Research Program with the SERC and the World Bank

Policy Study on
Electricity Universal Service in China

Research Team of Policy Study on Electricity Universal Service in China

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Preface

Since the 16th Congress of the Chinese Communist Party, China's central government and the State Council have worked out strategic objectives to comprehensively build a well-off society, put forward strategic tasks to build the New Socialist Countryside as well as taken measures to build a socialist harmonious society in accordance with the scientific development concept. Under new situations, the central government has presented all industries and departments with new demands in order to guarantee basic subsistence of people in urban cities and rural areas. As far as the electricity industry is concerned, all-out efforts should be made to provide electric services with rational price and high quality and to press forward the works in terms of universal service in electricity with a view to carry out the social and economic development strategies. The program made an analysis and conducted in-depth research on China's universal service policy in electricity with advanced international practices and local conditions taken into consideration.

Including a multiple-layer of meanings such as availability, non-discrimination and affordability, universal service in electricity has gained general acceptance of the international community and has been successfully implemented in some developed countries. China is a vast and populous country, with most of its population living in rather concentrated areas. However, there are still some residents living in remote or deep mountainous areas or on islands, with no access to electricity for basic subsistence. At the end of 2005, there were about 2.5 million households living in areas uncovered by electric networks. 70 percent of China's population is living in rural areas, some of which still suffer from inadequate supply of electricity and that the quality of power supply cannot be guaranteed. As the reform of China's power system gradually deepens, the power enterprises have maintained rapid development, with the current installed capacity exceeding 500 million kilowatts. However, given the speed of our economic development, supply-and-demand tension of electricity continues to exist in certain regions and in a certain period of time, thus power switch-off has occurred from time to time. Promoting universal service in electricity is one of the major tasks facing China's power development. This topic makes objects of universal service in electricity in the narrow sense as the major subject of study.

With the financial aid of the World Bank, the China Electricity Regulatory Commission has coordinated efforts to conduct research into the universal service in electricity since 2006. The program is composed of two parts: the first part is the research and investigation into the universal service in electricity, which is led by the North China Electric Power University; the second part is the study of the strategic workout scheme of the universal service in electricity, which is led by the Energy Research Institute, NDRC and coordinated by the Department of Political Science and Public Administration, Peking University.

On the basis of comprehensive research and study, the report proposed advice on the standard system, fund-raising and compensation mechanism, regulatory framework and related support policy of the country's universal service in electricity by giving reference to the domestic and international experiences of the electricity, telecommunications and postal industries and taking consideration into local conditions.

1. Policy Basis for Universal service in electricity

1.1 Major Conclusions of the Investigation and Study of Universal service in electricity

1.1.1 A Brief Introduction to Universal Service

As an internationally recognized concept, universal service falls into the category of public policy. It means that the state, in order to safeguard the basic rights and interests of all its citizens and to narrow the wealth gap, formulates laws and policies so that all its citizens, no matter where they live within the territory of the country, can obtain kind of service that can meet the demand of basic living requirements and development at a universal and affordable price.

At present, most countries around the world define the overall goal of universal service in electricity as providing reliable power at a reasonable price so as to meet the demand of those citizens who lack or cannot afford electricity. China's State Electricity Regulatory Commission has defined its universal service in electricity like this: "The state formulates policies and takes measures to ensure that all users have the access to reliable and consistent basic power service at a fairly reasonable price."

China's universal service in electricity has three layers of meanings. First, availability, that is, power service shall be available to all users. Second, non-discrimination, that is, equal treatment shall be granted to all users. Third, affordability, that is, a majority of the users can afford the service.

Obviously, universal service has some characteristics of public goods and market mechanism may not work when resolving issues related to it. Just like alleviating poverty, universal service is also an important function of the government. Therefore, issues like poverty and universal service can not be resolved merely by relying on universal economic growth and economic development; and thus the government needs to, through making laws and special policies, impose the obligation of universal service upon particular enterprises (generally referring to monopolized enterprises such as power network companies and telecommunications companies) and depend on such enterprises to carry out universal service so as to the policy goal of the government. Generally speaking, the variety and content of universal service has a direct and close relationship to public life. As society and economy develops, science and technology advances and people's living standard improves, the variety and content of universal service are also changing accordingly, with the state deciding or adjusting them by formulating laws and policies in different periods of time.

China is a vast and populous country. Although most of its population lives in concentrated areas, there are still some residents living in remote or deep mountainous areas or on islands, where there is an inadequate supply of electricity or simply no access to electricity. Therefore, it is necessary to further consider the issue of supplying electricity to their areas and solve the problem of lacking electricity. Due to the fact that 70 percent of China's population lives in rural areas, providing electricity to rural residents is the core issue of universal service. As the reform of China's electric-system gradually deepens, the power industry has maintained rapid development, with the current installed capacity exceeding 500 million kilowatts. However, given the speed of our economic development, supply-and-demand tension of electricity continues to exist in certain

regions or periods of time, thus switching off power has occurred from time to time. Despite a year-on-year increase of electrification rate in counties, villages and households, there were still about 2.5 million households with no access to electricity at the end of 2005. Thus, it is one of the urgent issues of China's power development to promote universal service in electricity.

1.1.2 Main Conclusions of Investigation

1.1.2.1 Research Methods, Sample and Contents of Investigation

The research was conducted nationwide in the country's 31 provinces, municipalities and autonomous regions with emphasis placed in six major regions including Tibet, Shaanxi, Shandong, Shanxi, Guizhou, Heilongjiang, Anhui, Jiangxi, Yunnan, Qinghai, Gansu and Jilin provinces.

For interview purposes, the research team randomly took three typical counties (one of them is powered by small hydropower station,) in every typical province as samples, 20 households in every county and no less than 60 households in every province. 1261 effective questionnaires were submitted with 814 in rural areas and 447 in urban cities, or 527 government-designated poor families and 734 non government-designated poor families.

In terms of research into related policies of local governments and grid companies, site inspections in the typical counties were carried out in the form of informal discussion. The main research contents include:

1) Research on basic situations to generally understand the current situations and problems of universal service, the scale of universal service that needs to provide nationwide, and the cost to provide such service. In detail, they are the number of villages, households, population and low-income population with no access to electricity; situations of power grid restructuring in rural areas and investment into villages with no access to electricity; operation and maintenance cost of power grid in rural areas in the recent years; electricity supply by small hydropower stations; electricity price movement after rural power reform, restructure and price unification; planning of the universal service in electricity during the Eleventh Five-Year Planning Period(2006-2010); governmental compensation mechanism or preferential policy given to those provide universal service; and basic problems.
2) Visit to residents, including low-income urban dwellers and poor rural people. Spot inspections were conducted to know backgrounds of users, to understand the current situations of the universal service in electricity from grassroots and to better know the needs and tolerance of the universal service in electricity of urban and rural dwellers. In detail, they are basic family background such as family members, their age, sex, education level and occupation; basic subsistence and production such as whether or not government-defined poor family, farmland area, major income, annual income; electricity consumption, electric device, electricity price and annual electricity consumption.
3) Policy research into the views and opinions of universal service in electricity of local governments and power companies. In detail, they are geographical location, population, demographic structure, GDP, economic structure and pillar industries; regions where poor people concentrate, their education level and nationality; situation

of power using, including overall electricity consumption, electricity using structure, valley-to-peak gap, generation hours, and trans-provincial transaction; local conditions and the potential influences on the universal service in electricity; related policies available and the compliance; how poor people are defined regionally and the scale, goals and standards of universal service in electricity; those who in responsibility of implementation, fund-raising channels of universal service in electricity; compensation mechanism to the power grid companies; desirable fund-raising channels and advice on how to devise compensation mechanism; and operation and regulation of universal service in electricity.

1.1.2.2 Number and Situation of Villages, Households and Population with No Access to Electricity and the Solutions

In the recent years, a few counties and villages gained access to electricity with greater efforts of all-level governments and power companies to construct and rebuild power grids. Up to the end of 2005, 98.79 percent of counties, 98.84 percent of villages and 99.37 percent of rural households within the business sphere of the State Grid Corporation of China (SG) have had access to electricity. According to the survey, there are 6268 villages and 1,410,343 households with no access to electricity within the SG business sphere, and 795,000 households, or 1.57 percent, and 3.2 million people with no access to electricity within the business sphere of the China Southern Power Grid. There are estimated 2.5 million households with no access to electricity in the country.

Questionnaires of 312 counties and cities in five provinces[1] are collected to know situations of those villages, households, population and low-income people with no access to electricity. The survey show 266 counties, or 6.11 percent, 17,756 villages, or 9.55 percent, 856,672 households, or 3.7 percent and 3,235,863 people (except Qinghai province), or 3.89 percent had no access to electricity in 1999 while 89counties, or 2.09 percent, 6730 villages, or 3.7 percent, 352,000 households, or 1.67 percent and 1,333,094 people (except Qinghai province), or 3.89 percent had no access to electricity in 2004. The statistics show great achievements have been made in the country's efforts to provide electricity service.

There are two options to provide electricity to villages used to have no access to electricity. One option is to extend power grid to those villages, the other is to provide electricity by building independent electric sources such as small hydropower stations, wind power stations, solar power stations or biomass generating electricity. It needs to take into consideration the reliability of electricity supply, local conditions, startup investment and maintenance cost to make overall evaluation in order to choose the adequate option.

1.1.2.3 Situations of Low-income Population and Electricity Consumption Per Capita

With the improvement of China's social security system, the proportion of "the most difficult groups" in the five provinces has been increasing year by year with those enjoy minimum social security increased to 427,949, or 3.22 percent, from 225,605, or 1.72 percent, in Gansu, Jilin and Yunnan provinces.

The survey found the country's social security system is far from satisfactory. Take Jilin for

[1] The survey was conducted in the five typical provinces including Yunnan, Qinghai, Jilin, Gansu and Jiangxi.

instance, when researcher asked those living in sheer poverty about reasons why they did not apply for government-designated “poor family” status to get subsidy, most of them said the appliance, limited by many conditions such as quota limits, is too difficult to succeed. There is much room to improve the social security system. And it also means this group of people is targeted to set up the system of universal service in electricity. In the recent five years, as the economy grows rapidly, the annual per capita income has increased by 31.37 percent from 2158 yuan in 1999 to 2835 yuan in 2004. But the annual per capita income in Qinghai is much lower than that of other four provinces. And the annual per capita income of “the most difficult groups” in the five surveyed provinces is much lower than that in other provinces in the country. Take Gansu and Yunnan for instance, the annual per capita income of “the most difficult groups” was 265 yuan in 1999, accounting for only 12.3 percent of that of Qinghai, Jilin, Yunnan and Gansu, and 376 yuan in 2004, 13.3 percent.

Electricity consumption per capita has increased with the economic growth and the income increase. Electricity consumption per capita of Qinghai, Jilin, Yunnan and Gansu provinces was only 96.48 kW•h. However, electricity consumption per capita of the five provinces increased by 64.1 percent from 1999 to 2004, compared with the annual per capita income growth of 31.37 percent. It means there are positive relations between electricity consumption growth and economic growth, and the electricity consumption growth goes ahead of the economic growth.

1.1.2.4 Actual Operation Cost and Rational Operation Cost Analysis of the Rural Power Grid

The power companies in Jiangxi, Jilin, Yunnan and Gansu continue to strengthen financial investment every year in the operation and maintenance of the power grid in rural areas with the annual growth rate of 16.8 percent in 2001, 33.9 percent in 2002, 29.9 percent in 2003 and 33.8 percent in 2004. The capital invested increased by 172 percent to 5618.84 million yuan in 2004 from 2065.67 million yuan in 2000.

The electricity sales of power grid in rural areas increase as grid transformation finished and operation cost goes up gradually. The sales rose by 85 percent from 9,692.54 million kW•h in 2000 to 17,926.41 million kW•h in 2004, with the annual growth rate of 11.5 percent in 2001, 9.2 percent in 2002, 22.5 percent in 2003 and 24 percent in 2004. Analysis showed the growth rate of operation and maintenance cost of power grid in rural areas exceeded that of electricity sales. The cost per unit for electricity sales rose steadily from 0.213 yuan/kW•h in 1999 to 0.313 yuan/ kW•h in 2004. Household lighting accounted for 90.38 percent of rural electricity consumption and irrigation-purposed electricity consumption, which had lower price than lighting, only represented 0.12 percent, so power suppliers still make profits with the current actual cost level. As expense structure from 2000 to 2004 remained similar, we are able to make an analysis of the cost structure of the five years through that of 2004. In 2004, salary, welfare and other expenses accounted for about 30 percent, depreciation fees 15 percent, material fees 15 percent, and interest fees about 2 percent, which reflected that electricity suppliers were not under too much pressure to pay off their loans.

The gap between rational electricity demand and the cost rose to 249.7319 million yuan in 2004 from 169.73698 million yuan in 2000. Despite the steady increase in the absolute value, the ratio of the actual cost to the demand-to-cost gap has been declining from 7.59 percent in 2000 to 5.72 percent. Given the electricity sales of the rural grid remain unchanged, the cost of per unit

electricity sales rose from 0.23 yuan/kW•h in 1999 and 0.33 yuan/kW•h in 2004.The comparison between the cost of per unit electricity sales and the lighting electricity price showed power suppliers are able to make profits and have a certain degree of capital potential to act as main electricity universal service provider.

1.1.2.5 Rural Power Grid Transformation and Investment in Villages and Rural Households with No Access to electricity in the recent five years

The planned investment in power grid reconstruction in the five provinces in the recent five years is 21,167.7873 million yuan, 20 percent of which are planned to come from public debts, 70 percent from bank loans and 10 percent are self-raised. The actual executed investment reached 18,411.9818 million yuan, 24 percent of which came from public debts, 54 percent from bank loans and 22 percent were self-raised. The non-executed investment was 2,755.8055 million yuan, or 13 percent. To be more specific, in Jiangxi, Jilin, Qinghai and Yunnan, the aggregated actual executed funds from public debts reached 2,441.2912 million yuan, compared with the planned 2,341.948 million yuan; the actual executed funds from bank loans reached 5,617.1229 million yuan, 73.9 percent of the planned 7,595.938 million yuan; the actual executed funds that were self-raised reached 2281.877 million yuan, 23 times as much as the planned which was 97.667 million yuan. According to the plan, there should have had no self-raised funds in Qinghai province, however, the actual executed funds self-raised reached as much as 2,113.32 million yuan, accounting for 66.31 percent. The rural grid transformation plan earmarked 10,012.9929 million yuan, or 47.3 percent, to be invested in electricity supply to villages with no access to electricity in the five years.

1.1.2.6 Survey of Rural Households and their Demands on Universal Service in Electricity

The surveyed 814 families in rural areas include 274 government-designated poor families. 1520 people, or 53.58 percent, are male and 1317 people are female, or 46.42 percent.

The analysis of occupations and main income sources of the families found most of the family members are engaged in traditional agricultural production. 63 percent are farmers and 9 percent are migrant workers. Agricultural income accounted for as high as 67 percent and service revenue accounted for 14 percent. Most of the surveyed believed their living burden was relieved, which could be reflected by the living cost and income changes. This is mainly due to the government's taxation reduction policy in the recent years.

During this period, the first and second phases of the rural power grid transformation were completed in all the provinces. The decline in rural electricity price contributes to the improvement of farmers' life. After investigation, the investigation team thinks that it is reasonable for the rural population relying solely on traditional agriculture to be concerned about the prices of agricultural products because they affect their income and the improvement of their living standards. Meanwhile, they regard the electrification project as a major event in their life, because electricity changes their life style into a totally different one from their ancestors. They can know the outside world through TV and they can also improve the production efficiency by the using of electrical machinery. Besides, it must be admitted that this investigation also makes the rural population become more interested in the electrification project.

In recent years, noticeable increase has been witnessed of farmer's income. The per capita

annual income of farmers has increased from 1460 yuan in 2001 to 2310 yuan in 2005, an increase of about 58 percent. Meanwhile, the per capita expenditure of farmers increased by 47 percent from 1200 yuan in 2001 to 1764 yuan in 2005. The comparison between the rises in income and expenditure reveals that farmers' life is still not well-off although their living standards have improved. The research group believes that the reform of "the same electric price in urban and rural areas" has lowered the rural electricity price and greatly promoted the increase of the power use volume in rural areas. We must admit that the increase in the power use volume in rural areas has also been influenced by some other factors such as the increase in household income. Besides, because of the introduction of "same electric price in urban and rural areas", expenditure on power use volume has not increased. In some households, it even decreases. Although the electricity consumption in rural areas has increased, the expenditure on power use accounts for a small proportion in the overall household expenditures and stays within rural household's reach.

Among 814 surveyed rural households, 446 households, or 72 percent, believe the electricity price is rational. The current electricity price can be accepted by most of rural households. Meanwhile, they hope the electricity price can be as low as possible. 221 households, or 34 percent, believe the electricity price cut to 0.15 yuan/kW•h to 0.30 yuan/ kW•h is the most desirable. 42 percent of the households hold the view that breakdown should be fixed as soon as possible and 19 percent favor reduction of power switch-off. But what they most care is whether or not the electricity universal service can really benefit them and when the universal service policy will be implemented. The electricity consumption pattern is as follows: 92 percent in household lighting, 3 percent in processing and only one percent in irrigation.

1.1.2.7 Research into Urban Low-income Groups and Demand on Universal service in electricity

The program surveyed a total of 447 urban low-income households, in which 253 households, or 57 percent, have minimum living pensions, with 1280 surveyed people, 677 male, 53 percent, and 603 female, 47 percent. The study of sample occupation and main economic income showed 23 percent of low-income households are engaged in the service sector while the laid-off workers, the unemployed and the patient who have long stayed in bed account for 32 percent which are not listed in the occupation part in the questionnaire. The main income sources are from doing service jobs.

When asked whether their life burden has increased, a pessimistic view is prevalent among urban low-income groups. 63 percent believe that they are having an increasingly heavy burden in their life in the past 5 years and they don't think that their burden will be reduced. Therefore, investment on social security should be increased and more concern should be given to the low-income groups. Meanwhile it reveals that the universal service in electricity aimed at low-income groups is an important measure in the reducing of their life burden. In recent years, the income and expenditure of urban low-income groups increase rapidly, but the increase rate is not that good compared to those of rural residents. The annual income per capita of rural residents has experienced an increase rate of 47 percent, from 2109 yuan in 2001 to 2581 yuan in 2005. Meanwhile, their average household expenditures have increased from 1785 yuan in 2001 to 2581 yuan in 2005. This represents major reasons why urban residents have a gloomy outlook towards their potential life burden.

With the introduction of the policy of " same grid, same price" in urban and rural areas, city

dwellers need to pay more on their residential power use, but the power use volume in the urban low-income households are on the rise. The reform of "same grid, same price" increases the proportion of expenditures on power to the overall household expenditures. The expenditure on power in urban low-income household has gradually become a relatively important part of their overall household expenditure. The implementation of the universal service in electricity is an important measure in the lightening of the burden on urban low-income households.

Among 447 surveyed low-income households, 218 households, or 59 percent, believe the electricity price is rational. The current electricity price can be accepted by most of low-income urban households. Meanwhile, they hope the electricity price can be as low as possible. 148 households, or 51 percent, believe the electricity price cut to 0.15 yuan/kW•h to 0.30 yuan/ kW•h is the most desirable. 49 percent of households hold the view that breakdown should be fixed as soon as possible and 25 percent favor reduction of power switch-off.

1.1.2.8 Universal Service Projects in Electricity under Construction and the Problems

Electricity universal service projects in electricity have been established in the 12 surveyed provinces, including the government's efforts to solve electricity supply problems, electricity available to every households, urban and rural grid transformation, unified electricity price in the same power grid, quality service, flood combat and disaster relief, migration, and electricity charge reduction, among others. Main problems facing electricity universal service include:

A. Serious Capital Shortage for Applying Universal Service in Electricity

At present, the areas with no electricity refer mostly to the remote and the economically depressed areas. Many a poor family in country and city cannot get enough power even for their basic demand. To realize the universal service in electricity, a big amount of capital is needed to upgrade the power network, provide power subsidy for the poor families, and establish relatively independent power source and power supply system in remote areas. The biggest problem is how to raise this astronomical capital.

After the reform of the urban and rural networks, there is a capital shortage to maintain and operate the upgraded networks. For example, in Shandong province, the grid is aging 10 years after the reconstruction of the first stage of the urban electricity networks, but there is lack of money; in Shanxi province, the net structure for the rural power network is usually county-centered, and provides power with 110V in a radioactive way. But the investment focus of the reconstruction project in the first two stages is 35KV and below. However, most remote mountainous areas (esp. those which have contributed and suffered a lot during the Revolution), due to their poor economy, have fewer 110v transformer substations, longer wire, and single-track sing-transformation, which cannot meet the N-1 principle. Currently, province-wide, over 40 counties have no 220v transformation substations, about 10 counties no 110v transformation substations, and most with 35v single-track single-transformation substations. This serious situation asks for immediate renovation; in Tibet, the situation is even more special: the total volume for electric power capacity there is limited, the construction and operation cost, however, are rather high. With the dissatisfactory profit of the power enterprises, there is no possibility of self-investing and financing. From the past experience, no power project can be carried out easily. Take the Zhikong Hydroelectric Power station as an example. It took almost 20 years from the prophase preparation to the approval of the construction start-up. In the 10th 5-Year Term, the central government invested about 5 billion YUAN in power industry in Tibet, and 18.5 billion

YUAN is needed for power construction for the 11th Five-Year Term, which is a tough job.

The government has the responsibility to carry out poverty relieving, including helping the poor families with no power to get basic life electricity. However, it's impossible for the government to invest one-off. Therefore, more parties are needed to get involved for this investment to improve and settle this problem completely. But, even the independent reproducible energy is used, more difficulty is ahead in spreading, transporting, installing, training, maintaining, and managing as well. This means, the project of "sending electricity to village and household", compared with the former project of "sending electricity to village", is even harder, and will be the vital battle for the electrification of the countryside for our nation.

B. Lack of Enthusiasm of Power Suppliers

First, non-profit service has serious problems. After the upgrading of rural power grids, there is no clear-cut dividing line of electric equipment ownership, and this leads to the rising service cost. For instance, when a farmer asks to have their bulb changed, the rural power enterprise will send professionals and necessary vehicles there, and nothing but the bulb cost can be charged; Second, all, including the upgrading of rural power grids, flood control and drought relief（favorable terms for raising poultry during SARS）,emergency and disaster settlement, geologic disaster, migrant relocation, poverty relief, new countryside construction, ask for large investment from the power suppliers alone, with no support in the form fiscal allocation, policy, or capital from the government. The power supply enterprise at county level in mountainous areas with more disasters shoulders the heaviest burden; Thirdly, to carry out the "same price for the urban and the rural" policy, the power network enterprises suffer an income loss over tens of billions every year. For example, after the upgrading of the rural power grids, the power enterprises at the county level of Shandong Province, following the "sale to the household, meter-reading to household, charge to household, service to household" requirement, take cost accounting inside the county, and find, due to the high power supply cost of the rural power grids and the limited supply volume, if digested inside the county according to the "same network, same price between the urban and the rural", they will suffer deficit and have difficulty in maintaining the normal operation and management, not to mention further construction and development of rural power network. What's more, the power supply enterprise cannot regulate the local power price on the basis of local power supply cost. Therefore, policy should be made by the government to offer compensation to these enterprises, in order to generalize universal service in electricity in the rural area and assure the same power price between the urban and the rural.

To realize electricity accessibility and affordability to all Chinese people, a lot of detailed work needs doing. Currently, in China, the main body being responsible is mainly the State Grid Corporation and Southern Grid Corporation, as well as the attached power suppliers of different levels. To carry out the work like upgrading the urban and the rural network, system maintaining, need a lot of manpower and material; what's more, these work is non-profitable, and the cost depends on the power network enterprises themselves. Therefore, in order to carry out the universal service of power, the premise is to make and maintain a sound related motivating system, the guarantee is the enthusiasm of the power grids enterprises as the main body to carry out the service. In addition, as the grass-root components of the main body for universal service in electricity, the power supply enterprise at the county level should get a more profound understanding of the significance of universal service. Meanwhile, the knowledge of universal service in electricity should be publicized and generalized among the vast farmer users and urban

users entitled to basic living allowances, to strengthen supervising over universal service in electricity.

C. Lack of Effective Supervision System over the Universal Service in Electricity

At present, there is still no effective supervising in China over the universal service electricity. The related law system does not make clear the ultimate goal, the carrying-out mechanics, the carrying-out procedure, or the corresponding supervising institution (let alone its responsibilities and duties), or supervising methods. The lack of an effective supervising system will further push the universal service of power to face more challenges.

1.2 Lessons of Universal Social Service Drawn from Domestic Relevant Industries

1.2.1 Postal Service

The concept of universal postal service stipulated by *Universal Postal Convention* is: "In order to enhance the concept of an allied and unified postal field, all member states shall enable all users (customers) to enjoy universal postal service, that is to say, to provide frequent and quality basic postal service in every corner within the territory at an affordable price. For such reason, all member states shall, under their respective national postal law or in other customary forms, formulate reaching coverage, quality standard and reasonable charge related to postal businesses based on the needs of citizens and specific national conditions", "All members shall provide universal service and ensure lasting universal service by feasible means".

The governments of all member states agree that, in the 21st century, universal postal service is still an important means to realize right of correspondence and postal service still bears the responsibility of providing universal service to the general public; the government is responsible for developing postal service, providing quality universal service to the public and guaranteeing their right of correspondence so as to promote sustainable development of our society. China, as a signatory state to the Convention, has committed that citizens (customers) within its territory can enjoy universal postal service. China's postal service, like that of any other country around the world, is commissioned by the government and shoulders the task of providing universal service. The operations concerning correspondence handled by China's postal service are basic businesses in providing universal service; packages, printed matters, remittances delivered by the masses, confidential correspondence, issuing party newspaper and periodicals, letters free for compulsory servicemen and free postal service for readings for the blind also fall into the category of universal service of postal service; in addition, post offices and rural delivery lines established in the countryside and remote areas in order to provide universal service also belong to universal service. Because of China's vast territory and its relatively huge gap in terms of economic development level, the cost of maintaining universal postal service is pretty high. Compared with foreign countries, the universal service undertaken by Post of China are characterized by more variety, larger scale, heavier responsibility, huger obstacle, thus maintaining universal service is more difficult. Compared with foreign telecommunications industries, the universal service undertaken by Post of China features a wider coverage, and so the organization and implementation is harder, the task is graver and the cost of providing universal service is even higher.

According to the investigation and study of the postal service, the difficulties faced by the universal service of Post of China are quite similar to those faced by the universal service in electricity. The universal service in electricity in China is also confronted with such difficulties as

a great variety of electricity users, extensive distribution, heavy responsibility, expensive network maintenance, relatively high cost of maintaining universal service and difficulty in fund-raising. Based on comparative research, universal postal service may provide some effective lessons for universal service in electricity in the following aspects.

1.2.1.1 Making Law and Determining Monopoly Right Are The Top Priority in Ensuring Universal Service.

There is still no clear definition of universal postal service in the *Postal Law of the People's Republic of China* promulgated in 1986. At present, Office of Legislative Affairs under the State Council is taking a lead in amending such Law and will include regulations of universal postal service into legal norms. The reform plan of postal system issued by the State Council (guo fa [2005] Document No.27) defines: establishing a mechanism of universal service. China Post Group assumes the responsibility of providing universal postal service. The scope and standard of universal service should be determined through legislation. At the same time, postal enterprises must establish and improve a cost-efficient incentive mechanism and make great efforts to reduce the cost of universal service with the prerequisite of ensuring the capability and standard of universal service. Moreover, due to the interference of private postal service inside the post, there has appeared a phenomenon of gaining pretty advantages, that is, private investment is only targeted at profitable fields, while for non-profit social responsibility, nobody is willing to undertake. Therefore, determining monopoly right is the top priority in ensuring universal service.

1.2.1.2 Setting an Overall Goal and Guaranteeing the Realization of Social Universal Service in a Phase-by-phase and Step-by-step Manner

The business scope of China's universal postal service covers not only such basic operations like ordinary correspondences and packages but also such policy operations like letters free for compulsory servicemen, free postal service for readings for the blind, confidential correspondence, issuing party newspaper and periodicals and frontier correspondence. The universal service operations provided by Post of China outnumber that of any other county around the world and are done in a phase-by-phase and step-by-step manner. At each stage, the government plans a different scope based on realities and enlarges it gradually, thus providing a relatively complete service variety and higher quality of service in the end.

1.2.1.3 All objects Are Charged Uniform and Low Service Postage

Just like the post in other countries, in order to guarantee the right of correspondence of its citizens and enable its citizens and all social communities to enjoy universal postal service, Post of China, based on the cost standard lower than cost and cost-free policy formulated by State Bureau of Commodity Prices, has set up extensive postal business networks to provide universal service. Post of China implements low postage, with uniform charge for urban and rural areas as well as for the vast rural areas, remote areas and urban cities.

1.2.1.4 Supporting Social Universal Service with the Financial Subsidy of the Government

As China is a vast country with numerous underdeveloped regions and due to the heavy task

of guaranteeing frontier correspondence, these objective factors have led to a huge cost in maintaining universal postal service, and thus the Post, if merely relying on itself, can not stand the huge amount of deficit. As the top priority should be given to universal service, the postal department cannot completely follow market and economic rules in terms of management system, operation mechanism, network organization, mode of production and variety of business, resulting a heavy burden and great stress on universal service, which is particularly prominent in western areas of China. Meanwhile, the infrastructural facilities of providing universal postal service are weak, so basic conditions for production can hardly be ensured. Finally, staff's working conditions are tough, especially in some branch institutions, and the labor protection standard is quite low. Currently, primitive means like delivering on foot and on horseback have to be maintained in some rural areas and western regions. It is a commonplace for a county's delivery road to be over 100,000 meters, some even as long as 200,000 or 300,000meters.

The reform plan of postal system issued by the State Council (guo fa [2005] Document No.27) clearly defines that postal enterprises must establish and improve a cost-efficient incentive mechanism and make great efforts to reduce the cost of universal service with the prerequisite of ensuring the capability and standard of universal service. Upon such basis, the deficit of universal postal service should be subsidized by state finance. At present, the government departments concerned are still under research with regard to subsidizing universal postal service.

In light of the experience of universal postal service, workers engaged in universal service in electricity may have to work very hard. Therefore, the fund for universal service in electricity must provide workers with the most basic life guarantee and grant some monetary reward if necessary for better advancement of the task. The state exempts this project from VAT before the project cost of universal service gets compensated so that universal service can enjoy various preferential policies of the state.

1.2.2 Telecommunications

The definition of the universal service of China's telecommunications can be summed up as: providing standard voice service as well as other basic telecommunications service provisioned by telecommunications department in charge to all citizens within the territory of the People's Republic of China with universal and affordable telecom charges.

1.2.2.1 Providing Legislative and Legal Guarantee

Promulgated for implementation in September 2000, *Telecommunications Ordinance* is China's first comprehensive administrative law concerning the telecommunications industry. As for universal telecom service, Article 44 of *Telecommunications Ordinance* stipulates that "Operators engaged in telecommunications business shall perform corresponding duty of providing universal telecom service in accordance with the relevant provisions of the state." It also stipulates that "The cost compensation measure of universal telecom service shall be formulated by the responsible Department of Information Industry under the State Council, the Financial Department and the department in charge of price under the State Council and then submitted to the State Council for promulgation and implementation." These provisions of *Telecommunications Ordinance* provide the universal telecom service with legal basis and guiding way of thinking.

In November 2001, the State Council issued *Notice Concerning Printing and Issuing the*

Reform Plan of Telecommunications System. The Notice mentions that, as supporting measure of the reform plan of telecommunications system, "Universal service fund should be established as soon as possible. All enterprises engaged in telecommunications business shall undertake universal service and promote the change of the mechanism of telecommunications universal service so as to safeguard the universal telecom service under the circumstances of market-driven economy." This is the first time that the State Council mentioned in public official document that a fund for universal telecom service shall be set up.

Currently, Ministry of Information Industry is actively negotiating with National Development and Reform Commission. In order to assist the establishment and implementation of universal service fund, the two sides are busily drafting *Plan for Universal Service*, *Measure for Collecting and Using the Fund for Universal Telecom Service* and *Measure for Universal Telecom Service* so as to make clear the concept, objective, obligation and compensation mechanism of universal service by law. The future *Telecommunications Act* will define the function, mechanism and management framework on the part of the government when it implements universal service. The implementation mechanism and management system of universal service defined by law shall conform to the relevant provisions of *Agreement on Basic Telecommunications* of the WTO. First, the principle of neutrality in competition shall be followed. All qualified operators shall undertake the obligation of universal service and hand in a share of the fund. Next, management shall be made public and transparent. The proportion and amount of fund collection shall be based on scientific and reasonable calculation of cost. Market mechanism such as bidding shall be employed as much as possible in the utilization of the fund. All qualified operators shall have the opportunity to participate in the bidding of universal service projects. Third, an over-heavy financial burden for operators brought about by the obligation of universal service should be avoided and disturbance done to the telecommunications market should be reduced as much as possible. This requires that the objective of universal service must be reasonable and in accordance with rural residents' demand for telecommunications and with the economic and political demand of rural areas.

1.2.2.2 Setting an Overall Goal and Guaranteeing the Realization of Social Universal Service in a Phase-by-phase and Step-by-step Manner

The implementation of universal telecom service is a phase-by-phase and step-by-step process, which has different content and development goals at different stages of social and telecom development. As for which operations should be included into the scope of universal service and which means should be employed, these should be decided by the unique condition of each state. Although such social factors of a country as its politics, history, law and culture may exert an impact on it, economic level, natural conditions and telecom infrastructural facilities play a bigger role in the implementation process.

The overall goal of China's universal telecom service is to establish a mechanism of universal service and guarantee basic telecom service for different stages; and to gradually improve the popularity of various telecom businesses and ensure and enhance customers' interests. Its core content is to ensure that customers must have the access to telecom service within the endurable time limit and the reachable scope of region, to ensure the convenience of enjoying telecom service, to ensure universal telecom service provided in a fair, reasonable and non-discriminatory manner and that the service should be affordable to its subjects, to ensure a

stable service quality and a relatively high level of satisfaction, and to ensure that universal telecom service should provide basic telecom service. According to China's realities, from the perspective of region, subject with access to the businesses and variety of the businesses provided, China's universal service can be divided into several stages. In the first stage, telecom service is provided, covering major cities. In the second stage, the scope of telecom service is extended, covering cities and major counties and townships. In the third stage, universal access service is provided, basically realizing "village-to-village telephone call". In the fourth stage, household's access to telephone is basically guaranteed. In the fifth stage, the benefit of information is brought about to individuals, with higher level of information service provided. All basic telecom demand will be met and the general public will be provided with high-level information service.

Drawing on the division of stage of universal telecom service, universal service in electricity can be divided in to the following five stages:

In the first stage, on-the-spot investigation is carried out in order to know the features of promoting universal service in each province. In the second stage, urban electricity supply is guaranteed so as to meet the electricity demand of cities with dense population. In the third stage, the coverage is extended, with electricity supplied to major counties and townships. In the fourth stage, electricity supply covers all natural villages. In the fifth stage, special service is provided based on the electricity demand of individual users.

1.2.2.3 Making Clear the Management Principles and Purpose of Universal Telecom Service

The management principles mainly include: a) Principle of non-discrimination. The conditions and procedure of managing and using universal telecom service shall apply to all telecom business operators and shall not discriminate against any individual operator or a particular kind of operators engaged in telecom business; b) Principle of openness and transparency. Universal telecom service shall be implemented in a fair, open and transparent manner; c) Principle of compensation. The fund for universal telecom service shall only compensate operators of universal service for the gap between their revenue generated from provision of universal service and the cost; d) Principle of neutrality in competition. The fund for universal telecom service shall not be used in a manner that exerts any positive or negative influence on operators' position of competition and their telecom operations, and shall not affect the commercial operation mechanism of the main body of operators.

The management purpose of universal service is to provide standardized, easy to operate and low-cost service. a) Standardized. Formulate relevant regulations concerning each link of the management of universal service and determine its working process so as to ensure the realization of the goal of universal service. b) Easy to operate. While corresponding management norms and measures are formulated, China's telecom reality should be taken into account so as to ensure that they are easy to operate. c) Low cost. On account of the asymmetric feature of information, government's reliance on information about the cost of enterprises should be reduced as much as possible and it is the same case with the cost of control.

1.2.2.4 Establishing and Standardizing Compensation Mechanism of Universal Service

Judged from international experience, compensation capital is possibly from universal service fund, state finance, taxation, surplus of high-rewarding businesses, loan or financial

assistance, license and auction of resources. Accordingly, contribution compensation may be from enterprises operated in low-cost regions, high-income consumers and the surplus of some profitable businesses. Based on the sources and outflows of compensation fund, compensation mechanism of universal service generally has the following forms: By means of market competition, especially through reform of privatization, competition and cost-based pricing measure; obligatory stipulation: implemented by means of license conditions and other control measures; cross subsidy: subsidizing within the internal businesses or different kinds of businesses provided by the leading operators; compensation for access deficit: competitive telecom operators pay leading operators to subsidize their loss suffered in access into the line; fund for universal telecom service.

These measures are not contradictory to each other and many countries employ a couple of means at the same time. The experience of all countries around the world and the theoretical standard of telecom economy demonstrate that universal service fund is the optimal choice to promote the sustainable development of universal telecom service in a competitive environment. However, it must be noticed that the complicated procedure of administering the universal service fund and great difficulty in calculating the cost may lead to a relatively huge transaction and management cost. Therefore, a demand for higher efficiency of governmental controlling department has been put forward. Cost compensation mechanism, income compensation mechanism and price compensation mechanism must be established as soon as possible.

Given China's telecom development stage and referring to international practice, China's universal telecom service adopts a compensation mechanism with the fund for universal telecom service at the core. Through formulating *Measure for Collecting and Using the Fund for Universal Telecom Service*, the government standardizes sources of the fund for universal telecom service and stipulates the measure for collection targeted at telecom operators in details; standardizes specific scope of utilization of the fund for universal telecom service; and enhances the benefits of utilizing the capital by further classifying the management and utilization of universal service fund.

1.2.2.5 Improving and Strengthening Supervision

Supervision and control of the telecom industry mainly depends on internal supervision and control, but there is no specific measure and no special department in charge. Ministry of Information Industry, for most part, is busy formulating development strategies of telecom and pursuing scientific and technological innovation. However, with constant progress of telecom technology, the quality of universal telecom service has been improved remarkably. In light of the experience of telecom, the promotion of China's universal service in electricity must follow the guidance of technology. And under a reasonable system of supervision, various measures of universal service must be implemented in a phase-by-phase and step-by-step manner and goals for each stage be achieved so that the overall goal can be attained finally. The department for industry management needs to make development plan of universal telecom service based on the reality of national economy and telecom industry. In the plan, the department should make clear the goal for each stage and the variety and scope of universal service and organize the implementation with the approval of the state. The department for industry supervision must create a favorable external environment for operating enterprises to carry out universal telecom service. It must also use legal and economic means and gradually reduce administrative means to establish and improve the

mechanism of supervision and control, and beef up efforts in supervising and controlling so as to provide a fine platform for safeguarding consumers' rights and interests.

According to the experience concerning universal telecom service, for the purpose of more standardized, orderly and healthy development of universal service, the following principles must be adhered to in actual practice. First, principle of integration with international standard, that is, the establishment of universal service must help break monopoly, protect competition and promote development; be conducive to supervision and management so that the function of the fund is more open, fair and transparent; and help constantly improve public welfare and ensure the sustainable development of national economy. Second, principle of defining rights and duties clearly, that is, every individual shall be entitled to the basic right of enjoying universal service and every operator shall have the duty to provide universal service. Third, principle of sustainable development, that is, the objective of universal service must keep updating with economic and technological development; and the level of service needs to be continuously improved, which shall be going hand in hand with the development of the power industry instead of simply being an expedient.

1.3 Lessons of Universal Social Service Drawn from Foreign Relevant Industries

1.3.1 Postal Service

1.3.1.1 Strengthening the Building and Perfecting of Legal System of Postal Service

Proceeding from the perspective of protecting their own interests and national interests and safeguarding the security of state information, many developed countries attach great importance with the control, management and protection of postal monopoly right, for which countries around the world have formulated complete, definite and detailed legal provisions. The Postal Law of France stipulates that letters and packages weigh less than 1,000 grams shall be monopolized by Post of France. The Russian government released postal monopoly in 1995 by revising the *Postal Law*. However, after 4 years of operation, it discovered that not only the right of correspondence of its citizens was not protected but correspondence sovereignty and security of state information had been severely damaged due to the influx of foreign capital. In 1999, the Russian government summed up its lessons and restored postal monopoly of the state by revising *Postal Law*, in which it stipulates that "Post of Russian is entitled to natural monopoly right and undertakes the task of consolidating state organization and exercising national sovereignty."

In addition, some countries even have established special enforcement force to provide postal monopoly right with a strong and powerful judicial guarantee. For example, in the United States, there are over 7,000 postal supervisors and more than 5,000 postal police officers enforcing the law on behalf of the state and never allowing non-postal enterprises to encroach upon postal monopolized businesses. Even for Italy only with a population of over 57 million, a postal enforcement team made up of 300-plus people has been set up.

1.3.1.2 Defining the Scope of Postal Monopoly Right and Giving Corresponding Protection

All countries and regions have granted monopoly right of different degrees to the postal department in various forms. The Republic of Korea, one of the "Four Tigers" of Asia, stipulates

that “Apart the from the state itself, nobody shall engage himself/herself in business of correspondence or deliver correspondence for others by taking advantage of his/her organization and networks. And nobody shall commission legal correspondence operator to deliver letters.” In order to realize universal postal service, the United States has carried out postal monopoly of correspondence, including bills, certificates, commercial letters and postcards. And the country has no intention to open it within ten years and never allows non-postal companies to encroach upon monopoly business. What’s more, the United States even stipulates that only post bureau can install and use mailboxes. Though the European Union demands its members to reduce the scope of universal service and cut monopoly right of postal businesses, it still regards mails weighing less than 350 grams as postal monopolized business. Non-postal companies may operate such business but the charge is five times of postage. With a history of over 300 years in modern postal service, the Great Brain still clearly stipulates that “All correspondence mailed into the country shall be handled by the postal department” in order to ensure the security of state information.

Nearly all countries around the world (even for countries whose postal service has been incorporated) have implemented postal monopoly of correspondence. Some countries have released it on condition of monopoly. In general, all countries throughout the world are mainly adopting such three means as postage restriction, weight restriction and delivery restriction to conduct monopoly protection.

1.3.1.3 Establishing and Improving Compensation Mechanism of Universal Postal Service

In order to take concrete steps to implement universal postal service, all countries have defined the concept and scope of universal postal service and established compensation mechanism of universal postal service. The mechanism mainly falls into the following several categories: direct subsidy by the state finance; reducing and remitting taxation; transferring business revenue to compensate universal service; granting managerial authority to non-profit postal businesses; establishing universal service fund; and providing policy support to universal postal service (mainly including postal monopoly right and priority of postal transportation and inspection).

The government has the duty to safeguard its citizens’ right and freedom of correspondence. It commissions postal enterprises to provide universal postal service in order to fulfill its duty. The stability and long-term nature of compensation mechanism should be taken into account when compensation mechanism of universal postal service is to be established. The compensation mechanism of universal postal service must be stipulated by law so as to ensure its smooth implementation. As a comprehensive system, fund for universal postal service may be established by learning from the way of telecom so as to guarantee the stability of compensating universal service. Direct subsidy by state finance is feasible if necessary, e.g. when fund fails to make up the deficit of universal service. Meanwhile, tax preference, business compensation and other preferential policies may be employed in a comprehensive way so that deficit of universal postal service can be compensated and the postal authority can better fulfill its responsibility of providing universal service.

1.3.2 Telecommunications

Nowadays, countries worldwide that have successfully implemented universal telecom

service are the United States, India, Australia and Mexico, Chile and Peru of Latin America. In spite of their varying successful experience, there are some characteristics in common.

1.3.2.1 Ensuring the Establishment of Universal Postal Service System through Legislation

The concept of universal service was put forward as early as 1934 in the *Telecommunications Act* of the United States. In 1996, the Act established the US universal service system. In 1997, *Order of Universal Service* promulgated by Federal Communications Committee (FCC) states clear provisions concerning the specific implementation measure of universal service. In several years after, FCC promulgated again a series of articles as the supplement of *Order of Universal Service* so as to further improve the universal service system of the United States. *Telecommunications Act* of Australia in 1997 clearly stipulates that the major content of Australia's "Universal Service Obligation (USO)" is "to enable all Australian nationals to reasonably enjoy standard call service, paid public phone service and the stipulated transmission service on a fair basis". Subsequently, the country promulgated *Law on Upper Limit of Universal Service Price* and *Law on Consumers' Rights and Interests and Service Standard* in succession and gradually established and improved universal service management system. India's first National Telecommunications Policy (NTP'94) wrote universal service into policy document for the first time and defined it as providing particular basic telecom businesses to all citizens at an affordable and reasonable price. NTP'99 emphasized that one of the primary goals of universal service obligation was to provide telecom service to areas sparsely populated (with rural and remote areas, mountainous areas ad tribal regions included). In the Amendment of India's *Telecommunications Act* of 2004, the content concerning universal service fund was written into the Act and made it lawful. In 1994, the Peru government formulated general Telecommunications Act, in which the concept of universal service is proposed. The Act also determines that the primary goal of universal service is to promote the popularity of telecom business in rural areas and some low-income urban regions (remote areas in particular) or isolated areas.

1.3.2.2 Using Fund for Universal Telecom Service as Value Compensation Mechanism

Currently, operators worldwide with successful practice of implementing universal telecom service all replace traditional cross subsidy with universal service fund. Major subjects for universal service fund collection are telecom operators. For example, the total volume of US universal service fund in 2002 was 5.86 billion US dollars, accounting for 2 percent of US telecom revenue. All US telephone users must pay for the universal service fund each month, which is collected by operators first, then submitted to state or federal finance (jointly formed as universal service fund) and finally distributed to the operators investing in high-cost and low-benefit areas. Australia also adopts the means of universal service fund to subsidize the deficit of universal service, which in specific words is operation-maintaining cost subsidy of cost subsidy. In 2002, the telecom revenue of Australia was 13.38 billion US dollars, of which the collected universal service fund accounted for 1.4 percent. In India, apart form ISP, all operators take 5 percent of the gross revenue after adjustment out as payment for universal service fund.

1.3.2.3 Setting up Special Managerial Authority for Universal Service Fund

Special managerial authority for universal service fund is in charge of collecting, distributing and using universal service fund as well as of drawing up documents related to universal service fund. In the United States, FCC, simply as a managerial and controlling department of universal telecom service, is responsible for formulating policies and supervising the enforcement, while the special managerial authority for universal service fund is a civil non-profit organization authorized by the government, which, as the executive body of universal service policies, is in particular charge of project and fund management of universal service. In Australia, management of universal telecom service is under the direct control of ACA and the department in particular charge is USO sector, which consists of three groups, namely, fund group, subsidy group and supervisory group. These three groups are respectively responsible for managing universal service fund, appraising universal service cost and supervising whether telecom companies have fulfilled their universal service obligation. India's universal service fund is managed by the department of fund management. As bidding is the way of choosing operators, so a major task on the part of the department of fund management is to work out the bidding procedure, including terms and conditions of bidding, and then to assess the bidding plan. After finishing the tasks above, some agreements need to be signed between the department of fund management and telecom operators, and the department of fund management is also responsible for accepting the claims of universal service operators. From the perspective of storing and auditing fund, no matter it is the United States, South Africa, Australia or France, they all use a special account. Moreover, the relevant provisions of these countries stipulate that both the balance and the outcome of the account of universal service fund shall subject to the audit of independent auditing body (including National Auditing Bureau and accounting and law firms).

1.3.2.4 Implementing Universal Service Projects through Bidding

In the process of utilizing fund, operators of all countries implement universal service projects through bidding. Those who offer the lowest quotation can obtain subsidy so as to ensure the minimum cost of universal service. Bidding can save the government from the huge amount of work done for precise calculation of cost subsidy. Australia's supervisory and controlling institution first appoints traditional operators as the obligatory suppliers of universal service and makes public each year areas suffering losses due to provision of universal service. Then the institution calculates the cost of universal service with method of avoidable cost and publicizes the outcome. If other operators can issue valid certificates to show that they can provide universal service with an even lower cost, then they can compete for monopoly right of universal service. At present, project bidding of universal service in India is carried out in big regions. The task of nationwide universal service has been divided into 21 telecom regions. In each region, before the bidding starts, the department of fund management conducts investigation and study (All data needed are submitted by the operators.) and employs experts to develop an engineering mathematical mode and find out a most effective access service mode based on the natural geography and population features. And then, on the basis of such mode, the department in question figures out how much investment is needed for this region, upon which it proposes the highest subsidy volume of the bidding. During the bidding, usually there are several operators competing for one region. Therefore, the government chooses the operator giving the lowest

quotation (Such quotation should be lower than the highest subsidy volume.) to provide access service so as to make the policy more transparent.

1.4 Lessons of Universal Service in Electricity Drawn from Abroad

Up to now, no country has clearly put forward the concept of universal service in electricity in its legislation. However, almost all countries have proposed the fundamental principles that power companies need to observe in their legislation. And these principles are in line with the requirements of universal service in electricity.

At present, research on universal service at home and abroad, for the most part, lays emphasis on the telecom industry, while study on the universal service in electricity is still in its infancy. By analyzing the experience of such countries as Britain, the United States, France, Australia, Spain, New Zealand, Bangladesh, Argentina, Kazakhstan, Japan and Sweden, it is not difficult to see that these countries, in terms of universal service in electricity, share the following experience in common: First, legislation is employed to seek legal guarantee for the universal service in electricity. Second, establishing or authorizing special power supervisory and controlling institution. Third, constantly deepening the reform of power management system and striving for a nationwide unified power market. Fourth, a compensation mechanism of universal service in electricity should be set up. Take Spain for example. Its *Electric Power Law* adopted in 1997 stipulates that power network enterprises shall undertake the duty of constructing and extending electric network. The country also has established an energy management committee in charge of the supervision of the entire power system. Currently, Spain has realized 100 percent universal service in electricity. If there is a new-established residential area (even only one household) with no access to electric network, the power network enterprise in charge of this region is responsible for completing the extension and supplying electricity within designated time. All cost needed will actually be covered by the state finance. Within one cycle of every four years, power network enterprises report to the energy management committee the plan and budget of extending power network at the beginning, and the budget and cost are cancelled after verification at the end of each cycle. By establishing such compensation mechanism, the obstacle of hardware facilities needed by power network enterprises while providing universal service has been removed.

Despite the fact that no country has clearly put forward the concept of universal service in electricity, most countries (including developed and some developing ones) regard supplying remote areas with electricity as one fundamental task of power service and put in into practice. Developing countries and the developed ones with vast territory mostly use renewable energy to generate electricity based on their individual conditions. In this case, they have not only made full use of various resources, efficiently improved energy utilization ratio and met their nationals' demand for electricity but protected the natural environment. Peru, Australia, Nigeria, Egypt and Chile are good examples in this regard. Furthermore, with a rather low level of comprehensive national strength and per capita living standard, developing countries need to consider the affordability of their citizens when taking power generation and supply into account. Therefore, most governments of these countries grant electricity subsidy to low-income residents so as to realize the goal of providing universal service in electricity. Democratic People's Republic of Korea, Mexico and the Philippines are examples in this regard.

Though most countries have made a promise concerning the policy of universal service to

some extent, in the process of reform, the issue of universal service still has given rise to numerous conflicts. As a matter of fact, among the many important theoretical and practical problems caused by universal service policy, two remain the focus of dispute: First, what is the optimal scale for network expansion? Second, how to fix the price so that universal service policy can be best implemented? As power supply exceeds power demand in developed countries, so power supervisory and controlling department does not have to give too much consideration to power supply. Moreover, developed countries have basically realized universal service in electricity, which has a lot to do with their long-term history of power construction and development. These countries, after scores of or a hundred years' construction, are already in possession of a wide-spread power network, the European countries in particular, as they have small territories, well-developed coverage of electricity and strong economic strength, even when there appears a need for power network extension and capacity expansion, demand of capital will not be high. This is quite different from China's national conditions and its power market quotation. That is to say, China can not learn much from the experience of foreign countries with regard to universal service in electricity. Although domestic institutions concerned and experts have already started to pay attention to universal service in electricity, most of them only look at the brief introduction of overseas practice without setting forth any specific implementation mechanism and corresponding policies and suggestions on the basis of China's national conditions.

2. The Fund Raising Mode and the Compensation Mechanism of the Universal Service in Electricity in China

2.1 Standard of the Universal Service in Electricity

2.1.1 Target Groups of the Universal Service in Electricity

The first priority to carry out universal service in electricity is to define target groups.

2.1.1.1 Urban Low-income Groups

To carry out universal service in electricity in the urban low-income groups, the first thing is to target those who need subsidies. The urban low-income residents are divided into three groups according to the minimum living pension. The first group includes those without living incomes, working abilities or legal guardians. The second group includes those who fail to find job when they receive unemployment benefits or when the relief period expires and the per capita income is below the minimum living standards. The third group includes families in which per capita income is below the minimum living standards after the working people get salaries, the unemployed get allowances and the retired get pensions. In 2005, there were 22.328 million people and 997 households that receive minimum relief. Average Minimum Relief Standard by Region in 2006 is as follows. (See Table 1)

Table 1. Average Minimum Relief Standard by Region in 2006

Unit: Yuan

Region	Standard	Region	Standard	Region	Standard	Region	Standard
Beijing	310	Shanghai	320	Hubei	146.75	Yunnan	166.71
Tianjin	300	Jiangsu	219.12	Hunan	145.89	Tibet	205.75
Hebei	152.78	Zhejiang	231.1	Guangdong	206.24	Shaanxi	151.67
Shanxi	135.36	Anhui	173.63	Guangxi	142.56	Gansu	142.05
Inner Mongolia	130	Fujian	173.58	Hainan	140	Qinghai	175.98
Liaoning	174.15	Jiangxi	139.58	Chongqing	176.19	Ningxia	168.64
Jilin	137.57	Shandong	186.7	Sichuan	142.23	Xinjiang	129.62
Heilongjiang	123.48	Henan	144.89	Guizhou	143.53		

The above-mentioned minimum living pension standards are set by local governments. The current poverty line is worked out on the basis of 20 commodities and services that meet necessities of basic subsistence, which is called basic demand method. The average minimum living pension standards and expenses set by cities vary with local conditions and consumer price. The Regulation of Minimum Living Cost of Urban Residents stipulated that the minimum living cost should be set in accordance with expenses of clothe, food and houses that meet subsistence demand of urban residents and with charges of water, electricity, gas and education taken into consideration to guarantee people's basic subsistence.

In accordance with above-mentioned principles, the government should provide the urban low-income group with basic subsistence services, including subsidies to living-purpose electricity charges. The Regulation of Electricity Supply Supervision (on trial) stipulated that electricity suppliers should undertake their responsibilities to provide universal service in electricity in order to guarantee that all people have access to electricity at the generally accepted electricity prices and the electricity regulator is responsible for supervision. Accordingly, the government and electricity suppliers have responsibility to provide universal service in electricity to the urban low-income groups that meet the minimum relief standards.

2.1.1.2 Rural Areas

The target groups of the electricity universal service in rural areas mainly include those who get no access to electricity and those who cannot afford electricity.

The cost of living varies in different areas and that is also true of the standards for the cost of living. At present, the poverty level set by the civil affairs bureau in our country is a minimum expenditure level which can satisfy the basic need of the rural poor population. At the present stage our national strength is not solid and this poverty level is determined by the objective reality of China. The civil affairs bureaus publish a social relief table once a quarter and the objects of the universal service in electricity in rural areas and remote areas can refer to the latest table to determine which group can enjoy the electrical power use subsidies. However, it does not necessarily include all the poor population in the universal service in electricity. Because the group on the top of the list of social relief is the "households enjoying the five guarantees"---mainly composed of childless and infirm old persons who cannot take care of themselves in daily

life. These persons should be accommodated into the “old folks’ home”. Another group in the list of social relief is the mentally retarded population who cannot handle electricity properly and the supply of electricity will be a danger to their life. As to this group, the supply of electricity should be withheld unless they are under guard. Therefore these two groups should be excluded from the universal service in electricity and the universal service only applies to other poor families designated by the civil affairs bureaus at various levels.

2.1.1.3 Outlying Areas

The universal service in the rural areas mainly caters to

1) The population in the old revolutionary base areas, areas inhabited by minority nationalities, frontier areas and poor areas. These areas are not far from the power grid but are not covered by the power grid due to economical underdevelopment.
2) The population in the sparsely-populated remote mountain regions, western farming-pastoral region and islands. These areas are usually located in inaccessible parts and far away from the grid where the high cost for power supply and the limited power use volume made it not economical to expand grid network.
3) The populations in remote poor regions who cannot afford the rural grid retrofit economically.

Limited by the national strength, the number and distribution of the outlying areas and households where power access is still not available cannot be solved at one time. The power service in remote areas should be satisfied step by step. Most of the non-connected households scatter in a remote area, and in some cases in order to connect one household in the power grid requires several kilometers of the supply lines and a transformer. Taking into consideration of the small capacity and high damage, it is a big waste of social material at the present stage when our national economical conditions are rather poor. The current practice is to provide power connection according to the population, and a village with more than 30 households will be provided with the power access. After our national economical conditions improved, the power access of poor population in outlying areas will be satisfied gradually, say if the investment cost is below 50,000 yuan per household or the village with more than 10 households.

2.1.2 The Current Situation of the Universal Service in Electricity in China

Universal service in electricity is restricted by a few factors, among which economic development level and power grid construction are the most obvious. With the country’s vast territory and unbalanced economic development, the construction of power grid varies in the east, middle and west areas. Therefore, the program conducted research into the universal service in electricity for urban low-income group, rural areas and the outlying areas in accordance with the variation of the residents’ basic subsistence. The current situations are analyzed by target groups as follows:

2.1.2.1 The Urban Low-income Groups

Electricity supply is one of the basic necessities in the life of urban residents. The efficient solution of the electricity demand of urban low-income groups plays an important role in

promoting social equality and maintaining social stability. By satisfying the electricity demand, the government helps to solve the practical difficulties in low-income groups and regulate the income distribution among people. Moreover, it constitutes an important part of the building of a well-off society and a harmonious community. At present, the well-off society has already been achieved in urban cities. According to some investigation, at this stage more electrical appliances will be used by urban residents for their convenience and the household electricity consumption will also increase. Since 1990s, under the guidance of the Central Party Committee and the State Council, local people's governments at various levels, together with the Electric Power Sector, have implemented a series of projects such as the urban power grid upgrading, "one meter for one household" to improve the electricity service in urban cities, provide electrical service for the urban low-income groups and improve the life quality of those people. The statistics of urban residents' electricity consumption in 2004 are listed below in Table 2.

Table 2 Urban Residents' Electricity Consumption in 2004 （per capita）

	Unit	Total	Lowest-income Households	Among them: Difficult Households	Low-income Households
Amount	Killowatt-hour	402.24	215.35	195.33	264.86

The statistics show residential electricity has become a basic demand of urban residents, and even for the low-income groups, the total amount of electricity purchased per capita for a whole year has almost reached 50 percent of the average level of the whole country.

The sample investigation made on China's universal service in electricity reveals that 63 percent of the urban low-income households believe that their life burden is on the increase. In sharp contrast, only 31 percent of the investigation objects believe that their family income will increase in the coming year. It demonstrates that at the stage when the economic competition is becoming increasingly intense and the social transformation is yet to finish, the expectation for life of the urban low-income groups is not optimistic. Therefore, the whole society should show close concern towards this group and give them more support and assistance. Providing universal service in electricity is naturally an important part to lighten their burden and improve their life quality.

In recent years, especially with the introduction of the nationwide "same grid same-price in town and rural area" with the purpose of providing rural areas electrical service at a more reasonable price, the electric power use price for urban residents increases constantly and the burden of power use has become relatively heavier. The proportion of the expenditure on electric power use increases in the overall household spending. 59 percent of the investigation objects hold that the electricity price is reasonable, that is to say, a large proportion of the difficult households thinks the electricity price is high. In their expectation for the government, over half of the investigation objects (51%) think that the ideal price of electricity should be between 0.15 and 0.3 yuan per kilowatt-hour. Meanwhile, the issues which get the greatest concern of the difficult household include prompt treatment with malfunction (49%), reducing the frequency of limiting power utilization amount (25%) and the capacity expansion and the reconstruction of current power grid (21%).

According to the investigation, we can reach the following conclusions: first, the urban power grid coverage is rather high, providing the vast majority of urban residents with reasonable electricity service on relative unified price. Second, with the increase of the living standards of urban residents and the constant rise in electrical power price, the burden of power consumption is becoming increasingly heavier for urban low-income groups. Third, although the governments and the power suppliers have increased the input on the reconstruction of urban power grid, a large part of the low-income groups still haven't enjoyed the electricity service amount to the average social service level.

2.1.2.2 Rural Areas

China has long adopted the policy of emphasizing electric power generation, ignoring power supply service and the users' electricity consumption demands in terms of power investment. The government invests little in the rural power grid below 10 kilovolt and the setup and maintenance of rural electrical facilities are mainly funded by farmers themselves. Moreover, the dualistic economy structure itself leads to the serious disparity between urban and rural areas. The backwardness of the rural economy inhibits the electrical power use in rural areas. In order to promote the healthy, sustainable and rapid growth of the rural economy, in 1998 the State Council ordered to have the rural power grid in 2366 counties upgraded within 3 years to realize the goal of "same grid, same price in town and rural area", which accelerates the building and upgrading of rural power grid, speeds up the rural electrical power development and reduces the burden of electricity utilization in rural areas. Up to the end of 2005, the total investment has amounted to 380 billion yuan, exceeding the total investment in rural power grid in the past 50 years since the founding of the PRC. Every county has been connected to power grid. The rate of power penetration of townships, villages and peasant households has significantly grown respectively to 99.9 percent, 99.8 percent and 99.4 percent. After the construction and transformation of rural power grids, the structure and quality of the rural power grid has been greatly improved. The power grid security, the power supply quality and reliability has been constantly upgraded. Over 99.6 percent of the voltage is now up to standard and the reliability of power supply has reached 99.7 percent. The sales price to peasant households lowered substantially and the standardized power price has been brought about. The situation of "different price for different village" no longer exists, and the demand for power utilization increased rapidly. Over the past two years, the power use volume at county level or below has increased rapidly, reaching 15 percent on average, with some places even reaching 20 percent. The popularity of electrical appliance and the degree of rural electrification is increased constantly. Although the rural power construction has made big progress, by the end of 2005, there are still 2.5 million households throughout the country with no access to power yet.

Despite great progress of the country's rural electricity construction, there were still 344 counties (325 in Tibet, 12 in Sichuan, 6 in Qinghai and 1 in Heilongjiang), 6268 villages, and 1,410,343 households with no access to electricity within the SG business sphere up to the end of 2005. In the business sphere of the China Southern Power Grid, 99.52 percent of villages and 98.43 percent of households already had access to electricity while 795 thousand households and 3.2 million people had no access to electricity. There were 2.5 million households around the country with no access to electricity.

There are big gap of basic electricity consumption between urban cities and rural areas. The random survey of the State Statistics Bureau show in 2004 every 100 rural households in the 12 provinces in the country's western areas owned 25.85 washing machines, 79.77 electric fans, 7.72 refrigerators and 62.57 color TV sets, only accounting for 27 percent, 77 percent, 9 percent and 49 percent of urban households in the western regions respectively. And every 100 rural households in China owned 37.32 washing machines, 17.75 refrigerators and 75.09 color TV sets, only accounting for 39 percent, 19 percent and 56 percent of urban households respectively. Further investigations show the gap of power construction between the rural areas and urban cities has been slowly narrowed although rapid progress has been made in rural power construction. Take washing machines owned by every 100 households as an example, the proportion of rural households to urban households in the 12 provinces in western China was 20 percent in 2000, 24 percent in 2003 and 27 percent in 2004. There is tough work ahead and a long way to go to raise electricity consumption in the country's rural areas.

In addition to the big gap between rural areas and urban cities, the backwardness of rural electricity service is reflected in the regional unbalance. The vast territory and regional economic development disparity are direct reasons for the regional serious unbalance in the electricity sector. Up to the end of 2004， per capita installed capacity reached 0.331 kW•h, per capita electricity consumption was 1,372.9367 kW•h, and per capita living electricity consumption was 198.09333 kW•h. The proportion of the middle areas to the east is 68 percent in terms of per capita installed capacity, 63 percent in terms of per capita electricity consumption and 45 percent in terms of per capita living-purpose electricity consumption. And the proportion of the western areas to the east is 82 percent in terms of per capita installed capacity, 78 percent in terms of per capita electricity consumption and 51 percent in terms of per capita living-purpose electricity consumption.

The 2004 NBS statistics show the durable consumer goods owned by every 100 rural households vary greatly in the east, middle and western areas of China. Specifically, the proportion of washing machines of Guangxi to Beijing and Jiangxi to Beijing was respectively 4.7 percent and 7 percent. The proportion of electric fans of Qinghai to Shanghai and Inner Mongolia to Shanghai was respectively 3 percent and 3.5 percent. The proportion of refrigerators of Guizhou to Beijing and Guangxi to Beijing was respectively 3.8 percent and 4 percent. The proportion of color TV sets of Tibet to Shanghai and Guizhou to Shanghai was respectively 23 percent and 34 percent.

The 5th Plenary Session of the 16th Central Committee of the Communist Party of China put forward a historical task of building a new socialist countryside, which constitutes an important strategic step in the solution of the "Three-Agriculture" issues and the building of a harmonious society. In order to head into to an all-round well-off society, China must establish and strengthen the fundamental position of agricultural industry because, without a well-developed agriculture industry, prosperous villages and rich farmers, the country unlikely build a well-off society in an all-round way. As an important material basis for the social and economical development in rural areas, rural electrical power plays a significant historic role in the solution of the "Three-Agriculture" issues and the building of a new socialist countryside. At present, to better serve the purpose of the construction of new socialist countryside, we must set up the standards of the universal service in electricity, raise the fund for the universal service in electricity from various channels and establish a compensation mechanism of the electric universal service. We

must also increase the coverage of power grid, enhance the reliability of rural power supply, ensure the implementation of the rural electric universal service and thus let electricity play a leading role in the economical life in rural areas. The remote rural areas are often ignored in this respect because the profit got from the power service cannot make up for the risk involved. Therefore, unless the government interferes in this matter, these remote rural areas will be the last area connected into the power grid. In this sense, the problem of connection to power grid is much more serious in the countryside than with the urban low-income residents.

2.1.2.3 Outlying Areas

The power construction in remote areas is an important way to help farmers and herdsmen to shake off poverty and become better-off, meanwhile it is also an important political task for promoting the stabilization of the frontier and national unity. After years of great effort, the power construction in remote rural areas has made great achievement. Starting from 1990s to the end of 2005, about 60 million people in remote areas are provided with power access for residential use with the power grid expansion, rural power grid transformation and separated power system construction. From 2002 to 2004, the "sending electric power to villages" project was started to provide power for the public utility and residential use in the countryside and town in the western outlying areas. The central government and local government respectively allocated 2 billion and 2.7 billion yuan to build many power stations using renewable energy including PV Power, PV / wind Hybrid and small hydro-power in 900 county seats and towns in the 12 provinces (regions and municipalities) in Inner Mongolia, Qinghai, Xinjiang, Sichuan, Tibet and Shanxi.

The current regions with no access to power connection refer to the sparsely-populated western rural areas (See Table 3). Compared with the areas where the "sending electric power to villages" project are conducted, the poor natural condition and backwardness in economical development in these regions made it even more uneconomical to apply the traditional power supply methods such as the expansion of power grid. Therefore, power construction in these regions will be a formidable task.

Table 3 Distribution of the Population with no Access to Electricity (13 Provinces and Municipalities in the west)

	Province(Autonomous Region, municipality）	Population with no access to electricity (mln.)	The proportion in the total population with no access to electricity in the whole country
Southwest	Yunnan Province	21.894	22.38%
	Sichuan Province	19.392	19.82%
	Tibet Autonomous Region	12.007	12.27%
	Guangxi Province	7.279	7.44%
	Chongqing Municipality	5.523	5.64%
	Guizhou Province	4.664	4.77%
	Sum	70.759	72.32%
Northeast	Gansu Province	5.234	5.35%

	Qinghai Province	4.954	5.06%
	Shanxi province	4.778	4.88%
	Xinjiang Autonomous Region	4.157	4.25%
	Ningxia Autonomous Region	0.497	0.51%
	Inner-Mongolia Autonomous Region	7.466	7.63%
	Sum	27.086	27.68%
Total		97.845	100%

(The population with no access to electricity in other provinces is not included)

2.1.3 Standards of Universal Service in Electricity in Different Regions

According to international practice, with the development and maturity of power supply technology and business, the content of universal service also evolves gradually. The economical level and power supply level vary greatly in different areas of China, therefore the standards of the universal service in electricity should be promoted step by step under the principle of availability, capacity and non-discrimination.

The survey showed the demand for power varies in different places. The average monthly power use volume in the indigent household in Xinjiang and Tibet is about 6 kW•h, while in Beijing it is about 15 kW•h. The electric universal service is provided to realize social equality and to safeguard the basic right of all citizens. It is guaranteed that all citizens, no matter where they live, could enjoy the basic electrical service. According to the investigation, the lowest standard for the average monthly power use volume for each household should be no less than 10 kW•h throughout the country.

The poor households in Xinjiang and Tibet have no other electrical appliance than the basic lighting, while in Beijing and Shanghai, most of the poor households are equipped with such electrical appliances as TV and washing machine. Therefore, the standard for universal service in electricity should be determined according to the local standard of the poor population. Besides, in setting up a lower standard, special attention should be put on meeting the basic living demand which means not only the need for lighting but also the need for TV should be met, a window through which they come to know the outside world.

On this basis, electric universal service, especially the urban electric service should also take into consideration the factors of energy conservation and environmental protection. The application of new energy-saving technology in electrical household appliances should be expanded to realize the goal of "double-win" of universal service and scientific development.

In the report, we set two scenarios, namely basic subsistence scenario and well-off life scenaria, for universal service in electricity in urban cities, rural areas and outlying areas, which are analyzed as follows. (See Table 4)

Table 4 Standard of Universal Service in Electricity

	Basic Subsistence	Well-off Life
Urban Low-income Households	3 Energy-saving Lamps 1 Electric Fan 1 Color Tv Set	4 Energy-saving Lamps 1 Electric Fan 1 Color Tv Set 1 Washing Machine 1 Energy-saving Refrigerator 1 Grease Pump
Rural Areas	3 Energy-saving Lamps 1 Electric Fan 1 Color Tv Set	4 Energy-saving Lamps 1 Electric Fan 1 Color Tv Set 1 Energy-saving Refrigerator
Outlying Areas	2 Energy-saving Lamps 1 Radio or 1 White and Black TV Set 1 Satellite Dish	3 Energy-saving Lamps 1 Color Tv Set 1 Energy-saving Refrigerator

2.1.3.1 Urban Low-income Groups

At present, almost all the cities and towns have been connected into power grid and most of the urban residents can get access to electricity. Limited by their economical conditions, some poor families could not afford power consumption or are not willing to spend on power. Therefore, it is the principal task of universal service in electricity in urban cities for the government and power suppliers to try their best to ensure power use quality and encourage the power consumption of the low-income urban residents when they are willing and can afford to purchase power.

The two scenarios hereby established include basic standard, which is to meet urban residents' basic demand on electricity, and the well-off standard, which is to make a picture for the future universal service in electricity on the basis of the promotion of energy-saving technology.

1) Basic Subsistence Scenario

The subsistence demand of urban residents is met and the energy-saving technology is popularized to a certain extent. Every household will own 3 energy-saving lamps, 1 electric fan, 1 washing machine and 1 color TV set.

The demand on electricity consumption should be pinpointed. In terms of household lighting, given that three 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 48 kW•h; given that one 40-watt electric fan works for 360 hours a year, the annual electricity consumption will reach 15 kW•h; given that one 60-watt color TV works for 1460 hours a year, the annual electricity consumption will reach 88 kW•h.

On the basis of the above scenario, the annual electricity consumption of every household

should be no less than 151 kW•h in the universal service in electricity for urban low-income groups.

2）Well-off Life Scenario

The well-off life demand of urban residents is met and the energy-saving technology is largely popularized. Every household will mainly own 4 energy-saving fluorescent lamps, 1 electric fan, 1 washing machine, 1 energy-saving refrigerator, 1 color TV set, 1 grease pump and 1 air conditioner.

The demand on electricity consumption should be pinpointed. In terms of household lighting, given that four 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 64 kW•h; given that one 40-watt electric fan works for 360 hours a year, the annual electricity consumption will reach 15 kW•h; given that one 400-watt washing machine works for 30 minutes one time and 4 times a week, the annual electricity consumption will reach 40 kW•h; given that one energy-saving refrigerator consumes 0.9 kW•h a day, the annual electricity consumption will reach 330 kW•h; given that one 60-watt color TV works for 1460 hours a year, the annual electricity consumption will reach 88 kW•h; given that one 100-watt grease pump works for 600 hours a year, the annual electricity consumption will reach 60 kW•h.

On the basis of the above scenario, the annual electricity consumption of every household should be no less than 597 kW•h in the universal service in electricity for urban low-income groups.

2.1.3.2 Rural Areas

Most of rural areas are covered by power grid and most rural households can accept the current electricity price. However, the survey shows it is the most important thing for rural residents to guarantee the quality of power supply and 42 percent of rural households believe the breakdown should be fixed timely and the frequency of breakdown should be reduced.

1）Basic Subsistence Scenario

Every rural household will own 3 energy-saving lamps, 1 electric fan, 1 washing machine and 1 black and white TV set.

The demand on electricity consumption should be further pinpointed. In terms of household lighting, given that three 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 48 kW•h; given that one 40-watt electric fan works for 360 hours a year, the annual electricity consumption will reach 15 kW•h; given that one 60-watt black and white TV works for 1460 hours a year, the annual electricity consumption will reach 58 kW•h.

On the basis of the above scenario, the annual electricity consumption of every household should be no less than 121 kW•h in the universal service in electricity for rural areas.

2）Well-off Life Scenario

Every household will mainly own 4 energy-saving lamps, 1 electric fan, 1 energy-saving refrigerator and 1 color TV set.

The demand on electricity consumption should be pinpointed. In terms of household lighting, given that four 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 64 kW•h; given that one 40-watt electric fan works for 360 hours a year, the annual electricity consumption will reach 15 kW•h; given that one energy-saving refrigerator consumes 0.9 kW•h a day, the annual electricity consumption will reach 330 kW•h; given that one 60-watt color TV works for 1460 hours a year, the annual electricity consumption will reach 88 kW•h.

On the basis of the above scenario, the annual electricity consumption of every household should be no less than 497 kW•h in the universal service in electricity for rural areas.

The quality of universal service in electricity should be guaranteed in addition to the service standards of the two above-mentioned scenarios.

2.1.3.3 Outlying Areas

Suffering from an economical backwardness and limited by their purchasing power, the farmers and herdsmen still have a strong demand for power supply for production use and residential use, especially after the "same grid and same price" practice has adopted. Although the traditional power construction in remote areas will cost a lot and with big difficulties, the remote areas enjoy rich renewable energy resources, which makes it practical to generate power using stand alone RE power generators.

As to the universal service in electricity in remote areas using stand alone RE power generators, its service standards should be different from those of power grid expansion and the service standards should be adjusted according to the economical development and the increase of the living standards of the local farmers and herdsmen. Therefore, in accordance with power and power supply, the electricity universal service standards are set under the two scenarios as follows;

1）Basic Subsistence Scenario

Every rural household will own 2 energy-saving lamps, 1 radio or 1 black and white TV set and 1 satellite dish.

In terms of household lighting, given that two 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 32 kW•h; given that one 10-watt radio works for 4 hours a day, the annual electricity consumption will reach 15 kW•h; given that one 60-watt black and white TV works for 1460 hours a year, the annual electricity consumption will reach 58 kW•h; given that one 20-watt satellite dish works for 4 hours a day, the annual electricity consumption will reach 30s kW•h.

On the basis of the above scenario, the annual electricity consumption of every household should be no less than 120 kW•h in the universal service in electricity for the outlying areas if black and white TV is used.

If centralized power-supply system of independent renewable energy generation is adopted, it will be established in residential areas inhabited by at least 30 households, and full time of annual generation of the renewable energy system is about 1,000 hours. Electricity consumption by some public facilities, businesses (such as tourism and stores) and simple production may be taken into

consideration.

2）Well-off Life Scenario

Every household will mainly own 3 energy-saving lamps, 1 satellite dish, 1 energy-saving refrigerator and 1 color TV set.

In terms of household lighting, given that three 11-watt fluorescent lamps illuminate for four hours one day, the annual electricity consumption of every household will reach 48 kW•h; given that one 60-watt color TV works for 1460 hours a year, the annual electricity consumption will reach 88 kW•h; given that one 20-watt electric fan works for four hours a day, the annual electricity consumption will reach 30 kW•h; given that one energy-saving refrigerator consumes 0.9 kW•h a day, the annual electricity consumption will reach 330 kW•h.

On the basis of the above scenario, the annual electricity consumption of every household should be no less than 496 kW•h in the universal service in electricity for the outlying areas.

If centralized power-supply system of independent renewable energy generation is adopted, it will be established in residential areas inhabited by at least 30 households, and full time of annual generation of the renewable energy system is about 1,000 hours. Electricity consumption by some public facilities, businesses (such as tourism and stores) and simple production may be taken into consideration.

In addition, the electricity universal service should guarantee services in terms of electricity reliability.

Regional electricity consumption standards under different scenarios are shown as table 5.

Table 5 Regional Electricity Consumption Standard in Different Scenario

Unit: kW•h

Household Electric Device		Urban Low-income Group		Rural Areas		Outlying Areas	
		Subsistence	Well-off Life	Subsistence	Well-off Life	Subsistence	Well-off Life
Energy-saving Lamp	Number	3	4	3	4	2	3
	Annual Electricity Consumption	48	64	48	64	32	48
Electric Fan	Number	1	1	1	1	0	0
	Annual Electricity Consumption	15	15	15	15	0	0
Color TV	Number	1	1	0	1	0	1
	Annual Electricity Consumption	88	88	0	88	0	88
Black and	Number	0	0	1	0	1	0

White TV Set	Annual Electricity Consumption	0	0	58	0	58	0
Washing Machine	Number	0	1	0	0	0	0
	Annual Electricity Consumption	0	40	0	0	0	0
Energy-saving Refrigerator	Number	0	1	0	1	0	1
	Annual Electricity Consumption	0	330	0	330	0	330
Grease Pump	Number	0	1	0	0	0	0
	Annual Electricity Consumption	0	60	0	0	0	0
Satellite Dish	Number	0	0	0	0	1	1
	Electricity Consumption	0	0	0	0	30	30
Total	Annual Electricity Consumption	151	597	121	497	120	496

2.2 Estimated Funds in Need

Given China's national conditions and strength as well as the development of electric power, and that the development of electric power is also a regional issue, the goals set by the state for regions with no access to electricity are as follows:

1) By 2008, electricity will have been supplied to households without electricity with the investment cost below 20,000 YUAN for each household and to villages without electricity inhabited by more than 30 households;

2) By 2010, electricity will have been supplied to households without electricity with the investment cost below 30,000 YUAN for each household and to villages without electricity inhabited by more than 10 households;

3) By 2020, electricity will have been supplied to households without electricity with the investment cost below 50,000 yuan for each household and to villages without electricity inhabited by more than 5 households.

In view of the above, the capital demand of the universal service in electricity in China is as follows:

2.2.1 Solving the Problem of Electrification Cost for Households without Access to Electricity

According to investigation and study statistics, during the "11th Five-Year Plan" period, State Grid plans to invest over 22 billion yuan to solve the problem of electrification for about 1.15

million households without access to electricity, and China Southern Power Grid is also to invest 3.3 billion yuan to solve this problem for 410,000 households, leaving about 700,000 households without electricity (households without electricity with the investment cost below 30,000 yuan for each household).

By 2010, electricity will have been supplied to households without electricity with the investment cost below 30,000 yuan for each household. According to the electrification plan of the State Grid, the electrification cost for each household on average is 19,100 yuan. The investigation and study of Qinghai Province shows that the electrification cost for each household had exceeded 20,000 yuan by 2005, and therefore the rest 700,000 households without electricity can obtain electricity supply based on the standard of 30,000 yuan for each household on average.

According to the standard above, total electrification cost of supplying electricity to households with the investment cost below 30,000 yuan for each household is 46.3 billion yuan. By 2020, 250,000 households will have been supplied with electricity with the investment cost below 50,000 yuan for each household, costing 12.5 billion yuan.

2.2.2 Users' Power Rates and Power-supply Enterprises' Operation and Maintenance Cost

The Fifth Census of the State Statistics Bureau demonstrates that there are 23.65 million rural poor people and 30 million urban people living on subsistence allowance nationwide, with 3.13 people in each household. Among them, there are 9.97 million urban households across the country enjoying minimum living allowance (Year 2005), 2.5 million households living in remote areas with no access to electricity and 5 million poverty-stricken households in rural areas.

According to the monitoring statistics of National Development and Reform Commission concerning major commodities and service projects of China's 36 medium- and large-sized cities in 2005, the average power price for urban residential consumption of electricity in these 36 cities is 0.51 yuan per kW•h. Based on the power price of the agricultural network of State Grid from April to June in 2005, the average power price for rural residential consumption of electricity of the whole system is 0.5199 yuan per kW•h. According to the investigation and study statistics of China's universal service in electricity, the average cost of electricity sales in all provinces was about 0.23 yuan per kW•h in 1999 and about 0.33 yuan per kW•h in 2004, with unit cost of electricity sales on the rise as expected; average operation and maintenance cost for hydropower was 0.23 yuan per kW•h; the cost of solar electric power plants was around 5 yuan per kW•h; and the minimum operation and maintenance cost for wind power plants was 0.5 yuan per kW•h.

For urban low-income groups, if power price is calculated at 0.51 yuan per kW•h and operation and maintenance cost at 0.5 yuan per kW•h, then the total capital needed is 1.521 billion yuan per year based on basic standard living and 6.012 billion yuan per year based on comparatively well-off standard of living. For prospective beneficiaries of universal service in rural areas, if power price is calculated at 0.5199 yuan per kW•h and operation and maintenance cost at 0.5 yuan per kW•h, then the total capital needed is 618 million yuan per year based on basic standard living and 2.537 billion yuan per year based on comparatively well-off standard of living. For remote areas, initial investment in the system and cost operation and maintenance should be included into the capital demand needed for universal service provided by independent renewable energy system. In small-scale hydroelectric power, small-scale wind electric power and photovoltaic systems, great differences exist between investment and cost of maintenance and operation. Investment in small-scale hydroelectric power system is no more than 5,000 yuan per

kW•h, but the figure jumps to 70,000 yuan or so per kW•h for photovoltaic system or wind-PV hybrid power system. Estimates show that only no more than 10 percent of people without access to electricity have the potential of simply relying on small-scale hydroelectric power system for electric power. Therefore, estimate of initial construction investment should be temporarily based on the measurement and calculation of independent photovoltaic system or wind-PV hybrid power system. If the number of current households without electricity is calculated at 2.5 million, the capital needed is 21 billion yuan per year based on basic standard living and 86.8 billion yuan per year based on comparatively well-off standard of living.

According to the investigation outcome of "Transmitting Electricity to Villages", for centralized independent renewable energy system, if cost of changing storage battery is taken into account, annual cost of operation and maintenance on average will be 4,000 to 6,500 yuan per kw (In some areas of Qinghai-Tibet Plateau, the cost is as high as 6,000 to 6,500 yuan per kw, while in other areas, the cost is 4,000 to 5,500 yuan per kw in general.). If one third employs centralized system (Responsibility for the maintenance of household system and the corresponding cost may be assumed by peasants.) and the maintenance cost is calculated at 5,500 yuan per kw, then annual operation and maintenance cost is 550 million yuan for living standard below the basic level and 2.273 billion yuan for living standard below the comparatively well-off level.

Capital needed to provide electricity universal service for urban low-income groups, rural areas and remote regions is shown in table 6.

Table 6 Electricity Charges, Operation and Maintenance Fees and Start-up Construction Investment

		Urban Low-income Group		Rural Areas		Far Outlying Areas	
		Subsistence	Well-off Life	Subsistence	Well-off Life	Subsistence	Well-off Life
Electricity Consumption (kW•h/household)		151	597	121	497	120	496
Start-up Investment (Bln Yuan)		—	—	—	—	21	86.8
Annual Investment (Bln Yuan)	Electricity	0.768	3.036	0.315	1.293	—	—
	Operation and Maintenance	0.753	2.976	0.303	1.244	0.55	2.273
	Total	1.521	6.012	0.618	2.537	0.55	2.273

2.3 The Capital Sources, Fund Raising Methods and Principle of Input

2.3.1 The Capital Sources

The capital sources of the universal service in electricity may include:

(1) Fiscal allocation. It is the most direct form, which shall come from local government and central government;

(2) Partly paid by users. Some of economically capable households without access to electricity can afford a part of electricity fees.

(3) The power price markup, such as Three Gorges Fund. An independent power service fund can be built up in such a way as getting a small proportion take-out per kW•h.

(4) Commission from the sales income of power grid enterprises. According to the international common practice, the industry with natural monopoly should be responsible for the corresponding universal service. Hence, the fee should be paid by the power grids enterprises, esp. by their sales income, and at last the pay gets transferred to the nationwide power users via power grids enterprises.

(5) Special funds, such as the government's 50 billion yuan agricultural investment in 2006. With which the National Development and Reform Committee publicized the agricultural investment policy of the central government and clear regulations for agricultural investment focus. Among them, there is the investment for rural power construction. Besides, the nation has established special fund for reproducible energy development; however, the accurate amount and the ways of using have not been given out clearly, and listing independent power system of reproducible energy as one focus should be taken into consideration.

(6) Establishment of universal service fund to receive various donations. As the direction of future electricity power reform, electricity-admittance system will be more healthy and comprehensive, and according to some international common practice, let it serve the universal service fund in terms of admittance.

(7) Funds from international development institutions.

2.3.2 Fund Raising Methods and Principle of Input

After an analysis of the fund-raising methods for universal service of 18 countries, they can be summed up into the following ones:

——Uniform charge according to a certain proportion of some management index.

——Compensation for deficit of access and charged based on minute or with each mainline as the benchmark (Compensation for deficit of access was originally used to replace cross-subsidy and was practiced in the United States, Canada and Australia, but duo to its low efficiency in practice and the fact that it hindered competition, this method has been discarded by these countries.)

——Mode of license, which is raising the requirement of universal service in the process of issuing license. This is a material and obligatory mode of provision.

——Governmental provision, through direct/indirect subsidy, reduction or remitting.

In the specific case of China's universal service in electricity, the country may offer a variety of methods for choice by considering the goal of universal service. As for the existing power -supply enterprises, a certain proportion of their revenue may be collected as universal service fund. According to the survey of collecting proportion of some countries, 2 percent is widely accepted. An over-high proportion will be a huge burden for electricity-supplying enterprises.

As the reform of power market progresses, a certain amount of conditions for universal service may be added when licenses are issued to new power-supply enterprises. As for the

electricity-supplying enterprises that need support, the government may offer some subsidy or reduction when collecting a uniform proportion for fund-raising targeted at previous electricity-supplying enterprises.

The fund for universal service in electricity is mainly used for the following two purposes: First, giving subsidy of cost deficit to power enterprises that provide universal service in electricity; and second, giving subsidy of electricity to the vulnerable groups of China. Regarding the cost compensation of power-supply enterprises, the government may refer to the volume of cost deficit submitted by enterprises and, after the examination and calculation of management authority, withdraw some capital from the universal service fund as compensation so as to mobilize the enthusiasm of the power enterprises to provide universal service, while with regard to the subsidy for the vulnerable groups of the country, the government should give top priority to those who can not afford electricity and compensate their electricity charge so as to ensure their access to basic electricity service. Whatever the fund for universal service in electricity is for, the following principles must be observed:

First is principle of special fund for a special purpose. Established to realize universal service in electricity for the entire society, the fund for universal service in electricity should be used in all kinds of activities aimed to promote the development of universal service in electricity. Any act that intends to use the fund for any other purpose shall be banned and topped.

Second is principle of transparency. As the fund for universal service in electricity is collected from the additional fee of electricity and is the payment for electricity by terminal users, the principle of transparency should be abided by when utilizing the fund. The management authority of the fund for universal service in electricity should timely make public the purpose and amount of the fund used and regularly subject to the auditing of the auditing department.

2.4 Electricity Universal Service Mode

2.4.1 Universal Service Subjects

Universal service includes subjects at three different layers, with the government as the subject of responsibility, power network enterprises as the major subject of implementation (In areas uncovered by electric networks or under particular circumstances, other enterprises may function as the subject of implementation.) and state electricity supervisory body as the subject of supervision. Currently, under the condition of state-owned enterprises like State Grid and China Southern Power Grid conducting monopoly, power-supply enterprises shall also function as the subject of responsibility and undertake part of the obligation of universal service.

In promoting universal service in electricity, the purpose lies in realizing social fairness and ensuring social stability by the provision of basic power service. As a result, as a public service undertaking of public welfare, the government has the duty to provide essential public goods for the whole society if it is to play a dominant role in it. Meanwhile, in the current situation, power network enterprises, especially those cross-regional, nationwide state-owned ones (mainly State Grid and China Southern Power Grid) occupy a monopolized position in power industry and enjoy excess monopolized proceeds thus generated. Thus, the electric enterprises shall also undertake part of the responsibility of universal service in electricity and the obligation of cross subsidy.

Therefore, fund raising of universal service in electricity should be mainly realized through

government subsidy and subsidy of power network enterprises. Specifically speaking, there are three means as follows. First, governments at the central and various local levels directly provide capital subsidy for basic electricity to low-income groups, poor people in rural areas and remote areas without access to electricity. Second, power network enterprises provide the capital needed for basic electricity supply and the subsidy for high-quality electricity-supplying service to low-income groups, poor people in rural areas and remote areas without access to electricity within the areas in their charge. Third, combining building a "resource-conserving" society and carrying out energy-saving task, the government and enterprises should make joint input of capital in universal service in electricity to promote the use of energy-saving technology and electric appliances and the realization of the goal of universal service.

2.4.2 Operation Mode Analysis

A study of the universal service home and abroad show that there are two operational modes widely used: one is fund operation mode, the other appointed operation mode. The fund operation mode is composed of 4 forms: the first, a universal service fund committee is founded by the electricity supervising committee, to be responsible for the fund operation; the second, an independent committee is established to take the responsibilities; the third, the power supply enterprise is entrusted to operate the fund; the fourth, a mixed committee, likely, to be composed of representatives from 3 parties, the government, the electricity supervising committee, and the power supply enterprise. The appointed mode has two forms: one, under the prescribed circumstances, the government offers some economic compensation; the other, digested by the enterprise alone and completely. As shown in Chart 1 and Table7:

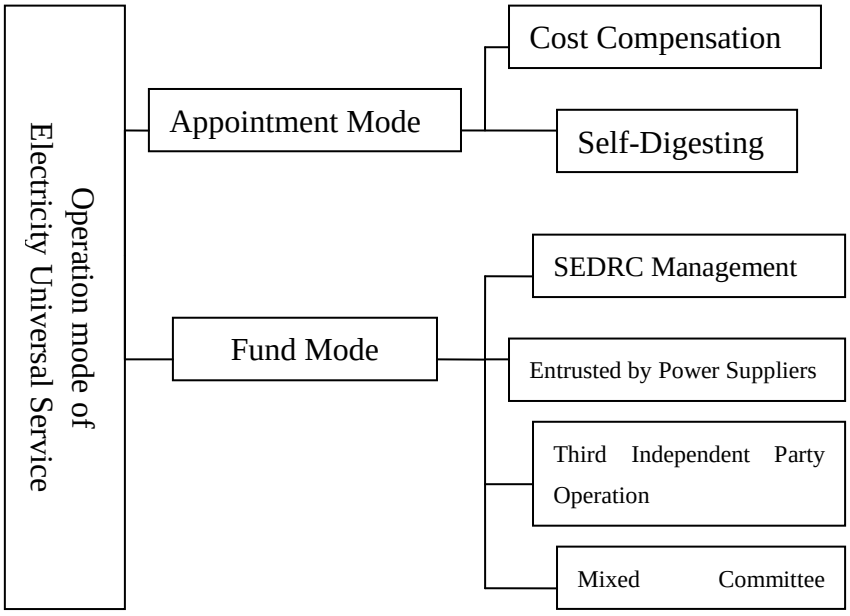

Chart 1: Operation mode of electricity universal service

Table 7: A Comparison between Appointed Mode and Fund Mode

	Advantage	Disadvantage
Appointment Mode	Simple manner and clearly defined responsibilities; Lower universal service cost with capital self-digesting mode since they can rely on their own technology and experience.	Normal business and universal service business mixed, hardly distinguished and inconvenient for capital compensation; The big network being hard to coordinate due to the existing smaller networks; Inconsistent capital compensation leading to impact on national fiscal; Unsymmetrical information being harder to supervise;
Fund Mode	Fixed goal, transparent process, being easy to supervise; More likely to use more sources to solve universal service problems; Public bidding reducing cost, and information publicized; Less interference among projects; Better for coordinating power suppliers in different business areas;	Fund operation costs;

It is known to all, since power suppliers enjoy business monopoly position in the country, they should accordingly take the duty of universal service in electricity. The government therefore can accredit all responsibilities of universal service in electricity to power suppliers in such a way as legislation to require power suppliers to cut electricity charges for the poor and to solve problems for those non-electricity households. It needs to stress that the solution of non-electricity household issue does not necessarily ask for the extending of the big net. In fact, it can be solved by dispersive power sources. The effectiveness of universal service is the first priority to choose the modes, appointment mode or fund mode with a view to ensure the best economic and social effects with the lowest investment, and effective supervision.

2.4.2.1 Appointment Mode

The Appointment mode has two forms, which are the cost compensation form, and the self-digesting form.

Table 8 A comparison between Cost Compensation Form and Self-digesting Form

	Advantage	Disadvantage
Cost compensation form	Clear dividing line between rights and duties; To realize fairness of universal service through shift payment system;	To establish capital raising mechanics To establish capital distributing mechanics Too many departments needing coordinating, increasing difficulty in coordinating capital; The increasing universal service cost due to the capital-raising cost and finance cost;
Self-digesting form	Saving capital-raising cost and finance cost;	The reducing enthusiasm of enterprises; The universal service fairness cannot be achieved through shift payment system;

Cost compensation form is a form in which the government gives compensation of universal service cost to power suppliers. First, the programs of power suppliers must be those prescribed in policy or law, and fulfill the range, goal, and criteria; second, the comptrollers audit the universal service program cost; last, the compensation will be made to power suppliers according to the universal service compensation policies.

Under self-digesting form, the government does not compensate power suppliers; instead, the universal service fees will be counted in the total cost volume of the year, and be deducted from the sales. However, this does not mean the enterprise can report its own universal service cost, and the cost still has to be audited carefully by the national auditing departments, to avoid exaggeration in cost.

The difference of these two forms lies in that for cost compensation form, the profit of power suppliers is not affected by the government allocated compensation while, for self-digesting form, the profit of power suppliers is cut by the in-reckoning of the cost. However, both should have their universal service cost audited strictly according to universal service laws and regulations.

Cost compensation form is more complicated: first, the compensation capital source should be taken into consideration, e.g., national finance, power price markup, and may be taken out from the sales volume of power suppliers, according to some foreign practice; second, how to distribute should also be considered carefully, that is, how to realize fair distribution among all power suppliers; last, preservation and increment of value need to be considered if the capital is more than needed while fund raising capacity needs to be strengthened if there is a capital shortage.

According to the early calculation and the publicized total profit volume of National Grid Corporation and South Power Grid Corporation in 2004, power suppliers has the ability to shoulder the cost of the universal service in electricity. Also, according to “loss and compensation” principle, the compensation can be rejected and self-digesting is needed. Therefore, self-digesting is recommended. Besides, due to the different cost of universal service of different enterprises, thus different total volume, shift payment mechanics can be applied to make universal service cost shouldered jointly.

One more thing worth mentioning is the business area issue. According to the net-building situation in China, there are still many an area not covered by National Grid Corporation and

South Power Grid Corporation. For example, among the 16 districts and 129 counties in Yunnan, 6 districts and 33 counties are administrated by the Yunnan Bureau of Water Resources instead of the big network（Yunnan Power Grid Corporation）. There are two entrusting forms: one, "the kids should be cared about by their own parents", that is, auditing the universal service cost of each power supply enterprise will be enough; the other, everything is entrusted to National Power Network Corporation and South Power Network Corporation. And the non-self-owning business areas will be coordinated. The form is shown in Table 9:

Table 9 Comparisons between Business Areas in Entrusted Mode of Universal Service

	Advantage	Disadvantage
Full trust to National Power Network Corporation and South Power Network Corporation	Clear dividing between rights and duties; Cross-subsidy available in the big net to get universal service capital;	Capital-raising mechanics needed; Being responsible for universal service in non-self-owning business areas, harder to coordinate;
Divided according to business area	Clear dividing between rights and duties; Better coordination among all business areas;	Supervising and administrating cost rising; Cross-subsidy among power suppliers unavailable; impossible for the poor areas to pay the universal service capital;

2.4.2.2 Fund Mode

The four types of committee of Fund Mode have their own advantages and disadvantages, shown in Table 10. The electricity supervising committee form is recommended, because, its responsibilities are clear, the goal clear too, and it helps to coordinate among power suppliers in all business areas, to master the operation of all programs completely, is easy to supervise, and at last achieving the goal of universal service better. Three requisites are needed for effective management over the capital of universal service in electricity: first, the comprehensive goal of the fund and the corresponding and specific program goal should be made clear; second, in the carrying-out of the fund, the policy should be consistent; last, an agreement on goal and program designing should be realized among all major parties involved. The major parties should include at least the supervisor, the policy-maker, and the service supplier as power supply enterprise. Only when the three requirements are fulfilled, will the universal service in electricity fund function properly, and will universal service be carried out smoothly.

Table 10 Comparisons between Fund Mode Forms of Universal Service in Electricity

	Advantage	Disadvantage
Electricity-Supervising committee	Well-defined responsibilities, specific purpose; Familiar with the related laws and regulations of universal service in electricity; Better to achieve universal service goal with operation and supervising combined; Easier to coordinate all power supple enterprises, assuring the carrying out of universal service all around the nation; With comprehensive branches, beneficial for managing and cost saving;	The same institution to supervise and operate makes the inner auditing harder.
Chosen power supply enterprise	Power suppliers being more enthusiastic; A good knowledge of universal service situation in all areas helps to carry out the universal service;	Unsymmetrical information makes auditing and supervising harder;
Third party	Being neutral, hence, fair; Professional operation;	An independent organization, and branches needed, raise the cost;
Mixed committee	Better for coordination among all sides; Transparent capital using helps supervising;	The off-balanced coordination inside the committee leads to possible conflicts, thus affecting the carrying-out;

If fund mode is chosen, then, the managing of capital for universal service in electricity is the basic assurance for the effective functioning of the service. First, "Managing Regulations of Universal Service in Electricity", or the likes, is needed, to make clear the legal duties for all power supply enterprise toward universal service in electricity; to stipulate the ranges in area and business to be benefited by the universal service in electricity; to prescribe the principles of fund using, to choose the universal service supplier through public bidding, including design, construction, and operation. What's more, specific and relatively independent managing institution for universal service in electricity should be founded according to laws and regulations, and this institution should be composed of experts on electricity managing, economics, laws, and so on; this institution, following the principle of being open and transparent, carries out universal service in electricity managing according to law, including calculating the cost, selecting highly-effective power enterprises to provide universal service in electricity, supervising and checking service quality, and evaluating.

BOT program operation mode is a representative of Fund Mode, and the specific operation procedure is shown below:

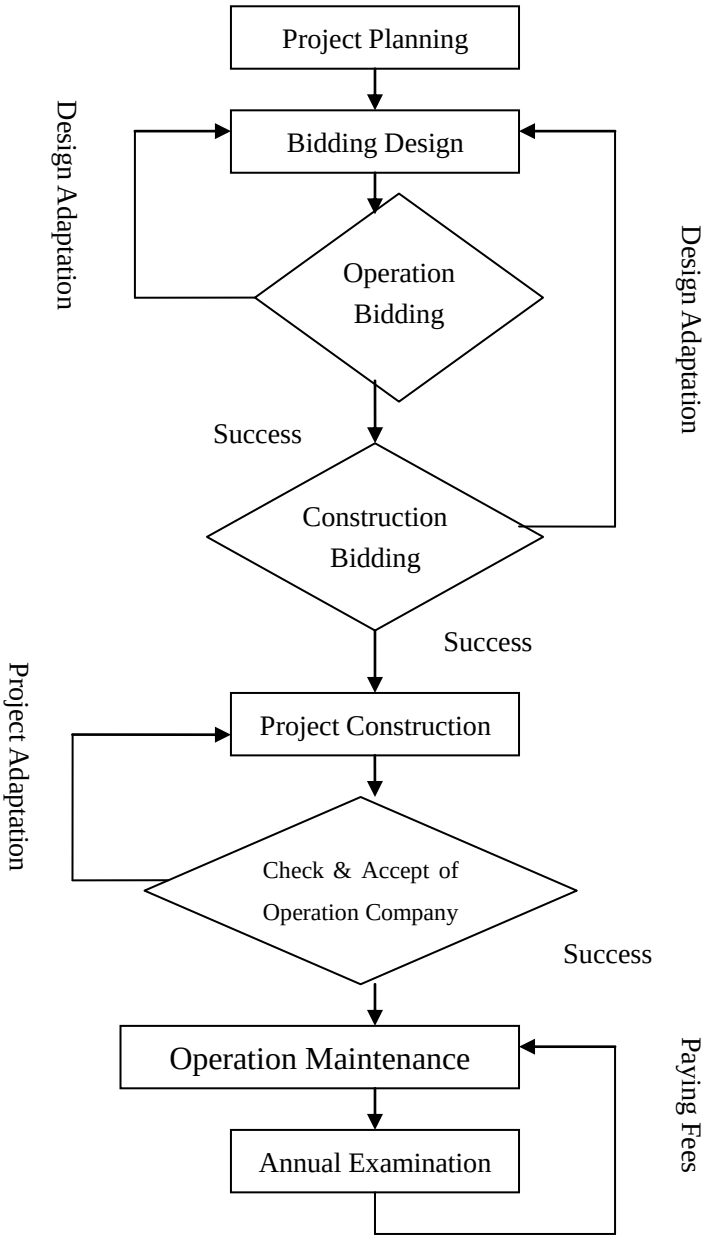

Chart 2 BOT operation mode procedure

First, the public bidding of designing according to the project planning: the designing should not be limited to building a large-scale network, solar energy, wind energy, the clean energy like small hydropower is also acceptable; then, the public bidding should be evaluated according to the lowest standard of the accumulation of startup investment and 10 years' operation and maintenance expense, since the cost of power supply project includes two parts: one is the start-up construction cost, the other daily maintenance expense, which includes expense for manpower, material, maintenance, and even the wire abrasion. According to "same net, same price" principle, generally, the power charge income of universal service in electricity cannot fully make up the operation and maintenance expense; besides, the households who do not have the access to electricity are usually poor ones located in remote areas, and can not afford power. Therefore, the operation expense should be taken into consideration at the early stage of the investing, to achieve

the lowest overall cost. In this way, electricity will be not only “accessible”, but also “affordable” for the public.

Next, according to the requirements and expense for operation and maintenance in the design, operation bidding is taken. If the bidding goes smoothly, the construction bidding follows; if no, the design should be adapted, and even the designing bidding should be carried out again. The bidding parties for operation bidding can be local power supply enterprise, or local government, or even a business in operational maintenance. After a successful construction bidding, the project can be carried out, checked and accepted by the operation company. Then, the project will be turned over to the operation company for operation and maintenance. According to the bidding price, a certain amount of money will be paid to the operation company.

Via bidding in this form, the cost, quality, and schedule will be under control. Moreover, a better choice, to establish a large-scale network, or to employ dispersive electricity sources, combined with the local source situation, will be made.

2.4.2.3 Operation Mode Suitable to China

In accordance with the country’s current situation, China can adopt commercially operated fund mode as the country is not completely covered by big power network and there still existed many small electricity networks and the independently run PV Power system is not limited by the grid connection while some regions which have yet to be covered by power grid should adopt the appointment mode rather than fund mode with a special management department in charge to be appointed by the government.

According to the analysis, China can not copy the current practice of other countries. We must take into consideration the current situations and market of the power sector and should choose the mode of universal service in electricity suitable to local conditions.

2.5 Compensation Mechanism of Universal service in electricity

There are many sorts of compensation mechanisms for power-supply enterprises. In spite of the fact that the power management system adopted and the scope and quality of universal service in electricity stipulated by countries differ from one to another, countries across the world appoint power-supply enterprises to undertake the obligation of universal service. At the same time, governments adopt political, legal and economic means to ensure that power-supply enterprises provide universal service. Countries both at home and abroad mainly take the following measures to guarantee that power-supply enterprises perform the duty of universal service.

2.5.1 Using Monopoly Right to Guarantee Universal Service Provided by Power-Supply Enterprises

The state should guarantee the monopoly right of power-supply enterprises. Only in this way can it ensure power-supply enterprises gain reasonable profits so as to provide universal service in electricity. In addition, thanks to the presence of State Grid and China Southern Power Grid, the capital for universal service in electricity may be temporarily born by power network companies. As China is vast in size, cross subsidy can be carried out, with developed regions subsidizing

underdeveloped regions.

2.5.2 Providing Tax Preference

The cost of universal service should be entitled to part of tax preference, enabling the limited capital to play a bigger role. Besides, reduction and exemption of taxes should be granted to power-supply enterprises providing universal service so as to make them more enthusiastic in doing so.

2.5.3 Government Establishing Universal Service Fund

Internationally, governments of many countries directly establish a fund special for universal service, compensating those who undertake the obligation of universal service. For example, "Chapter Three Universal Service" of the Postal Law of Germany stipulates that "When operators demonstrate that their cost outnumbers revenue due to long-term provision of universal service, they can apply to the controlling authority (Note: postal responsible department of the government) for subsidy." "Time of granting subsidy may be at the end of the fiscal year of such deficit, and the volume of subsidy equals cost minus revenue in providing such service."

2.5.4 Government Compensating Universal Service By Means of Transferring Business Revenue

The government should, through legislation, transfer a certain proportion of the revenue of regions that do not undertake or take less obligation of universal service to regions undertaking more obligation of universal service. For example, the government may take part of the sales revenue of the developed regions in eastern costal areas of China and give it to power-supply enterprises in western China that are engaged in universal service in electricity.

2.5.5 Direction Financial Allocation by the State to Compensate the Deficit of Universal Service

The government may grant direct financial allocation to power-supply enterprises to subsidize their deficit of universal service. For example, the Swedish government allocates 200 million Kronor to Post of Sweden each year to subsidize the latter for its cost in retaining the postal service networks so as to provide the Swedish masses with universal service.

2.5.6 Business Compensation

The government helps power-supply enterprises handle some profitable businesses by administrative and economic means to expand their revenue and offset part of the cost expenditure in providing universal service. For example, most of the quality service of power network companies is free of charge, and therefore, the government may support the companies in question in collecting some labor fee and material fee for compensation.

2.5.7 Establishing Power Rate Regulatory Mechanism

The government establishes power rate regulatory mechanism by law to ensure that enterprises undertake the duty of universal service. Charges of universal service shall be controlled by the state. When power-supply enterprises that undertake the duty of universal service have no ability to undertake such duty due to deficit, they may report to the supervisory and controlling institution for power rate regulation so that the compensated power rates can break even.

2.5.8 Policy Preference

Apart from taxation, the state may also provide support in other aspects. For example, the purchase of wind power and solar power systems can enjoy more financial subsidy.

3. Supervision Framework of Universal Service in Electricity

3.1 Supervision Target

Based on the experience of other industries in the national and international perspective, the continuous development and advance of relevant technologies and businesses will have the concrete content and targets of the universal service in electricity evolved accordingly. At present, China witnesses the diversity of the economic development and electricity development as well as the demands of various communities in various areas. Therefore, the targets of the universal service in electricity shall be achieved by phases and levels.

The targets of the universal service in electricity determine its supervision targets.

Specifically, the supervision targets of the universal service in electricity are carried out mainly in the quantity, quality and fund raising and using in concern with the universal service in electricity.

3.1.1 Quantity

As it has been stated, on the basis of the research results, the minimal target is to ensure a minimal 10 kW•h for one household in every month around the country. In addition, in consideration of the current conditions and development outlook in China, the program is to set up targets and specific standards. The targets constitute three groups who are under poverty in urban low-income groups, rural areas and outlying areas. Respective standards for basic subsistence and well-off life scenarios are set as follows to meet the basic demands of urban residents and to propose an outlook for the universal service in electricity based on energy-saving technology promotion.

Under basic subsistence and well-off life scenario, the low-income urban households shall consume no less than 151 kW•h and 597 kW•h every year; the rural households shall consume no less than 121 kW•h and 497 kW•h every year; and the household in the outlying areas shall consume no less than 120 kW•h and 497 kW•h every year.

3.1.2 Quality

The power industry gives its priority to safety as ever. The first reason is that the electricity safety is essential to the power industry and the society. The accident of power network causes loss to itself, e.g. casualty and physical injury, equipment damage or production suspension on one hand. It greatly takes effects on economic activities and people's life as well as the overall society on the other hand. For example, between 1960s and 1970s, the blackout paralyzed the metropolis like New York and Tokyo. Then, it is believed that "the accident of the power network is a disaster in a society." Secondly, the power industry is one based on hi-technologies. Andy operation violating the rules and electrocution in particular will cause physical injury and casualty. Such cases arose from the occurrence of power industry. There are hundreds over thousands dead from electrocution nationwide every year. The power authority makes physical electrocution one of the five prevention issues. The universal service in electricity should adopt effective measures to ward off accidents of physical electrocution. Thirdly, the targets of universal service in electricity are subjected to the vulnerable crowd whose rights deserved need to be safeguarded by the government according to the supervision regulation.

It is the principal promise that the power network maintains the uninterrupted power supply for its users. Modern life is indispensable to the power. In addition, power breakdown will incur huge loss to the production, processing and control system and computers. It is impossible for each power supply unit or power generation unit to uninterruptedly supply or generate power. Hence, the layout of equipment and construction of the network shall be sufficient as well as enough quantity of standby application. This is where the power industry differs from other industries. In order to maintain the equipments, equivalent average effectiveness can represent equipment supplying and generating power; power supply ratio represents power supply system. The universal service in electricity shall be achieved through the sophistication of these two indicators and in connection with the international standards.

The power quality indicator refers to frequency and pressure at present. As an indicator of network, frequency shall be ensured in the respect of the grid; the pressure is safeguarded collaboratively by the various networks within a system. The safe operation of the system needs control on the pressure of the pressure centre unit in the acceptable scale and also monitor the real-time pressure of the pressure monitor point. Besides the frequency and pressure, the power quality indicator includes harmonic wave and flicker which take effect on the specific process and control equipment. For users, it is not possible for users to measure the frequency and pressure if setting up monitoring point in the distributing system for the accounting the pressure on the local area. So, it is necessary to monitor the power grid in regular time and adopt measures based on the results therefore, in consistence with the supervision of the power grid operation and the relevant authorities

The universal service in electricity shall offer cheap price. The supply-demand relations between the power grid and users can be described as absolute monopoly, which is defined by the nature of scale economy of the power grid. Therefore, the relation between the user's demand and power price is rigid. For the protection of the user's interests, the power grid company shall pursue the power sale price as low as possible and the power supervision authority shall monitor the cost of the power grid company and limiting it for its super profit.

The quality of the electricity universal services is determined by the quality of power supply, including:

In rural areas, besides the service standards defined by the above-mentioned scenarios, the quality of power supply service set for the universal service in electricity shall also achieve following targets: to ensure electricity safety, to improve power supply service quality, to increase the annual average time free of electricity breakdown and to reduce average repairing time as much as possible.

In outlying areas, besides the service standards defined by the above-mentioned scenarios, the quality of power supply service set for the universal service in electricity shall also achieve following targets in terms of systematic technology: to ensure electricity safety, to improve power supply service quality, to increase the annual average time of centralized power supply system and household power supply system free of no electricity breakdown and to reduce average repairing time as much as possible.

3.1.3 Fund raising and using.

Based on the researches, the research team suggests the follows points. Funds are collected for the universal service in electricity. The state power grid and the south power grid are responsible for the implementation of the universal service in electricity. The collection of the fund and the investment payment are carried out by the four state-owned banks. The Ministry of Finance is responsible for the approval of fund using and the authorization of fund distribution. The Power Supervision Commission implements the overall supervision, auditing the fund using planning, annual financial budget and engineering financial budget of the universal service in electricity processed by the national power grid and the south power grid, safeguarding the fund using for the specified purpose or in transparent way. As a result, the target of the universal service in electricity can be realized.

3.2 Supervision and Control Principle

3.2.1 Supervising and Controlling According to Law

Universal service in electricity involves the interests of governmental institutions and all sorts of customers. Experience drawn from other countries shows that law must be made on the basis of speeding up universal service in electricity and that a legal system in accordance with socialist market economic system and trend of international power reform, promoting sustainable, stable and healthy development of the power industry and improving the efficiency of the power industry as well as China's overall competitiveness must be established as quickly as possible. Thus, universal service in electricity will be legalized to guide and standardize behaviors of various aspects and a legal basis will be laid for the supervision and control of universal service in electricity.

3.2.2 Consistent Rights and Duties between Subjects and Objects

In the first place, subjects and objects of universal service in electricity should be clearly defined. According to the attributes of universal service in electricity, namely, availability, non-discrimination and affordability, it is required that each citizen shall be entitled to reliable, continued and sufficient power supply at a reasonable price, which is goal rather difficult to attain if we purely regard enterprises or the government as the only subject of service. Therefore,

governments at all levels and power enterprises together make up the mixed subject of universal service in electricity, which not only is in line with China's national conditions but also corresponds with the developments of China's power industry. This is because: first, universal service in electricity needs the government to draw up policies and issue measures, especially needs institutional arrangement of measures, establishment of compensation mechanism of universal service and more continuous input into and policy support of universal service; second, the objective, plan, standard content and scope should be standardized by state legislation, guided by government policies, supervised and controlled by government departments and organized and implemented by power enterprises.

Universal service includes subjects at three different layers, with the government as the subject of responsibility, power network enterprises as the major subject of implementation and state electricity supervisory body as the subject of supervision.

Objects of universal service in electricity refer to the targets receiving the service, which can be further divided into objects in the broad sense and objects in the narrow sense. Objects in the broad sense refer to all social population within the territory, that is, the vast number of power users who have normal access to electric power without the restriction of time and space. Objects in the narrow sense only refer to those still uncovered by power network and with no access to electricity up to now, to social vulnerable groups who can not afford electric equipment and power rates, as well as to units and individuals without continuous access to electricity as demand exceeds supply, resulting in seasonal and regional lack of electricity, and due to unfair power cut and power limit. All objects of universal service in electricity are entitled to safe, stable, sufficient and continuous power supply. This topic makes objects of universal service in electricity in the narrow sense as the major subject of study

Next, the rights and duties on the part of subjects and objects should be clearly defined, and the supervisory and controlling principle of consistency between rights and duties should be observed. In the implementation of universal service in electricity, rights and duties of the government, power generating enterprises, supervisory and controlling institution and targets of service should be made clear.

3.2.2.1 Deciding Projects and Project Legal Persons through Bidding and Changing Disorderly Competition

The reform plan of power system has clearly stated that the legal person of power project should be selected through market competition. This is an important part of China's reform of its power investment system and a significant measure taken to change the disorderly competition in the development of power projects. In addition, this demonstrates that the government carries out fair, open and just control and service for all power project investors and creates favorable environmental foundation and conditions for universal service in electricity.

With regard to deciding projects and project legal persons through bidding, the basic requirements are as follows: the government authority in charge approves power development plans at the country and region level and make them public and issues project tenders stating name of the project, limit of investment volume, expected online power rates, basic external conditions, expected value of major technological and economic targets of the project, dates of commencement and completion and environmental and ecological requirements. The authority in charge may work out qualifications and conditions for access and specific measures of bidders and

employ project legal persons around the whole society. Meanwhile, the responsible authority must impartially judge the bids and approve project legal persons when approving projects.

3.2.2.2 The Power Network Transmitting and Distributing Electricity without Interruption

It has been put forward in the reform plan of power system that big users may choose power suppliers to purchase electricity and conduct experiments on the reform of transmission system. Authorized big users also become one subject of power market transactions. Therefore, one question has come out as to how to provide universal service to these users and all distribution companies.

Big users may freely choose power generating enterprises with the pre-condition of unobstructed power network, otherwise, the input made by power network to overcome and remove the obstruction should be compensated in a reasonable manner. This sort of compensation may be provided by universal service fund retained by the entire market or by one or several relevant big users. As for its priority of transmitting electricity to distribution companies across the country or big users, the demand of all distribution companies should be met first. When transmission cannot be implemented based on the optimal plan due to big users' independent choice of power suppliers, additional loss of power network should be reasonably compensated.

When, after calculation, power network enterprises can not provide universal service of selected purchase of electricity to users or need to conduct technological innovation and infrastructure construction concerning the volume limit of power network, these issues should be included into mid- and long-term plan and annual plan and considered when appraising and fixing the transmission rate of power network enterprises.

3.2.2.3 Ensuring Supporting Services So that Power Networks Can Function Safely and Transactions Go Successfully

Plant-and-network separation gives rise to the emergence of shared burden of other services engaged in power transmission. In accordance with current international practice and given China's practical conditions, in the process of building power market, universal service in electricity in particular, the supporting services mainly perform the following functions: providing power networks with peak and frequency adjustment, system reserve, reactive compensation and dark start-up. Some of these services are provided by power plants to power networks, while some are just the opposite. But all services will be delivered to users, and therefore the cost involved in providing supporting services need to be rationally apportioned and allocated.

First of all is adjustment of peak and frequency. The load of power networks is subject to fluctuation. By comparison, the load fluctuation of power plants is relatively stable. Under such circumstances, operations will increase loss and decrease efficiency and benefits. A large number of load arrangements are made through contract negotiation and balancing the interests of the two sides with price. Daily load fluctuation of power networks may also have power plants compensated when they bear load fluctuation by means of price competition, but fluctuation beyond price competition should resort to supporting services. That is to say, if power plants undertake additional adjustments besides normal load adjustment, they must be compensated according to the public standard. Additional adjustments also include adjustment of mode of operation under the condition of accidents, and the part generated due to deviation from normal

mode of operation should also be compensated.

Second is system reserve. Current system reserve generally includes reserve for load, maintenance and accident. Apart from maintenance reserve which can be regulated and controlled by working plan, other reserves are quite arbitrary. From the perspective of system, it is absolutely essential for power plants to provide it with reserve. However, on the part of power plants, it is kind of give and sacrifice, thus they deserve compensation. Moreover, the electric power and electric quantity purchased by the system from power generation operators should be absolutely guaranteed. Power generation operators should set proper reserves so as to fulfill the agreement. Thus, all-network reserve should have kind of segmentation mechanism. If power generation operators promise power networks electric power and electric quantity without any arrangements of reserves and in need of the system to provide reserves, and then power generation operators should also pay for the cost of purchasing reserves.

Third is reactive compensation. Reactive power source of the system mainly falls into two categories: one is that power generation operators transmit active power and reactive power at the same time, but long-distance transmission of reactive power is extremely uneconomical; and the other reactive power source is the rotating or static reactive compensation equipment installed in local power networks by power network operating enterprises. Some reactive electric power and electric quantity installed on the side of users only exist between power network enterprises and users and are realized through "adjustment of power factor". With plant-and-network separation, there is a reasonable distribution of the provision of reactive power among all power generation operators, thus becoming a composing part of the universal service provided to power generation operators by power network operating enterprises. The solution is still economic means. However, the formation of China's power system has its own history and different power plants have different positions and roles in the system. There are some written items concerning the reactive facilities of all power plants in the originally designed system power factor. As a result, history should be respected and appropriate measures taken in the process of market reform.

Fourth is dark start-up. Dark start-up refers to the power needed by system for recovery after major accidents.

Fifth is other service. E.g. stable controlling service and automatic generation control.

3.2.2.4 Obligatory Acquisition

Among China's energy policies, there is sort of power in line with environmental and ecological guidelines as well as industrial policy, but it is visibly more expensive than conventional sources of energy. After the market pattern of online price competition took shape due to market reform, this kind of electric power is not competitive at all in terms of price. At present, such electric power mainly refers to electricity generated by some renewable resources and new energy, for example, electricity generated by wind power, solar power, biomass energy power and small-scale hydroelectric power plants. This sort of electric power must be included for universal service in institutional arrangement, but special policies must be formulated and issued as encouragement, which mainly include:

First of all, the government determines the share of renewable energy power within power network. The maximum amount (or proportion) of such share should be examined and verified based on the development and bearing ability of resources.

Second, the price of renewable energy power may be determined or guided by the government.

The government should be prioritized to make adjustment and authorize power network enterprises concerned to carry out obligatory acquisition.

Third, profits produced from acquisition should be apportioned throughout the country. New energy and renewable energy for the purpose of providing universal service in electricity should be compensated by appropriate fund and subject to the examination and check of power supervisory and controlling department.

3.2.3 Separating the Functions of the Government from Those of the Supervisory and Controlling Institution

Whenever there is an independent supervisory and controlling institution, supervision and control and the formulation of industrial and public policies should be implemented by two different departments, that is to say, the functions of the government should be separated from those of the supervisory and controlling institution. For example, formulating relevant industrial and public policies on "West-East electricity transmission project", development and utilization of clean energy and universal service in electricity should be the responsibility of the energy department of the government, namely National Development and Reform Commission. State Electric Power Regulatory Commission takes part in it, and major implementation units such as power network enterprises and some business departments concerned should also take part in it. State Electric Power Regulatory Commission should promote the legislation of universal service in electricity, urge governmental sectors concerned to draw up industrial and public policies concerning universal service in electricity, implement the supervision and control of universal service in electricity in accordance with law, accumulate experience in the process of supervision and control and put forward suggestions regarding how to adjust and amend industrial and public policies.

3.3 Task and Substance of Supervision and Control

3.3.1 Universal Service Open to the Entire Society

3.3.1.1 Providing Various Sorts of Information Service

Releasing necessary information on universal service in electricity is an important link for monopoly enterprises to improve service, put themselves under the supervision of the entire society and change the current pattern of asymmetric information. As market information is diversified, for power network enterprises, information service in the following aspects is the most important.

1) Information on market demand and supply. In order to create a transparent market environment for users as well as power suppliers, power network enterprises should, on a regular basis and at the level of regional and provincial power markets, release the concrete results of power consumption and expected power demand supply in future periods of time.

2) Information on supply of resources. Here, resources refer to those already exploited or to be exploited in the region, including information on project construction of power sources and power networks.

3) Transaction and price of electric power and electric quantity. Opening information in this

regard facilitates the supervision and control of the supervisory and controlling institution and the masses.

4) Information on relevant industries. This means providing information on the possibility and feasibility of service of electricity to the relevant industries, thus playing a supporting role in guiding industrial investment.

5) Information on total volume, structure, regional distribution and other major issues of the power resources in this region. Power network enterprises should provide the information above in an open and free-of-charge manner.

3.3.1.2 Formulating Industry Stipulations and Rules and Enhancing the Social Responsibility of Power Enterprises

Universal service in electricity is not the behavior of any individual enterprise but rather a cause which deserves the attention of the whole industry. Therefore, it has become an objective requirement to sum up existing experience and turn the experience into industry stipulations and regulations. After a study on the service stipulations and rules for power-supply enterprises, China Federation of Electric Power Enterprises provided some valuable suggestions on how to provide excellent service in the power industry.

First, customers come first and their demands should be prioritized. The goal is to meet customers' demands, with marketing focus laid on customers. The concept of "survival through providing excellent service" should be established and each staff member should cultivate a sense of responsibility——"everyone is serving others". With customers' demands satisfied, the economic benefits on the part of power-supply enterprises should be in line with the social interests of the vast number of customers.

Second, the supply of electricity should be safe, reliable and good in quality. Improving the structure of power networks and reducing the frequency of accidents in order to ensure safe and reliable supply and utilization of electricity; attaching great importance to safety in production and reducing the number of deaths and casualties resulted from electric shock so as to guarantee safe use of electric equipment; reducing pre-arranged frequency of power cut and shortening the time for maintenance through careful organization to diminish the loss imposed on customers; and ensuring the quality of electricity with the voltage no less than 95 percent at users' terminal.

Third, seeking high efficiency and energy conservation and promoting management of demand. Management of demand for electricity means kind of method and technique which reduces electricity consumption, improves load and brings the supplying property of resources into play on the basis of reasonable and efficient use of electricity. Also called as load management, it is a method and technique that benefits the entire society. Management of demand for electricity, a key composing part in combination of resource planning and an advanced resource management method and technique currently advocated throughout the world, is applicable to the operational mechanism of market economy, encourages competition of resources, values cost benefit and promotes economical, top-grade and highly-efficient energy service. Thus, its application in the power field has scored remarkable success.

Management of demand for supply refers to managerial and administrative activities in which power companies take effective incentive and guiding measures as well as appropriate mode of operation, work together with customers to improve the ration of economical utilization of electricity and reduce power consumption and demand for electricity while satisfying the need for

the same power function, aiming at saving energy, protecting the environment and providing resource service with the lowest cost. Major measures include load shaping techniques. Power peak load shifting and changing the shape of the load curve can be used to improve the load ratio. As to the control means that can be taken advantage of, besides direct load control and indirect power peak load shifting, there is interruptible load control, which is suitable to some techniques that do not require high compatibility of power supply. Power rates for such interruptible load may be paid at a lower price. A large number of effective electricity-saving techniques are adopted through controlling the terminal so that electricity can be utilized in an economical and efficient way under the same conditions of electricity service. Economic means should be employed to strengthen the management of demand for power supply, with the most effective means being implementing different power rates for peak and bottom periods and seasonal power rates. Management of demand for power supply is a huge systematic project. The reason why it is included into universal service in electricity is that it brings benefit to the entire society and needs the support and participation of all customers.

Fourth, guided by science and technology, the service should be rapid and convenient. A rapid and convenient procedure of reporting for installment of and access to electricity should be established. Business offices handling the business of reporting for installment of and access to electricity at the level of county or above should have no days off. Rapid-in-response system of maintenance should be maintained and 24-hour maintenance service provided to customers. The systematic function of the customers' service center should be brought into play with their needs and voices reflected promptly and efficiently. Service information of enterprises should be transmitted so as to work as a bridge of communication between the two sides. A highly-efficient and orderly marketing and managerial system should be set up to standardize the behavior of enterprises' service.

Fifth is management in accordance with law and fulfillment of "openness, fairness and justness". Sticking to management in accordance with law and standardized administration and working together with customers to ensure an orderly power market; making public the whole process of handling business and strictly carrying out the power rate policies and charging regulations of the state, with no charging items and standards in any form separately established. Implementing an open, fair and just bidding mechanism to prevent any equipment of inferior quality from going online and any unqualified construction team from getting involved and affecting the safety of the power networks.

Sixth is polite and civilized, sincere and devoted service. The mode of service should be innovated in an up-to-date manner so that customers will increase their demand for electricity with pleasure. Highlighting the focus of service with due consideration for all concerned and enhancing the goal and management of service with a clear aim and striving to satisfy customers with special demand for electricity.

Seventh is social supervision and fulfillment of all promises. Establishing a smooth supply-and-demand channel of exchange, strengthening the transparency of power-supply service, improving feasible service supervisory mechanism and publicizing complaint hot-line telephone and informants' hot-line telephone, with the former replied within five working days and the latter replied within ten days. Severely punishing and rectifying acts of breach of rules and disciplines, setting a corporate image featuring promises honored and faith and honesty valued and earnestly accepting the supervision of the government, society and all customers.

3.3.1.3 Ensuring Users' Equal Right of Enjoying Service of Electricity

First of all, the subjects of universal service in electricity have the duty and responsibility to safeguard and guarantee all social members' equal right of enjoying service of electricity at a reasonable price, which is total significance of universal service in electricity. a) Undeveloped and backward regions where residents can not afford electricity. Their earliest access to electricity is undoubtedly the top priority of universal service. b) Remote and sparsely-populated country areas where the expenditure of building infrastructural networks is high, resulting in prohibitively expensive service of electricity; and c) some special groups, such as the disabled, laid-off workers, retirees above a certain age, backward areas inhabited by minority groups, low-income families, households enjoying the five guarantees, compulsory education institutions and non-profit medical institutions in underdeveloped regions. Different preferential service should be granted based on practical conditions and targets. Comprehensive measures need to be taken when extending universal service in electricity to some vulnerable groups in economically underdeveloped regions, for example, reducing and remitting power rates, namely, formulating a standard of reducing and remitting power rates for poverty-stricken peasants. Poor peasants should be provided with electric equipment at a preferential price to help increase their per capita electric quantity. The additional cost and loss of revenue on the part of power network enterprises due to the reduction of power rates and cost of electric equipment should be reported to local Development and Reform Commission, State-owned Assets Supervision and Administration Commission or State Economic and Trade Commission and get compensated by the fund for universal service in electricity with their approval. For those remote mountainous areas uncovered by power networks, especially deep mountainous areas and regions extremely sparsely-populated, where the construction cost of power networks and cost of electricity are high, the possibility of starting business is quite low due to inconvenient transportation. The sparsely-distributed residents only use electricity for illumination and electric household appliances. Therefore, their electricity quantity is rather low and the load is quite small, resulting in huge loss. The unit cost of setting up power-supply equipment is prohibitive because of harsh natural conditions, thus the power-supply cost is accordingly high, and power network enterprises usually lose money if they implement the existing power rates. This problem can be solved by the following means. First, after comparison, small-scale hydroelectric power plants, wind power, solar power, biomass energy power or diesel electric power stations should be established when local energy resources are available. Electricity should be supplied separately and low-voltage networks built locally. Second, if there is no energy resource that can be exploited available, power networks should be extended and electricity transmitted to every user. Increase of power rates due to the prohibitive construction cost and huge loss should be compensated by the fund for universal service in electricity.

Next, with the development of rural economy and increase in the disposable income of rural residents, the major task of providing universal service to rural areas is to reform and construct power networks, expand amount of power supply, improve service facilities and the quality of service, remove institutional obstacles, reduce power rates and lighten the burden of peasants.

In the first place, supplying electricity to each county, township and village of rural areas should be absorbed into the annual task of normal universal service in electricity. Plans must be drawn up so that breakthroughs can be made during the 11th Five-Year Plan period. Of the capital for reforming and constructing rural power networks, part should be set aside for projects aimed at supplying electricity to all counties, townships and villages. These projects should be built by

government bonds. As a result, the number of peasants without access to electricity will be significantly reduced.

Second, continuing the practice that urban and rural areas use the same power network and enjoy the same power rates regarding residential consumption of electricity. Same-network-and-same-price is an important measure taken to implement universal and equal service in rural areas. In light of the end position of rural power networks, relatively backward technical equipment, long-distance transmission, huge loss and consumption, plus some managerial factors, power rates in rural areas far exceed that in urban cities, which fall short of the requirement of universal service in electricity. The following measures might be feasible to change such situation: the government or power-supply enterprises subsidize rural areas for the power rates, which will add to the financial burden and reduce power enterprises' profits for a long time; another measure is to practice cross subsidy between urban and rural areas and implement same-network-and-same-price policy with regard to the residential consumption of electricity of urban and rural residents. That is to say, the urban and rural residents of a region with access to electricity, with the precondition of not decreasing the business revenue of power-supply enterprises, put the electric quantity and power rates of urban residents and those of rural residents together and get an average power rate. Generally speaking, urban residents will pay more power rates in this case with rural residents paying less, thus alleviating the burden on peasants. In the comment given by the State Council to On Accelerating the Reform of Rural Power System and Strengthening Rural Power Administration (guo fa (1999) Document No. 2) promulgated by the State Economic and Trade Commission, it has been made clear that "In provinces (autonomous regions or municipalities) where the conditions are ripe, a uniform price may be promoted; while in provinces (autonomous regions or municipalities) where the conditions are still not ripe, for counties which are under the direct supply of electricity and management within the provinces (autonomous regions or municipalities), city-and-township uniform price may be promoted, for other counties, 'one county, one price'. Rural and urban cities should gradually realize the comprehensive arrangement in terms of power rates and practice same-network-and-same-price."

After reform, in 2001, Jiangsu and Shanghai realized the practice of same-network-and-same-price throughout the province (municipality); some regions, cities and counties of Zhejiang, Shandong, Henan and Gansu realized same price; and the counties of some provinces realized same price. According to statistics, by the end 2001, there had been more than 200 counties where urban and rural areas shared the same power network and the same power rates regarding residential consumption of electricity. Practice has approved that such measure is in accordance with China's national conditions and that the implementation is stable.

Third, the reform of rural power system should be further deepened. Promoting and improving the reform of stock-holding system and establishing modern enterprises' system in an active and stable manner; reforming the subsidiaries of the power-supply enterprises of counties which are under the direct supply of electricity and management; and gaining lessons and proposing measures concerning the improvement of the reform based on pilot projects. Reforming the power-supply stations at county and township level is the key of rural power system reform. So far, over 95 percent of China's counties and townships have their own power-supply stations and a new-type rural power-supply management mode has been established, with rural power market constantly standardized and level of service visibly raised. The power-supply stations at county and township level consolidate and improve rules and regulations, raise level of operation and

have realized the management mode of “three open” (open electric quantity, open power price and open power rate), “four to each household” (selling to each household, copying the meters of each household, charging each household and serving each household) and “five uniform”(uniform power price, uniform receipt, uniform meter-copying, uniform accounting and uniform check), thus rooting out the three headaches of rural utilization of electricity. The phenomena of “gratitude electricity, authority electricity and relationship electricity” should be strongly prohibited.

3.3.1.4 Deepening Traditional Electric Service and Including It into Universal service in electricity

Traditional electric service should be deepened with the aim of establishing a “civilized industry”. Standardized service of power-supply business in cities above the level of prefecture should be carried out and model windows of power-supply business in rural areas set. Commitments of power-supply service should be made public and supervision from the whole society actively accepted.

First of all, service provided to users by power-supply enterprises should be standardized and institutionalized and become the voluntary act of enterprises and staff. A complete customer service system should be established. This system includes institutes organizing service, business flow and operational rules and regulations. Currently, most power-supply enterprises have set up customer service center, which is a window unit accepting customers’ application for business, information inquiry, reporting for maintenance, complaints, issuing power-cut forecasts, reminding arrears and providing information on supply and consumption of electricity.

Second, from the long-term perspective, market development will gain increasing significance and the business mode of “waiting for customers and power rates to come” will undoubtedly be eliminated. Marketing service agency should change its attitude from passive to active, aiming to meet customers’ demand and gain more profits for enterprises. The marketing service agency should also analyze market environment, carry out market research, establish marketing information system, formulate marketing strategies and innovate means and mode of service.

Third, directing distribution network system to operate and practice, handle accidents and ensure secure and stable operation of power networks. Various technological measures should be adopted to improve the quality of electric energy. Directing engineering service agency to look for and clear all the trouble based on the information provided by the information service agency.

Fourth, paid technological service may be provided, such as maintenance of users’ equipment, check of relevant projects, instruments and meters and training for workers engaged in electric service.

Five is commitment to social service. As early as 2001, the then existing state power companies put forward a uniform eight-point commitment concerning electric service to standardize power-supply service, which evoked strong responses in the entire society. Quality service should be provided continuously in the future.

Six, individual innovations of all power-supply enterprises should be respected, all kinds of quality service activities promoted and relevant rules and regulations summarized, formulated and improved.

3.3.1.5 Power Enterprises Should Continue to Expand the Content of Service and Improve Its Quality

First is changing the concept. In order to open the market, introduce the competitive mechanism, and enhance staff's sense of serving the customers voluntarily, overseas power enterprises have conducted a series of cultural reforms: calling users customers and building up the concept of respecting customers; calling distributing electricity as supplying electricity and meeting customers' needs; changing electricity management into customer service and building up the concept of "Excellent Service + Quality Products=100% Victory"; and changing controlling electricity to popularizing electricity and recommending top-grade electric products and instrument to customers so as to use electricity more frequently and more efficiently and expand the market.

Second is extremely considerate service. Power enterprises offer various means of paying electricity bills to help customers find one way acceptable to them. Major means of payment include payment in cash at proper places, payment in check, payment of an agreed odd amount each month or each quarter and pre-payment by meter. The network of payment provides considerate service seven days each week and can re-supply electricity within one day after arrears are collected. New customers can get power supply within 24 hours after the installment of electric equipment is proved to be safe. Maintenance workers will arrive at the spots of power cut within one hour after being notified and make emergency repair. Customers who will be affected by planned power-cut will be notified in advance. Customer consultant group and regional customer consultant committee should be established, customer opinion card, customer quarterly journal prepared and service commitment and survey of customers' opinions done so as to strengthen communication with them. Customer service center provides 24-hour service every day. Customers' inquiry calls should be received within four rings. It is not allowed that customers wait for more than 20 minutes in the service center to make an inquiry. No matter what business customers need to handle, power enterprises must do a good job in helping get their business done. Neglecting customers is never permitted.

Third one is users with particular needs. Many overseas power companies have formulated Code of Conduct for serving senior and disabled users and set guarantee standard and comprehensive standard. Guarantee standard is kind of standard that must be attained in every individual case. If the required standard has not been attained, power companies have to compensate the affected customers. Comprehensive standard refers to the pre-determined minimal service standard which common users are entitled to expect and which is not suitable for individual guarantee. As for users with particular needs, like senior citizens, the disabled, chronics, and users in urgent need of such electric equipment as dialyser and artificial oxygen respirator, power companies will arrange registration for them. Then, the specially-trained staff will give free assistance to these users, provide them with various adapters and controlling facilities on a larger scale, install sets of secure and reliable instrument in senior citizens' homes and reserve a spare mains in case of overload. Telephone calls or family visits may be employed to help users improve energy efficiency and change the position of electricity meters for free so as to facilitate the checking by the disabled and senior citizens. Users with difficulty in eyesight, hearing and speaking should be provided with "oral electricity bill", printings with big-sized characters and Braille electricity bills and allowed to entrust a third party, either relatives or friends, to handle electricity bills or other issues. All power companies ensure the safety and reliability of power use

for vulnerable user groups by means of password.

Fourth is preferential power price. China's preferential power price is the legacy of planned economy, which, in essence, is another form of financial subsidy, as then electricity was controlled by the state. Basically state policy-rated, preferential power price is mainly granted to the following several categories: first, northwest China, especially a particular kind of agricultural irrigation in Ningxia Xihaigu and Hexi Corridor of Gansu; second, important lifeline enterprises, military industrial enterprises and enterprises with special nature controlled by the state, such as individual plants engaged in nuclear industry; and third, particular techniques of some competitive enterprises, such as electrolytic aluminum enterprises. The two power network enterprises formed after reorganization of the power industry continue the preferential power price, transferring government subsidies to power network operating enterprises, which is against exchange at equal value of market economy. Therefore, such situation should be gradually transformed with the reform of power price. One feasible measure is to cancel such price subsidy. Subsidy for rural power supply should be replaced by governmental transfer payment; and as for industrial enterprises, the problem should be solved through tax adjustment.

Fifth is electrification. Electrification is a particular situation in China's power supply, which mostly occurs in mines and family communities of some enterprises. On the one hand, extension of public electric power networks is not economical. On the other hand, the existing power network of enterprises can supply electricity quickly and conveniently. Therefore, Article 20 of Regulations on Power Supply and Use stipulates that: "For regions uncovered by public power-supply facilities, power-supply enterprises may commission units nearby capable of electricity transmission to supply electricity." According to China's realities, conditions should be actively created to cancel to electricity in a gradual manner.

Sixth is families short of fuels. In order to alleviate the difficulty faced by families short of fuels, power enterprises, all natural gas companies, the government and regulators as well as the consumers should work together and establish a "task group" to solve the problem and help families with particular needs improve their energy efficiency free of charge. Power companies have adopted power price for small quantity use of electricity and canceled fixed power rate for users consuming small quantity of electricity.

3.3.1.6 Guaranteeing the Safety of Power Networks

Power network enterprises constantly enhance the reliability and ability of recovery of power networks so as to reduce the negative impact imposed by external factors such as climate and trees. Long-distance power network control and the automation of transformer substations have greatly reduced accidents of power-cut. The installment of long-distance control and remote devices in main transformer substation also has significantly reduced the time needed for recovery. Projects transforming the power systems in downtown areas and suburbs, automation of power-supply system and aerial cable innovative projects all have enhanced the reliability of electric power supply.

After the reorganization of China's power industry and the establishment of a new system, universal service in electricity is faced with new problems. That power network operating enterprises provide numerous power generating operators with universal and equal service should be a pioneering task of universal service in electricity, which should be continuously developed and improved in practice.

3.3.2 Construction of an interactive system in universal service in electricity

The universal service in electricity is related to government, power grid enterprises in and power generation enterprises. The integration of the users' interests to the universal service in electricity has to set up an interactive system, namely the interactive system of the comprehensive power services.

3.3.2.1 The construction of customer assessment system and the increasing of the public's participation

The power industry used to follow up the firm performance assessment or contesting among service units which are organized by the government or an authority. However, these activities depend too much on the subjective standard and thus lack of recognition in the public. In order to make up this recognition, it is worthy making use of the methods in the foreign country, which means to establish customer trust and assessment system, namely, a customer satisfaction indicator. In the West, this indicator results from that the industry has fully aware of the industry on the importance of customers and pursued for their satisfaction. In the meanwhile, this indicator can help increase the competitiveness and directly present the strategy of economic effect. Finally, this indicator can be used as an important mean to enhance the firm's operation.

The customer's satisfaction refers to a status of being enjoyable or disappointed with a product or service in result of a comparison between the effect (or the result) of recognition and his or her expected values. The satisfaction degree is the qualitative of customer's satisfaction in percentage as used by many countries from 100 down to 0 by maximum to minimal satisfaction.

Each enterprise can choose various customer samples, the total of which shall not less than 0.1 percent of the aggregate customers. The questions on each sample should be designed on the ground and completely reflect the services and their depth of the enterprise. At the same time, a couple of indicators are set to discover the feedback of customer, for example, customer expectation, recognition quality, recognition value, satisfaction degree, and customer complaint. The customer satisfaction is calculated based on three variables: the total degree of satisfaction, the diversity of the expected recognition and quality, the distance between actual product/service and the expected product/service. The customer satisfaction for each enterprise goes between 0 and 100 and it for the industry therein is the levied average of sales income.

The inspection on the indicator of customer satisfaction undergoes to the enterprise itself and the assessment throughout the whole industry shall stress its objectivity and justice by means of the industry union or association.

3.3.2.2 Effective Complaint Management

The indicator of customer satisfaction presents the overall level of the universal services of power grid firm but may not reflect the course of dialogue between individual behaviour and society. Therefore, it is necessary to legally formulate a complaint management.

There are two kinds of complaint management. The one is set up by the enterprise or its superior enterprise (or its receiver) based on the enterprise's regulated issues related to the complaints, which are clearly defined by the Regulation on Power Supply and Utility and the eight items of commitment undertaken by the power enterprise to the public. Furthermore, the power

enterprise shall regularly issue the result of the complaint management to the public, where the complaint management shall be disclosed to and inspected by the public. The other one is established by power inspection authority. According to the responsibilities defined the power inspection commission and its branches shall have their own complaint management sector which mediator and arbitrate the dispute on the power use between power grid enterprise and the customer and on the power purchase between power grid enterprise and power generation firm.

3.3.2.3 The establishment of risk management for an enterprise

For the power grid enterprise, the different understanding on one issue may be disclosed by media or reported to the relevant authorities. It may take effect to a great extent, sometimes. An accident caused for some season or major force to the power grid may involve the users. It is called the risks of the power grid enterprise. On the condition that the power grid enterprise is much related to the producer of power resource and customer, it is particular to adopt the power grid enterprise and risk management to the universal service in electricity.

The risk management for an enterprise includes three aspects as follows:

The first is risk recognition system. The enterprise shall assign a function department to undertake the work recognize risks which include complaints and reports from all walks of society, the letter of inquiry sent by the superior firm or the adverse issues published by the media. The risk recognition shall be quickly beware and reported. At the very first moment when risk occurs, it shall be informed to the decision-maker. The risk recognition system shall organize some personnel to consult and judge the risks and offer the strategic suggestion on the risk management.

The second is risk management command system. The enterprise shall appoint a top decision-maker to take charge of the overall works on risk management, set a temporary risk management command team and a standing department for daily works. The decision-maker of risk management shall be authorized a special power of command. The works on risk management shall be undertaken by relevant business department so as to avoid interest conflict between the departments.

The third is an early warning system and risk management preparation. The early warning system makes use of technical means to analyze variables incurred in the process of operation, to monitor the status which is compared with the indicator of preset status and then conclude the risk possibilities and the risk prevention. Meanwhile, based on the analysis on the historical risk management the enterprise shall extract some basic experience for the preparing solution. Once a risk occurs in the enterprise, the preparing solution can be process to avoid the expansion of the risks and improve the effect of the risk management.

3.4 Supervision Institutes and Their Responsibilities.

According to the targets, discipline, tasks and content of the supervision on universal service in electricity and also considering the state conditions and concrete situation, the State Power Commission take responsibilities to undertake the supervision on the universal service in electricity. In the process of supervision, the Commission’s main responsibilities are to monitor the implementation of the universal service in electricity in respect of the quantity, quality and fund raising and using for the universal service in electricity, to coordinate the problems produced in the process of services, to accept complaints and advise on the solutions, to timely conclude and

promote the experience of the comprehensive services, to feedback the service problems and to prepare and carry out yearly working plan.

The State Power Supervision Commission's short-term responsibilities for the universal service in electricity are as follows:

The first is to clear off the concept of the universal service in electricity through a research, to define the content, scope, width of this service and the operating depth in connection with the state conditions, and to approach a concord understanding between governments at all levels, enterprises and users and operates all works in the platform of the universal service in electricity.

The second is to intensify the publicity on universal service in electricity in form of national or international research meeting to expand the concept of the universal service in electricity to the enterprises at all levels, in particular the heads of enterprises and users, to expand the influence of this concept for the self-protection awareness of people to the services.

The third is to make full investigations and researches on the universal service in electricity undergone to the power suppliers nationwide, analyze relevant issues and prepare for the legal making of the universal service in electricity. Also, it shall develop an ad hoc research and topic-based research and define its key works.

The fourth is to develop the investigation and research on the quality of the universal service in electricity. The format contract set by the power-supply enterprise containing unequal terms and conditions such as statutory obligation of "final interpretation", reducing and exempting its own responsibilities, including notice, announcement, notification and so-called industrial conventions is against the discipline of the universal service in electricity and the mission for the people. This shall be one of the key works for the electricity supervision commission.

4. Policies and Suggestions on Universal service in electricity

4.1 Setting a Multilevel Goal of Universal Service That Corresponds with Economic and Social Development

According to international experience, the concrete content of universal service in electricity should also keep evolving with the development of power technology and the expansion of business. Policies of China's universal service in electricity with a multilevel goal should be worked out upon such basis and carried out in a stage-by-stage and layer-by-layer manner.

The goal of universal service should be different at different stages, namely, short-term goal, mid-term goal and long-term goal. Goals for different stages, for example for 2008, 2010 and 2020 may be set. Goals should also demonstrate regional differences based on the unique conditions of the eastern, middle and western parts of the country. Business types of universal service should be gradually expanded in regions where the conditions are ripe to reflect the level of economic level.

4.2 Establishing and Improving the Relevant Legal Guarantee System

China's universal service in electricity has a late take-off. Up to now, there has been no complete set of laws and regulations to supervise and control it, which directly affecting the

progress of related work. Thus, at present, it is urgent to formulate relevant laws and regulations in this regard. In order to ensure that universal service may develop in a more standardized, orderly and healthy manner, the following principles should be followed in actual practice:

First is principle of integration with international standard. The establishment of universal service mechanism should help break monopoly, protect competition and promote development; be conducive to supervision and control so that the fund will be operated in a more open, just and transparent manner, help constantly improve public welfare and guarantee the sustainable development of national economy.

Second, principle of defining the rights and duties on the part of subjects and objects clearly, that is, every individual shall be entitled to the basic right of enjoying universal service and every operator shall have the duty to provide universal service.

Third, principle of sustainable development, that is, the objective of universal service must keep updating with economic and technological development; and the level of service needs to be continuously improved, which shall be going hand in hand with the development of the power industry instead of simply being an expedient.

4.3 Formulating a Special Plan for Universal Service in Electricity and Forming a Corresponding Target System

Universal service in electricity has a bearing on the overall situation of building up a harmonious socialist society. Therefore, it needs concerted efforts of all governmental departments concerned and all enterprises of the power industry, needs comprehensive consideration within the framework of development of the power industry, and needs a well-coordinated relationship between it and the development of renewable and new energy resources. Based upon the considerations above, it is suggested that the governmental department in charge formulate a special plan for universal service in electricity after connecting it with other relevant plans and use such plan as the guiding document to coordinate all departments concerned in a joint effort to promote all kinds of relevant tasks.

Given China’s vast territory and that the level of economic development and the condition of power supply vary from region to region, it is impossible find out a uniform and qualitative standard. It is quite crucial for the improvement of the level of universal service in electricity to formulate different standards and adjust the standards with the change of relevant factors according to different period of time and different regions. It is suggested that the governmental department in charge set up a dynamic mode of measurement and determine universal service standard by quantitative means based on different situations of the regions at different periods of time.

Factors need to be considered in the standard mainly include: GDP, GPI, per capita income, proportion of power expenditure in residents’ consumption, regional ratio of access to electricity, per capita consumption of electricity and power rate. Quantitative measurement of the implementation of universal service can help provide a basis for state’s legislation concerning universal service in electricity and further promote the development of universal service in electricity at the same time.

4.4 Improving the Regulatory Mechanism of Universal Service

4.4.1 Regulatory Institution

According to the managerial experience of power public welfare fund both at home and abroad, the fund management institution has three modes: the governmental department, power enterprises and independent non-profit agencies. From the perspective of realities, the fund for universal service in electricity should be managed by the governmental department rather than power enterprises.

Notice Concerning Printing and Issuing the Reform Plan of Telecommunications System by the State Council (guo fa〔2002〕Document No.5) clearly puts supervision and control of implementing policies concerning the universal service in electricity into the responsibility of State Electric Power Regulatory Commission. And the State Electric Power Regulatory Commission also defines its duty in *Regulatory Measure for Power Supply Service (Trial)*. The subjects regulating universal service in electricity should be the State Electric Power Regulatory Commission and institutions appointed by it.

The subjects carrying out universal service in electricity are mainly power-supply enterprises and the objects subject to regulation are such enterprises as are engaged in power-supply businesses within the territory of China and have obtained power business license in accordance with law, including State Grid, China Southern Power Grid and other local power-supply companies.

Given China's vast territory and huge differences among regions, the management authority of universal service under the State Electric Power Regulatory Commission may adopt the mode of "vertical establishment and level-by-level management", that is to say, the regulatory structure can be divided at the level of central government and provinces (autonomous regions and municipalities).

Major responsibilities of the State Electric Power Regulatory Commission for regulating universal service in electricity include: researching into policies and measures of universal service; assessing the cost of universal service and organizing the collection and distribution of universal service capital; determining the target and scope of universal service, editing and reporting the budget and final accounts of the income and expenditure of the fund; monitoring, appraising, supervising, checking, and rewarding and punishing universal service; and proposing various suggestions on universal service to the governmental department in charge.

4.4.2 Regulatory Measure

The rules and regulations of the regulatory measure of China's universal service in electricity shall be formulated in accordance with Article 5 of *Regulatory Measure for Power Supply Service (Trial)* promulgated by No.8 Order of the State Electric Power Regulatory Commission: "Electric power regulatory institutions shall supervise and control the implementation of universal service in electricity by power-supply enterprises. Power-supply enterprises shall, in accordance with the provisions of the state, perform their duty of providing universal service in electricity and ensure that everybody shall have access to basic power supply at a universal and acceptable price."

4.4.3 Principles and Objectives of Regulation

The objective of the regulation of universal service in electricity should be the same as what has been described in Article 5 of *Regulatory Measure for Power Supply Service (Trial):* "Power-supply enterprises shall, in accordance with the provisions of the state, perform their duty of providing universal service in electricity and ensure that everybody shall have access to basic power supply at a universal and acceptable price."

As for the regulation of universal service in electricity, principles of in accordance with law, independence, justness and transparency should be adhered to through formulating definite regulatory legal provisions and transparent regulatory procedures. Fair competition should be encouraged while competition in chaos opposed so as to improve the efficiency of regulating universal service in electricity.

4.4.4 Regulatory Means

Regulatory means for universal service in electricity include legal and administrative means, economic means and corresponding technological means.

The State Council has clearly defined the responsibility of the State Electric Power Regulatory Commission for the regulation of universal service, but the corresponding regulatory system still needs much improvement. Close attention should be paid to the formulation of regulatory laws and regulations on universal service in electricity so that the regulation has laws and regulations to go by from the very beginning. With regulations to go by, it means defining power-supply enterprises' duty of providing universal service and the scope, goal and standard of their duty in legislation. According to the need of regulation, formulating, amending and abolishing law should go hand in hand upon the basis of sorting out the existing law. More efforts should be made to improve the laws and regulations concerning the subjects of power regulation and to set up a system of law, regulations and rules concerning the regulation of universal service in electricity.

Fund management mode means to strengthen the economic means of regulating universal service in electricity. Market competition mechanism should be introduced into the economic means of universal service in electricity. On the one hand, power-supply enterprises' duty of universal service in electricity should be enhanced and part of the universal service capital should come from their sales income. On the other hand, commercialized operation mode and marketized distribution mechanism should be introduced so that in the process of universal service in electricity, power-supply enterprises who work more are paid more, work less are paid less, and those who do not finish their tasks should be severely punished. Economic lever should be employed to stimulate power-supply enterprises' enthusiasm in this regard.

System of informationization of regulation should be constantly improved. At the same time, the regulatory authority will do more research into the operation mechanism of universal service capital to avoid fake information, deception and moral risk that may possibly arise from the process of implementing universal service in electricity. Regulatory system, informationization of examination and approval, and publication of information of administrative affairs should be completed in a step-by-step manner. Finally, a complete three-layer system of informationization of regulation consisting of report forms, reports and examination and approval will be formed. The regulatory authority itself should also improve regulatory means, publicize information of

regulation in a timely manner through Internet and subject to social supervision in accordance with law so as to enhance the transparency of the administration of the regulatory authority and safeguard the principles of justness, fairness and openness.

Proactive regulation and supervision should be strengthened. Though proactive regulation and supervision will increase the cost on the part of those subject to regulation and supervision, the increase is relatively small. As violation already happens, violators are usually faced with relatively huge losses, so they are willing to break the rules at a higher price. Strengthening proactive regulation and supervision in universal service in electricity can help reduce cost of violation and improve the efficiency of regulation and supervision.

4.5 Formulating Relevant Supporting Policies

Universal service in electricity is a welfare project which brings benefits to the masses. Therefore, the government should give cost compensation to the power enterprises providing universal service and grant them a series of preferential treatment though state macro-regulation and control so as to enhance their enthusiasm for providing universal service.

4.5.1 Loan Policy

Power industry is an investment-intensive industry. As for rural areas where the cost of universal service is higher and remote areas with no access to electricity, the government should give scope to its role of macro-regulation and control and grant interest-free or low-interest loans to projects providing universal service in electricity.

Projects providing universal service in electricity may obtain loans from state policy-related financial institutions and commercial banks. As projects providing universal service in electricity are risky and non-profitable, it is not easy for them to get loans from commercial banks. State policy-related financial institutions, established by the government to realize particular social and economic goals, have the duty to serve the policy purposes of the government in terms of determining prospective borrowers and loan volumes and should bear the responsibility of providing financial service to projects supplying universal service in electricity.

Power enterprises providing universal service may choose one from such state policy-related banks as State Development Bank, the Export-Import Bank of China and China Agricultural Development Bank as the loan provider. And the state policy-related banks should seriously consider the special characteristic of universal service in electricity and grant some preferential policies to the power industry. Specifically speaking, the policies include reducing loan interest rate or providing interest-free rate and extending the deadline for returning the loan. At the same time, consideration should be given to low-interest loans like loans granted to old revolution base areas, areas inhabited by minority nationalities, frontier areas and poverty-stricken area for economic development and aid-the-poor discount loans.

At present, long-term loans obtained by power enterprises are largely loans on credit. In light of the special characteristic of universal service in electricity, loans on mortgage or pledged loans should be taken into account. Power enterprises may arrange a loan from a bank by mortgaging the facilities or equipment of the project or choose other flexible means of guarantee like “pledging the earning right of power rates”, “mortgaging the assets of project under construction” and “pledging the rights and interests of the shareholders”. The loan term for hydroelectric

projects currently can be extended to 15 to 30 years, thermal power projects 15 to 20 years (including grace period) and power network projects 20 years.

4.5.2 Tax Policy

With reasonable tax rate, the state ensures that power enterprises obtain a certain amount of accumulation capital in production and operation and then use the capital for extended reproduction so as to promote the development of power cause. Specifically speaking, the preferential tax policies that may be adopted are as follows:

1) Investment in universal service in electricity should enjoy tax-free policy so as to boost investment in this regard, reduce investors' losses and compensate cost of universal service in electricity. To be more specific, it includes: investment in universal service in electricity enjoying tax-free policy for the purpose of attracting power-supply enterprises' investment of power building for remote and underdeveloped areas; following the tax-collecting method of agricultural network building fund, capital used in power building only subject to value-added tax (VAT) and free from other taxation.

2) The actually collected power rates of universal service in electricity should be based on for tax dues accounting. Currently, arrears of electricity users are a quite grave problem. For the sake of social stability, with arrears uncollected, power enterprises themselves pay for the tax dues with capital for production and operation based on the power rates payable, thus leading to a short-term capital deficiency in the power industry. Universal service in electricity mainly serves low-income groups, so collecting power rates is more difficult in this case compared with that of common users. Therefore, it is suggested that power enterprises implementing universal service in electricity work out the tax dues on the basis of the actually collected power rates.

3) Alleviating the tax burden upon the renewable energy used in universal service in electricity. In light of high VAT rate for and heavy hidden tax burden on hydropower and wind power, it is suggested that hydropower and wind power enterprises carrying out universal service in electricity be allowed to depreciate fixed assets and use spare parts or tools with high value as income-tax countervailing, or appraise and fix a proportion and "first collect and then return". Meanwhile, reducing the VAT rate of hydropower and wind-power should be taken into account. In order to share the tax burden with coal-power in a fair manner, the VAT rate of hydropower may be reduced by 13 percent. Compared with hydropower, the actual VAT burden of wind-power is even higher due to its smaller proportion of purchase of raw materials. In order to show the encouragement for environmental-friendly and renewable energy of the state, the VAT rate of wind-power should be reduced to 6 percent and equal that of the small-scale hydroelectric power plants.

4.5.3 Financial Policy

As a fundamental industry and an important link in national economy, the state should grant appropriate financial aid and preferential treatment to power industry and other fundamental industries and make vigorous efforts to support its development. Universal service in electricity is a welfare project. The government should seriously consider the special characteristic of the business of universal service in electricity operated by power-supply enterprises and grant them some preferential policies and financial aid, which can be summed up into the following:

1) Relaxing the Control of Projects Concerning Universal service in electricity Property

When planning, examining and approving the infrastructure of the same region, National Development and Reform Commission should give top priority to power-building projects, projects extending power networks and new energy generation projects in particular. New energy is encouraged to be used for supplying electricity to remote areas so as to resolve such issues as power supply tension and high cost of power supply in those areas. As for projects in need of the same materials and resources, power-building projects should be prioritized. The special characteristic of universal service in electricity should be considered during the process of developing the power industry, and priority should be given to power-building projects.

2) Granting Preferential Policy to Power Generation by Renewable Energy Resources

As an effective measure to realize the universal service in electricity, power generation by renewable energy resources should enjoy preferential policy: as for the land used by power enterprises during their supply of electricity to remote areas, the state authorities concerned may consider reducing the datum price of land for industrial use, the tax burden of land use tax upon power enterprises and the cost expenditure of power-supplying enterprises.

4.6 Pushing Universal Service in Electricity Forward with State Energy Policy Combined

As the development of renewable energy and new energy has special significance in pushing universal service in electricity forward, it is suggested that governmental department in charge should grant more preferential policies to renewable energy and new energy in building the implementation framework of universal service in electricity.

In order to promote the building of a resource-conserving and environmental-friendly society, the government should, in the process of carrying out universal service in electricity, especially granting direct subsidy to targets of universal service, consider the effect of input as compensation and energy conservation in a comprehensive manner so as to avoid new waste of electric resources because of the provision of direct subsidy. It is recommended that the governmental department concerned, in the process of implementing management of demand for electricity, promoting energy-conserving household electric appliances and buildings as well as constructing cheap renting houses and economical houses, combine the goal of energy conservation and that of universal service and plan the utilization of the two parts of capital from an overall perspective so as to maximize the utilization ratio of the capital and public interests of society. It is also suggested that the department concerned implement the goal of scientific outlook to development while meeting the basic daily needs of the targets of universal service.