Thesis

Stakeholders, Bureaucratic Structures and Negotiations in China's Policy-making Process

—Analysis on the Evolution Process of China's Renewable Energy Promotion Policy

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Abstract: The Chinese government has been making a lot of efforts to develop renewable energy(RE). As a result of the efforts, from the beginning of the 21st century to nowadays, China has made remarkable progress in developing renewable energy's facilities and in increasing market share of RE electricity, etc. Behind the great achievements is the policy support. China's renewable energy promotion policy has evolved from the initial tendering policy, to Feed-in-Tariff (FIT) that enforced in 2005, and to Renewable Portfolio Standards(RPS) that launched in 2018. Here comes the research question of this paper: how does China's renewable energy promotion policy evolve from FIT to RPS? The central argument of the paper is that there are three key factors that influence China's renewable energy policy choice, including the policy adaptability to the development stage of the industry, the power of central energy governance institutions, the power of local governments and other stakeholders. The paper applies these key factors to analyze China's renewable energy promotion policy evolution process.

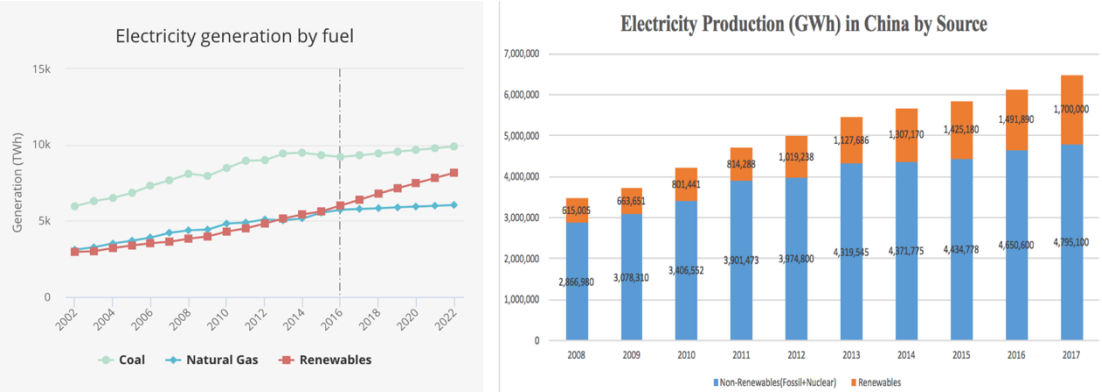
Key words: China, renewable energy, policy-making, Feed-in Tariffs, Renewable Portfolio Standards.

Introduction

The world is shifting from fossil fuels to renewable energy. In 2015, for the first time, renewable energy accounted for over half of the global electricity generation capacity (see Figure 1, left), and the developing trend of renewable energy keeps going on. It is expected by International Energy Agency(IEA) that the proportion of renewable energy electricity generation will reach 30% in 2022, rising from 24% in 2016. [1]

China is also transiting to the renewables, with its ambitious plans to have renewable energy accounted for 15% of total primary electricity consumption by 2020, and 20% by 2030. Within the renewables, non-hydro renewable energy would account for 9% of consumed electricity by 2020, almost doubling their generation share within five years. As could be seen from Figure 1(right), China's renewable energy achieved great progress in the past decades. The percentage of renewable energy electricity production rose from 17.6% in 2008 to 26.2% in 2017. China's energy transformation is not only to address the air pollution issue aroused by rapid industrialization, but also to seek the position as the global leader in the battle against climate change.

Figure 1. Electricity Generation by Fuel around the World(left) and in China(right)



Source: IEA Report: Renewables 2017(left and right); China's Statistical Bureau(right); National Energy Administration(right).

Behind the rapid development is the policy support. By the beginning of 2013, 127 countries around the world have already formulated or introduced renewable energy

[1] Renewables 2017, IEA. Retrieved May 1, 2018, from https://www.iea.org/publications/renewables2017/#section-4

policies, of which the proportion of developing countries exceeds two-thirds.[2] Overall, the renewable energy support policies cover various fields such as power generation, heating (cooling), and transmission, etc. Most of the support policies focus on the power generation industry. They include the Feed-in Tariff(FIT), Renewable Portfolios Standards(RPS), Net Metering tariffs, tendering policy, etc., among which FIT and RPS are the most common applications.

FIT means the government mandates that renewable energy power generation is purchased in accordance with a certain price. FIT is still the most widely used policy around the world in the field of renewable energy power generation. Countries such as Germany, Spain, France adopt FIT. While RPS refers to the mandatory regulation of the market share of renewable energy electricity. Countries such as the United States, the United Kingdom are typical countries that implement RPS.

China started developing renewable energy since the beginning of the 21st century. By now, China's renewable energy promotion policy has evolved from the initial tendering policy, to FIT that enforced in 2005, and to RPS that launched in 2018. It is a long policy evolution process accompanied with many negotiations and conflicts of interests. To understand China's renewable energy industry, is important to have a clear view of the policies that support it. This paper puts forward the research question: How does China's renewable energy promotion policy evolve from FIT to RPS? To answer the question, the paper refers to a wide range of policy reports, news, academic books, government documents etc. to do a qualitative research. The central argument of the paper is that there are three key factors that influence China's renewable energy policy choice, including the policy adaptability to the development stage of the industry, the power of central energy governance institutions, the power of local governments and other stakeholders.

In the following parts, first I would do the literature review, to see what researchers have been done in the area of China's renewable energy policy, what are the insufficiencies of the current study and what this paper would do to improve the current research. Then, the analysis framework of this paper would be proposed, followed by the analysis of China's central energy governance institutions. After that, I divide the

[2] NEA. (2014). Analyzing Renewable Energy Policies around the World. Retrieved May 17, 2018, from http://www.nea.gov.cn/2014-05/14/c_133332280.htm

policy evolution process into three periods, I would apply the key factors that I put forward to analyze how China's renewable energy promotion policy has been evolved from FIT to RPS. The I propose some future challenges and the final conclusion.

Literature Review

The references of this paper are from several research fields, here I would list several important references.

First, reports and studies on China's renewable energy developments. They were done by international organizations such as IEA, domestic and foreign research institutions and other researchers, etc. For example, IEA included the China's part in its annual World Energy Outlook. China National Renewable Energy Centre (CNREC) published annual China Renewable Energy Outlook to analyze the full Chinese energy system, and to offer policy measures to promote renewable energy. CNREC also published energy policy newsletters to update the energy transition and to collect recently announced government RE documents.

Also, to understand the policy-making process, China's political system and energy institutions are necessary knowledge. China's contemporary political system, its leading political institutions, the distinct features of China's political culture were discussed in detail in Susan V. Lawrence and Michael F. Martin's (2013) paper. In terms of research on China's energy management agencies, Erica S. Downs (2008) pointed out that China's energy bureaucracy lacked the authority, autonomy, and tools to manage the energy issues.

Then, as for the study on renewable policy, Ryan Wiser, Jan Hamrin and Meredith Wingate (2002) reviewed the implementation of FIT, tendering policy, and RPS in different countries, also compared the relative merits and disadvantages of each policy for China. Energy Research Institute of National Development and Reform Commission(NDRC), Energy Foundation, State Grid Energy Research Institute, and National Renewable Energy Center (2017) jointly published a research on renewable energy pricing mechanism under the framework of electric power sector reforms. Ren

Dongming (2013), the senior official from the Renewable Energy Development Center of NDRC, in his book on the policy research of RPS, studied different RPS design in different countries and put forward the preferred RPS framework for China in the future.

However, current research still has flaws. So far, none of the research or reports have studied the entire RE policy evolution process of China, no one has concluded the important factors that influence RE policy choice, no analysis on how the changing energy institutions influenced the energy policy evolution. Identifying these factors is meaningful for proper understanding of China's renewable energy policy development. In the following analysis, this paper will study the entire evolution process of China's RE promotion policy, including characteristics of the RE industry in each policy period, the reasons for different policy choices at different stages, the roles of energy institutions' and other stakeholders in shaping the policy, etc. I hope the analysis will make up inadequacies in current research and propose new ideas.

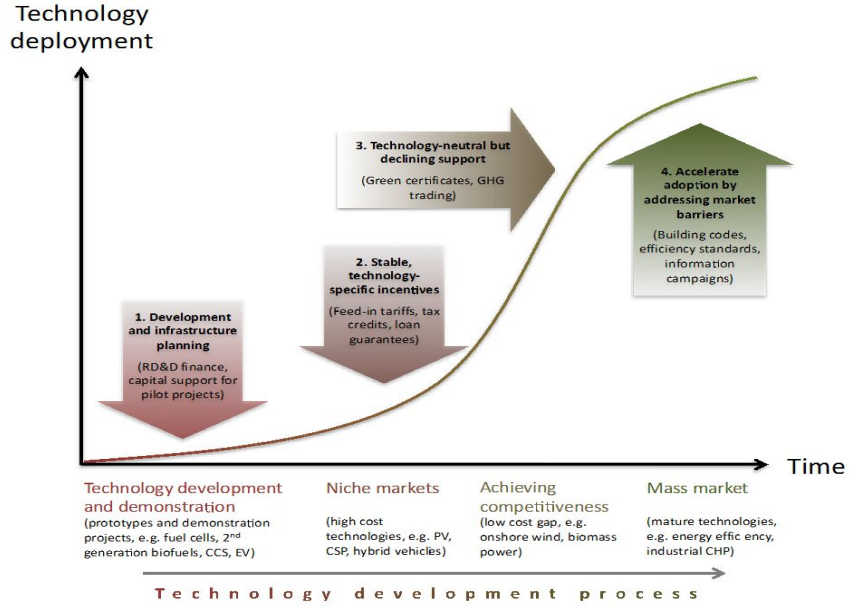
Analysis Framework

In the paper, I divide China's renewable promotion policy into three periods to study the policy evolution process. In terms of factors that influence the policy choice at each stage, there are many but I conclude the crucial three ones based on the research. To be specific, the explanation of the three factors is as follows.

1.The policy adaptability to the development stage of the industry: the most important factor affecting the choice of renewable energy promotion policy. Renewable energy promotion policy should evolve in accordance with the development stage of various RE technologies and RE related industries. According to the figure from IEA's Energy Technology Perspective, in a nascent renewable energy industry, development and infrastructure planning (including RD&D finance and capital support for pilot projects) tend to be adopted to support the RE deployment. As RE grows to a niche market, stable technology-specific incentives such FIT and tax credits are suitable to be used. Under the policy support, the RE industry grows rapidly during this period and evolve to a competitive market. Under a well-functioning electricity market, green certificates and the greenhouse gas trading policy have the condition to be implemented. From the

beginning of the 21st century to now, China's renewable energy industry evolved from a weak status to a rapidly growing existence, but a mature market has not yet been formed. Based on the evolution of the renewable energy industry, it is reasonable that the RE promotion policy should also change.

Figure 2. Technology Deployment Process of Renewable Energy



Source: IEA's Energy Technology Perspective.

2.The power of central energy governance institutions: means the political power of national-level ministers and commissions to enforce the policy. In my opinion, power of central energy governance institutions is influenced by three variables. The first one is the centralization level of power. The less centralization level of power means the more institutions involved in managing energy issues. The less centralized of power, the easier to be influenced by different agencies' opinions towards a policy. The second variable is the institutions' uniformity of opinions towards a policy. If central energy governance institutions hold agreement, then no matter the power is dispersed or not, the will of the central government to implement policy is strong. However, if these institutions opinions toward a renewable energy policy are conflicted with each other, then the less centralized power, the policy is less likely to be approved at the national level. The third variable is the political ranking of energy institutions. The higher political ranking of energy institutions, the stronger political power they have to enforce the policy.

3.The power of local governments and other stakeholders: means the political power of governments of different political rankings such as provincial governments, and political power of electricity generation enterprises, grid enterprises (state-owned enterprises also have political rankings), etc. Based on the content of renewable energy policy, they could be the vested interests, or be granted with benefits in the future, or loss the vested interests in the future, so they may support or reject the policy preference of central authority. Although they are not as powerful as central energy governance institutions, their attitudes toward the renewable energy policy can influence the policy choice in a more or less degree. For example, if they united to express dissents towards a policy, the central authority would feel it hard to execute the renewable energy policy and may have to reconsider another policy.

The three factors would be used to do the analysis in the later parts of this paper.

The Power of Central Energy Governance Institutions

Before moving to discuss the prolonged policy evolution process, I would like to analyze China's energy governance institutions.

As I put forward in the former part, the factor "the power of central energy governance institutions" is influenced by the centralization level of power, institutions' uniformity of opinions towards a policy, and political ranking of energy institutions. Under this assumption, the institutional setting on energy governance influences the power of central authority, and then indirectly influences renewable energy policy choice.

In terms of "institutions' uniformity of opinions towards a policy", in China's first renewable energy development period, ministries that have the right to govern energy issues dissented on RPS policy design. National-level authorities encountered difficulties in reaching an agreement on RPS design, this was one of the reasons to give up RPS in Renewable Energy Law in 2005; while in the second period, ministries had an agreement on the RPS, so the power of central authority was strengthened. However, in the second period, RPS faced strong opposition from local governments, so even though central authority reached a consensus this time, China failed to transform from

FIT to RPS. I will explain the details of the change in ministries' opinions and their impacts on policy choice in the following part.

For the left two variables, "the centralization level of power" and "the political ranking of energy institutions", although they did not have a radical change in China's RE policy promotion process until now, their gradual reforms did have an impact on choosing RE policy.

From the initiation phase of developing renewable energy to the adoption of FIT in 2005, to evolved to RPS in 2018, China still lacks a single and powerful energy institution to coordinate the interests of various stakeholders. But according to the news, a new Ministry of Energy that would integrate energy governance power currently scattered across many government institutions is going to be established in the future. Although it is still unknown that "which departments may be merged, re-organized or eliminated", [3] it is hopeful that this time the power disperse problem may be finally solved.

The problem of dispersed energy governance among institutions is because China's energy bureaucracy has experienced periodic reconstructions from the year 1949, and "these constructions have produced institutions that lack the authority, autonomy, and tools to govern the energy sector".[4] Among these institutions, the most important one is the National Development and Reform Commission (NDRC). NDRC is a macroeconomic governance agency under the State Council. Its broad functions include but not limited to:

"Formulate and implement strategies of national economic and social development; to direct, promote and coordinate the restructuring of economic system, etc. In terms of energy-related issues, NDRC is responsible for organizing the formulation and coordinating the implementation of plans and policy measures for national energy conservation and comprehensive utilization. In accordance with relevant regulations

[3] Josephine Mason, Benjamin Kang Lim. (2018). Exclusive: China Plans to Create Energy Ministry in Government Shake-up. Retrieved May 1, 2018, from https://www.reuters.com/article/us-china-parliament-energy-exclusive/exclusive-china-plans-to-create-energy-ministry-in-government-shake-up-sources-idUSKCN1GK179

[4] Erica S. Downs (2008). China's "New" Energy Administration. *China Business Review*. 35(6), 42-45. P43.

of the State Council, the NDRC is also responsible for the administration of the State Grain Administration and the National Energy Administration, etc.".[5]

Other ministries also undertake policy functions in energy issues. For example, the management of energy products import and export are attributed to Ministry of Commerce, energy conservation and environmental protection issues were governed by Ministry of Environment Protection, which was reformed to Ministry of Economy and Environment in March 2018. Energy technology research and development are related to Ministry of Science and Technology. State-owned Assets Supervision and Administration Commission(SASAC) supervises and arranges state-owned energy enterprises. Even the state-owned energy enterprises, such as State Grid, Petro China, Shenhua Group shoulder some policy functions.

In 2003, the Energy Bureau was established under NDRC to manage energy issues, but the power was still dispersed among several ministries, so that the Energy Bureau lacked the authority and manpower to decide and implement a policy.

Trying to solve the problem, in the year 2005, the Chinese government established the National Energy Leading Group. Headed by the Premier, the Leading Group was an advisory and coordination body under the control of State Council, established to strengthen energy sector management. However, the energy governance woes were deeply rooted and only by one Leading Group cannot address the diluted power problem.

The decentralized institutions decreased the efficiency and weakened the power on deciding a policy. Unlike US that has a decentralized federal system where the RPS policy is conducted by each State, in a centralized government like China, all the administrative units are under the direct control of the officials in the capital. That is to say, to implement RPS in China, central authority should not only formulate a nationwide development goal but also decompose the goal into various provinces, requesting each province to follow the quotas. Under such political system, achieving an agreement in renewable energy quotas would be much difficult than in a decentralized federal system because conflicts of interest occur in both national and

[5] Main functions of the NDRC. Retrieved May 3, 2018, from http://en.ndrc.gov.cn/mfndrc/

local level. Compared to RPS, implementing FIT in the RE industry's initiation phase would not have so much difficulty in consensus building. From this perspective, in the year 2005 when China's energy governance power was very dispersed and even the National Energy Administration had not yet been established, implementing FIT would be much easier than RPS.

China kept trying to centralize the political power on energy governance, by establishing a higher-ranked body and by merging current institutions. In 2008, China's National People's Congress(NPC), the national legislature approved the establishment of two new energy institutions – the National Energy Commission (NEC) and the National Energy Administration (NEA). NEC has the highest ranking among China's energy decision-making bodies. It took two years for NEC to be finally established in 2010, headed by the Premier. NEC replaced the National Energy Leading Group with over 20 members, including ministers from various governmental institutions such as NDRC, Ministry of Finance, Central Bank and state-owned companies. NEC aims to strengthen central governance in the energy-related issues. To be specific, it is responsible for drafting national energy development strategy, discussing major energy security and development issues, coordinating domestic energy development and international energy cooperation. [6]Another newly established energy institution – NEA that replaced the Energy Bureau of NDRC is going to manage NEC's daily affairs. NEA has broad responsibilities, including but not limited to "formulating and implementing energy development plans and industrial policies; administering energy sectors including fossil fuels, power (including nuclear power), new and renewable energy and etc.".[7]

Although NEA's capabilities in energy governance were stronger than the former NDRC Energy Bureau, NEA still struggled to fulfill the mandate. There are two main reasons contributing to this problem. First, the energy governance power was still spread among several institutions, though not as dispersed as before. NEA was established by the integration of the Energy Bureau under the NDRC, the Administrative Office of National Energy Leading Group, and by the absorption of nuclear power governance functions of the National Defense Science and Technology

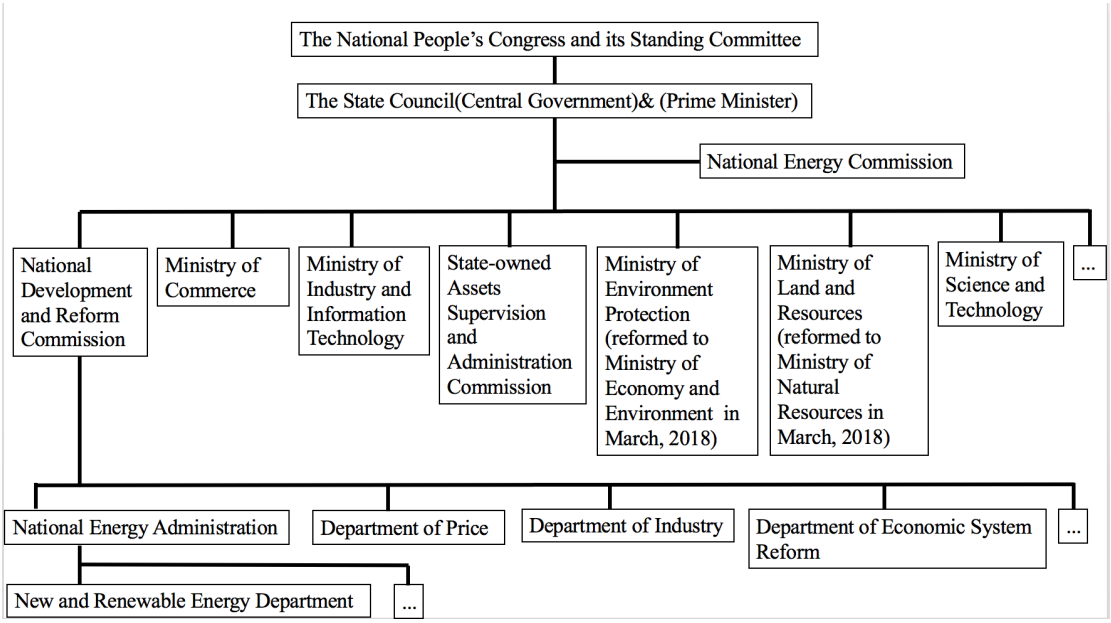
[6] National Energy Commission. (2008). Retrieved May 17, 2018, from http://www.nea.gov.cn/gjnyw/
[7] National Energy Administration. Retrieved May 3, 2018, from http://en.ndrc.gov.cn/mfod/200812/t20081218_252224.html

Commission. However, energy policy functions undertaken by Ministry of Finance, Ministry of Commerce, Ministry of Environment Protection (reformed to Ministry of Economy and Environment in March 2018), State-owned Assets Supervision and Administration Commission (SASAC), and other ministries remained the same. The second reason is related to the political ranking of NEA. As a vice-ministerial body, NEA remains under the jurisdiction of the NDRC. It means that NEA cannot directly report to the State Council, it is supposed to inform the State Council of energy strategies, developing plans, policy suggestions and so on through its parent agency, the NDRC. Therefore, NEA's governance power is largely weakened. What' more, some state-owned energy companies are actually much powerful than NEA, such as China Petroleum and Chemical Corporation and State Grid, the heads of these companies hold ministerial rank. These state-owned energy companies have the right to hold direct discussions with senior PRC leadership, which further undercutting NEA's authority.

The power centralization reforms kept going on. In 2013, based on a plan from the State Council and the approval from NPC, the State Electricity Regulatory Commission (SERC) was merged into NEA, thereby the energy governance power was further centralized. However, as long as NEA holds a vice-ministerial political ranking and under the jurisdiction of NDRC, NEA would lack the authority to deal with disputes among more powerful institutions. But thanks to these reforms, the national-level energy governance power has been gradually centralized.

Making a summary, China's major institutional settings on energy issues could be illustrated as the following figure.

Figure 3. China's Renewable Energy Governance Institutions



Now, finally, a radical institutional reform is on the way. According to the news that first published on 8th of March, 2018, the Chinese government plans to establish a new Ministry of Energy to streamline and consolidate authority for managing energy issues. [8] The new ministry would replace current NEA, and it would be no longer under the control of NDRC. That is to say, the new Ministry of Energy would have equal political status with NDRC and other ministries, it could report directly to the State Council. As a consequence of the structural reform this time, the energy governance power would be much more centralized than before, plus with higher political ranking, the power of central authority could be much stronger.

But the full content of the new ministry's authority remains unclear, including which department or ministry would be merged, whether it would have oversight of China's state-owned energy enterprises, etc. Also, the new ministry is in the planning stage, so it is unsure what it would be when it finally established. But still, the new Ministry of Energy could be expected to solve the diluted energy governance power problem. After the original Ministry of Energy abolished in 1993, having experienced institutions reconstructions for many times, it is the first time that China's central authority decided to establish a ministerial-level energy governance institution.

[8] Latham, Watkins LLP. (2018). China Plans New Energy Ministry to Replace the National Energy Administration. Retrieved May 4, 2018, from https://www.globalelr.com/2018/03/china-plans-new-energy-ministry-to-replace-the-national-energy-administration/

Interestingly, on the 23rd of March 2018, just within one month that the news said there would be a Ministry of Energy in the future, NEA published a draft policy for RPS. Although the published government document is still in its draft form, this is a solid step in the direction after the prolonged debate on FIT and RPS. Considering the difficulty in consensus building for RPS, a stronger power of the central authority is beneficial for enforcing the policy. China's strive for the establishment of Ministry of Energy would form a stronger power of central energy governance institutions to implement the RPS in the future.

China's Renewable Energy Policy Evolution Process

From tendering to FIT and to RPS, the evolution of China's renewable energy policy has been a prolonged process. Based on China's renewable energy's development status, opinions from the central, local governments and other stakeholders, I divide China's renewable energy evolution process into three periods. In the following part, I would apply the key factors that I put forward to analyze how China's RE promotion policy has been evolved.

Period 1 (2000~2005): from tendering policy to FIT

This period starts from the beginning of the 21st century when China initiated renewable energy development, ended when FIT was adopted in the 2005 Renewable Energy Law.

1.1 The policy adaptability to the development stage of the industry

In the early stages of China's renewable energy development, the industry was very weak, with only 350,000 kilowatts installed wind capacity in the year 2000. At that time, no matter the governments, research institutes, or the industry participants, there was no a unified opinion and a mature theory to decide what kind of development path that the renewable energy industry should follow.

At that time, the State Planning Commission, which is the future NDRC co-organized a series of academic and policy discussions with World Bank. It was hoped that by

studying foreign renewable energy policies, a renewable energy policy mechanism suitable for China could be introduced. There were two brainstorming sessions that were important for the future China's renewable energy policy. [9]

In 1999, the first co-organized brainstorming session was held. The main topic was the Goals and Challenges for Chinese Government to Develop Renewable Energy and the Cooperation Framework with World Bank. Delegates proposed four measures to deal with the possible challenges in developing renewable energy. The one with the highest importance was that introducing a law to request grid companies to buy renewable electricity.

In 2003, the Renewable Energy Scale-Up Program[10] held a brainstorming session on Mandatory Market Share (MMS) with the Chinese government. The meeting mainly discussed three kinds of prominent policies in the international society. They were Renewable Portfolio Standards (RPS), Feed-in-Tariff (FIT) and Bidding System (Tendering Policy). Delegates also discussed the advantages and disadvantages of the RPS and FIT.

However, neither RPS nor FIT, it was the Bidding System, i.e. Tendering Policy that was the first one to be put into practice. NDRC considered that the priority for developing renewable energy was to expand the industry scale, and the most effective policy to expand the industry was the tendering policy. A tendering policy means that "using government-overseen competitive processes to meet a planning target with long-term power purchase agreements with renewable generators". [11] Similar to FIT, tendering policy also guarantees the purchasing price of renewable energy output, but it adopts a competitive bidding process to select projects (energy generators) that could offer the best price. During the bidding process, "renewable developers submit proposals to build new renewable generation facilities and indicate the price they would accept for their output. The lowest priced renewable energy projects are then selected with a guarantee to purchase all the output from these projects".[12] Until 2005, both RPS and FIT were still on a policy discussion stage, it was several bidding projects

[9] The following brainstorming is summarized from Ren Dongming. (2013). Renewable Energy Quota System Policy Research – System Framework and Operation Mechanisms. China Economy Press. P60~62.
[10] CRESP is a pilot program for the World Bank-Global Environment Facility(GEF) Strategic Partnership to develop renewables in China.
[11] Ryan Wiser, Jan Hamrin, Meredith Wingate. (2002). Renewable Energy Policy Options for China: A Comparison of Renewable Portfolio Standards, Feed-in Tariffs, and Tendering Policies. *Center for resource solutions.* P5.
[12] Ibid. P6.

organized by the NDRC that acted as a starting point of China's renewable power industry. Accompanied by the renewable energy development, there was also a growing need for a law to manage the expanding industry.

In 2003, the National People's Congress included the Renewable Energy Law into the legislative plan for that year. During the drafting process of the legislation, the debate on whether adopting the RPS in legislative content or not was very fierce. Delegates from various institutions involved in this debate, including delegates from the Energy Bureau of NDRC, the Energy Research Center of NDRC, Environment Protection and Resources Conservation Committee of National People's Congress, domestic and foreign policy specialists and energy entrepreneurs. As the result of the discussion, FIT and RPS were both written into the draft, that the coexistence of the two policies. To be specific, Article 23 and 24 put forward the proposals for FIT. Article 23 stipulated that China implements a classified on-grid tariffs system for renewable energy power generation. The classification of on-grid tariffs shall be determined by the pricing authority of the State Council in accordance with the characteristics of different types of renewable energy generation and with the principles conducive to the development of renewable energy sources. Article 24 of the draft made the requirement on the issue of apportioning the surcharge price of electricity. [13] Unfortunately, I failed to find the original text of the drafted Renewable Energy Law in 2004, these policy contents are collected from the bulletin report of National Peoples' Congress and from the book written by Ren Dongming (2013), who is the senior official from the Renewable Energy Development Center of NDRC. Details about the apportion of the renewable energy surcharge are unknown. RPS was put forward in Article 18 of the draft. The specific content was the national energy authority can stipulate the quantity of renewable electricity generation for giant power generation enterprise, based on the coal-fired plant's generating power of that enterprise. After the quantity of renewable electricity generation is confirmed, the giant power generation enterprises must execute it. [14] Article 15 proposed that the grid enterprises shall purchase the full amount of on-grid renewable electricity produced within its jurisdiction areas. [15]Hence, in the draft, RE quota obligation holders were giant power generation enterprises (production side) and

[13] National People's Congress. (2004). Explanation on the Renewable Energy Law(draft). Retrieved May 4, 2018, from http://www.npc.gov.cn/wxzl/gongbao/2005-04/25/content_5337638.htm
[14] Ren Dongming. (2013). Renewable Energy Quota System Policy Research – System Framework and Operation Mechanisms. China Economy Press. P65.
[15] National People's Congress. (2004). Explanation on the Renewable Energy Law(draft). Retrieved May 4, 2018, from http://www.npc.gov.cn/wxzl/gongbao/2005-04/25/content_5337638.htm

grid enterprises (demand side), there was no provincial quotas. The drafted law was submitted by Standing Committee of the National People's Congress to the State Council for approval. And in 2005, after the policy reviewing process, at the 14th Meeting of the Standing Committee of the Tenth National People's Congress, Renewable Energy Law was announced. In the Law, the implementation of FIT was confirmed while the content of RPS was deleted.

Taking the development stage of the renewable energy industry into consideration, it is rational for Chinese authority to choose FIT when the renewable energy industry was nascent.

The first reason is that FIT is relatively simple and low-risk, so that it protects the nascent industry while encouraging its growth. By specifying the sales price of renewable power, the expected return on investment in renewable energy is clarified. By the standardized contract terms and conditions, negotiations of investment are simplified. By a substantially higher purchase level than that of the tendering policy, the investment is further driven by benefits. These protective measures make FIT a particularly beneficial policy to the early stage of the renewable energy industry. By offering these benefits, it is expectable that many investors would enter the renewable energy industry. Although FIT is also accompanied by a complicated price-setting process and cost-sharing system, the benefits brought by FIT was regarded significant larger than the cost.

The second reason is that China did not have the competitive market conditions to implement RPS in the early RE industrial stage. Different from FIT, RPS specifies a quantity of renewable energy to be included in the electricity market. It also specifies who is responsible for consuming the renewable energy and the penalties for non-compliance, so that a certain amount of renewable energy is assured to be purchased. However, RPS policy tends "to be silent on price and leave that to be determined by the market",[16] so the well-functioning electricity market is much more needed for enforcing the RPS. A comprehensive RPS package requires an effective administration mechanism to support trades in the renewable energy markets such as the green certificates trading. In this respect, RPS is applicable to countries with developed

[16] Ryan Wiser, Jan Hamrin, Meredith Wingate. (2002). Renewable Energy Policy Options for China: A Comparison of Renewable Portfolio Standards, Feed-in Tariffs, and Tendering Policies. *Center for resource solutions.* P4.

energy markets like the United States. On the other hand, FIT does not require such complex and sophisticated administration, hence it is more suitable for a regulated electricity market like China.

At that time, there were existed successful FIT practice in other nations, which could be applied to garner useful experience for China to develop renewables. In the first decade of the 21st century, FIT has been the primary mechanism adopted to support renewable energy development in Europe. Under the policy umbrella, Europe experienced a fast development on wind-power production capacity, and Germany became an important reference country for China. Since the implementation of the Renewable Energy Law in 2000, Germany had been spending huge sums of money to actively encourage and develop renewable energy and has made remarkable achievements. In Germany, the share of renewable energy in electricity generation has risen from 6% in 2000 to about 25% in 2013. The fixed electricity pricing policy it adopted was considered to be very useful by many researchers and policymakers around the world. It was regarded reasonable for a government to adopt FIT in the early industrial age.

1.2 The power of central energy governance institutions

As I analyzed in the former part, the institutions' uniformity of opinions towards a policy influences the willingness in deciding a policy. If governance institutions opinions towards a RE policy are conflict, then the less centralized power, the policy is less likely to be approved at the national level. Central energy governance institutions' dissents towards RPS was one of the reasons that led to the deletion of the RPS content in Renewable Energy Law that published in 2005.

At that time, China's national-level energy governance power was very diluted. Within the State Council, there were many ministries shouldering parts of responsibility for the energy management. During the State Council's approval process, many ministries expressed their different views on the drafted Renewable Energy Law. These ministries included but not limited to Ministry of Commerce, State-owned Assets Supervision and Administration Commission(SASAC), Ministry of Land and Resources. In terms of political ranking, although NDRC is the ministerial ranking, it is the same as other ministries. While the Energy Bureau under the control of NDRC was even not a

ministerial rank. In this respect, although NDRC and the Energy Bureau were the most important institutions in managing energy issues, they lacked the political power to coordinate conflicts of interests from other ministries. Because national-level energy governance power was decentralized, so the policy-making process was easy to be influenced by the uniformity level of opinions from different institutions.

As for the different opinions from other ministries, to be specific, State Electricity Regulatory Commission (SERC) argued that the RE production quota of giant power generation companies shall be regulated by not only the major energy institutions but also SERC itself. Similar to SERC, Ministry of Environment Protection (reformed to Ministry of Economy and Environment in the March, 2018) also proposed to involve in stipulating the enterprises' RE electricity production quota. Ministry of Water Resources advised to revise the Articles to implement not only RPS and but also the Green Certificate Trading System. Apart from that, the production quota of renewable electricity shall be regulated by the State Council's Department of Economic Management. Ministry of Water Resources proposed that the quota of renewable energy shall be targeting at grid enterprises (electricity demand side), not at the power generation enterprises (electricity sell side). SASAC argued that setting the quota for giant power generation enterprises is not good for the marketization of renewable energy development. If we only set quotas for power generation enterprises without stipulating the quotas for the demand side to consume renewable energy, the market would be unbalanced. [17] Obviously, some institutions only considered their self-interests. These various opinions show that due to the different administrative functions of different institutions, the viewpoints of their proposals were also different, hence their arguments were very divergent. Due to the ministries' dissents on RPS, central authority's determination on coexisting FIT and RPS in Renewable Energy Law was weakened.

In addition to the conflicts of opinions among the ministries, the diluted governance power and the not powerful enough energy institutional settings also contributed to China's choice to FIT in 2005. Compared to FIT, RPS requires the central authority to allocate quotas of RE consumption for each province, the policy negotiation process would have been much more difficult. Hence, considering the dispersed energy

[17] Ren Dongming. (2013). Renewable Energy Quota System Policy Research – System Framework and Operation Mechanisms. China Economy Press. P65.

governance institutions at that time, it was easier to adopt FIT that offers benefits to promote the RE industry and be less likely to arouse conflicts of interests.

In 2005, Renewable Energy Law was announced, enacting for the purpose of promoting the development and utilization of renewable energy. In the Law, the implementation of FIT was confirmed whereas the RPS's content in the draft version was deleted. The FIT policy content includes:

"The on-grid electricity prices for projects of electricity generation by using renewable energies shall be determined by the administrative department of price of the State Council in light of the conditions of different areas and the characteristics of electricity generation, etc. Power grid enterprises were required to purchase the generated renewable energy at the setting price. If there are excessive costs that cannot be recovered from the selling price of electricity, the power grid enterprises may apply to the renewable energy development fund for subsidies. The fund is composed of the annual special purpose fund arranged by the national finance, and the renewable energy tariffs levied on electricity users, etc.".[18]

Under the FIT umbrella, there would be a Renewable Energy Development Fund to support the RE industry. The fund is composed of the special-purpose fund that is financed by the government, as well as the renewable energy tariffs (surcharge) that are burdened by end-users. The electricity surcharge revenue is used to fill the gap of the purchase price between renewable energy generation and conventional energy generation. The government special-purpose fund is mainly used to support the technology advancement of RE, to develop RE projects in rural, pastoral, remote or islands areas, to explore RE resources, etc. [19]

2. Period 2 (2006~2015): the trial to adjust the RE promotion policy

The second period starts after 2005 when FIT was adopted, ended by 2015 when China's trail to adjust the policy to RPS was failed. This period is featured by a rapidly

[18] The Central People's Government. (2005). Renewable Energy Law. Retrieved May 6, 2018, from http://www.gov.cn/ziliao/flfg/2005-06/21/content_8275.htm
Ministry of Commerce. (2013). Renewable Energy Law. Retrieved May 17, 2018, from http://english.mofcom.gov.cn/article/policyrelease/Businessregulations/201312/20131200432160.shtml

[19] Ministry of Finance. (2011). The Notice of Interim Measures to the Levy and Use of Renewable Energy Development Fund. Retrieved May 6, 2018, from http://zhs.mof.gov.cn/zhengwuxinxi/zhengcefabu/201112/t20111212_614767.html

growing renewable energy industry, the serious conflicts of interest from local governments, and again the weak coordinating power in central energy institutions.

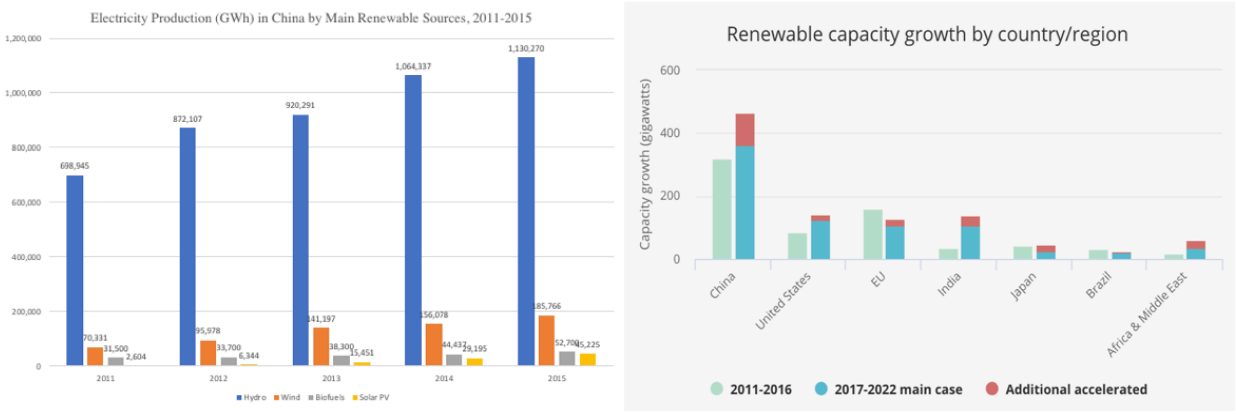
2.1 The policy adaptability to the development stage of the industry

During this period, renewable energy industry achieved a remarkable success under the policy support of FIT. However, two serious problems also aroused due to FIT policy, they were power curtailment and the subsidy gap. These problems made central government determined to change the renewable energy policy.

2.1.1 The achievement under the FIT policy

After the promulgation of Renewable Energy Law in 2005, the Chinese government released several Notices on the benchmark feed-in tariffs to improve the policy umbrella. For example, in 2009, NDRC released the Notice on Improving the Pricing Policy for On-Grid Wind Power to specify the wind power's feed-in tariffs. The whole country was classified into four wind energy areas with different benchmarks on-grid tariffs. The pricing policies for solar PV, hydropower, and biomass were also specified by NDRC. Another policy support was China's 12th Five Year Plan of Renewable Energy Development issued by NDRC, calling for expanding the use of renewable energy around the country. Under such policy background, China's renewable power capacity has grown faster than expected.

Figure 4. China's Renewable Energy Development



Source: IEA.

As can be seen from Figure 4 (right), nowadays, China alone accounts for over 40% of the renewable capacity growth around the world. Among the renewable energy resources, hydropower is the most dominant. "In 2015, China installed 19 GW of

hydropower capacity, accounting for about 57% of global new installed capacity". [20] Wind power also experienced a rapid progress. During this period, the average annual increase rate in installed wind-power capacity and electricity generation were both around 30%.

The effectiveness of FIT was demonstrated by the great achievement. Ten years after China initiated developing renewable energy and five years after choosing FIT in the Renewable Energy Law, China has already become the world leader in renewable energy.

2.1.2. Power curtailment problem

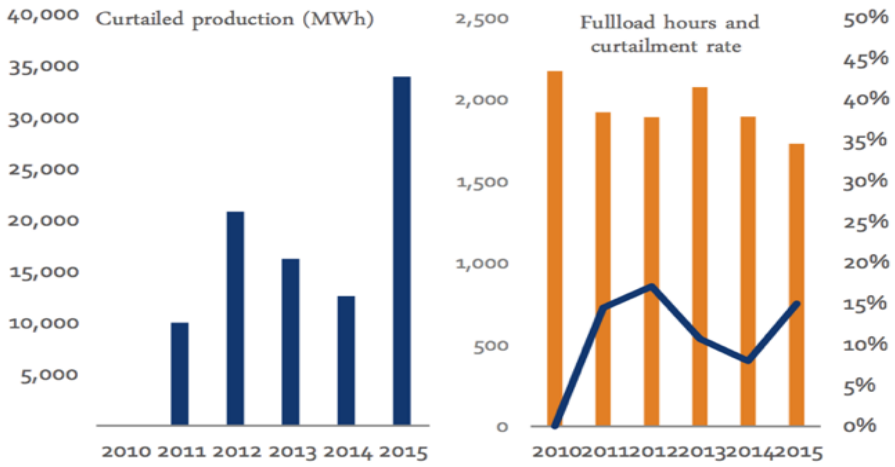
Accompanied by renewable energy industry scale-up, FIT also brought some negative impacts. These problems made central authorities determined to adjust the RE promotion policy.

The most severe problem is the power curtailment. It applies to occasions when renewable energy is available, but not applied to the grid. Renewable energy power generation is featured by intermittency and uncertainty. If it is not dispatched well, then the generation would be wasted or there could be a risk of the blackout.

China experienced a significant wind-power curtailment since 2011 and the problem exaggerated year by year. According to Figure 5(left), in 2011, the total amount of wind curtailment over the country exceeded 10 billion kWh. The economic efficiency of wind power generators dropped drastically. In 2012, the amount of wind power curtailment even doubled to 20 billion kWh (economic loss exceeded 10 billion Yuan)[21], and the amount doubled again in 2015. The national average curtailment ratio in 2015 reached 15% and rose to 21% in 2016, which means that there were 21% of the generated wind power was wasted in the year 2016.

[20] DBS Group. (2016). Renewable Energy in China, Transiting to a Low-Carbon Economy. P33.
[21] Policy Negotiation in Renewable Portfolio Standards. (2017). Retrieved May 7, 2018, from http://www.china-nengyuan.com/news/108716.html

Figure 5. China's Wind Power Curtailment During 2010 - 2015



Source: China Renewable Energy Outlook 2016, CNREC.

There are several reasons led to the severe curtailment problem. The first one is the FIT policy. FIT only targets at the electricity supplier side, encouraging renewable generators to develop renewable energy, while it does not require any enterprises or departments to shoulder the responsibility of consumption. In the initial age of industrial development, the amount of renewable power generation was small, so the imbalance of supply and demand was not significant. However, once the industry grows to a developed stage when supply is sufficient enough while demand side still not yet developed, the RE power market would become unbalanced, thus resulting in the power curtailment. Besides, the attractive RE tariffs of FIT drive renewable power developers rush to invest projects, bringing the excessive manufacturing capacity problem, hence the overproduced electricity tends to be wasted. The surge of China's renewables curtailment in 2016 was largely driven by wind developers' rush to build renewable energy projects in the northern regions in order to qualify for higher feed-in tariffs. Other reasons such as the geographical mismatch between resources and load centers, the lack of power transmission ability and the unmatured electricity market also contributed to the power curtailment problem.

Facing the severe power curtailment problem, the Chinese government took some measures to adjust power generation of other energy sources in accordance with intermittent RE power generation. Meanwhile, RE generators were also asked to adjust their output. For the traditional energy side, in May 2016,13 provinces were required

to suspend the approval of launching self-provisioned coal power projects, and 15 provinces were required to slow down coal power projects that have already been approved. An early-warning mechanism was also established to predict and prevent local governments from making decisions that would exacerbate excessive coal power output in the future. Based on the warning signals for the next three years, the 28 provinces regarded as the most severe ones shall suspend the approval of launching coal power projects, the enterprises shall reconsider their investment. By curbing the further development of the dominant coal power, these measures were to prevent the competition between coal power and renewable energy.[22] For the renewable energy side, in February 2017, NEA issued a red alert on six provinces that did not meet the requirements for the minimum hours of wind power utilization in 2016, these provinces were not approved to construct new wind power projects in 2017.[23] Controlling traditional and renewable energy projects construction, these measures were made to secure the energy supply-demand balance. But in order to solve the power curtailment problem, only by these measures is not enough.

2.1.3 The subsidy gap problem

Subsidy gap means the gap between the subsidy that power generation enterprises are supposed to get and the subsidy they actually get. Following a rapid expansion of capacity, China found it became a struggle to pay billions of subsidies to renewable power generators. This is also an important reason that made Beijing decided to change the renewable energy policy.

According to Figure 6 from CNREC, coal's power price is the lowest compared with all the renewable energy resource. Even though the cost of renewable energy power generation has been decreasing gradually in recent years, renewable energy is still not directly competitive with fossil fuels in the absence of accounting for the power generation externalities such as environmental damage. The renewable surcharge is always needed to support RE power.

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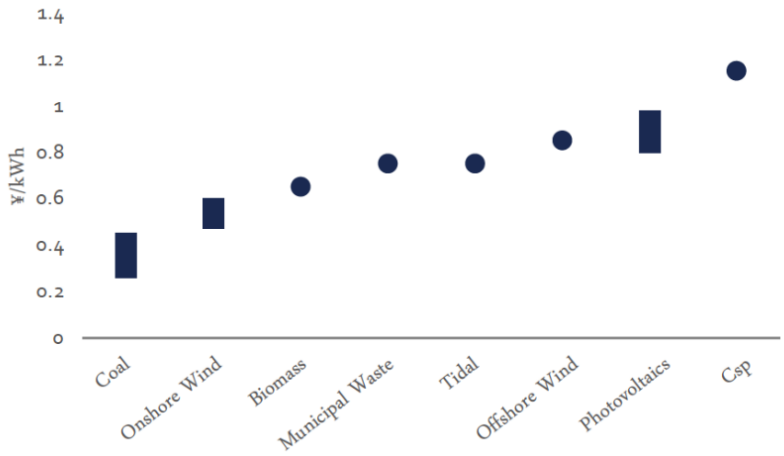
[22] Miao Hong, Song Ranping. (2016). China's Three Measures to Tackle with Renewable Energy Waste. Retrieved May 7, 2018, from http://www.wri.org.cn/China-s-1-2-3-punch-to-tackle-wasted-renewable-energy

[23] The Limit of Electricity Generation and the Downturn of Electricity Purchase, the Bottlenecks of Wind Power Development Shall Be Addressed. (2017). Retrieved May 7, 2018, from http://www.xinhuanet.com/2017-04/01/c_1120740602.htm

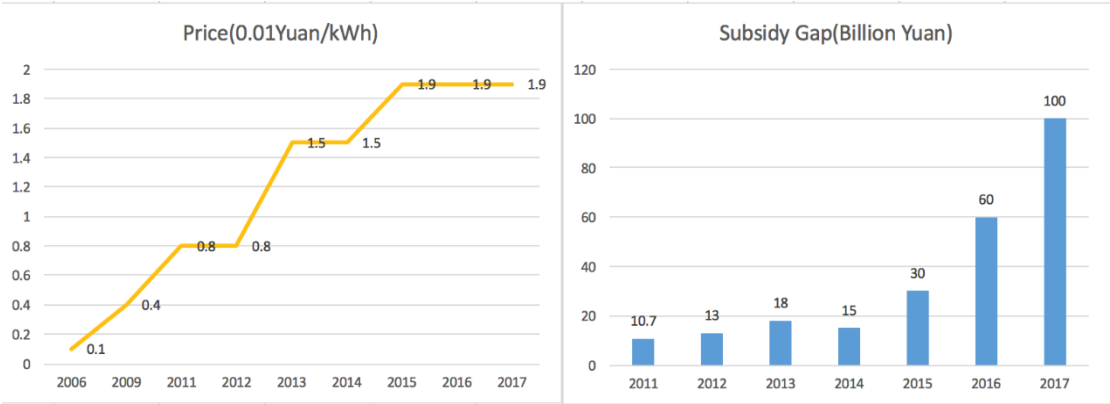
Figure 6. Comparison of Power Prices for Different Technologies in the Chinese Energy System



Source: China Renewable Energy Outlook 2016, CNREC.

Based on Renewable Energy Law, the price gap between coal and other renewable energy is to be subsidized by the RE tariffs, which is a component of Renewable Energy Development Fund. Renewable energy tariffs largely come from the surcharge on electricity sales, burdened by end-users. As seen from the figure, the renewable surcharge has been raised several times in recent years in order to keep up with the renewable energy generations, but the subsidy gap still keeps enlarging in a more rapid speed. The gap doubled to 30 billion Yuan by 2015 and doubled again in 2016, finally it reached 100 billion by last year. The huge gap has not only imposed great pressure on the government but also impeded the development of renewable energy industry.

Figure 7. The Renewable Surcharge Under FIT(Left) & The Subsidy Gap(Right)



Source: NDRC, NEA, Ministry of Finance, China Energy News.

There are mainly two reasons to the subsidy gap problem.

The first reason is that the RE development in China has been very fast, the amount of RE projects that needs subsidies has grown rapidly, so the adjustment in the renewable surcharge is difficult to keep up with the speed of development, resulting in insufficient subsidy funds. Hence, the renewable tariff surcharges in China is supposed to increase. However, current China's economy is facing the downturn pressure, a few cents increases in the price of electricity would greatly affect the competitiveness of enterprises and would also offset the incentives provided by the state's structural tax reductions and other measures. Enterprises have been strongly urging the reduction of energy costs, the State Council has also issued the tasks on the industrial cost reduction, including the electricity price reduction. No matter FIT or RPS, it is difficult to raise the electricity price (surcharge) to fill in the subsidy gap under such background.

The second reason is that many self-provisioned power plants refuse to pay the tariff surcharge, so a huge amount of tariff surcharge is failed to be collected by the government. In Renewable Energy Law, there is not any clear stipulation in terms of how to punish these power plants' actions. Therefore, governments' levying on the RE tariff lacks the executive force. Argued by the person from self-provisioned power plants, they think the nature of self-provisioned power plants is different from public power plants, FIT cannot treat them as other power generators. Electricity produced by self-provisioned power plants is used by the enterprises that established these power plants, this amount of electricity is not transacted as a commodity. Besides, they think that it is unfair to pay the tariff surcharge. Self-provisioned power plants were encouraged by the state to be established during the power shortage period. At that time, these enterprises took huge risks to build their own power plants. They undertook the responsibility to develop the national power industry, but they have not enjoyed any electricity subsidy policy from the state like what public power plants received. It is unfair for them to shoulder the responsibility for developing the national renewable energy industry while not being granted the right to a fair treatment. FIT's requirement to pay the tariff surcharge increases the inequality. As a result, self-provisioned power plants' evasion in paying tariff surcharge has surpassed 70 billion Yuan by last year. [24]

[24] Lu Bin, Su Nan. (2018). Self-provisioned Power Plants' Opinions on Paying for the Renewable Energy Fund. Retrieved May 8, 2018, from http://guangfu.bjx.com.cn/news/20180508/896225.shtml

In addition to these reasons that led to the subsidy gap, the delayed payment of subsidy also posed the challenge to the RE development under FIT policy. These problems affected power generators' cash flow and follow-up investment, urging the central authority to adjust the RE promotion policy.

2.1.4 The insufficient electric power marketization

The side effects of rapid development have made the national energy authority to reconsider current renewable energy policy mechanisms, the appeal to RPS was receiving increasing attention. It seems that China was about to enforce RPS at that time, but there was one fatal flaw of Chinese electricity market that impeded the policy change. The flaw was the lack of the market-based mechanism to promote efficient operation of power dispatch. Although China's generation rights trading has been allowed by State Electricity Regulatory Commission (SERC) since 2008, at that time, the trading was mainly organized by the government, mainly based on intra-provincial level transactions. There were no specialized trading organizations such as Beijing Power Trading Center and Guangzhou Power Trading Center to manage the trading issues. To establish a well-functioning electricity market still has a long way to go. The good news is that national generation rights trading was growing since 2014 when Yunnan province took the lead to launch the broader and more flexible generation rights trading projects.

For China, the important reference country to study the RPS policy was the United States. In the US, RPS programs are formulated and assessed by each State's governments, targeting at grid enterprises and public service enterprises. Another common feature is that many State policies contain a renewable electricity credit (REC) trading system. The RPS implemented in the United States is based on a mature electricity market, where regulation from the government is little. Under a market-based mechanism, the renewable energy quotas encourage energy generators to sign a long-term Power Purchase Agreements (PPAs) with grid enterprises that undertake the responsibility of quotas. As a result, the difficulty of financing renewable energy generation projects is lowered. On the other hand, grid enterprises are also encouraged to sign PPAs with renewable energy power generators to buy renewable energy electricity and green certificates. While in China, although the reform of the electricity

market had been in progress, a relatively mature market had not yet been established. It was difficult for China to enforce RPS that requires high marketization level.

2.2 The power of central energy governance institutions

In 2012, NEA issued the "The Twelfth Five-Year Plan for Renewable Energy" to support the RE development, RPS was mentioned in the plan. NEA would stipulate the non-hydropower renewable energy consumption quota for each province. Governments of all levels shall undertake the administrative responsibility to carry out the electricity quotas for renewable energy in the region, and the grid companies shall assume the implementation responsibilities for the completion of renewable energy quotas within the scope of their business areas. Some large-scale power generation enterprises shall have a prescribed renewable energy output. [25]

This is the first time that RPS has appeared on the national energy planning document. Based on the statement, we know that China's first RPS design targeted at local governments, power grid enterprises, and power generation enterprises. It seems that China was going to evolve from FIT to RPS. But the real challenge for the policy change is in the future.

Based on the proposal in the Twelfth Five-Year Plan for Renewable Energy, NEA needed to allocate each province's quotas of non-hydropower RE consumption. Hence the "Measures for the Management of Renewable Energy Power Quotas" (discussion draft) (hereinafter referred to as the "Measures") was released by NEA to further specifying the policy design of RPS. It was clarified that the State Council's energy authority together with the supervision, statistics, and auditing departments, as well as the State-owned Assets Supervision and Administration Commission(SASAC), State Electricity Regulatory Commission(SERC), etc. would examine each province's performance on renewable energy quotas. Again, there came the problem of diluted power in national-level. Although NEA that established in 2008 has stronger political power than the former Energy Bureau, it was still not powerful enough in terms of political ranking and the energy governance power was still decentralized. As can be seen from the Measures, several ministries under the State Council had the right to involve in the implementation of RPS, including SERC and SASAC that expressed

[25] NEA. (2012). Publishing the Twelfth Five-year Plan for Renewable Energy. Retrieved May 7, 2018, from http://www.nea.gov.cn/2012-08/08/c_131767651.htm

their dissents in the first policy-making period when reviewing the Renewable Energy Law. In the Measures published this time, this ministries' requirements, or proposals were realized. For example, SERC's opinion that it would like to be involved in stipulating the enterprises' renewable electricity output quota, SASAC's recommendation that China should set the quota for both the power generation enterprises and grid enterprises, these opinions were clarified in the Measures. Therefore, it is no wonder that the Measures could receive a higher level of agreement among the national-level institutions this time.

To make a short summary, in the second policy-making period, the power of central authority was stronger than the first period. Although the dispersed power and insufficient political ranking problems were not yet to be solved, the Measures took different ministries' interests into accounts, so this time opposition from ministries were little.

2.3 The power of local governments

In the "Measures for the Management of Renewable Energy Power Quotas" (discussion draft), the non-hydropower RE consumption quotas for each province by the year 2015 was also specified. The completion rate of the quota was incorporated into performance evaluation system of the provincial government. Here is the most controversial content of the Measures.

During the period of 2012~2013, NEA and CNREC conducted extensive surveys and asked for comments on provincial renewable energy targets. In the reviewing process, the developed eastern provinces expressed objection towards the corresponding renewable energy quotas…Several major provinces in the eastern and central provinces consider themselves as undertaking too high quotas."[26] Unfortunately, I failed to find in any reports or news mentioning about which provinces put forward their disagreement. But considering robust evaluation and enforcement mechanisms, it is no wonder that local government opposed the RPS strongly.

By the Measures, NEA tried to link the achievement on local renewable energy quotas with the evaluation of local government performance by a strict veto power.[27]

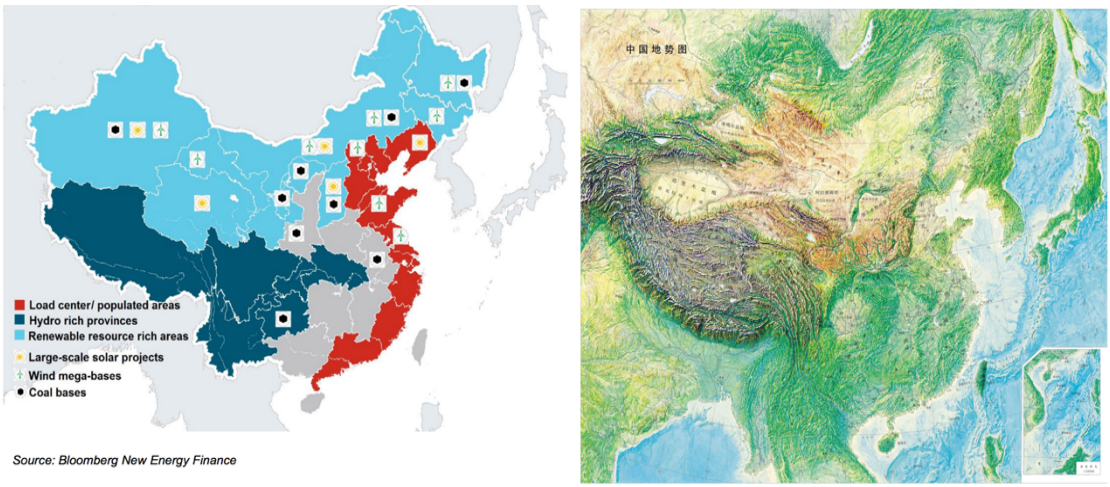
[26] Policy Negotiation in Renewable Portfolio Standards. (2017). Retrieved May 10, 2018, from http://www.china-nengyuan.com/news/108716.html

[27] Ibid.

Therefore, provincial governments not only had to face the pressure from renewable purchase obligation, but also the pressure from local governments' performance evaluation. By this policy design, the central authority wanted to motivate the local government to promote the consumption of renewable energy. But for local officials, it could have been a reason for disqualifying a cadre from the promotion. What's worse, for eastern developed provinces, their pressure to meet the quotas was much more severe than the western and northern provinces. The season is as follows.

In China, there's a geographical mismatch between renewable energy resource-rich areas and load consumption centers. As could be seen from Figure8, the eastern plains and southern coasts of the country consist of fertile lowlands and foothills, these provinces are China's population and economic center with high consumption of electricity. However, the renewable energy resources in eastern regions are much less than those in northern and western regions. By now, eastern regions' mainly electricity resource is thermal power. Whereas western and northern China are dominated by sunken basins, rolling plateaus, and towering massifs. The population in these provinces are much less than eastern areas. Due to the undulating terrain, scarce precipitation, and other national conditions, these areas are abundant in renewable energy resources such a hydropower, wind power and solar PV. Therefore, eastern provinces face much heavier pressure to meet the RPS quotas than the western and northern provinces.

Figure 8. Map of Renewable Energy Distribution (left) & Map of China's Terrain(right)



The "Renewable Energy Quota and Assessment Methods (Trial)" (hereinafter referred to as the "Methods") was published in 2014, which was the revised version of the Measures. The non-hydropower RE quota for all provinces by 2015, 2017 and 2020 was specified.

Local governments shall formulate plans to undertake the RE quotas in the administrative region and urge the market entities in the region to complete the quotas. The entities undertaking the quotas included the grid companies (State Grid Corporation and South China Grid Corporation, and their provincial grid companies, as well as other local grid companies), industrial enterprises with self-owned power plants, and large end-users involved in direct power purchasing. "Large end-users involved in direct power purchasing" means that power plants build a separate electricity transmission line for the high power-consuming enterprises such as steel or electrolytic aluminum enterprises, so that these enterprises could buy electricity directly from power generators. Some of the eastern developed provinces, such as Zhejiang was required to reach the quotas at 2%, 4%, and 5% at the three time points, which did not seem to be harsh, but for a province that used thermal power as their main energy source, these indicators are not easy. In 2014, in the Zhejiang Province's energy planning documents, renewable energy sources were usually classified into "Other Energy Sources" that accounted for a very small proportion. Therefore, rising the small proportion of RE to a 2 percentage within one year was difficult. In other eastern provinces such as Guangdong and Jiangsu, the quota target was 4% in 2015. However, the RE consumption proportions in these provinces had not yet reached half of the target in 2014. [28] It would have been a very arduous task for these eastern provinces to increase renewable energy consumption to a high level within only one year. While for western and northern provinces such as Qinghai, Ning Xia, and Neimenggu, their 2015 non-hydropower quotas were 7%, 10% and 10% respectively. [29] It seems that the burden on these provinces was heavier than that of eastern provinces, the reality is not. Western and northern provinces are rich in renewable energy resources and it is easier for them to utilize the RE output.

[28] Ibid.
[29] NEA. (2014). Renewable Energy Quota and Assessment Methods.
Retrieved May 10, 2018, from http://news.bjx.com.cn/html/20140925/549979-3.shtml

If we check each province's non-hydropower consumption proportion in 2015 (the document was published by NEA), [30]we could find that in eastern provinces such as Jiangsu, Guangdong, Anhui, Fujian, their non-hydropower consumption proportion did not meet the requirement in the Methods, while for western and northern provinces such as Qinghai, Ning Xia, Gansu and Neimenggu, their consumption proportion met the requirement in the Methods. Therefore, if the Methods were approved in 2014, many eastern provinces could not have completed the RE quotas, they would have faced the penalties from the central government. It is no wonder that these provinces rejected the Methods.

Another reason for these provinces to reject the Methods is that the more wind power consumption, the less need for thermal power consumption. For eastern provinces that are lacking in renewable resources, they need to import wind power from other provinces, so the thermal power generation needed within the provinces would decrease. As a result, province-owned energy enterprises' revenue would decrease, which would also influence local governments' performance evaluation.

Hence, it is understandable that the Methods faced strong dissent from eastern developed provinces that are strong in the economy. When they united to propose the opposition, the political power is strong enough to influence the central authority's policy decision.

The revised Methods received approval from NDRC and was going to be submitted to the State Council for the final approval after the policy reviewing process. From the end of 2014 to the beginning to 2015, a large number of media reported that the renewable energy quota system will be officially launched. However, during the reviewing process, the Methods were met with strong opposition from several eastern developed provinces. The reason for their opposition was that the quota system's mandatory requirements for renewable energy consumption had a strong planned economy characteristic. Implementing such Methods is doing the planned economy[31].

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[30] NEA. (2016). 2015 Monitoring Report on National Renewable Energy Electricity Development. Retrieved May 10, 2018, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjj0oLy__faAhUEG5QKHbNGDTEQFjAAegQIABAt&url=http%3A%2F%2Fzfxxgk.nea.gov.cn%2Fauto87%2F201608%2FW020160823533283154880.docx&usg=AOvVaw3Y5gS_j-Oxg-GIdKv4jErA

[31] Policy Negotiation in Renewable Portfolio Standards. (2017). Retrieved May 10, 2018, from http://www.china-nengyuan.com/news/108716.html

We do not know what exactly happened in the policy negotiation process, as I cannot find any documents or news about the details. But as the result of negotiation, the Methods failed to be published, although it was supported by central authority.

3. Period 3(2016~now) from FIT to RPS

After the Methods met with resistance in 2015, the change of the RE promotion policy stagnated for more than a year. During the period from 2015 to 2016, the problem of China's RE development became more severe. The long-term and large-scale default in subsidy payment and the deterioration of RE power curtailment have caused many RE companies faced very heavy operational difficulties. But Chinese central authority attached high importance to the energy transition and energy consumption revolution. At the end of 2015, President Xi Jinping attended the opening ceremony of the Paris Conference on climate change and delivered a speech, mentioning that by 2030, non-fossil fuels would account for about 20% of the primary energy consumption in China. In the later in April 2016, China officially signed the Paris Agreement. Apart from that, the expressions such as raising the proportion of clean energy consumption and promoting energy transformation often appeared in the speeches of country leaders, showing China's determination on developing clean energy.

As we see, on the one hand, it is the urgent need for the reform of the new energy system. On the one hand, it is the country's international commitment of the national energy transition. Under such background, NEA has been finding how to break through the heavy barriers faced by the current RPS design, but local governments are still the biggest obstacle.

To implement the RPS, NEA has tried to lower the RE consumption quota for local governments' evaluation. In early 2016, two government Notices was released. One is to require coal-fired power plants that by 2020, their output of non-hydropower renewable energy generation shall at least account for 15% of the amount of their thermal power generation. They can complete quotas by building renewable energy projects by themselves or by purchasing green certificates. This approach was strongly opposed by the major power generation groups, it failed to be implemented at the end. The other one specifies the consumption proportion of electricity from non-hydropower RE sources for all provinces by 2020. According to the quotas of the non-hydro RE electricity made by NEA, the provincial energy authorities, together with the relevant

government departments at the corresponding level, would work out a mechanism for the implementation of RE development quotas. They shall stipulate the minimum proportion of non-hydro RE electricity supply and sale for power sale and supply entities within their provincial-level jurisdiction. But this Notice did not mention the evaluation approach and penalties for not achieving the quota requirement, it lacked effectiveness in practice.

Along with publishing these documents, NDRC and NEA were actively promoting the electricity marketization reform. In my opinion, it was the series of marketization reform that lay the foundation for the RE policy evolution in 2018.

3.1The policy adaptability to the development stage of the industry

The major marketization reforms in China's electricity market after 2015 are as follows.

3.1.1 Liberalizing electricity market

To build a more efficient and greener power market, the Chinese government has been trying to deregulate the government intervention in the electricity market.

Originally, China's electricity market heavily relied on the government regulation. At the beginning of each year, local governments would determine the generation dispatch order of all the power plants under their jurisdiction. The local governments also decided the wholesale power prices at which electricity generation enterprises could sell their generation to the grid enterprises, as well as the retail prices at which grid enterprises could sell electricity to customers.

While based on the reform of energy integration in 2017, in the future, the direct trading by RE energy power generation enterprises, grid enterprises, and electric power users would be largely promoted, including inner province trading and interprovincial direct trading.[32] Power purchase agreements between grid enterprises and power generation enterprises are encouraged, while governmental regulation would be less.

[32] NDRC. (2017). NEA's Notice of Gradually Liberating Power Generation and Purchase. Retrieved May 13, 2018, from http://www.ndrc.gov.cn/zcfb/zcfbtz/201704/t20170410_843769.html

The reform was implemented step by step. In terms of direct trading within the province, annual or monthly bilateral agreement and collective bidding, tendering, etc. are alternative trading types. Trading prices are determined by power users, grid enterprises, and power generation enterprises via negotiation or collective bidding. In terms of interprovincial direct trading, originally, the power purchase right outside each province for users or grid enterprises was very limited. While now, the purchase right outside the province would be much more granted, so that users or grid enterprises from other provinces could help to consume the RE power produced in different provinces. This could not only alleviate power curtailment problem but also prepare for the future implementation of RPS that would require a well-functioning market. To support the expanded interprovincial electricity transaction, power transmission channel capacity, except those was used for the prioritized power generation, will be completely open to all electricity market players. Under such infrastructure condition, renewable energy is to be arranged for direct trading in a relatively easy way. For example, in 2016, Beijing Electric Power Trading Center organized interprovincial trading of renewable energy for the three northeastern provinces. The interprovincial renewable energy trade volume reached 36.3 billion kWh, an increase of 23.5% compared to last year.[33] In case of the volatility and random of renewable energy, the standby coal-fired electric power would be used to stabilize the power delivery.

3.1.2 Introducing voluntary green certificate trading system

The green certificate trading system is an important component for a mature RPS policy package. When the quota obligation holders cannot generate their own renewable energy output, buying green certificate is an effective way to assure them to fulfill the RPS task. The trading system allows the RE quota obligation holders to purchase the green certificate that is equivalent to the amount of assigned RE quotas. The establishment of a tradable green certification system provides a very flexible mechanism for the fulfillment of quota obligations and has become a universal supportive policy for renewable energy industries.

[33] State Grid Energy Research Institute. (2017). Participation of Renewable Energy in Electricity Market and Policy Innovation. Retrieved May 13, 2018, from http://www.cnrec.info/_data/2017/07/10/9d497c1f_664d_4023_b318_1bf93a44d68b/file/05-20170720-%E6%96%B0%E8%83%BD%E6%BA%90%E7%94%B5%E5%8A%9B%E5%B8%82%E5%9C%BA%E5%8F%8A%E6%94%BF%E7%AD%96%E5%88%9B%E6%96%B0-%E6%9D%8E%E7%90%BC%E6%85%A7.pdf

In March 2017, NDRC, NEA and Ministry of Finance jointly launched a pilot program for the issuance of green certificates to RE power generators, accompanied with a certificates trading system on a voluntary basis. The green certificate aims to tackle with the RE subsidy gap and the lack of cash flow problems, as well as to lay the foundation for the future RPS system. To be specific, power generators can sell the certificates to buyers and each certificate represents 1 MWh of electricity output. By this way, these generators could raise short-term cash in the market, but they will no longer receive the renewable energy tariff surcharge subsidies. The price for the certificates is capped at the level of the subsidy currently received by power producers.[34]

However, without mandatory RPS quota in the year 2017, plus the green certificate was voluntary, the role of the certificate could play was very limited. Most voluntary purchases were by firms seeking to meet their own corporate social responsibility goals. Three months after its launch in July, until March 2018, the National Renewable Energy Information Management Center issued approximately 17.6 million green certificates. In the past nine months, only 27,000 copies have been sold, and only 10 million Yuan has been raised, accounting for approximately 0.15% of the issuance.[35]. Obviously, the voluntary green certificate was unable to make up with the huge subsidy gap. But as the first step of China's green certificate system, the initiative in 2016 is meaningful.

3.1.3 Further developing trading of power generation rights

Power generation rights mean the amount of electricity output stipulated by the power plants' electricity generation licenses. The power generation right trading refers to the power generation enterprises' transaction on their electricity generation amount. Through the trade, the generators that have higher generation cost could sell their power generation amount to generators with lower cost, thereby optimize the power structure and reduce emissions. The trade could be conducted within or across the province, and the main market players include thermal power generators and RE power generators, self-owned power plants, etc. To deal with the curtailment problem in some provinces,

[34] Liu Yuanyuan. (2017). China to Launch Green Certificates in Renewable Energy Sector. Retrieved May 13, 2018, from https://www.renewableenergyworld.com/articles/2017/03/china-to-launch-green-certificates-in-renewable-energy-sector.html

[35] Wang Lining. (2018). Renewable Portfolio Standards Landed, the Electricity Industry is Moving to the "Forced Clean" Era. Retrieved May 13, 2018, from http://tech.sina.com.cn/it/2018-04-01/doc-ifysuvyp0654352.shtml

interprovincial trading could play an important role. The trading price is supposed to be autonomously negotiated by the players.

In 2008 when the power generation rights trading started, it was focused on intra-provincial trading, and the transactions were mainly organized by the government. Gradually, interprovincial trading and marketization level in trading are growing. In 2014, Yunnan took the lead in launching the nationwide electricity marketization transaction, adopting four electricity market trading modes. In 2017, Guangzhou launched the first inter-provincial power generation right trading in the southern region. The generation right was traded from 49 thermal power plants in Guangdong to 14 hydropower plants in Yunan. In 2017, the national electricity generation rights trading volume was 152.77 billion kWh, compared to last year, it increased by 25%. [36]

We know that an important condition to implement a comprehensive RPS is to have the market-based mechanism to promote efficient operation of power dispatch. The reason for local governments to object the RPS Methods in 2015 was that they thought the Methods had a strong planned economy feeling. That is true. In 2015, China's electricity production and consumption were largely arranged by the government. Implementing the RPS quotas without the market mechanism, it would increase the difficulty for local government to fulfill the strict quotas. But China started several market reforms in these two years. By liberalizing electricity market, the energy consumption and pricing regulated by the government has been lessened, while power purchase and sale conducted by grid enterprises and power generation enterprises have been encouraged. As a result, the distribution of power resources has become more flexible than before. By introducing green certificate, the grid enterprises could buy the certificate to assure them to fulfill the RPS task, so the quota obligation holders will not face so many risks in failing to consume enough renewable energy and being punished. Although the certificate was voluntary in 2016, NEA has decided to make it mandatory in the future to cooperate with the RPS. The green certificate also makes the implementation of RPS becomes more likely. By developing trading of power generation rights, thermal power generators and renewable power generators could transact their generation rights. Thanks to the trade, eastern provinces that consume thermal power a lot could replace their non-renewable power generation with the

[36] Energy Research Institute. (2018). What is the Essence of Generation Rights Trading? Retrieved May 15, 2018, from https://www.china5e.com/news/news-1028853-1.html

renewable energy power produced by western provinces. Similar to the other two reforms, trading in generation rights could ease the RPS quotas' burden undertaken by a province. Although these reforms are not mature enough, they do facilitate better functioning electricity market, and they made a move on RE promotion policy evolution in the future.

3.2 The power of local governments

In March 2018, China issued a draft RPS policy that assigns provincial quotas for hydro and non-hydro renewable electricity consumption. The draft assigned the RE quota obligation holders, including the big grid companies, electricity retail companies, and large end-users participating in direct power purchasing. The calculation of RE electricity quotas is as follows:

Consumption of renewable energy in each province = Renewable energy power production within the province - Renewable energy delivered to other provinces + Renewable energy received from other provinces.[37]

The draft could be published to the society this time indicates that local governments tend to agree with the RPS content. In my opinion, there are mainly two reasons for this attitude change.

The first reason is the evaluation approach is not as strict as expected. [38] In terms of evaluating the performance of local governments and market players, provinces that fail to finish their quotas will be temporarily denied approval for new coal capacity installation and will no longer qualify for designation as energy demonstration zones. For market players, such as power retailing companies, if they fail to meet quotas, their participation in power trading would be reduced or canceled entirely in the coming year.

In terms of provincial quotas, this time, many of the provinces that face the largest challenge in increasing renewable energy quota are located in central eastern China, not the coastal provinces such as Shanghai, Jiangsu, Zhejiang, and Guandong. As can be seen from the map, in the central eastern area, Hunan's target is very challenging. It

[37] NEA. (2018). Renewable Energy Quota and Assessment Methods (draft). Retrieved May 15, 2018, from http://zfxxgk.nea.gov.cn/auto87/201803/t20180323_3131.htm

[38] Wang Lining. (2018). Renewable Portfolio Standards Landed, the Electricity Industry is Moving to the "Forced Clean" Era. Retrieved May 13, 2018, from http://tech.sina.com.cn/it/2018-04-01/doc-ifysuvyp0654352.shtml

will have to obtain 9% of its electricity from non-hydro renewable energy and raising the proportion to 19% in 2020. But in 2016, Hunan province produced only 2.9% of its electricity from wind and solar. Similar pattern to Anhui, Jiangxi and Henan Province.

Figure 9. Renewable Energy (non-hydropower) Quotas for Provinces by 2020[39]

The second reason is the enforcement of renewable energy electricity certificates, which are issued to renewable generators for each megawatt-hour (MWh) they produce. The more flexible mechanism enables not only the local governments but also the grid companies to fulfill the quota task in an easier way, compared to the Methods released in 2015. Based on the RPS draft proposed in March 2018, renewable energy electricity certificate is to assess the completion of quotas. Each market entity can complete quotas by conducting certificate transactions with other market players or renewable energy power generation enterprises.

Besides, those provinces that undertook the highest increase amount in quota are located in central China. As we know, northern and western China are abundant in renewable energy resources, they are near to central provinces, so it is easier for provinces such as Hunan, Anhui to receive interprovincial RE electricity.

As a result of these two reasons, local governments do not feel too much pressure in fulfilling the RPS quota environment. Therefore, this time the draft did not face strong

[39] Anders Hove, Daniel Wetzel. (2018). China is Planning Provincial Quotas for Clean Energy. Retrieved May 15, 2018, from https://www.chinadialogue.net/blog/10574-China-is-planning-provincial-quotas-for-clean-energy-/ch

opposition from local, although the national-level energy governance institutions are still dispersed.

Future Challenges

Passing the RPS draft is only the first step to the RE promotion policy adjustment, to implement the policy well still has a long way to go. The future challenges include but not limited to the following ones.

First, how to set and raise the quota for each province in a fair manner? If the quota entails unreasonable burden sharing among provinces or imposes too difficult target to achieve, there could be harsh opposition from some local governments or all of them in a united manner. According to the newly published RPS draft, the energy administration department of the State Council formulates renewable energy quotas for provincial-level administrative regions on an annual basis based on factors such as renewable energy resources, national energy plans, and the operating conditions of trans-regional electricity transmission channels.[40] More specific quota determination method is unknown. As discussed before, quota obligation does not match with renewable energy potential in each region. RPS factors in certificate trading from provinces with rich renewable energy resources to those with poor renewable energy resources bring consequent income transfer. Depending on initial quota allocation, provinces which will have to buy the huge amount of certificate could find it unfair. The government may consider using RPS as one of the means for income redistribution among provinces, but it remains to be seen whether renewable poor but economically rich provinces would swallow such policy.

Second, how to clarify interaction among existing generation rights trading and newly introduced RPS, as well as Emission Trading Scheme (ETS)? As discussed above, China introduced power generation rights trading of which purpose included promotion of less polluting power generation. As indicated by President Xi Jinping, China's carbon-dioxide emissions would peak around 2030. We can see that while striving for developing renewable energy, China also proposes the ambitious plan to reduce carbon emissions. China's carbon trading market has been operating in seven pilot provinces

[40] NEA. (2018). Renewable Energy Quota and Assessment Methods (draft).
Retrieved May 15, 2018, from http://zfxxgk.nea.gov.cn/auto87/201803/t20180323_3131.htm

for many years and the nationwide carbon trading market was launched in 2017 focusing on the power sector. It is not at all clear how these three policies are intertwined. In general, obligatory introduction of renewable energy either by FIT or RPS will reduce the demand for carbon credit demand in the sector, which could eventuate in low carbon price. This is highlighted as one of the contributory factors for stagnant EU-ETS credit price. Such unintended consequences due to co-determined enterprises' behavior are pointed out in various studies.[41] If the two policies are implemented simultaneously in the power sector, then the mutual exclusion and the boundaries of the two policies need to be clarified. Green certificates started in last year on a voluntary-based, it became compulsory along with the put forward of RPS in March 2018. Governments should take measures to prevent negative interactions between the policy interactions.

Third, how to fill in the subsidy gap, and who will bear the cost of RPS scheme? While RPS could be more cost-effective than FIT due to its reliance on the market, so long as it is intended to promote renewable energy by policy intervention, incremental cost needs to be borne by somebody. This is not clarified in the RPS draft. Based on the draft announced in March 2018, while selling renewable certificates, renewable energy power producers can still receive subsidies from the government (this is the essential difference between the 2017 voluntary green certificate). Therefore, the introduction of RPS is not likely to alleviate the ongoing subsidy gap problem. Enjoying benefits from both RPS and subsidy existing scheme could result in over-subsidization. These problems remained to be clarified, maybe in the next government RPS document.

Conclusion

China initiated renewable energy development since the beginning of 21st century. Nearly two decades passed, China's renewable promotion policy has evolved from tendering policy, to Feed-in Tariff policy in 2005, and to Renewable Portfolio Standards Policy in 2018. A long history with many policy negotiations and conflicts of interests. This paper addresses the research question: how does China's renewable

[41] Fankhauser, Samuel, Cameron Hepburn, Jisung Park. (2010). Combining Multiple Climate Policy Instruments: How Not to Do it. *Climate Change Economics,* 1(03), 209-225. Retrieved May17, 2018, from http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/02/WP38_UK-carbon-tax.pdf

energy promotion policy evolve from FIT to RPS? The central argument is that there are three key factors influencing China's renewable energy policy choice, including the policy adaptability to the development stage of the industry, the power of central energy governance institutions, the power of local government and other stakeholders.

The policy evolution history is divided into three periods. Before moving to analyzing the policy-making process, I studied China's central energy governance institutions, which are still featured by dispersed decision power among several ministries and insufficient political rankings. The institutions cause the energy policy choice easy to be influenced by different ministries and by local governments.

The first evolution period ended in 2005 when FIT was adopted. In this period, China's renewable energy industry was very weak, so the tendering policy was first adopted to develop the industry from zero. FIT is relatively simple in policy execution and it is clear in the RE electricity price and RE projects' contract, so the expected return is clarified. These features make FIT a protectable policy to a nascent industry. While a comprehensive RPS requires a well-functioning electricity market which China did not have in that stage. Therefore, from the perspective of policy adaptability to the development stage of RE industry, it is better to choose FIT at the first period. The other factor, the power of central energy governance institutions also influenced the RE policy choice. Ministries under the State Council held different opinions towards the RPS content in the Renewable Energy Law. Also, RPS needs the central authority to allocate quotas to each province. During this negotiation process, conflicts of interests are very likely to happen and it would have been an arduous task for the weak and decentralized central energy institutions to coordinate the dissents. As a result, it is understandable that the coexisted of FIT and RPS that proposed in the draft of Renewable Energy Law became impossible, FIT was chosen whereas RPS was deleted.

The second period started since 2006 and ended in 2015 when the policy adjustment from FIT to RPS was failed. Under the policy support from FIT, China's RE industry developed at an amazing speed. China has become the renewable energy leader in the world. However, problems such as power curtailment and subsidy gap emerged after 2010. These problems made central authority decide to adjust the RE promotion policy from FIT to RPS in order to adapt to the industry development status. But China still

lacked a well-functioning electricity market to implement RPS at that time. Also, because the quota imposed heavy political pressure on local governments of the eastern regions, so it was strongly opposed by these local governments. Although RPS received the stronger support from central authority this time, the dissents from local governments impeded the enforcement of RPS in 2015.

The third period is from 2016 to now. Finally, in March 2018, China's first policy draft on RPS was published. This is an important symbol of renewable policy evolution. After 2015 when the RPS Methods proposed by NEA met with frustration, China put many efforts to the electricity marketization reforms, including liberalizing electricity market, introducing voluntary green certificate trading system and further developing trading of power generation rights, etc. These reforms have made the RPS adaptive to the current industry development status, paving the road for the future RE policy adjustment. While for local governments that expressed their strong dissents in last period, this time, because the RPS evaluation approach is not as strict as expected, plus that the renewable energy certificates and other market transactions are available, so it is easier for both local governments and grid companies to complete the quotas. As a result of these reasons, the policy evolution from FIT to RPS could be achieved in 2018. However, passing the RPS draft is only the first step to the RE promotion policy adjustment, to implement the policy well still has a long way to go. The future challenges include, but not limited to:

1)How to set and raise the quota for each province in a fair manner.
2)How to clarify interaction among existing power generation rights trading, RPS and ETS.
3)How to address subsidy gap problem.

These issues entail many complexities and require delicate handling, which will affect effective and efficient work of RPS. They deserve further study.

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