actually dominated by the methodology of economics. Zhu Deming, in the article *Economic Thoughts on Inadequate Environmental Law Enforcement*, analyzed the causes of inadequate environmental law enforcement from an economic perspective. According to Zhu Deming's analysis, enterprises' nature of pursuit of profits and the high cost of law enforcement constitute the economic obstacles to environmental protection law enforcement. These include: (1) Economic means are weaker than administrative means; (2) Environmental benefits are weaker

① Liu Xiangmei: *Adopt Various Measures to Raise Enterprises' Environmental Law Violation Costs*, www.cenews.cn, April 27, 2004.

② Chinese Research Academy of Environmental Sciences: *Environmental Law Enforcement Capacity Building in China* (research report), 2001

than economic and social benefits; (3) The expected benefits of law enforcement are less than the transaction cost of law enforcement; (4) Penalty setup and magnitude are less than that of environmental damage and/or environmental costs; and (5) Environmental law enforcement is detached from the actual economic conditions. Zhu Deming noted that “Under market economy conditions, there is a relationship of mutual conflict of the same nature (namely, pursuit of the maximization of their own benefits) between the government, the law enforcement department and the enterprises. Invisible gaming occurs between the corresponding person in executive administration and the administrative law enforcer. When the expected benefits of law enforcement are less than the expected cost, the administrative department for law enforcement is likely to give up its law enforcement act and thus leave room for environmental law violations. The higher the cost, the further the distance and the lower the compensation for law enforcement, the greater is the likelihood of law violations. Weak law enforcement will be inevitable”^①.

Recently, the State Environmental Protection Administration has been organizing the implementation of the *Research on China's Environmental Supervision and Law Enforcement Efficiency Project*. It also has adopted an economic research methodology. Led by Lu Xinyuan, director of the Environmental Regulatory Bureau of the State Environmental Protection Administration and Dudek, Chief Economist of the US Environmental Defense, the Project will use the “cost/effect method” to analyze the setup of penalties for environmental law violations in China, and conduct an in-depth examination of the factors restricting environmental regulatory efficiency in China. These include laws and regulations, law enforcement capacity and technical support for law enforcement. Currently, the research project is in a preparatory stage, scheduled for completion by the end of 2006^②.

① Zhu Deming: *Economic Thoughts on Inadequate Environmental Law Enforcement*, Environmental Herald, 1996, Issue 4.

② SEPA: *Circular on Implementing the Research on China's Environmental Supervision and Law Enforcement Efficiency Project*, www.sepa.gov.cn, April 20, 2005.

2.4.7 Discussions on whether the power industry regulatory body should have the function of environmental regulation

Liu Shijin and Feng Fei wrote in *China's Power Industry Reform and Sustainable Development*: “The functions of the power industry regulatory body are mainly divided into two major parts: the regulation of power enterprises’ monopolistic acts and the regulation of transaction acts in the power market. Regulation is further divided into two major aspects: economic regulation and social regulation. Economic regulation mainly includes electricity price regulation, power market access regulation, power commodity regulation and service quality regulation. Social regulation mainly covers technical standards for power production, safety standards, service standards, regulation of environmental protection standards, clean energy development and improvement of energy efficiency. There is a need to centralize the regulatory functions which are now dispersed throughout the combined economic departments of the government, and authorize the regulatory body so that it can exercise such functions in a unified manner”. In *Electric Industry Restructuring and the Environment*, David Moskovitz explained the relationship between power restructuring and the environment as follows: “Power restructuring will undoubtedly affect the environment. As described below, the environmental effect of many restructuring efforts is an outcome of market structure and rule design, even though they do not seem to bear any obvious direct link with the environment. What is worth being alerted to is that improving economic efficiency and environmental quality presents an extremely good opportunity. For countries which have yet to realize or have ignored such influence, restructuring is likely to cause damage to public health and unnecessary environmental destruction”^①. In the *Research Report on the Establishment of a State Electricity Regulatory Commission*, which it drafted for the World Bank, the Regulatory Assistance Project made the following comments on the problem: “Power regulatory decisions may bring about major environmental consequences. Such consequences are likely to result in higher medical expenditures as well as crop yield reductions. When planning and expanding the power sector,

① David Moskovitz: *Electric Industry Restructuring and the Environment* (research report), 2000.

power industry regulation should take such environmental impact into account as an essential part. This will be more effective than considering the environmental impact after the environment has been damaged and big vested interest groups resist reforms”^①.

Internationally, and particularly in those countries where in-depth power system reform has been staged, environmental protection has gradually become a major function of the power industry regulatory body. These countries already have a very mature power market and their regulatory system is also very sound. According to the introduction on the US Federal Energy Regulatory Commission (FERC) website, FERC's tenet is “to regulate the energy industry and protect the economic and environmental interests of the US public”. One of FERC's regulatory functions is “to supervise the environmental impact of natural gas- and hydropower-based power generation projects and major power policies”^②. FERC and the 12 State-level power industry regulatory bodies in the United States are all under legal obligation to evaluate the environmental consequences of regulatory rules and policies when they formulate them. Generally speaking, because regulatory rules will directly affect power enterprises' decision-making, different regulatory rules will result in different decisions for enterprises when they select fuel and technologies. These decisions will in turn directly affect the environment. According to Ofgem's “*Environmental Action Plan, Annual Review 2001-02*”, the power industry regulatory body in Britain needs to regularly formulate an environmental action plan and review it annually^③.

2.4.8 Research on the improvement of China's environmental administration system

In the 2002 article *Thoughts and Suggestions Concerning Environmental Protection Institutional Reform*, Xia Guang pointed out that “the institutional reform plan to strive for is ‘The Ministry of Environment’ plan”. He suggested “strengthening the integrated decision-making capacity of the administrative

① Regulatory Assistance Project: *Research Report on the Establishment of State Electricity Regulatory Commission*, 2002, p.10.

② US Federal Energy Regulatory Commission: www.ferc.gov.

③ Ofgem: *Environmental Action Plan, Annual Review 2001-02*, www.ofgem.gov.uk

department for environmental protection and increasing its administrative functions over environmental and social affairs”^①. The Chinese Academy for Environmental Planning pointed out in its 2002 *China's Environmental Regulatory System Reform Plan* that the specific goals of China's environmental regulatory system reform should include: (1) Through the reform, basically establish a national environmental regulatory system in which “an environmental protection department performs unified supervision and administration, with other relevant departments holding their respective responsibilities”; (2) Further improve China's environmental regulatory system and truly strengthen or improve the environmental protection institutions and ability of governments at all levels; (3) Based on the distribution of environmental affairs powers between the central and local governments, specify the responsibilities, rights and obligations of the administrative departments of environmental protection of the central government and the local governments; (4) Through environmental regulatory system reform and innovations, focus on smoothing out and solving the environmental regulatory system problem where 2 to 3 departments have serious conflict; (5) While strengthening the unified environmental regulatory functions, raise the position and role of the environmental protection department in integrated decision making on social and economic development. The article also mentioned that the ideal institutional reform plan is to establish “a ministry of environment”. It suggested that “In the institutional reform of the next government, local agencies of the administrative department for environmental protection of the State Council should be established. The local agencies may adopt two forms or schemes: One is a regional agency; in other words, regional environmental protection agencies are to be set up for contiguous administrative areas. The other is by river basin; in other words, river basin environmental protection agencies are to be established. These detached agencies will all be led and administered by the State Council's administrative department for environmental protection and all their budgets will be arranged through central finance”^②.

① Xia Guang: *Thoughts and Suggestions Concerning Environmental Protection Institutional Reforms*, 2002.

② Chinese Academy for Environmental Planning: *Plan for China's Environmental Protection Administration System Reform*, 2002, P3 & p14.

2.4.9 On the principal-agent theory and its applications

In the field of institutional economics, the principal-agent problem generally refers to all the opportunist acts of the agent to be free from punishment when the principal has oversight. The well-known economists Wolfgang Kasper and Manfred E. Streit summarized the principal-agent problem as follows: "If the agent is aware that the principal does not know much about the details of its acts or maintains "rational ignorance", and that it can adopt opportunistic acts yet be free from punishment, then the agent will be tempted to act in an opportunistic way".^①

Principal-agent is a kind of common phenomenon in modern social life. Understood literally, entrusting means to entrust others to act for oneself, whereas agency means to act on behalf of others. The entrusting party is known as the principal, while the entrusted party is known as the agent. The emergence of the principal-agent problem is related to the following two factors: One is inconsistency of goals between the principal and the agent, while the other is information asymmetry between them. When there is more than one principal, the principal-agent problem is even further aggravated. It is held in institutional economics that there is a common motive of self-benefiting among economic entities. The principal's goal of interest maximization often needs to be realized through the agent's acts. However, the principal's goal is not necessarily always the same as that of the agent. The self-benefiting nature of the agent, and information asymmetry between the principal and the agent, are bound to result in the agent using its information advantages to maximally meet its own utilities through reducing labor efforts or adopting opportunistic acts. The effectiveness of principal-agent is also related to the length of the principal-agent chain. When the principal-agent chain is too long, the information asymmetry problem will become more serious and the cost of supervision will get higher.

The principal-agent problem is most likely to occur among large-sized organizations, such as enterprises and government institutions. In these organizations, there is often a lack of constraint and competition, making it easier for agents to

^① Kasper, W. and M. E. Streit: *Institutional Economics: Social Order and Public Policy*, Commercial Press, 2003, pp:77~78.

escape punishment for their opportunistic acts, and therefore able to take chances. In modern society, the principal-agent relationship exists widely in the social, economic, political and legal fields, such as between shareholders and company managers, between company managers and employees, between citizens and their political agents, between political leaders and executive bureaucrats under them, and so on.

The essence of the principal-agent theory is to solve the problem of incentives for the agent under the condition of information asymmetry. The solutions normally include: (1) The principal controls the agent through direct supervision or compulsory orders. If the principal is very familiar with the acts of the agent and the actions it is likely to take, then it can use instructions to command the agent. If the agent does not obey, the principal can punish it. However, this method will result in high supervision costs. (2) Formulate rules and incentive measures to force the agent to pursue the principal's interests out of consideration for its own interests. In other words, this is indirect control. This method can induce the agent to voluntarily act according to the will of the principal, thus saving supervision cost.

The principal-agent theory was first used to explain enterprises' organizational behavior. Later, it was used in research on bureaucratic systems. In the field of environmental regulatory problems, Mara Kathryn Warwick of Stanford University employed the principal-agent theory to conduct in-depth analysis of the role of bureaucracy, legislatures and citizens in environmental information collection and enforcement at small-scale enterprises in Shanghai. In her PH.D thesis *"Environmental Information Collection and Enforcement at Small-scale Enterprises in Shanghai: The Role of the Bureaucracy, Legislatures and Citizens"*, she reached the following research conclusions: "My research shows that this information asymmetry exists between the agents and principals in this analysis, in particular between township EPOs and district EPB officials, and between district EPB officials and SEPB"; "Citizens and people's congresses (as principals) also suffer from an information asymmetry; i.e., they do not have the capacity to independently collect information about the environmental performance of the vast majority of small-scale enterprises; they must rely on the information supplied by the bureaucracy. However, as described above, information collection by district EPBs and township EPOs is

limited, and in addition, most of this information is not made public. Therefore, citizens and people's congresses are insufficiently informed about the cumulative impacts of small-scale enterprises.”^①

2.5 Literature analysis

On the whole, domestic experts hold fairly unanimous views about the importance of environmental regulation in the power industry. Currently, the problem of environmental pollution in the power industry has drawn great attention from all walks of life. However, most current research on strengthening power industry pollution control in China still remains at the technical, policy and standards level. There is no special research on how to strengthen power industry pollution control from the aspect of improving the regulatory system.

Of course, weak environmental regulation in the power industry is closely related to the overall low level of environmental law enforcement in China. In the past decade or so, China has scored considerable achievements in environmental protection. However, non-compliance and weak enforcement are still common. Regarding the problem of weak environmental law enforcement, domestic scholars have done considerable research, but theoretical analysis has been minimal. The few cases of theoretical analysis all concern economic analysis. Institutional analysis is lacking. As for institutional research, there have been many suggestions as to how to raise the position of the administrative department for environmental protection and how to increase its environmental regulatory functions. There have been less discussions about the structural shortcomings of the system itself.

Regarding these blank research spots, the author has decided to take environmental regulation in Jiangsu Province's power industry as an example and through in-depth surveys and research, find out the problems with environmental regulation in Jiangsu. Then by theoretical analysis, the author will look for the institutional root causes of weak regulation, particularly the structural shortcomings of the system. Finally, with reference to international experiences, the author will

^① Mara Kathryn Warwick, “Environmental Information Collection and Enforcement at Small-scale Enterprises in Shanghai: The Role of the Bureaucracy, Legislatures and Citizens”, Stanford University, 2003

make policy recommendations for improving the environmental regulatory system of China's power industry. As for theoretical methodology, the author has selected the principal-agent theory in institutional economics as its analytical framework. The specific analysis process and conclusions will be introduced in Chapter 6.

Chapter 3 Research Methodology, Key Topics of Survey and Research and Theoretical Analysis Framework

3.1 Research Methodology

This paper is a survey and research report. It mainly adopts the methods of interview, literature review and theoretical analysis. The specific arrangements will be as follows: (1) Through interviews with environmental protection officials and experts both in Jiangsu Province and at the national level, and by sifting through environmental protection laws, regulations and policies, find out the main problems with environmental regulation in Jiangsu Province's power industry. (2) Use the principal-agent theory in institutional economics to analyze the institutional root causes of weak environmental regulation in Jiangsu Province's power industry, particularly structural shortcomings of the system. (3) Through sifting through foreign literature on environmental regulation, learn about the current status and future trends of the environmental regulatory system in countries with relatively successful environmental protection, and examine which experiences can be used as reference for China.

The paper is completed basically through qualitative research, for the following reasons. Environmental protection data obtained from the environmental protection statistics channels is based on local environmental protection bureaus reporting level by level, and for this reason suffers from poor accuracy and reliability. At the same time, the relatively truthful information obtained by environmental protection departments at all levels through site inspections is listed by the local government as confidential information, and therefore not open to other government departments or the public. (Such information asymmetry between the upper-level and lower-level environmental protection departments is precisely a problem for key analysis in this thesis). When more accurate environmental protection data cannot be obtained, the author will try to use qualitative description to reveal some in-depth problems with environmental regulation in Jiangsu Province's power industry,

3.2 Key topics of survey and research

The key survey and research contents of the paper will cover the following aspects:

- (1) Current status and development trends of the environmental regulatory systems abroad;
- (2) China's laws, regulations and institutional systems as related to environmental protection in the power industry;
- (3) Current status of Jiangsu Province's power industry and status of environmental pollution;
- (4) Environmental regulatory system in Jiangsu Province's power industry;
- (5) Main environmental regulatory problems in Jiangsu Province's power industry.

3.3 Theoretical Analysis Framework

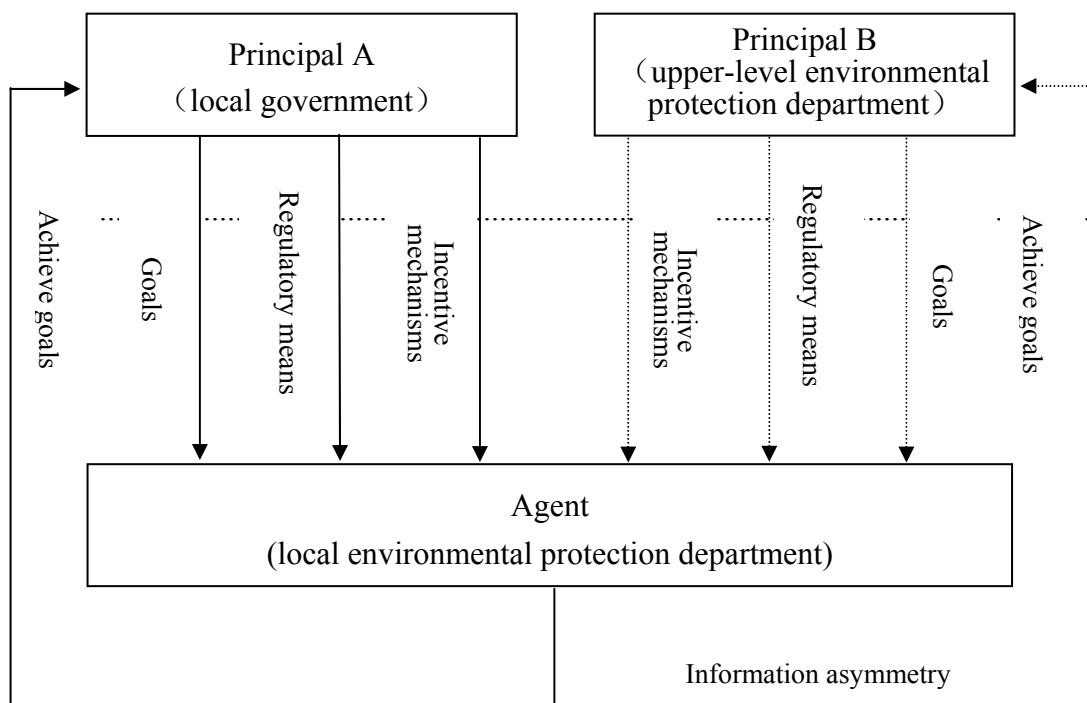


Fig.3.1 Analytical Framework of the Principal-Agent Theory

This paper uses the principal-agent theory in institutional economics to analyze the institutional root causes of weak environmental regulation in Jiangsu Province's power industry. In the field of institutional economics, the principal-agent problem refers to the opportunistic acts of the agent free from punishment when the principal is supervising. The essence of solving the principal-agent problem lies in addressing the problem of incentives to the agent under information asymmetry conditions. The emergence of the principal-agent problem is related to two factors: One is inconsistency of goals between the principal and the agent, the other is information asymmetry between the principal and the agent. When there is more than one principal, it is even easier for the principal-agent problem to become more serious. In the principal-agent relationship examined in the current paper, the agent is the local environmental law enforcement agency, while there are two principals: Principal A is the local government leader, while Principal B is the upper-level environmental regulatory agency. As Principal A, the local government leader has multiple goals, including economic growth, environmental protection, increasing jobs and getting good results in cadre assessment. Among these goals, economic growth is often seen as the primary goal, while environmental protection is in secondary position. As Principal B, the upper-level environmental regulatory agency has a relatively monolithic goal, namely, environmental protection. Because pollution control in the power industry often requires a very high cost input, Principal B's environmental protection goal is in conflict with Principal A's goal of pursuing short-term economic benefits. In this situation, it will depend on the principals' regulatory means and incentive mechanisms to the agent as to which principal's goal will be taken as the agent's primary goal. Concerning the problem of environmental regulation in Jiangsu Province's power industry, control of personnel appointments and fund sources for the local environmental law enforcement agency are both in the hands of the local government leader, while the local government owns a strong controlling power and gives effective incentives to the local environmental law enforcement agency. In comparison, the upper-level environmental regulatory agency has weak control and incentives over the local environmental law enforcement agency. It is very obvious that when the goals of the two principals are in conflict, the rational agent will choose

the goal of the principal with a stronger influence on it as its primary goal. However, the existence of information asymmetry provides the conditions for the agent to concurrently meet both Principals' goals. The agent can take advantage of the information asymmetry between itself and Principal B to process and filter the information on the pollutant discharge by the power enterprises which it administers. Or it can join hands with the enterprises who violate the environmental protection laws in order to cope with Principal B's inspection. In this way, on the surface at least, the agent has completed the tasks assigned to it by both principals, thus avoiding the principals pursuing its responsibilities.

3.4 Selection of object for survey and research

China's environmental regulatory system is highly consistent nationwide. In other words, "administrative area-based, level-by-level regulation" is adopted across the country. When selecting the region for survey and research, the author mainly considered three factors: (1) maturity of the power market in the region; (2) level of economic development in the region; and (3) government leaders' attitude towards environmental protection in the region.

Firstly, the maturity of the power market in a region is closely related to the direction of power sector reform. The development of power sector reform has a profound impact on the environment. Therefore, regions with a relatively well-developed power market can better represent the development direction of the nationwide power market, as well as the impact of the power industry on the environment. Secondly, if the economy in a region is relatively developed, it will have a stronger economic ability to tolerate the implementation of strict environmental standards and systems. Selecting such a region for survey and research can maximally reduce the constraint of economic tolerance of environmental protection, thus allowing more focused discussions about the institutional problem. Finally, government leaders' attitude towards environmental protection is also an aspect needing consideration. This can maximally remove the adverse effect of government leaders' personal thinking on environmental protection, thus allowing a more objective analysis of the institutional causes of weak regulation.

Based on these three criteria and through discussions with several experts, the author has decided to select Jiangsu Province as its survey and research object. Jiangsu is a province which started pilot power sector reforms fairly early in China. At the same time, it is an economically developed province. According to State Environmental Protection Administration officials, officials of the Jiangsu Provincial Government have adopted a very positive attitude towards environmental protection, and the province has taken a lead in environmental protection work over its peers in the country. Therefore, the author believes that taking Jiangsu Province as an example in order to analyze problems with the environmental regulatory system in China's power industry will be highly representative.

Chapter 4 Introduction to Foreign Experience

The course of environmental protection development in other countries has shown that in the process of industrialization, many countries had to face up to the conflict between economic growth and environmental development. They have also experienced the serious principal-agent problem which China is experiencing now. Environmental protection experience in other countries shows that a powerful environmental regulatory system will play an important role in reducing pollutant discharge and improving environmental quality. From the late 1960s to the early 1970s, most countries in the world established an environmental protection department. As environmental problems got more serious and environmental protection pressures mounted, many countries started to introduce their environmental protection policies. At the same time, they have also endeavored to look for solutions in the environmental regulatory system to better coordinate the conflict between economic growth and environmental protection. Of course, the environmental regulatory system that a country adopts will to a great extent depend on such factors as the country's existing political and economic system, the government regulatory system, market operation mechanisms and social and cultural characteristics. However, the general trend is that these countries have shown many common features during the process of strengthening their environmental regulatory systems: expanding the functions of the administrative department for environmental protection, raising the status of the administrative department for environmental protection, setting up regional environmental regulatory branches, establishing cross-departmental environmental protection coordination institutions, expanding the numbers of personnel of environmental regulatory bodies, and increasing investment in environmental protection. Conducting research into the process of environmental regulatory system development in foreign countries is of immense reference value with regard to China's environmental regulatory system. Below, a brief introduction will be made to the environmental regulatory systems in the United States, Japan, France and Canada, where environmental regulation has been fairly successful.

4.1 The United States

In the United States, the Federal Environmental Protection Agency is the administrative department for environmental protection. It is a government agency which is independent and reports directly to the president. The director of the Environmental Protection Agency is nominated by the president and his appointment takes effect upon approval by Congress. The director is a member of the cabinet. The current position of the Federal Environmental Protection Agency is attributable to the government institutional reform in 1970. The US president then centralized the environmental protection functions which were scattered among the Department of Agriculture, the Department of Health, Education and Welfare (now the Department of Health and Healthcare), the Interior Department, the Nuclear Energy Commission, the Federal Radioactive Substance Administration Commission and the Environmental Quality Commission, to give the Environmental Protection Agency full exercise over them. During more than 30 years of development, the US Federal Environmental Protection Agency has progressively strengthened its functions and has now developed into a large-scale government department, with independent law enforcement and high authority. Its main functions include: formulating and supervising the implementation of environmental protection standards; organizing environmental research; providing policy guidance and funding to the environmental pollution activities staged by state and local governments, private bodies, individuals and educational institutions; and also assisting the National Quality Commission to provide and recommend new environmental protection policies to the president. Starting from 1996, the US Federal Environmental Protection Agency has seen its budget rising year by year: from \$6.281 billion in 1996 to \$7.257 billion in 2001. The total number of staff in the Federal Environmental Protection Agency has also increased to over 18,000 at present from over 5,000 at the time of its being established, up by over twofold. The personnel makeup of the Federal Environmental Protection Agency consists mainly of two parts: One is the around 6,000 personnel at the Washington headquarters, who are responsible for formulating various environmental protection policies. The other includes approximately 10,000 work

staff distributed around the 10 regional offices across the United States, who are responsible for organizing the specific implementation of environmental protection policies, and supervising the implementation of various policies in the various states. In addition, the US Environmental Protection Agency also has some 2,000 directly affiliated research personnel. They offer technical support for policy formulation.^①

In the US environmental regulatory system, other relevant departments, rather than the Environmental Protection Agency, also exercise certain environmental protections within their administrative power: The Department of Commerce is responsible for the administration of endangered species; the Interior Department is responsible for administering the environmental impact of open mining activities and owns the administrative right over the State-owned land inside its jurisdiction; the Department of Transport is responsible for the administration of dangerous waste transportation and the Nuclear Energy Administrative Commission is responsible for preventing and controlling radioactive pollution.

The US environmental regulatory system is divided into the following levels: the US Federal Environmental Protection Agency, regional offices of the Federal Environmental Protection Agency, the state environmental protection agencies, the detached office of the state environmental protection agencies and the local (county and city) environmental protection departments.

The US Federal Environmental Protection Agency divides the 50 states in the United States into 10 regions for administration. At each major region, it sets up a regional environmental office. Each regional office represents the Federal Environmental Protection Agency to execute federal environmental laws, implement various plans of the Federal Environmental Protection Agency in the states which it administers, and also supervises the environmental protection work in each state. These 10 regional offices are an important part of the US Environmental Protection Agency. All the work staff of the regional offices are members of the Environmental Protection Agency, who number almost 10,000, accounting for some half of the total employees of the Federal Environmental Protection Agency. The appointment of the

^① Xia Guang, Zhou Xin and et al: *Research on the Relationship Between National Environmental Policies and Regulatory Systems*, July 2002, p:67.

regional offices' leadership, personnel pay and work budget are all decided by the Federal Environmental Protection Agency. The regional offices are only accountable to the Federal Environmental Protection Agency. Because the regional administrative officials are appointed by the Federal Environmental Protection Agency's executive officials, the state environmental protection agency cannot exert any influence on the appointment of regional employees^①.

In the United States, the administrative department for environmental protection in each state does not belong to the Federal Environmental Protection Agency. Instead, it independently performs its duties according to the laws of each state. The division of functions between the federal and state environmental protection agencies is based on consultations between the two sides and finalized in the form of law. Such federal and state relationship is known as "Federal—state partnership". The regional offices of the Federal Environmental Protection Agency are the key to the implementation of such partnership. They serve as the representative of the Federal Environmental Protection Agency to supervise environmental protection work in the various states. The administrative department for environmental protection of each state is responsible to the state government, while being subject to supervision and inspection by the Federal Environmental Protection Agency. In the execution of federal laws and policies, all the states need to draw up implementation plans and report them to the Federal Environmental Protection Agency for examination and approval. The various states formulate their state-level environmental protection laws and regulations in accordance with the provisions of law. However, the state-level environmental protection standards are no less strict than the national environmental protection standards. The personnel arrangement of the state environmental protection agencies are decided by the states themselves. The appointment of their directors and the formulation of their budget follow similar mechanisms to those of the Federal Environmental Protection Agency. The state governor makes a proposal for the state congress to approve before taking effect.

The relationship between state and local (county and city) environmental

^① Tian Chunxiu and Li Liping: *Trend of Strengthening of Environmental Regulatory Institutions in Foreign Countries*, World Environment, Issue 2, 2002.

protection agencies can be divided into two types: One is rather simple, in which the state environmental protection agency directly undertakes environmental administration across the state, with the various counties and cities not setting up environmental regulatory bodies. Some fairly small states adopt such a system, for example Delaware and Washington DC. The other one is identical to the Federal Environmental Protection Agency → regional office of the Federal Environmental Protection Agency → state environmental protection agency. The state environmental protection agency will also set up branches to supervise and administer local environmental law enforcement agencies, namely: state environmental protection agency → branch of state environmental protection agency → local (county and city) environmental protection agency. States that cover a large area and have a large population often adopt this system, such as California and Oregon.

To facilitate the coordination of the relationships between the various government departments, a cross-department environmental regulation and coordination institution, the US National Environmental Quality Commission, is also set up within the US environmental regulatory system. This Commission is established in accordance with the *US Environment Policy Law*, and is under the US President's Office. In principle, it acts as an advisor to the president on environment policies, and is also the main body for formulating environment policies. Its functions include: providing the president with consultation on environment policies; coordinating various executive departments' environmental activities, and so on. The Commission has played an important role in the effective implementation of national environmental protection work in the United States.

4.2 Japan

The Ministry of the Environment is the administrative department for the environment in the Japanese government, and supervises and administers environmental protection work in a unified manner. The main functions of the Ministry of the Environment include: formulating and implementing the overall environmental protection policies of the government; independently administering affairs which particularly have environmental protection as their purpose; and, along

with other ministries and departments, jointly handling affairs that have environmental protection as their partial purpose. For affairs and utilities which affect the environment, the Ministry of the Environment will intervene from the environmental protection perspective through ways such as giving advice. The Ministry of the Environment is directly affiliated to the cabinet of the prime minister, and can engage in direct dialogue with the prime minister on relevant issues. The minister of the Ministry of the Environment is a major cabinet member and has the opportunity to take part in politics. The Ministry also has the right to ask other ministries and departments to provide necessary information and explanations on relevant issues. On important affairs, it has the right to ask other ministries and departments to make suggestions. This forms an important institutional assurance for the Ministry of the Environment to participate in national economic management and include environmental regulation on the national administrative agenda.

The predecessor of the Japanese Ministry of the Environment was the Department of the Environment. Starting from the late 1980s, environmental regulatory work in Japan progressed on all fronts. Particularly after urban environmental problems and global environmental problems were put on the agenda, the Department of the Environment became more important. Its budgetary funds also were continuously rising, growing at an annual average of 5.4%. In 2001, the Department of the Environment was upgraded into the Ministry of the Environment, and also then became responsible for equipping and maintaining waste treatment facilities. Its budget reached 277 billion Yen and the total number of its work staff also rose to 1,311 in 2001 from 501 in the early period, more than doubled.^① Under the Department of the Environment, a deliberation committee was set up, which consisted of experts, scholars, retired central and local government officials and representatives from enterprises, citizens and NGOs. According to Japan's Basic Law on the Environment, the functions of the Deliberation Committee was to provide policy consulting services to the prime minister and the Ministry of the Environment. Its members were appointed by the prime minister. Currently, the Deliberation

^① Xia Guang, Zhou Xin and et al: *Research on National Environmental Policies and Administrative Systems*, July 2002, p:66.

Committee is divided into a comprehensive affairs committee, a policy planning committee and 10 other specialty committees on different environmental problems. The Deliberation Committee is a permanent body but not a government department.

Before the Department of the Environment was upgraded into the Ministry of the Environment, the environmental regulatory system of the central government in Japan adopted a typical “dispersed administration” structure. The Department of the Environment was responsible for formulating environmental protection policies and plans, and for supervising and administering nationwide environmental protection work in a unified manner. Other relevant ministries and departments were responsible for specific environmental protection work in their sector. When the various departments formed consensus views, this structure could result in united efforts. But more often than not, such a structure of dispersed administration easily created coordination difficulties between departments, as well as high coordination costs. In January 2001, the Department of the Environment was upgraded to the Ministry of the Environment, and the environmental regulatory duties of some ministries and departments were brought under the Ministry of the Environment for unified administration. This has greatly improved on the past situation of the administration being too dispersed.

As for the structure of responsibilities between the central government and local governments, the specific implementation of pollution control measures is mainly completed by local governments. While requiring the establishment of national environmental standards, Japan’s *Basic Law on Public Hazard Prevention* has also granted local authorities greater authority in connection with the formulation of local pollution control policies. The local governments play a major role in controlling pollution in industries and in solving urban environmental problems. However, the administrative department for environment of local governments in Japan is only responsible for the local government. The Ministry of the Environment holds exchanges on professional issues with the local governments and in most instances does not make direct contact with the local environmental law enforcement agencies. The environment standards formulated by local environmental law enforcement agencies are all stricter than those formulated by the central government. As for the

improvement of environment regulatory systems, local governments have also taken the lead. The central government is responsible for regional environmental regulation over large areas. In Japan, most land belongs to the State. Policies concerning land development, road construction, port building and water resources development and relevant protection issues are all under the control of the central government. Besides this, the central government adopts measures such as financial subsidy and issuing bonds to support local environmental monitoring facilities and environmental protection R&D capacity building. It also offers aid to small- and medium-sized enterprises to arrange pollution treatment facilities and to develop technologies. Subsidies from the central government are an important source of funds for local environmental protection.

What is worth noting is that Japanese enterprises have a strong awareness of environmental protection and adopt an independent environment management model. This is mainly attributable to the system of “enterprise administrators for public hazard prevention” established and implemented in the 1970s. This system aims to establish pollution control mechanisms within enterprises and make enterprises adopt independent actions and assume the responsibility for protecting the environment. Japanese enterprises generally have an environmental protection committee headed by their top executives. Such committees guide the environmental protection work in the units under the enterprises. Affiliated units whose pollutant discharge is over a certain level also need to set up an environmental management department, with the head of the units acting as the person in charge. Currently, most Japanese enterprises have included environmental protection work into their production system, and consciously adopt long-term pollution control measures.

4.3 France

In France, the environment regulatory functions are vested in the Ministry of National and Regional Development and Environmental Protection. This Ministry enjoys wide environmental regulatory authority and is responsible for all policies concerning environmental quality, water and air pollution, waste treatment and natural environment protection. It also formulates France’s national sustainable

development strategy^①. This model, which puts the national and regional development functions and the environmental functions in one organization, is very good for better embodying the environmental protection thinking in national and regional development planning. Other departments, such as water resources management, energy, nuclear energy safety and health and transportation, also have some responsibilities for environmental protection. When these departments make decisions relating to environmental protection, the minister for development and environmental protection needs to hold joint responsibilities along with the executive heads of these departments. As for the problem of inter-agency coordination, France has set up a ministerial-level environmental committee. Under the leadership of the Ministry of National and Regional Development and Environmental Protection, this committee offers guidance and coordination on relevant environmental issues between various departments of the central government to promote the implementation of environmental protection policies.

France's environment department was established in 1971. At that time, it was named the Ministry of Natural Conservation and Environment. When the Ministry of Environment was first established, it did not have a personnel force to support its operations. Later on, the government gradually realized that environment regulation involves different disciplines and departments. Subsequently, it successively transferred to the environment department some powers of the government departments that were previously established and organized according to sectors. This was in an effort to establish a highly efficient environmental regulatory system. Even if some functions have not yet been transferred, the environment department will coordinate and cooperate with those government departments that have more professional knowledge, political influence and financial resources, and exert an influence on them^②.

France is a republic. Its fiscal and legislation powers are concentrated in the central government, while local governments have very limited independent powers. As far as environmental protection is concerned, it is still the central government that formulates unified policies, while the local governments are responsible for

① ESSA Technology Co. Ltd and Chinese Academy for Environmental Planning: *Comparative Analysis of Environmental Protection Institutions in Canada, India, Brazil and France*, Environmental Policy in China, 3(1), January 14, 2002.

② Lovei Magda, Charles Weiss: *Environmental Administration and Systems in OECD Countries: experiences and lessons*, World Bank Technical report No.391, pollution management series.

implementation and administration. The main tasks of the Ministry of National and Regional Development and Environmental Protection include four aspects: monitoring environmental quality, protecting the natural environment, preventing, reducing and eliminating pollution and hazardous substances, and improving the quality of life. Among these four, pollution control is in a priority position in the Ministry's strategies. Under the Ministry, a sustainable development committee is also established. This committee provides consulting to the Ministry of National and Regional Development and Environmental Protection, sets the policy directions for sustainable development, and recommends national sustainable development strategies to the government. Environmental regulation in France is basically undertaken at four levels: state, region, province and city/town. Due to a high level of concentration, environmental protection work in cities and towns is also carried out under the strict control of the national environmental protection department.

4.4 Canada

Canada's Ministry of Environmental Protection is a statutory department which guides government policies and planning for environmental regulation and performs comprehensive coordination. The minister for environmental protection is directly accountable to the Parliament. In accordance with the *Environmental Department Act*, the Ministry of Environmental Protection is responsible for the comprehensive coordination of the policies and projects of the Canadian government. These policies and projects aim to conserve the natural environment and improve environmental quality. Its specific functions include: protecting and improving the quality of water, air, soil and other natural resources; protecting the ecological environment, including migratory birds and other non-indigenous animals and plants; conserving and protecting Canada's water resources; making weather forecasts; strengthening the implementation of the provisions for border water bodies formulated by the Canada-US International Joint Committee; and coordinating the environment policies and planning of the federal government. The powers, tasks and functions of the minister for environmental protection are so extensive that they can't be matched with

by other Canadian government departments^①.

The Office of the General Auditor of Canada independently executes auditing and inspections, provides the Parliament with objective information, suggestions and assurances, and uses this to supervise the operational responsibilities of the government and optimize implementation. In the process of revision of the *Auditor-General Act* in 1995, the post of environment and sustainable development commissioner was set up in the Office of the General Auditor. The establishment of the post is to let the government state on the greening of its policies, operations and projects. The environment and sustainable development commissioner needs to provide an annual report to the House of Commons on notable environmental and sustainable development issues. The 25 federal departments and bureaus need to formulate a sustainable development strategy and submit it to the environment and sustainable development commissioner to examine and verify. The implementation of the strategy is also subject to the supervision by the commissioner.

Another important feature of Canada's environmental regulatory system is the establishment of the Canadian Environmental Evaluation Agency. The Agency is set up according to *The Canadian Environmental Evaluation Act* which took effect in 1995. It is an independent agency which administers environmental evaluation at the federal level. The Environment Evaluation Agency is responsible for administering the federal environmental evaluation procedures and provides the public with opportunities for participation in the process of environmental evaluation. The Environmental Evaluation Agency directly reports to the minister for environmental protection and operates independently of all the federal government institutions, including the Ministry of Environmental Protection. The Agency is also responsible for leading the High-Level Administrative Committee on Environmental Evaluation participated in by all federal government departments. It offers guidance on environmental evaluation and forges cooperation between departments.

Although the Ministry of Environmental Protection has the function of

① ESSA Technology Co. Ltd and Chinese Academy for Environmental Planning: *Comparative Analysis of Environmental Protection Institutions in Canada, India, Brazil and France*, Environmental Policy in China, 3(1), January 14, 2002.

comprehensively coordinating the environmental policies and plans of the Canadian government, many other departments have also been granted specific responsibilities, so that they can provide special environmental technical expertise related to their own sector. These include the Ministry of Agriculture and Agri-Product, the Ministry of Fisheries and Oceans, the Ministry of Health and the Ministry of Natural Resources.

Canada has also set up a ministerial-level environment committee to serve as a forum for Canadian government departments to discuss environmental problems of both domestic and international concern, and to adopt joint actions. Its primary purpose lies in strengthening environmental protection and promoting sustainable development. Thanks to such a high-level, inter-agency environmental coordination institution, Canada has formed a complicated and efficient environmental regulatory system, which ensures a high degree of coordination in environmental regulation between departments and governments at all levels.

Canada's vertical environmental regulatory system is similar to that of the United States. The federal government and the provincial governments are jointly responsible for environmental regulation, and in accordance with the law, strictly divide their powers for such regulation. The municipal authorities have relatively limited powers and responsibilities for environmental regulation. For cross-provincial environmental problems, Canada has also set up regional branches of the Ministry of Environmental Protection.

4.5 Chapter summary

The environmental regulatory systems adopted by the 4 countries all have their respective features, and it is difficult to ascertain which is the best. The environmental regulatory system of a country needs to be determined by the political and economic system, the government administrative system, market operation mechanisms and social and cultural features of that country. Throughout more than 30 years of development, the United States, Japan, France and Canada have explored many successful avenues of environmental regulatory system building. Although the national conditions in these countries are very different from those in China, their successful experience is certainly of value in assisting China to establish its own

environmental regulatory system. A brief summary is given below of the outstanding features of the environmental regulatory system in the four countries.

The US Environmental Protection Agency divides the 50 US states into 10 major regions and sets up a regional environmental office in each region. In the states which it administers, each regional office implements federal environmental laws on behalf of the federal environmental protection agency. It also carries out the various plans of the US Environmental Protection Agency and supervises environmental protection work in each state. The regional office is an important part of the federal environmental protection agency and accounts for almost half of its total staff. The appointments of the regional office leadership, personnel pay and work budget are fully decided by the US Environmental Protection Agency. In most states, no city or county environmental regulatory agencies are set up below the state level. A system is adopted in which the state environmental protection agency directly administers environmental protection work below the state level. Under the Office of the President, a national environmental quality committee is set up. This committee provides the president with advice on environmental policies. At the same time, it also coordinates the environmental regulatory activities of the various executive departments. Japan has upgraded its Department of the Environment into the Ministry of the Environment, making the administrative department for environment a leading member of the cabinet. Local governments are mainly responsible for implementing pollution control measures. They also enjoy a fair amount of authority over pollution control policies. The administrative department for environment of the local government is only responsible to the local government. The Ministry of the Environment mainly exchanges with the local governments on local environmental issues and generally does not come into contact with the local administrative department for environment. A system of “enterprise administrators for public hazard prevention” is adopted, to encourage enterprises to carry out independent environmental management. In France, the financial and legislative powers are concentrated in the central government. The central government formulates environmental protection policies in a unified manner, while the local governments are responsible for implementation. Environmental protection work in

cities and towns is carried out under the strict control of the national environmental protection department. A ministerial-level environment committee is set up to coordinate environmental issues between government departments. Under the Ministry of National and Regional Development and Environmental Protection, a sustainable development committee is set up to establish the direction of sustainable development policies and to suggest national sustainable development strategies to the government. Canada's Ministry of Environmental Protection has also set up regional branches to supervise environmental protection work in the various provinces. In the Office of the General Auditor of Canada, a commissioner for environment and sustainable development is set up to examine and verify the sustainable development and greening aspects of the policies and plans formulated by various government departments. Another feature of the Canadian environmental regulatory system is the establishment of an environment evaluation agency. This agency operates independent of all the federal government departments and is responsible for administering the environmental evaluation of projects and plans. A ministerial-level environmental committee is also established to ensure a high level of coordination in environmental regulation between the departments and governments at all levels. In addition, there has been a trend of continuously strengthening administrative functions of the administrative departments for environment in these countries throughout the past 30 years.

Table 4.1 Features of Environmental Regulatory Systems in the United States, Japan, France, and Canada

Features of Environment Regulatory System

USA The federal environmental protection agency divides the 50 states into 10 major regions and sets up a regional environmental office for each region to supervise environmental protection work in the various states.

In most states, no city or county environmental regulatory bodies are set up below the state level. A system is implemented whereby the state environmental protection agency directly administers environmental protection work below the state level;

Under the Office of the President, a national environmental quality

committee is set up. This committee advises the president on environment policies. At the same time, it coordinates the environmental regulatory activities of the various government departments.

Japan Environment regulatory functions are highly concentrated in the hands of the Ministry of the Environment. The Ministry is a major member of the cabinet;

Local governments are mainly responsible for implementing pollution control measures. They also have wide power over the formulation of pollution control policies;

The administrative department for environment of the local government is only responsible to the government. The Ministry of the Environment mainly engages in exchanges with local governments, and generally does not directly come into contact with local administrative departments for environment;

A system of “enterprise administrators for public hazard prevention” is adopted to encourage enterprises to carry out independent environment management.

France Financial and legislative powers are concentrated in the hands of the central government. The central government formulates environmental protection policies in a unified way, while local governments are responsible for implementation. Environmental protection work in cities and towns is also carried out under the strict control of the national administrative department for the environment;

A ministerial-level environment committee is set up to coordinate environmental issues between government departments;

Under the Ministry of Development and Environmental Protection, a sustainable development committee is set up to establish the direction for sustainable development policies and to recommend national sustainable development strategies to the government.

Canada The Ministry of Environmental Protection sets up regional branches to supervise environmental protection work in various provinces;

In the Office of the General Auditor of Canada, a commission for environment and sustainable development is established to examine and verify

the sustainable development and greening aspects of the policies and plans formulated by various government departments;

An environmental evaluation agency is set up. It operates independent of all federal government departments and is responsible for administering the environmental evaluation of projects and plans;

A ministerial-level environmental committee is set up to ensure a high level of coordination in environmental regulation between departments and governments at all levels.

Chapter 5 Environmental Regulation in Jiangsu Province's Power Industry

5.1 Overview of Jiangsu Province's natural and economic environment

Jiangsu Province is located in the center of the eastern coastal area of mainland China. Situated at the lower reaches of the Yangtze River and the Huaihe River, Jiangsu adjoins the Yellow Sea in the east, neighbors Zhejiang and Shanghai in the southeast, and connects with Anhui Province on the west and Shandong Province in the north. The province has a land boundary 3,383 Km long and covers a land area of 102,600 Km², accounting for 1.06% of the national total, ranked the 24th in China. Jiangsu has a total population of 74.38 million, claiming 5th place among the provinces in China. Population density reaches 725 persons/Km², the highest in the country. Jiangsu now has 13 province-directly-administered cities.

Since the reform and opening-up, Jiangsu Province has scored remarkable social and economic achievements. Since 1992, its total output value has maintained 2-digit growth. In 2003, the province saw its best economic indicators since 1997. Total output value reached RMB 1.24518 trillion, up 13.5% over 2002, accounting for 10.7% of the national total. Per capita total output value topped \$2,000. Local general budget revenues amounted to RMB 79.8 billion, up by 27.8%. Fiscal revenues totaled RMB 196.89 billion, up by 23.1% year-on-year. Import and export value totaled \$113.67 billion, up by 61.7%. This made Jiangsu to be the second province in China, after Guangdong, to bring its import and export value over the \$100 billion mark. Actual direct foreign investment reached \$15.8 billion, accounting for 1/5 of the national total. Residents' per capita savings deposit topped RMB 10,000^①.

In recent years, Jiangsu Province has also made major progress in economic restructuring. Industrialization has gathered pace, while the services industry has maintained a fast growth momentum. In 2003, added values in the primary industry in Jiangsu reached RMB 110.68 billion, demonstrating a growth rate basically level with

① Source: *Jiangsu Statistics Yearbook 2004*, www.jssb.gov.cn.

the previous year. Added values amounted to RMB 678.23 billion in the secondary industry, up by 17.2% and to RMB 456.27 billion in the third industry, up by 11.7%. The ratio of the added values between the three industries was 8.9:54.5:36.6. Jiangsu is a cradle of China's national industries. It is a production base of textile, machinery, electronics, petrochemicals and building materials in China. The province has topped the country's added industrial value list for many consecutive years. In 2003, added industrial values in the whole province reached RMB 594.7 billion, accounting for 47.8% of the gross output value, up by 3% over 2000. Production value in heavy industry accounted for 63.5% of the industries over a certain scale. This shows that Jiangsu has entered a heavy industry development stage^①.

5.2 Status of power industry development and environmental pollution in Jiangsu Province

5.2.1 Power production and demand in Jiangsu Province

Jiangsu is an economically developed province in China. It also consumes vast amounts of electricity. During the Ninth and Tenth Five-Year Plan periods, economic growth in Jiangsu was particularly strong, and its power industry also grew quickly. At the end of 2003, installed power generating capacity in the province reached 22.08 million KW, while power output amounted to 133.676 billion KWh, slightly lower than in Guangdong and Shandong. With the supplementary power from outside, total power consumption in Jiangsu Province reached 150.512 billion KWh in 2003, up by 20.88% over 2002 and 2.15 times the amount in 1995^②. Despite this, Jiangsu still faced a power shortage of 3.90 million KW in 2003. In 2004, power demand in the province grew further. The maximum power shortage in summer exceeded 8 million KW. This made Jiangsu the province with the most serious power supply and demand conflict in China. Forecasts made by the concerned department shows that during the Eleventh Five-Year Plan Period, newly installed power generating capacity in Jiangsu is expected to be over 20 million KW.

① Source: *Jiangsu Statistics Yearbook 2004*, www.jssb.gov.cn.

② Source: *Jiangsu Statistics Yearbook 2004*, www.jssb.gov.cn.

5.2.2 Power structure in Jiangsu Province

Jiangsu lacks hydropower resources. Thermal power accounts for over 99.8% of the province's installed power generating capacity. Most of the thermal power generating units are coal-fired units, while oil-fired and waste heat-based generating units account for only a very small percentage. Currently, there is only one nuclear power generating unit in Jiangsu, that is, Tianwan Nuclear Power Plant in Lianyungang. In the first phase, the generating capacity will be 1 million KW. This nuclear power plant is currently still under construction.

5.2.3 Current status of environmental pollution in Jiangsu Province

In Jiangsu's power structure, coal-fired power generation is in an absolutely dominant position. The power industry accounts for some 65% of the total coal consumption in the whole province. The use of coal is the main cause of sulfur dioxide emissions and acid rain. Jiangsu is the only province in China which has both acid rain control areas and sulfur dioxide pollution control areas. The 10 cities of Nanjing, Wuxi, Xuzhou, Changzhou, Suzhou, Nantong, Lianyungang, Yangzhou, Zhenjiang and Taizhou were listed by the State as the key areas and key cities for "Two Controls" during the Tenth Five-Year Plan Period. In 2000, 574,000 tons of sulfur dioxide was emitted by Jiangsu's power industry, accounting for 47.7% of the total sulfur dioxide emissions in the whole province, higher than the national average. Given the province's percentage of the country's installed thermal power generating capacity, it is clear that the level of sulfur dioxide control in Jiangsu's power industry is actually higher than the national average^①. In 2000, Jiangsu accounted for 8.3% of China's total installed thermal power generating capacity, while its power output accounted for 8.7% of the country's total thermal power output. However, Jiangsu accounted for only 7.1% of the total sulfur dioxide emissions in China's power industry.

With the rapid growth of power consumption, there has been a trend of increase in the incidence rate of both sulfur dioxide emissions and acid rain in Jiangsu

^① Environmental Protection Department of Jiangsu Province and Environmental Protection Institute of State Power Corporation of China: *Performance-based Pollution Control Policies for Jiangsu province's Power Industry*, May 2003, p:14.

Province. In the 3 years from 1999 to 2001, sulfur dioxide emissions from the thermal power industry of the province reached 551,000 tons, 574,000 tons and 601,000 tons respectively, which accounted for 48.5%, 47.7% and 48.2% respectively of the total sulfur dioxide emission in Jiangsu^①. From 2003 to 2004, Jiangsu faced a serious power shortage. Large-scale coal-fired power plant construction commenced. In 2003, as much as 1.24 million tons of sulfur dioxide was emitted in the province. This made Jiangsu the 6th largest sulfur dioxide emitter in China, after Shandong, Hebei, Guangdong, Shanxi and Henan. According to Jiangsu's Tenth Five-Year Sulfur Dioxide Emission Reduction Plan, sulfur dioxide emissions in the "Two Control Zones" in the province at the end of 2005 needed to drop by 20% from 2000. For other regions, the target would be a reduction of 10%. However, the actual implementation result of the plan shows that there was no reduction in sulfur dioxide emissions in Jiangsu Province in 2003 as compared with 2000. On the contrary, there was actually an increase of 40,000 tons. The emission level in 2004 was basically level with 2003, while the acid rain incidence rate in cities reached as high as 1/3. One official at the Department of Environmental Protection of Jiangsu Province said: "Thermal power plants are a major contributor to sulfur dioxide emissions, accounting for almost 50% of the total. At present, these thermal power plants are precisely the slowest in implementing desulfurization projects". A total of 121 desulfurization projects were listed in Jiangsu's Tenth Five-Year Plan, more than 70 of which were thermal power plants. However, 37 have not yet started construction, and 34 of these are thermal power plants. Apart from sulfur dioxide pollution, coal-fired power plants also emit large amounts of nitric oxides, carbon dioxide and inhalable particles, which seriously affect the ecological environment and public health in Jiangsu.

① Environmental Protection Department of Jiangsu Province and Environmental Protection Institute of State Power Corporation of China: *Policies for Emission Performance and Pollution Control in Jiangsu province's Power Industry*, May 2003, p:14.

5.3 Environmental regulatory system of Jiangsu Province's power industry

It was introduced in Chapter 2 that daily supervisory and regulatory work on environmental protection in China is basically undertaken by the environmental protection bureau system. Discussions below will therefore focus mainly on the environmental protection bureau system's environmental regulation of the power industry.

At the end of 2003, Jiangsu's environmental protection system employed a total of 9,074 people. Among them, 2,115 were in the environmental protection bureaus, 2,509 in supervision institutes and 3,349 in monitoring stations. The work staff in the provincial environmental protection department numbered 82. Together with the personnel in the supervision institutes, monitoring stations, research institutes, publicity and education centers and information centers, the number of work staff in the provincial-level environmental protection system in Jiangsu totals 384. The number of work staff in the prefecture- and city-local environmental protection system was 2,243, while the number at the district- and county-level was 6,223. In townships, the number of administrative personnel for environmental protection stood at 224^①.

In China's environmental regulatory system, an administrative area-based, level-by-level regulation model is adopted. The main functions of environmental protection departments at all levels include:

(1) Implement national and local environmental protection policies, laws, regulations and standards, organize the implementation of the systems of pollution fee and "Three Concurrents" for construction projects, centralized pollution control, declaration and registration of pollutant discharge and a system of permit on discharge of pollutants (the last three are limited to the provincial level); (2) Organize the environmental impact assessment on major local economic policies and overall plans; (3) formulate local environmental protection laws, regulations and policies,

^① State Environmental Protection Administration: China Environment Statistics Yearbook 2003, pp: 235~238.

draw up the pollutant discharge standards and environmental quality standards (limited to the provincial level); (4) formulate local environmental protection plans and take part in the formulation of local medium- and long-term social and economic plans, as well as annual plans; (5) supervise and regulate pollution control and environmental monitoring work in their administrative areas, and also regulate natural environmental protection work in their administrative areas in a comprehensive manner; (6) take part in examining and approving the environmental impact assessment for basic construction projects and for technological renovation reconstruction projects (limited to the provincial level), together with development and construction projects which are over the set quotas; (7) regulate environmental supervision work in their administrative areas, investigate and handle environmental pollution accidents and ecological destruction problems; and (8) organize the implementation of: comprehensive environmental rectification assessment work; the system whereby local top executives assume responsibility for environmental protection targets; and the system of environmental law enforcement responsibilities.

In China, the environmental protection bureau system is only set up down to the district and county level, this being its lowest end. It does not extend to townships. Some district- and county-level environmental protection bureaus do assign township environmental protection administrative personnel to supervise the situation of pollutant discharge by small-sized enterprises. However, these personnel do not have the power of environmental protection law enforcement.

The environmental protection department regulates power enterprises mainly through participating in examining and approving construction projects, as well as supervising and administering enterprises' pollutant discharge. Environmental protection departments at all levels in Jiangsu have the following divisions of functions for participating in examining and approving construction projects and for supervising and administering enterprises' pollutant discharge:

(I) Project examination and approval

The powers of examining and approving power construction projects are mainly vested in the national and provincial-level administrative department in charge. Before September 2003, the procedure for examining and approving construction

projects was that the responsible department for investment (the development and reform committee) examined and approved project proposal and feasibility research reports, and then reported them to the environmental protection department to make examination and approval concerning environmental impact assessment and environmental protection. After the *Environment Impact Assessment Law* came into effect in September 2003, construction projects must be reported to the environmental protection department for environmental impact assessment first. They can only be reported to the responsible department for feasibility study and investment examination and approval after they have passed the environmental impact assessment (after 2004, a system of verifying project application reports was adopted). As for thermal power construction projects, those of 200,000 KW and over need to be reported to the State Environmental Protection Administration for environmental impact assessment and environmental protection examination and approval. Projects of 50,000 KW and over must be reported to the Department of Environmental Protection of Jiangsu Province for environmental impact assessment and environmental protection examination and approval^①. Because small power plant projects under 50,000 KW cause serious pollution and have low efficiency, in recent years the State has explicitly forbidden their construction.

(II) Pollutant emission administration

The functions of supervising and regulating pollutant discharge from power plants are jointly completed by the provincial, prefecture/city and district/county environmental protection departments. For power enterprises with an accumulated installed generating capacity of 300,000KW and above, the Department of Environment Protection of Jiangsu Province is responsible for supervising their pollutant discharge and collecting the pollution fee on them. For enterprises with an accumulated installed generating capacity of less than 300,000KW which discharge pollutants, the city environmental protection bureaus are responsible for supervising

^① No.15 Order of the State Environmental Protection Administration: *Provisions for Level-by-Level Examination and Approval of Environmental Impact Assessment Documents for Construction Projects*, November 1, 2002.

their pollutant discharge and collecting the pollution fee on them. For the remaining small power plants, the district and county environmental protection bureaus are responsible for supervising their pollutant discharge and collecting the pollution fee on them. The installed generating capacity of those small power plants which are under the regulation of district and county environmental protection bureaus is very small, totaling only around 4 million KW. However, these power plants are numerous, their power generation efficiency is low and they cause serious pollution.

5.4 Environmental protection innovations in Jiangsu Province

With the rapid development of the power industry, the Jiangsu Provincial Government has in recent years strengthened environmental protection. In 2000, it upgraded the provincial environmental protection bureau into the provincial environmental protection department and made it a "Level 1 bureau" in the provincial government. It is understood that in China only Jiangsu and Hainan have already listed their environmental protection departments as a "Level 1 bureau" of their government. In 2002, Jiangsu was the first to pilot such policies as implementing generation performance standards for power enterprises, and sulfur dioxide emission trading. These attempts, which try to minimize the social cost of pollution control through market trading, have produced a demonstration model for environmental governance work in other provinces and municipalities across China. To strengthen environmental regulation at the district and county level, Jiangsu has also undertaken the pilot implementation of a system of vertical administration of environmental protection bureaus under the city level in three cities, including Xuzhou. In October 2004, Jiangsu set up an environmental supervision bureau. By dividing the province into different regions, it also established branches of the bureau. In recent years, Jiangsu has achieved notable results in the drive to modernize its environmental supervision system, and has greatly improved its capacity for environmental law enforcement. Statistics of the Financial Department of Jiangsu Province and the People's Bank of China-Nanjing Branch show that in 2004, pollution fees collected in the province topped RMB 870 million, up 13% over RMB 770 million in 2003, Jiangsu thereby claiming the top spot in China in pollution fee collection for 4

consecutive years. Early in 2005, Jiangsu issued the *Interim Measures for Assessing Environmental Protection Work Performance for Major City and County Party and Government Leaders in Jiangsu Province*. This clearly shows Jiangsu's determination to pursue harmonious development between the economy and environmental protection.

5.5 Main problems in environmental regulation in Jiangsu Province's power industry

The efforts made and the results achieved by Jiangsu Province in the area of environmental protection in the power industry environmental protection are there for all to see. However, there are still many difficulties and obstacles in the environmental regulation of the power industry by the environmental protection department. Through interviews with relevant persons, the author has learned that the main problems with environmental regulation in Jiangsu's power industry include the following.

5.5.1 Interference of local protectionism in environmental law enforcement

In China, the idea of "Development is the hard truth" has been brought home to most people. An economic growth-centered cadre evaluation system has caused government leaders to make the pursuit of short-term economic growth their top priority. In recent years, the economy of Jiangsu has been developing very fast. Its economic structure is dominated by high energy-consuming industries such as textile, machinery, electronics, petrochemical and building materials. This economic structure has greatly increased the reliance of Jiangsu's economic development on energy supply. In 1998, power oversupply occurred in China. To avoid repetitive power building and investment waste, the State Development and Planning Commission adopted strict measures to restrict the building of new energies. Throughout that period of several years, Jiangsu Province maintained fast economic growth, and the existing power generation facilities could no longer meet the power demand. According to an official at the Department of Environmental Protection of Jiangsu Province, Jiangsu then reported a dozen power projects of 300,000KW to the

State Development and Planning Commission for approval. However, macro regulatory measures were adopted by the State Development and Planning Commission at the time, and the reported projects were kept for 2 years without approval. To prevent power shortages restricting its economic development, Jiangsu chose to bypass the examination and approval procedure of the State Development and Planning Commission, and built a number of small power plants with an installed generating capacity of 125,000 KW. However, these small power plants adopted rather outdated equipment and technology. Their generation efficiency is low and their pollutant emissions are heavy. Moreover, once they are in operation, they can only be retired after 15 to 20 years. This group of power plants have caused immense destruction to the environment. The official admitted: "The practice is not scientific at all. Large generating units need to be built". However, when there is conflict between economic development and environmental protection, government leaders will choose making environmental protection give way to economic growth. This problem is particularly serious with the county-level environmental protection department. The official noted: "Currently, the environmental protection department is under too much control by the local governments There are very complicated interpersonal relationships in the county government. If the director of the county environmental protection bureau gets too strict with environmental protection and obstructs economic development, the county governor will transfer him or her out."

During the interviews, the author has learnt that it is quite common for government leaders to intervene in environmental protection law enforcement. On one hand, this is related to the aforementioned idea of letting environmental protection give way to economic development. On the other hand, administration by law has just started in China, and the idea of rule by men is still strong, a legacy from several thousands of years. In early 2005, the State Environmental Protection Administration ordered the stoppage of 26 power plant construction projects which run against the *Environment Impact Assessment Law*. 7 of them are in Jiangsu Province, with an accumulated generating capacity of 4.86 million KW, more than twice the installed generating capacity of Gezhouba Hydropower Plant. It is very obvious that the construction of such a large number of projects which violate the

environmental protection law, right under the very eyes of the Department of Environmental Protection of Jiangsu Province and the city-level environmental protection bureaus, is bound up with the support and connivance of the government. Experts at the State Power Corporation's Environmental Protection Institute have noted that both the power plants' breach of environmental assessment procedures and the power shortage are related to the support by government leaders. In 2003, Jiangsu encountered a large-scale power shortage and had to pull switches to restrict power uses. Many enterprises could only open for operation for 3 days a week. In 2004, the power shortage in Jiangsu topped 8 million KW to become the province with the most serious power supply and demand conflict in China. The grave power shortage situation forced Jiangsu to accelerate power plant building. However, according to the provisions, only when a project has gone through environmental protection examination and approval and investment examination and approval can banks grant it loans, and these followed by construction. To solve the problem of power shortage as quickly as possible, the provincial government held emergency executive meetings, instructing that "Once projects are mature, construction can start". Then, a number of large-scale power construction projects got bank loans through government guarantee and started construction ahead of schedule, with their environmental impact assessment not having been done.

In the words of an environmental protection official, the environmental protection department has contracted the "softening bone syndrome" before local governments". This problem also has something to do with the fact that most large-sized power enterprises in China are State-owned enterprises. These large-sized State-owned enterprises often invest over RMB 100 million on construction projects. If a project fails to pass environmental impact assessment and has to be delayed, the risks of the enterprises and banks will eventually be assumed by the government. Once they start construction, enterprises can create huge economic benefits in a short period of time. For districts and counties with backward economic development, power enterprises occupy a much more important position in the eyes of the local government. An expert with the State Power Corporation's Environmental Protection Institute noted: "Power plants mean economic benefits to the local government.

Power enterprises can bring huge tax revenues to it. Some local governments are financially in the red, but once power plants are built, they will immediately be in the black. So, when power plant projects meet with the environment bottleneck, government leaders will definitely come out to solve it. Currently, civil servants' bonuses and welfare are all related to taxes. Pursuing economic benefit is therefore consistent with civil servants' own interests". He added: "The environmental protection personnel also have difficulties in law enforcement. Sometimes, when they mete out heavy punishments on enterprises city mayors and provincial governors will stand out to speak up for power enterprises. Government leaders are always very self-confident when they speak for power enterprises."

Intervention by government leaders has placed significant pressures on the environmental protection department, which in such circumstances can only "choose to be lax in enforcement". One official at the State Environmental Protection Administration said: "Institutionally, the heads of local environmental protection bureaus are appointed and paid for by the local government. This has often led to a situation where 'Those who remain in their post can not resist the law violation acts, while those who can resist cannot keep their post'". In the interview, the author has also found that there are in addition problems with some environmental protection officials' understanding of the relationship between economic development and environmental protection. One environmental protection official took the following view: "China is currently in a stage of primitive accumulation of capital and takes a road of extensive development. It is normal to sacrifice some environmental interests. Developed countries in the West have also taken the same road. For the environmental protection department, solving environmental protection problems is important. But, the more important thing is to cooperate with the government to boost the economy and raise people's standard of living. When the living standard of the ordinary people is raised, they will naturally have higher expectations of the environment. By then, we will have more money to work on environmental protection". It is clear that local protectionism has become the primary obstacle in the process of environmental protection law enforcement.

5.5.2 Lack of environmental oversight in the power sector reform

The author has learnt from the Department of Environmental Protection of Jiangsu Province and Jiangsu Power Grid Corporation that, before the power sector reform and restructuring, the provincial power bureau had the power of environmental protection and was responsible for regulating pollutant discharges from power enterprises affiliated to the provincial government, and for collecting pollution fees on behalf of the provincial environmental protection department. The environmental protection funds allocated by the provincial environmental protection department were also issued by the provincial power bureau to power enterprises (small power plants not under the provincial power bureau were administered by local environmental protection bureaus). Experts at Jiangsu Power Grid Corporation disclosed that the provincial power bureau had very detailed information on the quantity and sulfur content of fuel coal as well as the operational status and efficiency of dust catchers and desulfurization devices of its power enterprises. At the same time, because the pollution fee rate was rather low and the amount paid was not big, enterprises had no reason to cheat. Therefore, the environmental protection information and data obtained by the provincial power bureau were fairly genuine. As the power sector reform progressed, the power bureau was abolished and the provincial power company's generation assets were split. The power company then became the grid company and no longer had the right of leadership over generation enterprises. Though the newly established State Electricity Regulatory Commission stipulates in its institutional setup plan that it has some environmental protection functions, its primary task now is to regulate market operations. At the same time, because the State Council has yet to coordinate the environmental regulatory functions of the State Electricity Regulatory Commission and the State Environmental Protection Administration, the State Electricity Regulatory Commission has so far not formally done any environmental protection work.

After the power sector restructuring, all the environmental protection work of generating enterprises under the power bureau was transferred so as to come under the direct regulation of the provincial environmental protection department and the city environmental protection bureau. In developed countries, pollutant sources are

monitored by requiring enterprises to install continuous pollutant monitoring equipment and connect it with the network of the environmental protection department. In Jiangsu Province, the requirement for installing continuous smoke monitoring equipment in newly-built power plants was in place after a new thermal power plant pollutant discharge standard was adopted in 2003. There was no such equipment in old power plants. Even though the new power plants have the equipment installed, it is not yet connected to the environmental protection bureau's network. Consequently, the environmental protection department cannot keep real-time monitoring on enterprises' pollutant discharge. Information from the Department of Environmental Protection of Jiangsu Province and Jiangsu Power Grid Corporation suggests that the environmental protection department normally gets data on power enterprises' pollutant discharge through the following 3 channels: One is the pollutant discharge data reported by enterprises, such as through the pollutant discharge declaration and registration procedure; the second is the data which the environmental protection department gets from its regular monitoring of enterprises; and the third is the data which the environmental protection department estimates according to enterprises' power output and fuel coal quantity. However, there are problems concerning the reliability of all these 3 types of data. Firstly, the pollution fee rate has been rising continuously over recent years. In order to pay less pollution fees, most enterprises report less pollutant discharge. Secondly, the environmental protection department has limited manpower, but the number of enterprises that discharge pollutants is large. Technically, monitoring power enterprises' pollutant discharge is relatively complicated and takes a long time. As a result, the environmental protection department monitors power enterprises' pollutant discharge once a year at most. For such type of monitoring, it is very easy for enterprises to adopt measures to lower the level of pollutant discharge on the day of monitoring. Therefore, the data obtained from one monitoring session in a year can hardly represent the normal level of enterprises' pollutant discharge. Thirdly, because the environmental protection department does not have first-hand information on the amount and sulfur content of the coal consumed by enterprises, the estimated pollutant discharge amount is not very reliable. We know that pollutant discharge data

is the main basis for the environmental protection department to charge the pollution fee to enterprises which discharge pollutants, and to mete out punishments on activities that violate environmental protection laws. One can imagine that if the environmental protection department cannot get true data on enterprises' pollutant discharge, how can it effectively regulate enterprises that discharge pollutants?

5.5.3 Several government departments have overlapping responsibilities in overseeing the power industry

In China, government departments have overlapping responsibilities for regulating the power industry. In a way, the power industry has several “mothers-in-law”: the right to examine and approve investment in power construction projects (changed to “verification” in 2004) and the power planning functions are vested in the responsible department for investment and planning, the right to set electricity prices and formulate tax policies is jointly controlled by the hands of the responsible investment department and the financial department, the right to manage assets of State-owned power enterprises lies in the administrative department for State-owned assets, while the right of environmental regulation of power enterprises is in the hands of the environmental protection department. The responsible department for investment and planning, the financial department and the department for asset management all make decisions on the power industry within their respective authorities and responsibilities. Due to the lack of a cross-departmental coordination body, the policies introduced by these departments are sometimes in conflict with the environmental protection goals in China.

The examination and approval system for power construction projects stipulates that all coal-fired power plant construction projects must be subject to examination and approval by the State Development and Planning Commission. This policy helps the State to undertake macro regulation of investment in coal-fired power plants. However, in the past few years, when power supply could not meet demand, Jiangsu reported to the State Development Planning Commission a dozen 300,000KW and 600,000KW coal-fired power plants projects. Because no approval was obtained, Jiangsu had to bypass the State examination and approval procedure, so they built a

number of small power plants with an installed generating capacity of 125,000KW per unit. For thermal power plants, the bigger the generating capacity per unit, the higher their generation efficiency and the less pollution per unit power output in relative terms. This examination and approval system actually encourages the local governments to choose small power plants with low generation efficiency and heavy pollution. Moreover, once coming into operation, these power plants can only be retired in 15 or 20 years. The damage to the environment is considerable. In addition, the State also imposes very strict control in its examination and approval of the construction of power plants generating electricity using renewable energy. Even wind power plants with a total installed generating capacity of 50,000 KW need to undergo examination and approval by the State Development and Planning Commission^①. In fact, power generation by renewable energy basically causes no emissions and is thus of great significance in improving environmental quality. Strict examination and approval control is undoubtedly not good for encouraging the large-scale development of renewable energy power generation. An expert with the State Power Corporation's Environmental Protection Institute believes that the power shortage in the past few years and the current disorderly power plant construction situation are closely related to China's investment examination and approval system. He put it like this: "The function of the government should be to make proper forecasts and appropriate planning, and to guide the market through policies, while investors should make their own decisions on whether to go ahead with a project. However, civil servants now are all of an administrative rather than service type. They are not willing to decentralize their power. The problem of sectoral interests is the biggest obstacle to reform. In many countries, power construction projects go to the environmental protection agency for environmental approval, and report to the power regulatory commission for project filing. Someone has said that 'China's examination and approval system is a malignant tumor for economic development'. The tumor must be cut off. The current verification system is a variant form of the

① The State Council: Catalogue of Government-Approved Investment Projects (2004 Edition), July 16, 2004.

examination and approval system and still needs further thorough reform”.

As for the implementation of the environmental impact assessment system, an expert with the State Power Corporation's Environmental Protection Institute notes that “planning and environmental assessment is very important but also more difficult”. He puts forward two very realistic issues: local governments attach importance to planning, but what mechanism can the environmental protection bureau use as a constraint to local planning? The 2020 energy plan formulated by the National Development and Reform Commission does not involve the environment, how can the State Environmental Protection Administration make environmental impact assessment of the energy plan? He said: “The pollutant control goals of the environmental protection bureau are set based on the pollutant discharge data reported by enterprises. Many enterprises report less, because they fear that they will get more fines if they report more. The allocation of total pollutant discharge volume does not take environmental capacity as a criterion and is thus not scientific. Environmental capacity should be used to determine the total volume targets, and these targets should then be included in the development plan of the National Development and Reform Commission. In addition, when the premier has approved a certain plan at an executive meeting of the State Council, it will be impossible for the State Environmental Protection Administration not to let it pass the environmental assessment. Similarly, the local environmental protection bureau dare not disapprove a plan which has been set by the local government head. ”

State-owned asset management policies and fiscal policies will also affect the development of environmental protection. Concerning State-owned power enterprises' asset management, the State-Owned Asset Supervision and Administration Commission of China adopts a policy to encourage State-owned enterprises “to become bigger and stronger”. Backward enterprises are likely to face the fate of acquisitions or restructuring. This policy has quickened the power building steps of various State-owned generation groups, who were already very active after the power sector reform was launched, causing disorderly construction in the power industry. It has also worsened the threat of power plant building to the environment. The influence of the financial department on environmental protection in the power

industry lies in that it controls the electricity price and other fiscal policies relating to the power industry. Some research institutions have made policy recommendations favorable to environmental protection, such as including environmental costs into the electricity price, setting up a clean power development fund and significantly raising the pollution fee level. However, out of concern for rising electricity prices, the financial department has not adopted many of these policy recommendations.

It is clear that the several departments which have regulatory powers over the power industry have different priority goals within their respective responsibilities. Their departmental policies play an important role in guiding power enterprises and thus have a profound influence on the environment. If there is conflict between the regulatory policies of some departments and China's environmental protection goals, then these policies are likely to become a stumbling block to environmental protection in the power industry. Therefore, it is necessary to establish a cross-departmental coordination body, to ensure a high level of coordination between the policies of various government departments with regard to the environment goals.

5.5.4 There is information asymmetry between environmental protection departments at various levels

The feature of the administrative area-based, level-by-level regulatory system is that local governments are responsible for the environmental quality in their administrative areas. Therefore, the local environmental protection bureau is most familiar with the environmental quality and enterprises' pollutant discharge in its administrative area. Upper-level environmental regulatory agencies mainly get comprehensive information on enterprises' pollutant discharge through enterprises' pollutant discharge declaration and registration and environmental statistics. However, the declaration and registration and environmental statistics are currently all filled in by the enterprises themselves and are then reported to the administrative department for environment, which will report to its superiors. Often, the information obtained this way has poor reliability. Regarding the implementation of specific key projects, the upper-level administrative department for environment may also get information on project implementation through the regular reports made by the lower-level

environmental protection department. However, due to limited manpower, it is impossible for the upper-level administrative department for environment to fully examine and verify the information reported from low level.

According to the *Bulletin on the Implementation Status of the Monitoring and Reporting System for Total Pollutants Volume From Key Pollution Sources in Jiangsu Province in the First Half of 2003*, released by the Department of Environment Protection of Jiangsu Province in September 2003, there were fairly significant problems with the pollutant discharge data that enterprises reported to the local environmental protection bureaus at various levels in Jiangsu. The *Bulletin* noted: "Improvement has been made in the quantity and quality of the reported data. However, the overall status of implementation is still not satisfactory. The main problems are as follows: (1) The environmental protection bureaus in some cities and counties do not pay enough attention to the work and have not carefully implemented the requirements put forward by the provincial department. They have not specified the tasks and responsibilities of the departments for pollution control, environmental supervision and monitoring. Work on urging data reporting and data examination and verification lags behind. All this has affected the timeliness and quality of data reporting. (2) Some cities have yet to carry out benchmark surveys on enterprises' self-monitoring capacities. They have not urged enterprises without the ability of self-monitoring to make entrusted monitoring as required by "the reporting system". This has resulted in a serious lack of self-monitoring data from enterprises. Some 45% of the enterprises have not reported their self-monitoring data. This has directly affected the accuracy of the gathered data on the total volume of pollutant discharge from key pollution sources. (3) The environmental supervision departments in some cities and counties have not assisted in urging enterprises to report their self-monitoring data, nor have they carefully verified the reported data. (4) A few cities and counties have not supervised or monitored some enterprises according to the requirement, nor have they given explanations about it. This has resulted in incomplete supervisory and monitoring data on some enterprises."

It can be seen from the above situation that in China's environment regulatory system, there is serious information asymmetry between upper-level and lower-level

environmental protection agencies. Such information asymmetry allows local environmental protection officials, under pressure from government leaders, to give green light to enterprises' unlawful discharge of pollutants. Meanwhile, when the upper-level environmental regulatory agencies make special inspections, the lower-level agencies can join hands with enterprises to cope with such inspections, such as letting enterprises suspend operations temporarily, or start up pollutant discharge facilities in order to prevent problems being inspected, and thus keep local environmental protection achievements unaffected.

5.5.5 Environmental protection departments lack adequate regulatory capacities

Weak regulation of the environmental protection department is mainly reflected in three ways: inadequate technical ability, insufficient law enforcement power and low qualifications of environmental protection personnel.

Inadequate technical ability is mainly because most enterprises have not installed continuous smoke monitoring equipment. Even if newly built power plants have installed such equipment, most of them are not yet connected with the network of the environmental protection bureau. The environmental protection department cannot keep real-time monitoring over enterprises which discharge pollutants, and are thus unable to get their real pollutant discharge data. One official at the State Environmental Protection Administration said: "One important source of environmental protection data is pollutant discharge declaration and registration. The system has its basis in *The Air Pollution Prevention and Control Law*, which requires enterprises to monitor pollutant discharge on their own and report the data to the local environmental protection bureau. Where enterprises have no self-monitoring ability, the environmental protection bureau shall assist in undertaking monitoring. In the case of changes in enterprises' pollutant discharge, their declaration and registration should be updated. Environmental monitoring stations above the district and county level shall perform supervisory monitoring on enterprises. Where some county monitoring stations have no ability to monitor power plants, prefecture- and city-level monitoring stations should do the work. However, a lot of preparatory work needs to

be done for monitoring big power plants. This requires a lot of manpower and takes a long time. Sometimes, it cannot be done in one day. The State stipulates that key pollution sources should be monitored at least once a year. Boilers in power plants are much bigger than boilers in other industries. Therefore, all power plants are basically key pollution sources. The ability to ensure monitoring of these power plants at least once a year is related to monitoring stations' capacity. Some power plants cannot even be monitored once a year". As to how to strengthen the environmental protection department's technical ability in pollutant discharge monitoring, the official said: "After the new air pollutant discharge standard for thermal power plants came into effect in 2003, all new power plants are required to be installed with online continuous monitoring equipment. The national plan is that all power plants, old or new, must be installed with online monitoring equipment before 2008. This is the first step. The next step is to achieve online networking with the environmental protection bureau."

As for law enforcement, China's current law stipulates that the maximum on-site fine which the environmental protection department can impose on environmental protection law violations is RMB 200,000. Specifically, the maximum fine authorization is RMB 10,000 for the county-level environmental protection department, RMB 50,000 for the city-level environmental protection department and RMB 200,000 for the provincial-level environmental protection department. For enterprises which fail to implement the environmental protection department's order for pollution treatment within a set time limit, or the punishment of shutting down, suspending operations or transformation into other uses, the Law however does not have a provision telling the administrative department for industry to cancel or suspend the business license of enterprises which are ordered to suspend production. The environmental protection department can only apply to the court for forcible execution. Also, generally speaking, the court can only impose fines or order judicial detention on enterprises which refuse to execute orders. It cannot seal up the enterprises or their production equipment. One official at the Department of Environmental Protection of Jiangsu Province observed: "The environmental protection bureau has very limited law enforcement powers. When enterprises have

unlawful pollutant discharge acts, and shutdown, suspension or transformation measures need to be adopted, it is often very difficult to execute. The law does not authorize the environmental protection department to exercise these powers. The environmental protection department carries out law enforcement on enterprises violation acts on behalf of the government. However, sometimes when environmental protection personnel go to shut down enterprises, they ended up being locked up by the enterprises instead”.

The problem of low qualifications on the part of the environmental protection personnel is mainly reflected in the county-level environmental protection department. It is understood that in the environmental protection bureau of a certain county in Jiangsu, there are a total of 11 work staff, while the director and his deputies number 7. One expert said: “County governments often take the environmental protection bureau as a place to offer jobs for those officials that are going to retire, and what they are interested in is how to arrange positions for people when personnel reshuffling is carried out. They do not much care about doing good environmental protection work. As a result, many environmental work personnel know nothing about environmental protection”. As to how to strengthen county-level environmental protection regulation, one official at the Department of Environmental Protection of Jiangsu Province said: “Jiangsu is piloting institutional reforms. The district and county environmental protection departments will be brought back under the direct administration of the city government, and thus be free from district and county government control. This covers personnel appointment.”

5.5.6 Penalties for enterprises' violation of environmental laws are low.

Another major cause of weak environmental regulation in Jiangsu Province is that the pollution fee rate is too low and the punishments for environmental protection law violations are not severe enough. Penalties for enterprises breaching environmental protection laws and regulations are too low. It is understood that Jiangsu currently adopts the same fee rate as the national standard on thermal power plants' sulfur dioxide emissions, namely RMB 0.42/Kg. In other words, a pollution fee of RMB 0.42 is charged on every 1Kg of sulfur dioxide that enterprises emit.

After July 2005, it was raised to RMB 0.63/Kg. By comparison, a one-time investment of around RMB 100 million needs to be made to install desulfurization equipment on a 300,000KW generating unit, which has an annual operating fee of some RMB 20 million. This is equivalent to a cost of RMB 2 for desulfurizing every 1Kg of sulfur dioxide. This is far higher than the cost of paying the pollution fee. Consequently, enterprises would rather pay the pollution fee than install desulfurization facilities.

One official with the Department of Environmental Protection of Jiangsu Province said: "The difficult problem with desulfurization is that it requires too big investment. RMB 100 million is needed to install desulfurization facilities on a 300,000 Kw generating unit. How can such funds be found for old generating units? Enterprises do face difficulties. In addition, they are not enthusiastic about such an undertaking, one which brings back no returns. Some years ago, we allocated a considerable part of the environmental protection fund to help enterprises to installed desulfurization units. However, operation became a problem after the facilities were installed. Desulfurization facilities involve a very high operating cost. At the time, such cost was not considered when determining the electricity price. For every extra KWh electricity generated, enterprises had to pay 2 fen. Sometimes, during our inspections, when we asked them why they did not open the facilities, enterprises complained to us. Therefore, the problem of desulfurization cost should be resolved by the electricity price". One environmental protection expert held the same view: "For the sulfur dioxide control problem, the government must offer assistance through the electricity price, such as making a 2 fen increase per kwh. This will encourage enterprises to voluntarily adopt desulfurization. Also, other measures may be considered. For example, priority grid access may also be offered to desulfurized power. Rewards should be given to law-abiding enterprises. At the same time, severer punishments should be adopted to make law breakers pay a high price. "

Similar problems exist with the environmental impact assessment system for power construction projects. According to the provisions of *The Environment Impact Assessment Law*, the maximum fine for enterprises that violate the environmental impact assessment system is RMB 200,000. For power construction projects that

generally involve investments of over RMB 100 million, a fine of RMB200,000 is almost nothing. Starting construction and generating power as early as possible is where enterprises' true interests lie. Therefore, these rules have actually sent a clear signal to enterprises that all rational enterprises will choose to pollute rather than invest in pollution control, once they have compared the costs.

Chapter 6 Analysis of Environmental Regulation in Jiangsu Province's Power Industry Using the Principal-Agent Theory

As for the problem of environmental regulation of Jiangsu's power industry, there are principal-agent relationships at three levels. Firstly, at the provincial level of environmental regulation, the provincial environmental protection department as an agent is entrusted by the two principals of the provincial government and the State Environmental Protection Administration to exercise supervision and administration of power enterprises' pollutant discharge in the whole province. Secondly, at the city level of environmental regulation, the city environmental protection bureau as an agent, is entrusted by the two principals of the city government and the provincial environmental protection department to exercise supervision and administration of power enterprises' pollutant discharge in the whole city. Thirdly, at the district and county level of environmental regulation, the district and county environmental protection bureau is entrusted by the two principals of the district and county government and the city environmental protection bureau to exercise supervision and administration of power enterprises' pollutant discharge in the whole district or county. In the principal-agent relationship at these three levels, the provincial environmental protection department and the city environmental protection bureau concurrently serve in the dual role of both principal and agent. It has been introduced in the section above that the main factors causing the principal-agent problem are inconsistent goals between the principal and the agent, and information asymmetry between the principal and the agent. As for the problem of environmental regulation in Jiangsu Province's power industry, the agents do not face just one principal. Also, the goals pursued by different principals are not consistent; there is even conflict between them. In such cases, agents' decisions as to which principal's goals to pursue will mainly depend on the principal's regulatory means and incentive mechanisms over the agents. Below, an introduction will be given to the respective goals of the principals and agents in the three levels of principal-agent relationship involved in the environmental regulation of Jiangsu's power industry. The problem of information asymmetry between the principals and the agents will also be described. On this basis,

the author will analyze the effectiveness of the regulatory means and incentive mechanisms adopted by the principal over agents' opportunistic behavior.

6.1 Goals of principals and agents

The goals of the principal and the agent introduced in this paper include both formal organizational goals and personal preferences. Government leaders as a principal, the environmental protection department as an agent and the environmental protection department both as principal and agent may have diversified goals. Between various goals, principals and agents need to balance and coordinate. Below, the goals of each principal and agent in the principal-agent relationship at the first level will be introduced.

Principal A——Jiangsu provincial government leaders

The goals pursued by Jiangsu provincial government leaders mainly include: economic growth, environmental protection, more jobs and good results in cadre assessment. The goal of economic growth often takes precedence over environmental protection. This is mainly because since the reform and opening-up started in 1978, pursuing economic growth has long been the main thinking in the work of the Chinese government. The slogan of "Development is the hard truth" put forward by Deng Xiaoping has profoundly influenced and encouraged successive government leaders from the central to the local level. China has gradually reformed its political system from great power concentration at the central level to decentralization. The taxation system reform implemented in 1994, which separated central from local taxes, means that local economic growth can directly affect the fiscal revenues of the local governments. Such a change has greatly stimulated local governments' enthusiasm to develop their economy. China's current cadre evaluation indicator system has also highlighted the importance of economic growth in the assessment of government leaders' work performance. In the cadre evaluation indicator system, there are more economic indicators than social development indicators. Also, economic indicators such as industrial production value and export value are easier to measure than social development indicators. Such economic indicators can easily be reflected in the increase in local governments' fiscal revenues. Good evaluation

results in annual evaluation will also affect the chances for personal promotion for officials and the rise in their welfare income. Therefore, China's current government regulatory system and cadre regulatory system determine that local government leaders will take economic growth as their top priority, while placing environmental protection in a secondary position.

From the relationship between economic growth and environmental protection, there are certain conflicts between these two goals in the short term. Pollution control often involves a rather high cost. For example, a one-time investment of around RMB 100 million needs to be invested to install desulfurization equipment on one 300,000 KW generating unit. Each year, it also requires an operating fee of RMB 20 million. For power plants, this is a big investment. High environmental standards and strict environmental law enforcement mean increased costs and reduced profits for enterprises. For the government, this implies falling fiscal revenues. For fairly old power plants or small-sized township enterprises, it is not economic to install such expensive pollution control equipment. Under strict environmental law enforcement, the consequences of not installing pollution control equipment may include having a high fine imposed, or being compulsory shut down or being ordered to carry out modifications. At such a time, what the government then faces will not be just falling fiscal revenue. Social problems such as big layoffs to workers also occur. Therefore, local government leaders sometimes will resist environmental law enforcement in order to protect enterprises' interests.

However, this does not mean that government leaders can totally ignore environmental protection. This is because the work of provincial government leaders is also subject to the supervision of the State Council, the provincial people's congress, the State Environmental Protection Administration and the public. If no consideration is given to the environmental impact in the process of economic development, and ongoing environmental destruction is caused, provincial government leaders are bound to draw attention to various supervisors and face pursuit of their own responsibilities. This also will affect their own career prospects. Therefore, for local government leaders, the wise thing to do is to ensure that environment policies are executed to a certain degree, while not letting environmental

protection drag down economic growth.

Principal B——State Environmental Protection Administration

The State Environmental Protection Administration pursues a fairly monolithic goal, namely environmental protection. Its functions include: “implement State environmental protection laws and regulations and policies, supervise and administer environmental protection work in the whole country in a unified manner, prevent and control environmental pollution, protect the natural and ecological environment, improve environmental quality, and promote sustainable social and economic development”. The State Environmental Protection Administration’s work in the area of pollution control mainly includes: “Formulate national environmental protection policies, laws and regulations, pollutants discharge standards and environmental quality standards, ask local environmental protection bureaus to carry out implementation, and guide local environmental protection bureaus to formulate local environmental protection laws, regulations and standards; formulate national environmental protection work plans and medium- and long-term plans; formulate and implement various environmental regulatory systems; organize the implementation of key environmental protection projects; investigate and handle major environmental pollution accidents and ecological destruction events”.

Agent ——Department of Environment Protection of Jiangsu Province

The goals pursued by the Department of Environment Protection of Jiangsu Province and its work staff are a combination of the goals of the two principals and the agent itself, which include: environmental protection, cooperation with provincial government leaders to develop the economy, personal promotion, better welfare treatment and so on.

Principal A firstly faces the multiple goals of economic growth, social development and environmental protection. When entrusting its agent to regulate the environmental problems in the whole province, it will also convey to the agent the hidden rule of economic growth taking precedence over environmental protection. When the author interviewed an official of the Department of Environmental Protection of Jiangsu Province, he said the following: “The responsibility of the Environmental Protection Department is to solve the environmental protection

problem. But more importantly, it is to cooperate with the provincial government to boost the economy. Only when there is money can there be funds for environmental protection". He viewed the relationship between economic growth and environmental protection in the following way: "China is now in a stage of primitive accumulation of capital and takes the road of coarse development. It is very normal to sacrifice some environmental interests. Developed countries in the West have also taken this road; the notion of avoiding 'pollution first and control later' is not scientific".

Principal B's goal is relatively monolithic, namely, entrusting the Department of Environmental Protection of Jiangsu Province to implement the State Environmental Protection Administration's environmental protection policies and pollution control plan, and at the same time, formulate and implement environmental standards and pollutant discharge standards based on the environmental pollution situation in the province. According to the *Compilation Plan for the Institutional and Personnel Setup Within the Functions of Jiangsu Province's Environmental Protection Bureau*, the Department of Environmental Protection of Jiangsu Province will mainly have the following responsibilities: in accordance with the law and administrative regulations, supervise and administer environmental protection work in the whole province in a unified manner, prevent and control pollution and other public hazards, protect and improve the living environment and the ecological environment, and promote the sustainable, harmonious and healthy development of the economy and society. As for its actual work, Principal B—the State Environmental Protection Administration, offers specific professional guidance to the Department of Environmental Protection of Jiangsu Province. Also, through formulating annual environmental protection work plans, five-year plans and environmental protection plans, it determines the key environmental protection work of the Department of Environmental Protection of Jiangsu Province every year and every 5 years. In accordance with the requirements of the annual plans and five-year plans formulated by the State Environmental Protection Administration, the Department of Environmental Protection of Jiangsu Province will arrange the daily work of environmental protection in Jiangsu Province.

Apart from completing the tasks assigned by the two principals, the Department of Environmental Protection of Jiangsu Province and its work personnel of course

also pursue goals such as personal promotion and improved welfare treatment. The principals' regulatory means and incentive mechanisms over the agent will mainly decide how the agent arranges the priorities of the various goals, and which principal's goals it will pursue, particularly when there is conflict between the various goals. In the next sub-section, the author will analyze this problem in detail.

In terms of organizational structure, the principal-agent relationships at the second and third levels are quite similar to those at the first level. Here, no specific introduction will be made to the goals of each principal and agent in the principal-agent relationship at the second and third levels. The following table fully sums up the goals of each principal and agent in the principal-agent relationship at the three levels involved in the environmental regulation of Jiangsu's power industry.

Table 6.1 Goals of Principals and Agents

Level 1	Goals (unranked)
Principal A—Jiangsu Provincial government leaders	<ul style="list-style-type: none"> ▪ Economic growth ▪ Environmental protection ▪ Increase employment ▪ Get good result in cadre evaluation
Principal B—State Environmental Protection Administration	<ul style="list-style-type: none"> ▪ Environmental protection
Agent —Department of Environmental Protection of Jiangsu Province and its work staff	<ul style="list-style-type: none"> ▪ Implement environmental protection laws, regulations and policies ▪ Complete the work plan arranged by the State Environmental Protection Administration ▪ Cooperate with the provincial government to develop the economy ▪ Personal promotions and better welfare treatment
Level 2	Goals (unranked)
Principal A—City government leaders	<ul style="list-style-type: none"> ▪ Economic growth ▪ Environmental protection ▪ Increase employment ▪ Get good result in cadre evaluation
Principal B—Department of Environmental Protection of Jiangsu Province	<ul style="list-style-type: none"> ▪ Environmental protection
Agent —City environmental protection bureau and its work staff	<ul style="list-style-type: none"> ▪ Implement environmental protection laws, regulations and policies ▪ Complete the work plan arranged by the provincial environmental protection bureau ▪ Cooperate with the city government to develop

Level 3	Goals (unranked)
	<ul style="list-style-type: none"> the economy ▪ Personal promotions and better welfare treatment
Principal A—District (County) government leaders	<ul style="list-style-type: none"> ▪ Economic growth ▪ Environmental protection ▪ Increase employment ▪ Get good result in cadre evaluation
Principal B—City environmental protection bureau	<ul style="list-style-type: none"> ▪ Environmental protection
Agent —District (County) environmental protection bureau and its work staff	<ul style="list-style-type: none"> ▪ Implement environmental protection laws, regulations and policies ▪ Complete the work plan arranged by the environmental protection bureau ▪ Cooperate with the city government to develop the economy ▪ Personal promotions and better welfare treatment

6.2 Information asymmetry

It was introduced in Chapter 3 that the environmental protection department regulates power enterprises through the two processes of environmental protection examination and approval before power plants are built and of pollutant discharge supervision and administration after power plants are put into operation. The problem of information asymmetry is mainly concentrated around the latter process, namely supervising and administering pollutant discharges by power plants. In this process, environmental protection departments at all levels mainly get environmental protection information from the following sources: the system of pollutant discharge declaration and registration; environment supervision and monitoring; environmental statistics; and tip-offs from the masses. A brief introduction will be made to these sources of environmental protection information and methods of information management.

(I) Declaration and registration of discharge of pollutants

The system of pollutant discharge declaration and registration was set by the National Environmental Protection Bureau in 1992, in accordance with the

requirements of Article 27 of the *Environmental Protection Law*^①. Information on enterprises' pollutant discharge obtained from the pollutant discharge declaration and registration channel is the main source for local environmental protection bureaus' environmental protection database. When enterprises' pollutant discharge situation changes, there is a need to update the pollutant discharge declaration and registration. According to the *Administrative Provisions for Declaration and Registration of Discharge of Pollutants* issued by the National Environmental Protection Bureau in 1992, the environmental protection agencies in various provinces, prefectures and cities, districts and counties are responsible for administering the declaration and registration system, while enterprises which discharge pollutants shall be responsible for completing a declaration and registration form and submitting it to the environmental protection bureau. The local environmental protection bureau will gather such information and report it to the upper-level environmental protection bureau, and through this kind of level by level reporting, this information will finally be submitted to the State Environmental Protection Administration. The decision also specifies that the environmental protection department shall have the right to investigate and verify enterprises' actual pollutant discharge. In 1998, the State Environmental Protection Administration designed one key environmental protection system —the system of “One Control and Dual Standard Compliance”^②, requiring the environmental protection bureaus in various localities to specify a list of “key pollution sources”, based on the pollutant discharge declaration and registration information. Enterprises on the said list needed to account for over 65% of the total local pollution volume.

The pollutant discharge declaration and registration system and the subsequent system of “One Control and Dual Standard Compliance” provide the conditions for the formation of information asymmetry between upper-level and lower-level environmental protection departments. Firstly, the pollutant discharge declaration and

① Article 27 of the *Environmental Protection Law* stipulates that “Enterprises and utility units which discharge pollutants shall make declaration and registration in accordance with the provisions of the administrative department for environmental protection of the State Council”.

② The system of “One Control and Dual Standard Compliance” requires enterprises to strengthen pollution control and reach the emission standard required by the State by the end of 2000 and also that total emissions in various localities should also reach the emission standard set by the State.

registration system requires that enterprises should monitor their pollutant discharge on their own and fill in the pollutant discharge form and report it to the local environmental protection bureau. Enterprises without testing equipment may invite the local environmental protection bureau to help with testing. The pollutant discharge declaration and registration system also stipulates that the local administrative department for environmental protection shall have the right to investigate and verify enterprises' pollutant discharge situation. In the regulation of power enterprises, their installed generating capacity is used to determine the administrative authority of the environmental protection departments at various levels. Information on small power plants' pollutant discharge is controlled in the district and county environmental protection bureau, while the city has information on the situation of pollutant discharge from key pollution sources with an accumulated installed generating capacity of less than 300,000 KW. Information on the situation of pollutant discharge by key pollution sources and those with an accumulated installed generating capacity of over 300,000 KW is controlled by the provincial environmental protection department. Secondly, the system of "One Control and Dual Standard Compliance" requires the environmental protection bureaus in various localities to specify a list of "key pollution sources". Enterprises on the list should account for over 65% of the local pollution load. This also offers a certain degree of freedom of environmental regulation for local environmental protection bureaus. They can decide on their own the list of "key pollution source" enterprises which account for over 65% of the total pollution load in the whole province.

(II) Environmental supervision

In the environmental protection department's environmental regulatory work, performing environmental supervision of enterprises which discharge pollutants is an important item. The purposes of such environmental supervision include: inspect the operational status of pollution sources and pollutant discharge facilities; collect pollution fees; inspect the status of progress in construction projects and projects ordered for compulsory treatment within a set time limit; investigate pollution accidents, mete out punishments and handle disputes; and carry out on-site investigation of reported incidents. According to the *Work System for Environmental*

Supervision (trial use) issued by the National Environmental Protection Bureau in 1996, on-site supervision of key pollution sources and pollution control facilities should be undertaken at least once a month; on-site supervision of ordinary pollution sources and pollution control facilities should be not less than once a quarter; on-site supervision of construction projects and projects ordered for compulsory treatment within a set time limit should be not less than once a month. Prompt on-site supervision should be done on pollution sources reported by the masses.

After environmental supervision is concluded each time, the supervision personnel should form a supervision report. The upper-level environmental supervision body will inspect the supervision work of lower-level supervision bodies at least once a year. Supervision bodies which cannot fulfill its supervision responsibilities according to law shall be ordered to make rectification, or even be reported to the administrative department for environmental protection of the same level to withdraw some of its environmental supervision authorities. The lower-level environmental supervision body should provide a full report on the environmental supervision work of the current year in its administrative area to the upper-level body before the end of December each year.

(III) Environmental monitoring

Environmental monitoring refers to the environmental quality monitoring undertaken by the environmental monitoring stations of environmental protection bureaus at various levels. The objects for monitoring include: discharge from pollution sources, air quality, water quality, seawater quality and so on. The pollutant discharge data obtained from the environmental monitoring of pollution sources are the main basis for charging enterprises the pollution fee. *The Administrative Measures for Pollution Sources Monitoring* issued by the State Environmental Protection Administration in 1999 requires environmental protection bureaus at all levels to formulate annual monitoring plans for their monitoring station. Enterprises on the "key pollution source" list will be included in the annual monitoring plan, and the monitoring stations will regularly monitor those key enterprises that discharge pollutants. According to the provisions, key pollution sources should be monitored at least once a year. However, it is understood that in actual practice this is very hard to

ensure. There is no regular monitoring requirement for small enterprises outside the list. Such enterprises are normally only monitored when tip-offs have been received from the masses about their pollutant discharge. Similar to the pollutant discharge declaration and registration system, the environmental supervision and monitoring of power enterprises of different sizes is controlled by the hands of environmental protection departments at different levels. Based on the monitored pollutant discharge data, the environmental protection department will collect the corresponding pollution fee from the enterprises.

Environmental monitoring reports are divided into two types: data-type reports and text-type reports. Data-type reports refer to various report forms and floppy disks compiled based on the original monitoring data and archived by local monitoring stations. Text-type reports refer to reports which mainly contain text descriptions based on the various monitoring data and comprehensive calculation results. These are regularly reported by local environmental protection bureaus to upper-level environmental protection bureaus and the people's government of the same level. *The Environmental Monitoring Report System* formulated by the National Environmental Protection Bureau in 1996 makes the following provision for pollution source monitoring reports: local environmental monitoring stations at various levels shall be responsible for verifying and accepting the pollutant discharge status data reported by units which discharge pollutants, and report the verified pollutant discharge data to the environmental protection bureau. Once a quarter, the local environmental protection bureau will provide the upper-level environmental protection bureau with a text report on the situation of pollution source monitoring in its administrative area. Provincial environmental monitoring stations should sum up the monitoring data and basic information on the top 30 enterprises on the pollutant discharge list in their administrative areas once a quarter, and report them to the environmental protection bureau of the same level and the China Environmental Monitoring General Station. Every quarter, the China Environmental Monitoring General Station will sum up the monitoring data and basic information on key pollution sources in the whole country and report the supervision and monitoring data on the top 3 enterprises on the pollutant discharge list to the State Environmental Protection Administration. Local

environmental monitoring stations at all levels should be responsible for monitoring key pollution sources in their administrative areas, compile a data-type summary report on the key pollution sources specified by the State for the previous year, and send the report to the environmental protection bureau of the same level and upper-level environmental monitoring stations before the end of March each year. All provincial central environmental stations shall be responsible for compiling a data-type summary report on the key pollution sources in their administrative areas, as specified by the State, and report it to the China Environmental Monitoring General Station before the end of April of the current year. *The Environmental Monitoring Report System* also stipulates: "All the monitoring reports, data, materials and achievements of environmental monitoring stations belong to the State" and "Without permission from the administrative department for environmental protection above the city level, no unit or individual shall provide them to outside units, nor quote or publish monitoring, monitoring data and relevant materials which have not been formally published".

(IV) Environmental statistics

Environmental statistics are the only information on enterprises' pollutant discharge which departments other than the environmental protection department, and the public, can get. The environmental statistics system is established in accordance with the *Statistics Law of the People's Republic of China* and the *Interim Administrative Measures for Environmental Statistics* adopted by the National Environmental Protection Bureau in 1995. It is jointly completed by the environmental protection department and the statistics department. The work procedure for environmental statistics is as follows: the statistics department prepares a list of State-owned enterprises, and enterprises over a certain scale, and provides it to various provincial environmental protection bureaus, which will then distribute the list to city environmental protection bureaus, which will in turn distribute it to the district and county environmental protection bureaus. The district and county environmental protection bureaus will distribute the environmental statistics form to the enterprises on the list, and ask the enterprises to fill in their pollutant discharge data. Finally, the completed statistical data will be fed back level by level to the

provincial environmental protection bureau. Because the environmental statistical data is filled in by enterprises which discharge pollutants themselves, and obtained level by level from the district and county environmental protection bureaus, it is fairly difficult to avoid enterprises not truthfully reporting their data. Also, local environmental protection bureaus may filter out some of the information. Though the provincial environmental protection bureau will each year select some enterprises to make random checks, most of the data in the environmental statistics is nevertheless not verified. Because the reported environmental protection data only covers large-sized enterprises, the total pollutant discharge volume of the whole province can only be obtained by the provincial environmental protection bureau through estimations. For Jiangsu's power industry, the main basis for the provincial environmental protection department's estimation of the total discharge volume includes: power output, coal consumption and sulfur content of coal. It is very obvious that the environmental protection data obtained through such a statistical method will lack both integrity and truthfulness.

(VI) Tip-offs from the masses

China's environmental protection laws and regulations encourage citizens to participate in environmental protection. They report unlawful pollutant discharge acts to the local government, people's congresses and environmental protection departments at all levels by writing letters, by personal visits or by telephone. *The Measures for Complaint Letters and Visits Concerning Environmental Issues* adopted by the National Environmental Protection Agency in 1997 strengthened the responsibilities of environmental protection departments at all levels in handling problems reported by the masses. In many districts, counties and cities, the environmental protection bureaus have set up a special department to handle complaint letters and visits from the masses concerning environmental protection issues. Jiangsu's Department of Environmental Protection stipulates that on-site investigation and handling must be done within 3 days of receipt of tip-offs. Where matters are handled by the upper-level environment supervision department, it must arrive at the site to investigate within 10 days, and give a reply to the complainant within 20 days. According to the provision, local environmental protection bureaus

shall keep detailed records and investigation reports on the tip-offs from the masses, and regularly report to the upper-level environmental protection bureau the number and type of tip-offs which they have received. For major events, they shall report to local government leaders.

From the above 4 sources of environmental protection information, it is clear that the data about pollutant discharge in Jiangsu Province's power industry is basically in the hands of the administrative department for environmental protection whose level corresponds to the size of the enterprises. As for the information flow between upper-level and lower-level environmental protection departments, the pollutant discharge declaration and registration forms and the environmental statistical forms are filled in by enterprises themselves and reported to the provincial environmental protection department level by level. However, the environmental supervision reports, monitoring reports and detailed material on environmental protection tip-offs are kept by the local environmental law enforcement agencies themselves. Upper-level environmental regulatory agencies normally only get some information from the summary reports submitted from lower-level environmental protection departments. During this process, lower-level environmental protection departments may, for some reason, adjust and filter the environmental protection data under their control, and report the adjusted and filtered information to the upper-level environmental regulatory agencies. In addition, the environmental regulatory system involves a fairly large number of regulatory levels, from the township environmental protection administrative personnel dispatched by the district and county environmental protection department at the very grass roots, to the district and county environmental protection department, then to the city environmental protection department, the provincial environmental protection department and finally to the State Environmental Protection Administration. Apart from the information asymmetry between the upper-level and lower-level environmental protection departments, the environmental regulatory system in Jiangsu also has the problem of a too long principal-agent chain. From the formal institutional setup, there are 3 levels of principal-agent relationship. If the township environmental protection administrative personnel dispatched by the district and county environmental

protection department are included, there will be 4 levels of principal-agent relationship. A too long principal-agent chain will also affect principal-agent efficiency, resulting in untimely information transmission and feedback, which further aggravates the information asymmetry. Such information asymmetry between the principals and the agents makes it possible for the agents to adopt opportunistic measures.

6.3 Regulatory means

In the principal-agent relationships at the 3 levels of environmental regulation in Jiangsu's power industry, Principal A (local government leader) adopts similar regulatory means over the agent (local environmental protection bureau) at each level. Principal B (upper-level environmental protection bureau) also adopts similar regulatory means towards the agent (local environmental protection bureau) at each level. Therefore, this section will not make separate analysis of the principal's regulatory means over the agent for each level. Instead, it will generally compare the differences between the local government leader's regulatory means to the local environmental protection bureau, and the upper-level environmental protection bureau's regulatory means to the local environmental protection bureau.

Principal A (local government leader)'s regulatory means over the agent (local environmental protection bureau) mainly include: the right of control over funds, the right of appointment of main leaders, and the right of administrative leadership and supervision. In any organizational structure, the right of control over funds and the right of appointment of main leaders are always the most powerful means of control. By controlling the rights of fund budgets and appointment of main leaders over the environmental protection bureau, the local government leader can effectively control the acts of the environmental protection bureau and make it come into line with its own goals. The local government also has set up an environmental protection committee to represent it in supervising the work of the environmental protection bureau. At the same time, it also coordinates the relationship between the environmental protection bureau and other administrative departments. The said committee has the right to directly require the local environmental protection bureau

to execute a certain kind of specific work, for example: to investigate and monitor enterprises' pollutant discharge, and ask the environmental protection bureau to report on the status of implementation of the work assigned by the committee. The local government leader may also supervise the work of the environmental protection bureau through information feedback from enterprises. Most large-sized local power enterprises are State-owned enterprises, and their top executives maintain a close relationship with government leaders. If the environmental protection bureau's environmental protection law enforcement infringes too much upon the interests of a certain enterprise, the top executive of the said enterprise may report the matter to the government leader, and ask it to come out to make a plea. Once the government leader approves the view of the said executive, it will find the head of the environmental protection bureau and ask for lowering the pollutant discharge or reducing punishment on the enterprise. Because of the close relationship between enterprises and government leaders, if the environmental protection bureau fails to act according to the will of the government leaders, it is likely to be brought to the government leaders again.

By comparison, Principal B (upper-level environmental protection bureau) has very limited regulatory means over the agent (local environmental protection bureau). It can neither set the fund budget for the local environmental protection bureau nor appoint its main leaders. The upper-level environmental protection bureau mainly monitors the local environmental protection bureau through offering professional guidance to it and supervising its work. The ways by which the upper-level environmental protection bureau provides professional guidance to the local environmental protection bureau include: formulating annual work plans and five-year environmental protection plans for the local environmental protection bureau, such as requiring the local environmental protection bureau to implement the pollutant discharge declaration and registration system, the system of "One Control and Dual Standard Compliance", and the system of total volume control on sulfur dioxide emissions. The upper-level environmental protection bureau mainly supervises the local environmental protection bureau through asking it to make regular work reports. Unless major accidents occur, the upper-level environmental

protection bureau normally does not go to local enterprises to examine the actual situation of their pollutant discharge. Due to serious information asymmetry between the upper-level and lower-level environmental protection bureaus, and the upper-level environmental protection bureau having no effective regulatory means, there is possibility that to show good work performance, or in yielding to pressures from local government leaders, the lower-level environmental protection bureau will treat and filter the information which it reports to the upper-level department. .

6.4 Incentive mechanisms

Government work staff in China get relatively fixed pay. Principal A(local government leader)'s incentives to the agent (local environmental protection bureau) mainly include more bonuses, houses, allocation of car and other welfare. For many civil servants, their pay is linked to tax revenues. When the government gets more tax revenues, the civil servants will get better welfare. However, such an incentive is sometimes in conflict with the environmental protection goals of the local environmental protection bureau. This is particularly outstanding at the county level. For example, if a county is economically backward and financially in the red for consecutive years, one or two power plants can immediately turn the situation around. When power plant projects encounter the environmental protection bottleneck, the county governor is bound to be prominent in coordinating the environmental protection department, while the work staff of the environmental protection department will also generally actively cooperate. This is because building power plants implies increased tax revenues for the government. Indirectly, it means better welfare to the civil servants. Local governments can also provide incentives to the agent through the cadre evaluation system, and make priority arrangements concerning promotional opportunities and welfare treatment for officials who get good results in the cadre evaluation.

Principal B (upper-level environmental protection bureau) can offer very few incentives to the agent (local environmental protection bureau). Before July 2003, the right of use over local pollution fees was entirely controlled by the local environmental protection bureau. Although 80% of the pollution fees needed to be

used in enterprises' pollution control, the local environmental protection bureau could also get 20% of it as its office funds. At the time, the local environmental protection bureau was very enthusiastic about implementing the national and local pollutant discharge standards. In 2002, the State Council adopted the new *Administrative Regulations for the Use of Pollutant Discharge Charges*, which was implemented in July 2003. According to the Regulations, 10% of the pollution fees paid need to be paid to the central treasury, 5% to the provincial treasury and 85% to the local treasury as the special environmental protection fund for the level concerned. The Regulations specifically stipulate that "In the collection and use of pollution fees, revenue and expenditure must be strictly separated. The collected pollution fees must all be paid to the treasury, while the funds needed for environmental protection law enforcement will be listed in the budget of the department, to be guaranteed by the finance of the same level" and that "All the pollution fees should be used particularly in environmental pollution control. No unit or individual shall retain or use it for other purposes". On one hand, the issuance and implementation of the Regulations have brought the abuses of pollution fees under control. On the other hand, it has also deprived the upper-level environmental protection bureau of an important incentive for environmental supervision management over the local environmental protection bureau. As for environmental supervision personnel management, China's *Work System for Environmental Supervision* stipulates that "The upper-level environmental supervisory body may suggest to the administrative department for environmental protection that they transfer from tier supervision post those work staff in the lower-level environmental supervisory body who are not suitable for environmental supervisory work" and that "The next higher environmental supervisory body shall be consulted on its opinion on the appointment of the person to take charge of the lower-level environmental supervisory body". It is clear that the upper-level environmental supervision department only has the right to suggest rather than decide on the personnel arrangements for the lower-level department, thus making it difficult to form effective incentives.

Table 6.2 Principals' Regulatory Means and Incentive Mechanisms Over Agents

(Principal A—local government leader, Principal B—upper-level environmental protection bureau, agent —local environmental protection bureau)

Regulatory Means and Incentive Mechanism	Local Government Leader over Local Environmental Protection Bureau	Upper-Level Environmental Protection Bureau over Local Environmental Protection Bureau
Source of funds	√	X
Personnel appointment	√	X
Administrative leadership	√	X
Work supervision	√	√
Welfare and promotions	√	X

6.5 Principal-agent problems

It can be seen from the above analysis that regarding the problem of environmental regulation in Jiangsu Province's power industry, the agent at each level (the local environmental protection bureau) always needs to face two main principals (the local government leader and the upper-level environmental protection bureau). Also, the local government leader's economic growth goal often takes precedence over the environmental protection goal. To a certain degree, this is in conflict with the environmental protection goals pursued by the upper-level environmental protection bureau. China's administrative area-based, level-by-level environmental regulatory system grants the local environmental protection bureau wide powers. These include collecting information on enterprises' pollutant discharge through the pollutant discharge declaration and registration system and the environmental statistics system, investigating and verifying enterprises' actual pollutant discharge through the environmental supervision and monitoring system, and getting more information on enterprises' law violations through tip-offs from the masses. In actual practice, except for the environmental protection information reported by enterprises themselves, such as pollutant discharge declaration and registration and environmental statistics as reported by the local environmental protection bureau to the provincial environmental

protection department level by level, the other information which the local environmental protection bureau obtains through on-site investigation and monitoring, as well as through tip-offs from the masses, is kept in archives by the local environmental protection bureau, and is not reported to the upper-level environmental protection bureau. The upper-level environmental protection bureau only gets some information from the work summary reports from the local environmental protection bureau. Due to limited funds and manpower, the upper-level environmental protection bureau cannot fully supervise or verify the affairs administered by the local environmental protection bureau. The existence of information asymmetry provides the local environmental protection bureau with the conditions to concurrently meet several mutually conflicting goals. The local government leader controls the right to decide on funds and the right to appoint main leaders over the local environmental protection bureau, and thus can effectively control the local environmental protection bureau. At the same time, the mechanism which links pay with tax revenue for civil servants and the local government also encourages the local environmental protection bureau to maximally cooperate with the government to boost economic development. As a principal, however, the upper-level environmental protection bureau has no effective regulatory means of incentive mechanisms over the local environmental protection bureau. It is very obvious that when the goals of two principals are in conflict, the sensible agent will take the goals of the principal with a stronger influence on it as its primary goals. Meanwhile, it can also make use of information asymmetry between the principal and the agent to process and filter the information on enterprises' pollutant discharge and on the environmental governance in its administrative area, or join forces with the enterprises that unlawfully discharge pollutants, in order to cope with the inspections by the upper-level environmental protection bureau. This way, the agent seems to have completed the tasks assigned by two principals, thus avoiding the principals pursuing its responsibilities. In other words, the agent takes an opportunistic act when the principals do not have all the information.

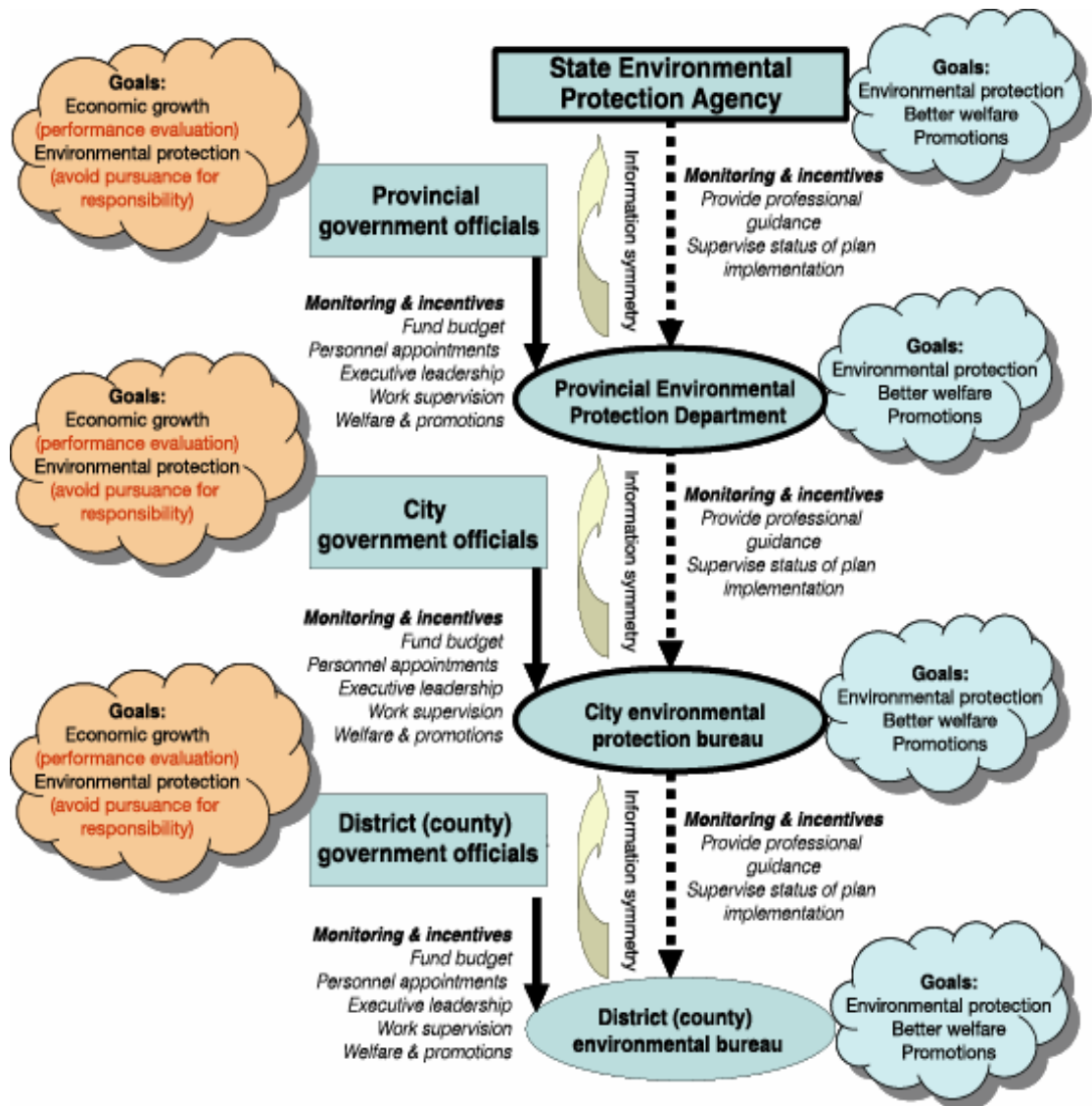


Fig.6.1 Principal-Agent Relationships in Environmental Regulation in Jiangsu Province's Power Industry

From the principal-agent analysis, it is found that weak environmental regulation in Jiangsu Province's power industry is caused by the following institutional causes. Firstly, the agent—the local environmental protection bureau—is not independent in environmental law enforcement; secondly, Principal B—the upper-level environmental protection bureau—lacks effective regulatory means and incentive

mechanisms over the agent—the local environmental protection bureau; thirdly, Principal A—the local government leader—is influenced by the economic growth-centered cadre evaluation system and takes economic growth as its top priority; fourthly, there are actually 4 levels of principal-agent relationships in China's environmental regulatory system. According to the principal-agent theory, too long a principal-agent chain will also affect the efficiency of information transmission, thus further aggravating the principal-agent problem.

6.6 Chapter summary

There are mainly two factors that cause the principal-agent problem: inconsistency between the principal's goals and the agent's goals, and information asymmetry between the principal and the agent. On the issue of environmental regulation in Jiangsu's power industry, the agent faces two main principals, and the goals pursued by these two principals are not always the same, and even come into conflict at times. At this time, the agent's decision as to which principal's goals to pursue will mainly depend on the principal's regulatory means and incentive mechanisms over the agent. From the 4 aspects of the goals of the principal and the agent, information asymmetry between the principal and the agent, principals' regulatory means over the agent and principals' incentive mechanisms to the agent, this chapter has analyzed the principal-agent problem in the environmental regulation of Jiangsu Province's power industry thus: When there is conflict of goals between local government leaders and upper-level environmental regulatory agencies, because the local government leaders possess stronger and more effective regulatory means and incentive mechanisms over the local environmental law enforcement agencies, the local environmental law enforcement agencies will naturally set the goals of the local government leaders as their primary goals. Meanwhile, they will take advantage of the information asymmetry between them and the upper-level environmental regulatory agencies, and process and filter the information on enterprises' pollutant discharge and information on the environmental governance in their administrative area, in order to make the upper-level environmental regulatory agencies believe that their agent has satisfactorily completed the tasks. It is found from the principal-agent

analysis that in the environmental regulation in Jiangsu's power industry, the local environmental law enforcement agencies do not have an independent position in environmental law enforcement, and the upper-level environmental regulatory agencies lack effective regulatory means and incentive mechanisms over the lower-level environmental protection department. Influenced by an economic growth-centered cadre evaluation system, the local government leaders take economic growth as their top priority. The principal-agent chain of China's environmental regulatory system is too long. All these are the main causes of weak environmental regulation.

Chapter 7 Policy Recommendations for Improving the Environmental Regulatory System of China's Power Industry

Weak environmental protection has long been a problem in China. Many experts and scholars in China have conducted relevant research. They have also made very good policy recommendations concerning the institutional reform of the State Environmental Protection Administration. One of the policy recommendations is to upgrade the State Environmental Protection Administration into a Ministry of the Environment, with greater comprehensive decision-making powers, increased budget and personnel. Once implemented, these reform measures will have a significant influence on raising the position of environmental protection in national economic development planning and investment project planning, and on strengthening the effort and effect of the State administrative department for environment concerning guidance over local environmental protection work.

Of course, upgrading the environmental protection body cannot solve all the problems. The survey and research findings obtained by the author concerning environmental regulation in Jiangsu Province's power industry show that there are instances of serious weak regulation and inadequate law enforcement when local environmental law enforcement agencies supervise pollutant discharges by enterprises and execute environment laws, regulations and standards. Jiangsu is an economically developed province in China. It has also taken the lead in strengthening the environmental regulatory system and in implementing environmental protection policies. Given its problems above, the overall level of environmental law enforcement nationwide gives even less cause for optimism. Through the principal-agent analysis, the author has found that the institutional causes for weak environmental regulation in Jiangsu Province's power industry include: (1) local environmental law enforcement agencies are dependent on local government leaders; (2) upper-level environmental regulatory agencies have weak controls over and provide few incentives to lower-level agencies; (3) local government leaders are

greatly influenced by the current economic growth-based cadre evaluation system and take economic growth as their highest priority; and (4) the principal-agent chain is too long and affects the efficiency of the information transfer in the whole environmental regulatory system. According to the principal-agent theory, the essence of solving the principal-agent problem lies in solving the problem of incentives to agents under the conditions of information asymmetry. Usually, there are two solutions: (1) The principal controls the agent by direct regulation and compulsory orders. This method can maximally reduce information asymmetry. It allows the principal to have full knowledge of the actions of the agent, as well as the actions which the agent is likely to take, and thus be able to use instructions to command the agent. If the agent does not obey, the principal can mete out punishments. (2) The principal can formulate rules and incentive measures to make the agent voluntarily act according to the will of the principal out of consideration for its own interests. Of course, when applied to environmental regulation, these methods can only solve problems through environmental regulatory system reform. At the same time, we must also adopt hard constraints to strengthen the environmental protection thinking of local government leaders.

In addition, we can also adopt a theoretical perspective of public governance to help solve the problem. In other words, consideration should be given to letting the government and society jointly supervise and manage pollution control work in the power industry. Given that the power industry is an infrastructure which supports national economic development, and yet is also the largest fixed source of air pollution, controlling pollution in the industry will be of strategic importance, not only in improving the quality of the environment, but also in achieving sustainable economic and environmental development in China. However, the administrative department for environment alone seems to be weak when it comes to rectifying such a big polluter. As the regulatory body for the power industry, the State Electricity Regulatory Commission should also assume some responsibilities and strengthen the environmental protection requirements for generating enterprises through market access and other means. Meanwhile, we may also give play to the supervision ability

of the public and NGOs, and let the whole of society take part in pollution control work in the power industry.

Based on such thinking, and with reference to best international practices, the author suggests improving the environmental regulatory system of China's power industry from the following aspects:

- (1) Reform the environmental regulatory system, and ensure the independence of environmental law enforcement agencies;
- (2) Strengthen the environmental regulatory functions of the State Electricity Regulatory Commission, and through formulating power market access standards and internalizing environmental cost into the power price, encourage the development of clean power generation;
- (3) Implement a green GDP accounting system, include environmental protection into the cadre evaluation system, and strengthen environmental protection incentive mechanisms to government leaders;
- (4) Strengthen the capacity building of the environmental supervision and monitoring institutions;
- (5) Establish a ministerial-level environment committee to coordinate the environmental protection goals of various government departments;
- (6) Strengthen the public supervision of environmental protection, make environmental protection information open, and give full play to the roles of the public and NGOs in supervising and promoting environmental protection.

7.1 Reform the current environmental regulatory system to ensure the independence of environmental law enforcement agencies

Non-compliance and weak environmental regulation in China are essentially the result of intervention by local protectionism. To change this situation, it is necessary to ensure that environmental law enforcement agencies are independent, so that they can independently and fully exercise their law enforcement powers. As for reforming

the current environmental regulatory system, the author suggests that the following two options should be considered:

Scheme I: Change the current regulatory model to one in which the State Environmental Protection Administration vertically administers the environmental protection system nationwide.

Environmental protection departments at all levels are to be set up by the State Environmental Protection Administration in a unified manner, making their personnel arrangements and providing their funds. Local environmental law enforcement agencies should be thoroughly separated from the administrative leadership relationship with the local governments. However, adopting vertical administration of the environmental protection system does not mean just shifting the personnel appointment power or the fund budget decision power from local governments to the State Environmental Protection Administration. Taxation system reform is also needed as a supplementary measure. Bringing local environmental protection departments at all levels under the direct administration of the State Environmental Protection Administration implies that the Administration will need substantial funds. This is something difficult for central finance to bear. Therefore, when the environmental regulatory system is reformed, there is also a need to correspondingly reform the taxation system. Apart from the problem of funds, environmental regulatory system reform may also meet with political obstacles. Consequently, it may become a long-term goal to achieve vertical administration of the environmental protection system.

Scheme II: The State Environmental Protection Administration sets up regional branches, and in small provinces and municipalities environmental protection departments under the provincial level adopt provincial-level vertical administration.

In this aspect, we use as reference the practices in the United States and Canada, and divide China into several major regions according to geographical location. We suggest that the State Environmental Protection Administration set up regional

branches to supervise the status of implementation of national environmental protection laws, regulations and standards in the provinces and municipalities in their administrative areas. Under the provincial level, vertical administration should be adopted for the environmental protection departments. Several provinces may be selected for pilot work first. After sufficient experience has been accumulated, it may be gradually expanded nationwide. To ensure the independence of environmental law enforcement agencies, there is also a need to strengthen the supervision of people's congresses, and to adopt mechanisms of pursuit of responsibility along the horizontal direction, in order to change the situation where government officials are only responsible to their superiors.

It is understood that the State Environmental Protection Administration has already made some trial institutional reforms, such as setting up regional branches under the environmental supervision bureau, to supervise environmental law enforcement in the provinces in each major region. Currently, the State Environmental Protection Administration is also considering a plan for it to vertically administer the environmental supervision force. Regarding this plan, the author believes that it will help improve the current situation, but it may also bring about a series of more complicated problems. For example, environmental supervision and monitoring are the "two legs" for local environmental protection bureaus to carry out environmental regulation. If the leg of environmental supervision is sawn off, it will be more difficult for the local environmental protection bureaus to effectively regulate the pollutant discharge by industrial enterprises in their administrative areas. It follows that even if the supervision bodies are administered vertically, the local environmental protection bureaus will still conceive ways to set up their own supervision personnel. This will form two supervision bodies: the central one and local ones. Such overlapping institutional setup will not only waste manpower and financial resources, but this could also easily cause chaotic environmental protection law enforcement, and make it difficult for pollutant discharge enterprises to adapt to. The author therefore thinks that the best way is to reform the environment regulatory

system in a systematic manner, rather than take out one functional part of the system for special treatment.

7.2 Strengthen the environmental regulatory functions of the power industry regulatory body

The power industry is the largest fixed source of air pollution. Pollution control in the industry is of strategic importance for improving the environmental quality and for achieving sustainable economic and environmental development in China. The State Electricity Regulatory Commission is the regulatory body of China's power industry. It is responsible for supervising the operation of the power market, and takes part in setting electricity prices. In his book *Introduction to the Economics of Government Regulation*, the Chinese scholar Wang Junhao elaborates on the responsibilities of the power industry's regulatory body as follows: "The power industry is a naturally monopolistic industry with a huge impact on society, and very complicated technical and economic features. This determines that government regulation of the power industry^① is also extensive. Though the key to government regulation lies in controlling enterprises' monopolistic behavior, environmental regulation also occupies an important position as far as the power industry is concerned"^②. International experiences show that social regulatory institutions are showing great capacity deficiencies when they implement social regulation over certain industries. Cooperation from industry regulatory bodies is thus essential for achieving regulatory goals. Countries with deep power sector reforms have realized that taking environmental protection as one major function and closely cooperating with the environmental regulatory body is the only way for the power industry regulatory body to effectively ensure the sustainable development of both the power industry and the environment. With reference to China's situation, the author

① "Regulation" here is towards monopolistic industries and has the same meaning as "supervision".

② Wang Junhao: *Introduction to the Economics of Government Regulation*, Commercial Press, 2003, pp:266-269.

believes that the State Electricity Regulatory Commission may strengthen its environmental regulation of power enterprises from the following aspects.

7.2.1 Encourage the development of clean power generation through market access and electricity pricing instruments

China's power industry is now in a transitional period leading to a competitive power market. Current reform of the sector aims to set up an open, fair and just power market. It has been decided to implement competitive bidding at the power generation end. At this stage, if the factor of environmental protection is not considered when designing market rules and regulatory means, the new price-based grid access mechanism will pose a serious threat to the environment. This is mainly because in a competitive wholesale power market, grid-connection price is the only factor that determines enterprises' competitiveness. If the market rules give no consideration to the environmental protection needs, those old, heavily polluting power plants will draw upon their cheap price to get competitive advantages, while new clean power plants are placed in a disadvantageous position. This will further intensify the already serious pollution in China's power industry. Therefore, apart from the "cooperating with the environmental protection department to supervise and inspect the implementation of environmental protection policies, laws, regulations and standards in the power industry", as suggested in the "Three Fixes Scheme"^①, SERC should also adopt such means as market access and electricity pricing to raise the environmental protection requirements for power enterprises. The specific suggestions are as follows:

(1) The power grid connection rules stipulate that priority access will be given to clean power, to encourage generation enterprises to improve their energy efficiency and adopt clean power generation resources to reduce pollutant emissions;

^① "Three Fixes Scheme" refers to the *Provisions for the Authorized Institutional and Personnel Setup of the State Electricity Regulatory Commission* approved by the State Council in February 2003.

(2) Adopt policies for internalizing environmental costs into the electricity price so that clean power generation resources can reach a fair position in market competition.

7.2.2 Cooperate with the administrative department for environmental protection in the supervision and administration of pollution control in the power industry

Due to their wide administrative areas, it is impossible for environmental protection bureaus at various levels, acting as the administrative department for environmental protection, to get very familiar with the technical and economic features of all the industries under their administration. The power industry is one with very strong technical and economic features. Until real-time online monitoring can be implemented for enterprises which discharge pollutants, the administrative department for environmental protection will be even more in need of cooperation with the regulatory body of the power industry concerning environmental law enforcement. This is the only way to get more accurate data on enterprises' pollutant discharge and thus more effectively manage them. The State Electricity Regulatory Commission's "Three Fixes Scheme" approved by the State Council has put forward the function requirements for environmental protection for the State Electricity Regulatory Commission, namely "to cooperate with the environmental protection department to supervise and inspect the implementation of environmental protection policies, laws, regulations and standards in the power industry". The author believes that the State Council should noticeably coordinate the division of functions between the State Electricity Regulatory Commission and the State Environmental Protection Administration for pollution control work in the power industry, and specify the responsibilities of the State Electricity Regulatory Commission. It is suggested that the following functions should be granted to the State Electricity Regulatory Commission:

(1) Take part in formulating for the power industry pollutant discharge standards and pollution control plans by the administrative department for environmental

protection, and assume the main responsibility for implementing the standards and plans.

(2) Set up an environmental regulatory section under SERC's supervision bureau. It will assume the functions of environmental regulation of power enterprises undertaken by the State Power Corporation and its provincial branches before the power sector reform, and will assist the administrative department for environmental protection in supervising power enterprises' pollutant discharges and making efforts to implement the State policies to shut down small power plants.

7.2.3 Strengthen demand-side management, lower power demand and reduce power pollution

The end-use efficiency of power directly affects power demand. Experiences in many countries show that improving power utilization efficiency can effectively lower power demand, and thus reduce pollutant emissions in the power industry. In foreign countries, the end-use efficiency of power is raised mainly through promoting "demand-side management" among power companies. Demand-side management is a method which provides power users with energy efficiency services and adopts load management to save power. Currently, over 30 countries have used the method of demand-side management to improve the end-use efficiency of energy, reduce investment in power infrastructure construction, save energy resources and improve environmental quality, achieving notable results. Demand-side management has become an important support means for the sustainable power development strategy, and is now seen as a special kind of clean power resource.

The overall level of energy utilization in China is still very low at present. According to the 2002 report *Research on the Implementation of Demand-Side Management Policies in China*, prepared by the State Grid Corporation's State Power Economic Research Center, by the invariable USD price in 1995 China's energy consumption per unit production value in 1997 was 3.8 times the world average, 3.1 times that in South Korea and 11.2 times that in Japan. Even by the World Bank's Purchasing Power Parity (PPP), China's energy consumption per unit of production

was still twice as high as in developed countries. Meanwhile, the average energy consumption of 33 products in the 11 industries of coal, petrochemicals, power, iron and steel, nonferrous metals, building materials, chemicals, light industry, textile, railway and transportation in China, is 46% higher than the advanced world level. The causes of this gap lie in gaps in production scale, production process, technical equipment and management. China still has huge potential for implementing demand-side management, saving power and improving the environment^①.

It has been over 10 years now since the concept of demand-side management was introduced into China in 1992. However, power demand-side management in the country is still mainly about load management rather than improving the end-use efficiency. This is mainly because support policies are not very well provided for demand-side management programs, causing a conflict between improving end-use efficiency and power companies' goal of profit maximization. Consequently, power companies have no enthusiasm for investing in energy efficiency management.

The State Electricity Regulatory Commission, as the regulatory body of the power industry, assumes a heavy responsibility for sustainable development and power structure optimization. Power demand-side management, as a kind of new power supply resource, offers the advantages of low investment cost and no pollutant emissions. Therefore, it should be significantly promoted. The State Electricity Regulatory Commission should make breakthroughs on past work and truly solve the institutional obstacles to the implementation of demand-side management. With reference to current demand-side management problems in China, the author suggests that the State Electricity Regulatory Commission should make efforts in the following aspects:

(1) Seize the current opportunity of amending the *Electricity Law*, and include demand-side management into the law as an obligation for grid companies, so as to make them the main body for implementing demand-side management.

① Research Center for Power Economy, State Grid Corporation of China: Research on Policies for Implementing Demand-Side Management in China, 2002, pp:16-18.

(2) Suggest that the Ministry of Finance reform the financial settlement system for grid companies, so that they can include demand-side management investment into the electricity supply cost and recover such investment from power sales revenues.

(3) Or by way of a power surcharge, establish a special fund for demand-side management, and make it a long-term mechanism to provide support for demand-side management programs.

7.3 Strengthen environmental protection incentive mechanisms for party and government leaders

7.3.1 Implement a green GDP accounting system

Weak environmental law enforcement is not just a legal problem. It is also related to the political, economic and social aspects. Currently, productivity in China is still at a low level, so the means for economic growth are extensive. Government leaders pay attention to short-term economic gains and have a weak awareness of environmental protection. Therefore, it is necessary to adopt a green GDP accounting system. The view of scientific development needs to be embodied within economic growth, so as to achieve harmonious and sustainable development of the economy, society and the environment. Because green GDP accounting mechanisms are rather complicated, accurate data support will be needed to evaluate the quality of national economic growth, national strategic resources reserves, ecological capacity and tolerance values, as well as formulating goals and policies for environmental regulatory planning. Therefore, there is a need now to conduct more research on green GDP accounting mechanisms, carry out pilot work in several economically developed provinces and cities, and to promote it nationwide when the opportunity is ripe.

7.3.2 Include environmental protection into the party and government cadre evaluation system

Performance evaluation indicators are the “commanding rod” for setting work direction for government leaders at all levels. “Performance” is what government leaders at all levels value most. It is also the most important thing capitalized on for their promotions. A scientific and comprehensive cadre evaluation system can guide government leaders to respect natural laws and promote the harmonious development of the population, resources, the environment, the economy and society. Environmental protection is one of China's basic national policies. It is an important responsibility for government leaders at all levels. Currently, local protectionism has become the primary obstacle to environmental law enforcement. There is an urgent need to include environmental protection into the cadre evaluation system, in order to encourage government leaders to establish a scientific view of development and performance. Meanwhile, there is a need to establish and improve an environmental protection performance evaluation system, and a system of environmental audit for leading officials. There is a need to strengthen a system of pursuit of environmental responsibility for cadres, and implement “one vote veto” for major and huge pollution accidents, or intense repercussions in pollution.

7.4 Strengthen the capacity building of environmental supervision and monitoring institutions

7.4.1 Strengthen the environmental management means of environmental monitoring institutions

Environmental monitoring is the only way to obtain true and accurate data on enterprises' pollutant discharges. It is the basis for collecting pollution fees and implementing other environmental regulatory systems. Lack of environmental monitoring means is a major technical obstacle to environmental law enforcement. Therefore, there is firstly a need to improve the national environmental monitoring network and to force key polluting enterprises to install and run continuous smoke

monitoring devices, as well as network with the environmental protection bureau. The monitoring institution should keep real-time monitoring over polluting enterprises. The monitoring data should be transmitted through the network to the various departments of the environmental protection bureau so that they can get timely information on enterprises' pollutant discharge and environmental quality information, and thus strengthen regulatory work.

7.4.2 Strengthen the environmental management means of environmental supervision institutions

To strengthen environmental supervision means, there is a need to first make the environmental protection system operable, and to set up corresponding legal liability and punishment clauses for the obligatory articles in the environmental laws and regulations, also, to raise the magnitude of punishments on environmental law violations and increase the cost of unlawful activities. Secondly, there is a need to grant the environmental protection department the necessary means to enforce law in a forcible manner, so they can truly implement such punishments as “compulsory treatment within a set time limit” and “stoppage of production for rectification” over enterprises which discharge pollutants in violation of the laws. For the department for industry and commerce, courts and other law enforcement departments, there is also a need to specify their environmental regulatory responsibilities, so that they actively assist the environmental supervision department in enforcing laws on enterprises which unlawfully discharge pollutants, such as canceling their business license, or sealing up generation enterprises or their power generation facilities.

7.4.3 Strengthen the law enforcement capacity building of environmental supervision institutions

The environmental law enforcement force also needs to pay attention to strengthening their qualifications and capacity in order to improve their environmental law enforcement. This can be done in the following aspects: (1) strengthen training of the environmental supervision personnel concerning environmental protection and related laws, regulations and policies, and help the

supervision personnel to know more about production processes and industrial policies; (2) increase both the personnel and budget for environmental supervision bodies, and improve the law enforcement equipment for the supervision personnel, such as vehicles and evidence collection tools; (3) strengthen education regarding the professional code of conduct for the environmental supervision personnel, make them more professional, adopt standardized management and build a key, efficient, clean and civilized environmental law enforcement force; (4) improve the system of pursuit of environmental supervision responsibilities, strengthen performance assessment, link pay and promotions with work performance and strengthen incentive mechanisms. At the same time, strengthen environmental supervision audit, and deal strictly with administrative non-actions.

7.5 Establish a ministerial-level environment committee

It is mentioned in Chapter 3 that several government departments have overlapping responsibilities for the regulation of China's power industry. These involve the competent department for investment, the financial department, the administrative department for State-owned assets and the environmental protection department. These departments have different priority goals within their respective responsibilities. Their departmental policies have an important role in guiding power enterprises and thus a profound influence on the environment. In the research, the author has found that there is conflict between the regulatory policies adopted by some departments for the power industry and China's environmental protection goals. Some policies have become a stumbling block to environmental protection in the power industry. Therefore, it is necessary to establish a cross-departmental coordination body to ensure a high level of coordination between the policies of various government departments with regard to the environment goals.

The cause of this problem lies in the lack of communication and coordination in environmental protection issues between various government departments. Environmental protection is one of China's fundamental national policies. All government departments should implant the spirit of environmental protection into

the formulation and implementation of their departmental policies. On this issue, France and Canada have provided us with very good examples. In these two countries, there is a ministerial-level environment committee that acts as a cross-department body to coordinate environmental protection problems. It is recommended that China should also set up a ministerial-level environment committee, to be headed by the premier or vice-premier of the State Council. This committee should regularly hold dialogues on environmental protection between government departments, make the various departments adopt consistent policies on environmental protection, and jointly promote the sustainable development of China's power industry and national economy.

7.6 Strengthen the public supervision of environmental protection

The environmental problem is one which determines whether the national economy can achieve sustainable development. It is also closely related to the interests of every ordinary person. In environmental law enforcement, we can give full play to the enthusiasm of the whole of society for environmental protection. Particularly during the stage when environmental regulatory system reform is still in its infancy, and regulatory means are not yet sound, it is very necessary to draw upon the forces of the public and NGOs to strengthen environmental regulation over unlawful acts. In this respect, the author suggests to:

(1) Implement a system of open environmental protection information, perform annual environmental audits on key polluting enterprises, disclose relevant information, and promptly publicize key cases of environmental law violations, their investigation and punishment.

(2) Greatly publicize hotlines for tip-offs on environmental violations, implement a system of rewards to effective tip-offs, encourage the public to actively take part in environmental protection supervision. May also consider providing legal aid to citizens in environmental protection lawsuit cases.

(3) Encourage the development of NGOs which are enthusiastic about promoting environmental protection and sustainable development, set up special environmental protection supervisors in these organizations and keep them in regular contact with environmental supervision institutions.

Conclusions

This paper has surveyed and studied the environmental regulatory system of Jiangsu Province's power industry and the main problems facing it. Using the principal-agent theory from institutional economics, it has analyzed the institutional root causes of weak environmental regulation in Jiangsu's power industry. Regarding these problems, the author has made policy recommendations for improving the environmental regulatory system of China's power industry. In the research process, the author examined a large number of environmental protection laws, regulations and policies and conducted in-depth interviews with many environmental protection officials and experts. The author has also examined the current status and development trend of the environmental regulatory systems in countries where environmental protection has been very successful.

The main achievements of the current research are as follows:

(1) Through survey and research, the author has found that there are some in-depth problems with the environmental regulation of Jiangsu Province's power industry, including: local protectionism intervention on environmental law enforcement, lacking environmental regulation during the process of power sector reform, several government departments have overlapping responsibilities for regulating the power industry, environmental protection departments lacking adequate regulatory capacities, information asymmetry between environmental protection departments at all levels, low penalties for enterprises' environment law violations and so on.

(2) Using the principal-agent theory, the author has analyzed the 3 levels of principal-agent relationships in the environmental regulation of Jiangsu's power industry, including the goals of the principal and the agent, information asymmetry between the principal and the agent, and principals' regulatory means and incentive mechanisms over the agent. It is found in the analysis that Principal A (local government leader) adopts an economic growth-centered goal system, which is in conflict with Principal B (upper-level environmental regulatory agency)'s

environmental protection-centered goal system. Principal A owns stronger and more effective regulatory means and incentive mechanisms over the agent. Based on the forecast of the principal-agent theory, a sensible agent will definitely choose to keep consistent with Principal A's goals. Meanwhile, to avoid Principal B pursuing its agency responsibilities, the agent is bound to take advantage of its information asymmetry with Principal B to process and filter information on power enterprises' pollutant discharge, or to join hands with enterprises which discharge pollutants, in order to cope with Principal B's inspections.

Through the principal-agent analysis, the author has found that the institutional causes for weak environmental regulation in Jiangsu Province's power industry include: Firstly, local environmental law enforcement agencies are not independent in environmental law enforcement; secondly, upper-level environmental regulatory agencies lack effective regulatory means and incentive mechanisms over local environmental law enforcement agencies; thirdly, affected by an economic growth-centered cadre evaluation system, local government leaders take economic growth as their top priority; fourthly, the principal-agent chain in China's environmental regulatory system is too long, and this affects the efficiency of information transmission.

(3) According to the principal-agent theory, the principal-agent problem can be solved by strengthening the principal's regulatory means and incentive mechanisms over the agent. This paper has therefore made policy recommendations to reform the current environmental regulatory system, to ensure the independence of environmental law enforcement agencies. Regarding the other problems found in the research, the author has also suggested to: strengthen the environmental regulatory functions of the State Electricity Regulatory Commission, and through formulating power market access criteria and internalizing environmental costs into the electricity price, encourage the development of clean power; implement a green GDP accounting system, include environmental protection into the cadre evaluation system, and strengthen environmental protection incentive mechanisms to government leaders; strengthen the environmental regulatory means of environmental supervision and monitoring bodies, and enhance the capacity building

of supervisory and monitoring bodies; establish a ministerial-level environment committee to coordinate the environmental protection goals between various government departments; strengthen the public supervision of environmental protection, make environmental protection information open, and give full play to the roles of the public and NGOs in promoting environmental supervision.

The following aspects of the current research need to be further improved:

Firstly, as introduced in Chapter 2, China's regulatory system, apart from the environmental protection bureau system, includes the environment and resources protection committee of the people's congress, the environmental protection committee of the people's government, the public and other social institutions. Given that daily administrative work in environmental protection is currently basically undertaken by the environmental protection bureau system, and that the other regulatory entities have very limited participation in environmental regulation, this paper has placed its analytical focus on the environmental protection bureau system's environmental regulation of the power industry. As China's political system reform progresses, people's congresses, the public and NGOs are expected to play a more and more important role in the process of national and social administration. The current research has not conducted in-depth analysis of the roles of these regulatory entities, so this is an aspect for future improvement.

Secondly, in the process of principal-agent analysis, the author has taken agents as a whole to analysis their goals and preferences. In fact, each agent as an individual will be more or less different in terms of goals and preferences. These differences may affect their decision to choose the goals of which principal as their own primary goals. If time allows, further research needs to be done on this aspect.

References

(Omitted)