

Making Incentives for Renewable Energy in China Work: Case Study on Shanghai Green Electricity Scheme

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Abstract:

Being passed in 2005 and coming into effect on January 1st 2006, the Renewable Energy Law is the first comprehensive policy document that directly aims to promote renewable energy in China. It also acts as the legal basis for country-wide activity to drive renewable energy and to increase the share of electricity generated from renewable energy. During the past 5 years since the Renewable Energy Law's announcement, however, little research has been done to give a close look at how the law really works in practice, which accordingly becomes the focus of this article. By making a case study on Shanghai Green Electricity Scheme (Scheme) which creates incentives to drive renewable energy by local government in strict compliance with the Renewable Energy Law, the article explores the existing problems and barriers of this Scheme and discusses whether the Renewable Energy Law has addressed them and provided possibility to solve them in the long run, hoping to benefit the future law making and enforcement regarding renewable energy in China.

Keywords:

green electricity scheme, incentives, renewable energy law

1 Introduction

After 30 years' economic growth, China has become a divided society with remarkable growth rate on one hand, but also with deteriorating environmental conditions and astonishing resource scarcities on the other hand (Hallding, Han and Olsson, 2009). When the Hu Jintao-Wen Jiabao (Hu-Wen) administration took office in late 2002, they took a decisive shift in focus from the single-minded growth policies of the Jiang Zemin era to a broader notion of social development—in particular the search for an alternative path to industrialization —featuring high technology, good economic returns, low resource-consumption, low environment pollution and the full use of human resources” (Xinhua, 2006) under “the new guiding principles of *Scientific Development Concept* and the building of a *Harmonious Society*” (Halling, Hand and Olsson, 2009). The Hu-Wen leadership's development strategy has provided a historical opportunity for China to develop renewable energy and go green.

Against this backdrop, China has done a lot of right things to promote the development of renewable energy, including but not limited to developing an extensive set of laws, policies and programs in the pursuit of renewable and low carbon energy, setting a series of renewable energy related targets, making tremendous investment in renewable energy field and participating in global efforts to facilitate renewable energy technology transfer and cooperation.

Among these policy measures, the announcement of Renewable Energy Law has been regarded as the most effective one and attracted the most attention. Coming into effect on January 1st 2006, the Renewable Energy Law is the first comprehensive policy document that directly aims to promote renewable energy in China. A lot of literatures talk about the significant role Renewable Energy

Law has played in stimulating renewable energy and helping China to win a leading position in this field.

However, as Elizabeth mentioned, “even when you are looking at these big numbers that are coming out of China today, I think it really pays to give a close look at what is really happening on the ground” (Larson, 2010). Although 5 years have passed already since the announcement of the Renewable Energy Law, few people have tried to examine or evaluate its real effect, particularly in the following aspects: In what way the law has been enforced by local governments? To what extent the law has contributed to the generation and demand of renewable energy? What have been the pros and cons of the law?

Bearing these questions in mind, this article makes a case study on Shanghai Green Electricity Scheme, a scheme creating incentives to drive renewable energy by local government in strict compliance with the Renewable Energy Law. Specifically, the article examines the existing problems and barriers of this Scheme and discusses whether the Renewable Energy Law has addressed them and provided possibility to solve them in the long run, hoping to benefit the future law making and enforcement regarding renewable energy in China.

2 Overview of Shanghai Green Electricity Scheme

2.1 The Scheme in a Nutshell

The Shanghai Green Electricity Scheme offers electricity consumers in Shanghai the opportunity to “green” their electricity consumption by buying some amount of green electricity for which a premium needs to be paid. Through participation, Shanghai electricity consumers including both enterprise consumers and individual consumers can directly contribute to CO₂ reduction and environmental protection. The Shanghai Municipal Government guarantees that the additional payment for Green Electricity will be used to develop additional renewable electricity generating capacity such as wind farms. An independent supervising body is responsible for auditing the green electricity accounts and publishing the audit results to ensure that no more green electricity is sold than produced and that the consumers’ additional payment is used exclusively for developing renewable electricity generation capacity (Shanghai Green Power, 2005).

2.2 Guiding Principles

2.2.1 Voluntary Purchase

Consumers purchase green electricity on a voluntary basis.

2.2.2 Government Pricing

At present, the green electricity shall temporally not participate in the price competition on the electricity market for going onto the grid. Its price shall be set by the government according to the principles of “Being beneficial to the development and utilization of renewable resources, being economic and reasonable, being able to reasonably compensate for the cost and put apart room for profits”.¹

2.2.3 Incentivizing Purchase

The government of Shanghai Municipality encourages the development of green electricity and vigorously encourages consumers to voluntarily subscribe to green electricity by adopting the following measures:²

¹ Shanghai Green Electricity Marketing Promotion Regulation 2005, s 3(12).

² *Ibid.*, s 4(16, 17 and 18).

- ✧ The Shanghai Municipal Energy Conservation Supervision Center (SMECSC) shall regularly make public the list of users of green electricity, and award the honorary certificates to the users who have subscribed to green electricity.
- ✧ For the users who have signed with the electricity company a contract for a term of at least two years and annually subscribed to green electricity in the quantity of more than one million kilowatt hours, and whose purchasing capacity of green electricity accounts for no less than 10% of the previous year's electricity quantity used for manufacturing main products, the Shanghai Municipal Development and Reform Commission (SMDRC) and Shanghai Municipal Economic Commission (SMEC) shall authorize the SMECSC to grant them the Emblem of Green Electricity. The users who have obtained the Emblem may use it within the period of purchase.
- ✧ For the users making outstanding achievements in subscribing to green electricity, the SMDRC and SMEC shall jointly award medals to them.

2.3 Significance

2.3.1 Initiative Spirit

Shanghai has become the first developing country city in the world to offer green electricity.

2.3.2 Environmental Friendly

Given green electricity is produced from renewable resources such as wind, solar and biomass, the generation of green electricity produces little or no pollutants to air, water and land, therefore helping to reduce CO₂ emissions and improve air quality in Shanghai. In addition, green electricity does not consume fossil fuel, so it is beneficial to sustainable utilization of energy. Finally, developing the renewable energy industry promotes Shanghai's image as an environmentally conscientious and responsible city while improves local economy and employment (Shanghai Green Power, 2005).

2.3.3 Driving End-Users' Demand

This Scheme represents Shanghai government's efforts to enforce the newly issued Law of the People's Republic of China on Renewable Energies (Renewable Energy Law). In particular, different from the commonly-used measures of promoting renewable energies through encouraging the generation of green electricity, this Scheme aims to advance the development of renewable energies by increasing the end-users' demand for green electricity.

3 Working Mechanism and Existing Problems

3.1 Working Mechanism

The Shanghai Green Electricity Scheme was developed over 2004, formally launched in 2005, and was formally called and branded "Jade Electricity". In June 2005, the Shanghai government issued *Shanghai Green Electricity Promotion Regulation (Regulation)*. The *Regulation* establishes legal framework and provides specific guidance for implementing the Scheme. It states that the aims are pushing forward the development and utilization of green electricity in this Municipality, improving the energy source composition, promoting the protection of environment and the sustainable development, and creating a good atmosphere of the whole society showing concern about the development of green electricity.¹ The *Regulation* was formulated in accordance with the newly issued *Renewable Energy Law* at that time and turned out to be an important measure of the

¹ *Ibid.*, s 1(1).

Shanghai government to implement *Renewable Energy Law* and promote renewable energy in Shanghai.

The Scheme will initially support wind and PV electricity only. The approach adopted by the Shanghai government was “to start small and to let the Scheme develop and grow with increasing demand and increasing availability of renewable electricity” (ASTAE, 2006). To qualify as a Green Electricity user, customers must buy by yearly a certain amount of green electricity. For example, the minimum annual subscription shares for the residential household are ten quotas, with one quota defined as 12 KWh; the one quota for the enterprise (unity) user is set at 6000 KWh, and the minimum annual subscription shares are varied in accordance with the electricity volume consumed by that user in the preceding year.¹

The green electricity subscription fees are counted according to the unit price of green electricity and the green electricity capacity subscribed to. The unit price of green electricity is determined by the difference between the average on-grid price of green electricity and the on-grid price of electricity produced by Shanghai coal-fired new generator as examined and verified by the State. The unit price, namely the incremental cost of green electricity, has initially been set at 0.53 Yuan/KWh. The green electricity capacity is purchased through customers’ voluntary registration in compliance with the above mentioned minimum annual subscription shares. The term for the subscription to green electricity shall be one year, two years, or three years respectively. The subscription fees for green electricity shall be paid monthly through the current channel and method of paying electricity fees.² For example, if a household has subscribed to 10 quotas of green electricity, i.e. 120 KWh, for one year, then the household needs to pay an additional 63.6 Yuan for purchasing one years’ green electricity apart from the normal electricity bill. Given this total 63.6 Yuan will be distributed to 12 months, this household needs to pay an additional 5.3 Yuan when paying their monthly electricity fees.

3.2 Existing Problems

The biggest problem encountered by the Scheme is that the actual quantity of green electricity purchased is much smaller than expected.

In June 2005, the Shanghai government held the Ceremony of Signing Contracts to Purchase Green Electricity. During this ceremony 15 industries and institutions signed contracts with Shanghai Municipal Electric Power Company (SMEPC) for a duration of 1-3 years and became the first consumers to purchase green electricity.

However, after that the process of subscribing to green electricity became very slow. Over one year later, i.e., by the end of 2006, only 22 industries and 6842 households purchased green electricity amounting to a total of 15.82 GWh. Particularly, around 2/3 of the 22 industries are foreign funded enterprises (Chen, You and Zhou).

In addition, among Shanghai’s top 10 electricity-consuming enterprises, only Baosteel Corporation subscribed to 3 years’ green electricity amounting to a total of 1.2 GWh. To make it more clear, the single year of 2006 will be taken as an example to demonstrate the insufficient purchase of green electricity. In 2006, the total amount of green electricity purchased was around 8.5 GWh while the amount of green electricity generated that year was more than 20 GWh. Notably, the green electricity purchased was less than half of green electricity generated in 2006. For the surplus green electricity, the SMEPC had to temporarily pay for the price differential between green electricity and electricity generated by conventional energy.

Instead of rising, the public’s enthusiasm for purchasing green electricity even falls a little bit as time goes on. At the end of 2008, the green electricity’s purchase amount only accounted for 13.5% of its’ total supply amount in Shanghai (World Wind Power, 2009). Until recently, the green electricity scheme is not very popular with Shanghai citizens.

¹ *Ibid.*, s 2(9).

² *Ibid.*, s 2(10).

4 Barriers and the Way Forward

Given Shanghai's abundant renewable energy resources, advanced production capacity of equipments relevant to green electricity, and relatively high level of economic development and people's living standard, Shanghai has great potential to develop green electricity.

However, the Scheme has not been as successful as expected. According to a survey (Chen, You and Zhou, 2008) conducted by South-North Institute for Sustainable Development in 2006, the main reasons for customers' unwillingness to purchase green electricity are as follows: lack of sufficient understanding about green electricity (36%); unacceptable high price of green electricity (27%); no substantive benefits or returns to green electricity users (25%); lack of knowledge of how to purchase green electricity (10%).

4.1 Publicize the Scheme and Increase Public Awareness of Environmental Protection

To solve the problem of customers' lacking understanding about green electricity and lacking knowledge of how to purchase green electricity, the Shanghai government should take more effective measures to publicize the Scheme and gradually increase public awareness of environmental protection.

4.1.1 *Specific Measures*

First of all, to make the Scheme widely known by Shanghai citizens and enterprises, the Shanghai government should make full use of various media to introduce the Scheme such as newspaper, books, magazines, TV programs (including mobile TV programs), websites, booklets, posters and public service advertisements. Secondly, the Shanghai government may cooperate with NGOs and the producers and investors of green electricity to better publicize the Scheme. Thirdly, "Better city, better life" is the Shanghai municipality slogan to promote its image as an environmentally conscientious and responsible city. Development of green electricity is an important measure for Shanghai to realize its commitment. If the Shanghai government can combine the Scheme with Shanghai's city planning and development, the Scheme will attract more attention and gain more support. In addition, the Shanghai government needs to pay more attention to the large electricity users and encourage them to use green electricity. In the US, it is estimated that the total amount of green electricity purchased by the top 50 institution users surpassed 13.7 billion KWh annually, representing more than 70 percent of the green electricity commitments made by all the US green power subscribers (U.S. EPA, 2011). This has shown the significant role large electricity users may play and set a role model for the Shanghai government to emulate. Finally, the Shanghai government and SMEPC should provide better service and guidance to facilitate the purchase of green electricity.

4.1.2 *Special Point*

Given that green electricity is still quite new in China, most people have not fully realized the benefits of using green electricity. As we know, green electricity contributes to CO₂ reduction and pollution control mainly through its use of renewable energy and its clean production process. However, to end users, green electricity looks the same with conventional electricity. No matter green electricity or conventional electricity, they are transmitted through the same grid and users can hardly distinguish between them (Zhang and Gao, 2006). Therefore, during the publicity of green electricity, the Shanghai government should highlight green electricity's substantial benefits to environmental protection, create culture of "using green and being environmental friendly", and make the purchase of green electricity a kind of fashion.

4.2 Reduce the Cost of Green Electricity

The price of green electricity set by the Shanghai government is 1.14 Yuan/KWh and the price for conventional electricity is 0.61 Yuan/KWh. There exists an incremental cost of 0.53 Yuan/KWh

between the two. The high price of green electricity has deterred many consumers to use it and become the biggest barrier to the development of green electricity. Actually, this issue of price differential is quite common in China. There is a difference between power purchase price for coal-fired and for renewable energy generation in a number of provinces. Coal prices are always considerably lower. For example, in the provinces of Xinjiang, Liaoning and Inner Mongolia the wind power prices are even more than double the ones from coal.

4.2.1 Reasons for Green Power's High Price

Notably, such a price differential lies with the fact that the cost of electricity from renewable energy generation is higher than from coal. One reason for the relatively high cost of green electricity has been the weak domestic manufacturing industry in China. Specifically, renewable energy technologies are relatively nascent within the power sector and unlike conventional energy technologies do not benefit from the economy of scale. For example, in the wind industry, only a very small number of Chinese owned manufacturers have been established and they are significantly limited in the size and quality of the turbine they are able to produce. The small size and poor quality of domestic manufacturing industry forces renewable energy developers to import costly equipment from overseas, which increases the cost of electricity from renewable energy and inhibits the growth of the local manufacturing industry.

Another reason for the relatively high cost of green electricity has been the lack of competition and the relatively small scale of market.

Last but not the least, a more significant contributory factor to the high cost of green electricity has been the low-cost of coal-fired electricity generation in China. The full cost of coal-fired electricity has not been fully reflected in its price (Zhang, 2009). For example, the costs of transmission and distribution are not accurately reflected in the coal-fired electricity price. As coal resources are primarily located in the north of China, far from demand centres in eastern and south-eastern coastal areas, true transmission costs are likely to be high by comparison with renewable energy given that the southeast coast of China is rich in wind resources. More importantly, the environmental externalities associated with coal-fired generation have not been reflected in the price of conventional electricity because of weak pollution control. Thus, internalization of the environmental damage within the cost of coal may help to decrease the incremental cost between green electricity and coal-fired electricity.

4.2.2 Current Solution to the Issue of High Price

Due to the relatively high cost, green electricity is currently unable to compete with coal-fired electricity. Under the Shanghai Green Electricity Scheme, the grid price of green electricity is set by the Shanghai government according to the principle of "Being beneficial to the development and utilization of renewable resources, being economic and reasonable, being able to reasonably compensate for the cost and put apart room for profits"¹ or through public bidding with prices no higher than those set by the government for similar projects. The difference between the on-grid price of green electricity and conventional electricity is absorbed through the voluntary purchase of green electricity by the public, or is to be passed on in the selling price of electricity in case some remaining unsold green electricity exists.

Clearly, the Shanghai government takes pricing as an incentive to promote the generation of green electricity and to increase its market scale. However, such a fixed price guarantee can only be temporary because it is anti-competitive and can not reflect the real cost of green electricity. From the long run, to reduce the cost of green electricity is the key to the success of the Scheme and the development of renewable energy. The Shanghai government states that with the deepening of reform in electricity system afterwards, Shanghai shall establish and perfect competitive market of renewable energy. In addition, the Shanghai government determines to gradually reduce the cost of generation of green electricity through reducing revenue and providing allowance in order to reduce

¹ *Ibid.*, s 3(12).

the selling price of green electricity. Thus, we have reasons to believe that although the Scheme is currently small and confronted with some difficulties, it will grow with the increasing demand and increasing availability of green electricity and with the decreasing cost and decreasing price of green electricity.

4.2.3 *Renewable Energy Law's Constructive Role and Possible Drawbacks*

Notably, the Shanghai government establishes and implements the Scheme in strict compliance with the relevant State provisions and in particular, the Renewable Energy Law. In China, the central government sets the policy and legal framework to guide the development of renewable energy and the local governments are responsible to specify and implement the relevant provisions. Thus, the State-level laws and policies will also have a significant impact on the future development of the Scheme. As we know, the Chinese central government has long been concerned with the development of renewable energy and has made a strong commitment to growing the renewable energy industry. There have been a lot of national and provincial policy initiatives to foster the development of renewable energy. The Renewable Energy Law, which was passed in 2005 and came into effect on January 1st 2006, is the first comprehensive policy document that directly aims to promote renewable energy in China. It acts as the legal basis for country-wide activity to stimulate renewable energy and to increase the share of electricity generated from renewable energy. Hence, the Renewable Energy Law will be briefly examined here to see whether it addresses the four previously-discussed factors for green electricity's relatively high cost and provides the possibility of reducing the cost in the long term.

As previously mentioned, one reason for the relatively high cost of green electricity is the weak domestic manufacturing industry in China. To improve the quality and capacity of domestic renewable energy manufacturing industry, the fundamental way lies in the promotion of domestic technological innovation. The Renewable Energy Law stimulates domestic technological innovation mainly through encouraging investment in the research and development (R&D) of renewable energy, setting up a renewable energy development fund and establishing a feed-in tariff (FIT) system. Specifically, the Renewable Energy Law makes investment in renewable energy R&D a priority and provides that the government allocates funding for the scientific and technical research, application demonstration and industrialized development of the development and utilization of renewable energy so as to promote technical advancement in the development and utilization of renewable energy, reduce the production cost of renewable energy products and improve the quality of products.¹ The law also establishes a renewable energy development fund to support scientific and technological research, standard setting and pilot projects for the development and utilization of renewable energy, and to foster the localized production of the equipment for the development and utilization of renewable energy.² In addition, the Renewable Energy Law stipulates that grid utilities shall enter into agreements with licensed power generators to purchase all the renewable energy that they produce within the area of the grid,³ and the grid price of renewable energy shall be set by price authorities of the State Council.⁴ This implies establishment of a FIT system, an obligation on electricity suppliers to accept all power from renewable energy generators at a guaranteed fixed price set by the State. Given that the FIT system enables renewable power generators to capture the surplus created by technical change, it will stimulate them to invest in R&D to reduce costs and increase profits, thus providing a stimulus for technological innovation in China. Notably, the Renewable Energy Law promotes an innovative system for renewable energy technologies, which is likely to strengthen China's domestic manufacturing industry and hence to reduce the high cost of electricity from renewable energy.

However, room for improvement still exists. For example, the provision of renewable energy development fund does not specify the value of the increase in funding or the likely distribution of

¹ Renewable Energy Law of People's Republic of China 2005, s 3(12).

² *Ibid.*, s 6(24).

³ *Ibid.*, s 4(14).

⁴ *Ibid.*, s 5(19).

funding, so there is a risk that compliance could be satisfied with a very small increase or inappropriately targeted funding, contrary to the intention of the law. In addition, there contains no suggestion of tariff reductions overtime which could provide a further incentive for R&D investment in technological innovation among market participants. Finally, the Renewable Energy Law provides that middle and long-term targets for the total volume of renewable energy at the national level are to be set by the Energy authorities of the State Council subject to approval by the State Council,¹ and based on the national targets, provincial, regional and municipal energy authorities will prepare renewable energy development and utilization plans for their own administrative regions to be implemented subject to approval by governments at their own level.² This provides the basis for implementation of a mandatory market share policy (MMS), an obligation on electricity suppliers to source a proportion of their power from renewable energy generation. Given that MMS policy does not allow producers to capture the surplus from technological change, and universal pressure to reduce costs under MMS schemes can discourage R&D investments in favour of sourcing technology from abroad. This may prejudice technological innovation and hinder the development of domestic manufacturing industry. While experience in other countries has shown that the MMS is usually combined with tradable renewable energy certificates to ensure greater equity, efficiency and innovation that will deliver renewable energy at the lowest possible cost, there is currently an absence of such a mechanism to foster innovation and drive cost reductions in China.

To address the issue of insufficient competition, the Renewable Energy Law introduces the tender system, i.e., where there is more than one applicant, licenses for construction of renewable power generation projects will be determined through a tender system (Concession Programme).³ The Concession Programme may effectively stimulate competition and encourages a systematic effort to reduce costs through economy of scale and use of the very best available sites. The MMS mechanism can also provide pervasive competitive pressures, giving an incentive for cost reductions and project quality improvements.

As for the scale of market, the FIT and MMS can be used to stimulate an increase in market scale. The FIT helps to overcome the cost disadvantages of renewable energy sources and thus boost adoption of renewable energy technologies. Experience in other countries has shown a rapid increase in capacity following implementation of a FIT. For example, the FIT has been associated with a large growth in solar power in Spain, Germany and wind power in Denmark. The MMS may also be taken to scale up markets for renewable energy, but in a more steady way compared with the rapid increase led by the FIT. The US has been very successful in stimulating new renewable energy capacity through MMS policies. Increased market scale can reduce costs of renewable energy technology and bring economy of scale, which accordingly encourages further scale increases.

The Renewable Energy Law makes no reference to the low cost of coal-fired electricity generation in China. Compared with the relatively nascent renewable power industry, the conventional electricity sector enjoys more benefits during the decades of institutional and organizational adaptation. Particularly, the Chinese central government keeps electricity prices low in support of GDP growth for a long time and the environmental externalities associated with coal-fired generation have not been reflected in the price of conventional electricity. Now changes and improvements need to be made to pollution control policies so as to redress the economic balance between coal and renewable energy.

In short, the Renewable Energy Law helps to reduce the cost of green electricity and foster the development of renewable energy mainly through making provisions for implementing the three policy mechanisms, the FIT, the MMS and the Concession Programme. Actually, these are the most commonly used promotion policies in renewable energy field. However, the law does not specify the manner in which these three mechanisms will be combined. Given that these policies serve different purposes and have differing advantages and disadvantages, they need to be differentiated

¹ *Ibid.*, s 2(7).

² *Ibid.*, s 2(8).

³ *Ibid.*, s 4(13).

over time taking into account China's specific policy objectives, socio-economic conditions and the capacity to expand renewable energy production. In addition, the law would have been more effective and easy to be implemented had it paid more attention to details and included more specific provisions.

4.3 Incentivize Customers to Purchase Green Electricity

As mentioned above, the Shanghai government encourages customers to purchase green electricity mainly through increasing their sense of honour and promoting their public image. The primary encouragement methods include making public the list of users of green electricity and awarding them honorary certificates, Emblem of Green Electricity or medals. However, such methods have proven to be ineffective in providing proper incentives, and more initiatives should be taken to better incentivize customers to use green electricity.

4.3.1 Introducing Fiscal Incentives

Apart from giving commendation and honour, the Shanghai government may think about providing more attractive rewards for the users of green electricity. According to the survey in 2006, a quarter of respondents chose not to purchase green electricity because they were not satisfied with the relevant rewards and returns (Chen, You and Zhou, 2008). For example, some enterprises proposed that as a reward large users of green electricity should be allowed to emit more pollutants. Of course, this has been denied by the government (Yu, 2006). To encourage the wide use of green electricity, some measures involving substantive benefits such as preferential loans, direct subsidy to the users and tax reduction or exemption might be adopted as possible incentives.

For instance, experience in the Netherlands has shown a rapid increase in the demand for green electricity due to the adoption of tax incentive. Aiming at stimulating energy saving attitudes by consumers, the Dutch government started to collect the Regulatory Energy Tax (REB) on electricity consumption of all types since October 1996, irrespective of whether the energy resources used for generating electricity are renewable or not. Based on this tax policy, the Consumer-driven Strategy, a scheme encouraging the customers' voluntary purchase of green electricity promoted by the Dutch government from 1995, attracted little attention and consumer participation was quite modest. Later on, specifically beginning with 1 January 1998, the Dutch government introduced the "nil tariff" policy which exempts "domestic renewable generators and the selling of imported green electricity from the REB tax", thus allowing consumers subscribing to the green electricity not to pay the REB tax anymore (Dinica and Arentsen, 2001). This has led to dramatic expanding of customers' demanding for green electricity and now more than 20% of Dutch residents have chosen to use green electricity. Also deserving mention is the fact that "the higher the REB tax goes, the more attractive it will be for consumers to subscribe to a voluntary green electricity scheme" (Dinica and Arentsen, 2001). Apart from stimulating green demand, given that green electricity users are exempted from the REB tax and given the high level of the REB tax in the Netherlands, this tax policy helps renewable energy companies to lower cost so as to provide green electricity products at almost the same price as conventional electricity products. Therefore, the REB scheme has proved to be one of the most effective Dutch policy mechanisms, functioning not only as a powerful fiscal instrument to stimulate green demand, but also as a subsidy scheme to encourage green generation and green investments (Dinica and Arentsen, 2011).

4.3.2 Combining Voluntary Purchase with Mandatory Consumption

Currently, the Shanghai Green Electricity Scheme is fully based on voluntary purchase. Given the relatively high price of green electricity, only some enthusiastic customers are willing to pay for it. Even many government organizations in Shanghai have not taken initiative in subscribing to green electricity. Thus, a shift from this pure voluntary system to a mixed parallel system of voluntary purchase and mandatory consumption might hold the key to the success of this Scheme. Actually, many countries have done very well in combining voluntary purchase with compulsory

consumption. For example, all the US local governments are required to join the Green Power Partnership, a program aimed for promoting the purchase of green power, while other businesses, organizations and individuals are free to decide whether to buy green electricity or not. Similarly, in Germany, public utility companies are required to purchase green electricity. By collecting the REB tax, the Dutch government also combines voluntary purchase with compulsory consumption to increase the market demand for green electricity.

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6 References

- Asia Sustainable and Alternative Energy Program (ASTAE), 2006. China: Developing a Green Electricity Scheme for Shanghai. *ASTAE*. Available from: <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EXTAPASTAE/0,,contentMDK:21131261~pagePK:64168445~piPK:64168309~theSitePK:2822888,00.html> [Accessed 27 November 2009].
- Chen Xing, You Zhiwen and Zhou Liang, 2008. Green Electricity Marketing Design. *Shanghai Electric Power*, 6, 583.
- Dinica, V. and Arentsen, M., 2001. *Green Electricity in the Netherlands*. Oslo: Norwegian School of Management, 2/2001.
- Hallding K., Han Guoyi and Olsson M., 2009. A Balancing Act: China's Role in Climate Change. Commission on Sustainable Development, 47. Available from: <http://www.regeringen.se/sb/d/574/a/123915> [Accessed 11 June 2010].
- Larson, C., 8 February 2010. America's Unfounded Fears of A Green Tech Race with China. *Environment* 360. Available from: http://e360.yale.edu/feature/americas_unfounded_fears_of_a_green-tech_race_with_china/2238/ [Accessed 30 June 2011].
- Shanghai Green Power, 2005. What is Shanghai Green Electricity Scheme? *Shanghai Green Power*. Available from: <http://www.sh-greenpower.org/enindex.asp> [Accessed December 20 2009].
- Shanghai Green Power, 2005. Why Participate in Shanghai Green Electricity Scheme? *Shanghai Green Power*. Available from: <http://www.sh-greenpower.org/enindex.asp> [Accessed 20 December 2009].
- U.S. Environmental Protection Agency, 6 July 2011. National Top 50 Partner List. *Green Power Partnership*. Available from: <http://www.epa.gov/greenpower/toplists/top50.htm> [Accessed 3 August 2011].
- World Wind Power, 10 December 2009. Shanghai's green electricity should be cheaper. *World Wind Power*. Available from: <http://www.86wind.com/html/2009-12/fenglifadian-584.htm> [Accessed 3 August 2011].
- Xinhua, 22 April 2006. China Embraces New Scientific Development Concept: Hu. *People*. Available from: http://english.peopledaily.com.cn/200604/22/eng20060422_260256.html [Accessed 11 June 2010].
- Yu Xi, 2006. Why Shanghai Green Electricity is Unpopular. *People's Daily*, 10 April, 6.
- Zhang Qing, 19 June 2009. Barely Warm but Still Cool: China's Wind Power Policies Need More Support. *CCID Consulting*. Available from: <http://ccidconsulting.blog.sohu.com/118905030.html> [Accessed 19 December 2009].
- Zhang Rui and Gao Yang, 2006. The Current Development and Counter-Measure Consideration of Shanghai Green Electricity. *Power Demand Side Management*, 8 (4), 49.