Analysis of the Power of Subsidy Policy, which is used in Biomass Power Generation Industry---Take Straw Direct Combustion Power Plant for Example

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Abstract. Nowadays, Biomass power generation as a environmental friendly way to generate energy has become more and more popular around the world, especially in developed countries .Chinese government also encourages the usage of biomass in power generation, and they give many preferential policies to support this industry's development such as subsidy policy. But the effect is not obvious. As we all know, there is a economic phenomenon named tax shifting in the subsidy process which can reduce the effect of subsidy policy. This paper takes power plants which use straw as raw material for example，and uses the macroeconomics model of tax income and the theory of demand and supply as bases to find whether there is also a tax shifting in biomass power generation industry especially in power generation market, raw material market and analyze the effect of subsidy policy used in it.

Introduction

Background of the Paper. The Raw material of biomass power generation is based on straw, branches, firewood and other agricultural and forestry litter. Use biomass power to generate electricity makes most of agricultural and forestry litter profitable. Compared with thermal power, because using environmentally friendly materials, biomass power generation can greatly reduce emissions of carbon dioxide and sulfur dioxide, resulting in huge environmental benefits, alleviate the current growing haze, acid rain and other environmental problems，so highly respected. It is estimated that 250,000 kilowatts each operator of biomass generators, compared with the same type of thermal power units, annual reduction of carbon dioxide emissions by about 100,000 tons. And Biomass power generation can also lead farmers to increase income, increase employment and other aspects of social advantages. However, biomass power generation is being abandoned by most of the major central enterprises because of its poor performance, and the uncertainty of its future. Recently ,the subsidiary of the State Power Group named Guodianlongyuan, once again linked two of its biomass power company's asset to the Shanghai Stock Exchange, with about 40 million yuan concessions sale this branch. Not only the State Power Group, Datang, Huaneng and many other central enterprises also have had peeled biomass power transactions. The professional analysis is, an important reason for this phenomenon is widespread losses in the industry. Such as straw direct-fired biomass power industry, the phenomenon is caused by the increase of the costs and electricity subsidies are not in place.

Straw fuel and other raw material costs will be affected due to the season, influenced by the food production and other uncertain factors, and therefore more volatile. Analysis is more complex. This paper discusses the preferential tariff subsidies for biomass power generation industry, the degree of

effect. Straw direct combustion power generation for example.

The Problem to be Discussed. As far as we know，subsidies the power plants have about the price of electricity that use biomass power to generate are as followed:

Conventional electricity price subsidies.

According to "Renewable energy prices and cost-sharing management pilot scheme" (NDRC Price [2006] No. 7) Article III and Article VII, electricity price of Biomass power is formulated by government, the pricing department of the State Council formulate   benchmark prices which are different from region to region. Electricity price in one province consists of two parts: desulfurization coal price of the province in year 2005 and subsidy with a price of 0.25 Yuan per kilowatt-hour. This subsidy can be given since the date of power plant goes into operation and no longer than 15 years.

Temporary electricity price subsidies.

According to the National Development and Reform Commission and State Electricity Regulatory Commission on the 2007 January-September notification energy price subsidies and quota trading scheme additional renewable ([2008] No. 640), government gives a temporary subsidy to those straw direct combustion power plants who have loss in operation，and subsidy price of 0.1 Yuan per kilowatt-hour.

That is to say, in early day, for straw direct combustion power generation plants, the government gives them 0.35 Yuan for every kilowatt. It also means:

Price for every kilowatt= online Electricity price of Desulfurization coal +0.35. Benchmark price is born by power grid and the subsidy is born by country. According to Macroeconomic theory, due to the existence of tax shifting, the statutory incidence for subsidy may not get the true benefit. The main issue of this paper is try to discuss if subsidy is given in two options to power plants and grids, whether there is the existence of a tax shift , if it exists, how much is the number of pass, and to judge which is more beneficial to power plants.

The Analysis of Tax Shifting

Analysis of Tax Shifting in Power Generation Market.

Introduction of the market and the theory used in the analysis.

The followed hypothesis is based on the situation of demand and supply in power generation market. There are two main parts: Power Grid Corporation as the demand side and the power plant as the supply side.

In the research process, the paper uses the theory of tax shifting ,and the theory of partial equilibrium which depends on price to research the change of relative price caused by tax .(subsidy in the article can be seen as a kind of negative tax). The tool for analysis is the supply and demand model in a perfect competition market.

Introduction for the theory:

(1)Tax shifting

There are two parts in the tax process. One is the statutory incidence, which is the one who is responsible for tax in the legal aspects. The other is the economic incidence. That is the change of real income distribution caused by tax. By economic transactions, the statutory incidence can shift the tax burden to others (the one who really pay for tax). This process is called tax shifting.

Tax shifting is influenced by elasticity of demand. The one who has a smaller elasticity pays more tax. Supply elasticity is used to measure the extent of reaction of commodity supply's number, which changes with the market price.

(2)Partial equilibrium models

It is a method to analyze economic. It means when every factor remains unchanged expect the parameter people research, and only observe the effect to the economic variable when the parameter changes. Under this model, this paper only observes subsidy, this factor's effect to the relative price of supply and demand.

(3)Model of demand and supply in perfect competitive market

This model presents itself with Cartesian coordinate system, and is made up by a demand curve and a supply curve. It reflects a balance state of demand and supply. The horizontal axis represents electric quantity, and the vertical axis represents price. Normally, price is inversely proportional to the quantity of demand, and is directly proportional to the quantity of supply. Therefore, the demand curve monotonically decreases, and the supply curve monotonically increases.

(4)The analysis of elasticity

As the supplier, the main product of power plant is electricity. Most electricity must be sent to grids to get income and offset the cost of electricity generation to keep go on. The quantity of generated electricity mainly depends on power generating capacity instead of electricity price. Therefore, the supplier has a very small elasticity.

Among the power plants which have cooperation with State Grid, the Biomass power plants exist only with a few percent. The five main power generation groups still mainly use thermal power. Up to the end of 2013, the quantity of clean electric power has been improved to 37%, but the power generating capacity of thermal still keeps the first place, more than 50%. So, for Power Grid Corporation as demander, whether the straw direct combustion power plant sell electricity to it or not makes no difference. Therefore, the price which Power Grid Corporation gives to straw direct combustion power plant is heavily influenced by the market (when policy is not considered). So, the demand of Power Grid Corporation is full of elasticity.

(5)The analysis of this situation

According to the model, the horizontal axis in Fig. (1) represents electric quantity, and the vertical axis represents price. The power grid company can obtain 0.35 yuan from government subsidy when it buys per kilowatt-hour power from the straw direct-fired power plant.
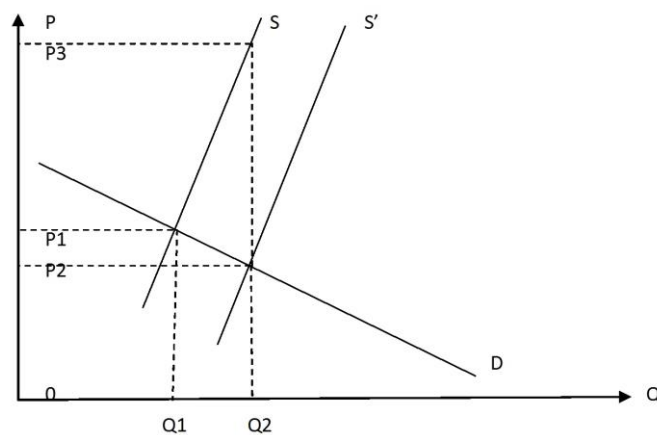

Figure 1.　Supply-demand model in power generation market

The policy of government leads to the increase of power generation from suppliers, but electricity demand of the power grid company has not changes. This is because the government subsidy makes the purchasing price of electricity power drop out 0.35yuan/KWH. The power grid company can obtain more electricity power for payment instead of getting more money for electricity. The government subsidy is actually a kind of subsidy of quantity. The electric quantity

from subsidy is equal to the value which is power generation multiply 0.35 and divide the current electricity price. This quantity comes from production of the power plant. Then the power generation from the power plant could be increased at a certain level derived from the subsidy. Therefore, supply curve moves to the right side, from S to S'. But demand curve remains unchanged.

The curve of supplier has large slope due to little elasticity. The curve of demander has small slope due to big elasticity. It shows that the price has significant influence on the demander.

As shown in Fig. 1. A (P1, Q1) represents original equilibrium price, and B (P2, Q2) represents new equilibrium price with government subsidy. Then the price paid by the power grid company drops to Point P2. Point C is the intersection between demand curve and supply curve S under this circumstance of equilibrium quantity. The abscissa P3 of the intersection point C is the price of supplier with government subsidy.

|P3-P1| represents the benefit of producer, and |P1-P2| represents the benefit of demander. The level of |P3-P1| is higher than that of |P1-P2|. Therefore, the power generation enterprise obtains more profits.

It can be conclude that the power generation enterprise is the true beneficiary due to its low flexibility in spite of the power grid company as the receiver of government subsidy.

The power generation enterprise can obtain extra 0.35yuan/KWH with power generation when it as the receiver of government subsidy. Consequently, the government subsidy can simulate the increase of power generation reaching to max equipped capacity. The supply curve moves from S to S'. However, the electricity demand of the power grid company would not increase since the government subsidy has no relationship with the power grid company. In addition, the power grid can load huge electricity quantity no matter how much quantity derived from the direct-fired power generation enterprise. The demand curve remain unchanged. Similarly, the curve of supplier has large slope due to low flexibility. The curve of demander has small slope due to high flexibility.

The above-mentioned model can be obtained.

Therefore, the profitability depends on the elasticity of supplier and demand. It has not direct relationship with the statutory incidence of government subsidy. Big elasticity leads to less subsidy, while small elasticity causes more subsidy in spite of tax shifting. When the power plant has no elasticity, it can obtain the whole benefit of government subsidy.

Analysis of Tax Shifting in Raw Material Market

Introduction of the market and the theory used in the analysis

On the basis of the above theory, and combine with the subsidy to power plant and problems about Agriculture, Rural areas and Peasantry, this part will probe: In raw material market, whether the subsidy can be beneficial to both farmers and power plants or not

It is the same that there are two main parts in the market. One is supplier: farmers.   The other is demander: straw direct combustion power plant.

The analysis of elasticity:

Straw is widely used in countryside, it can be used as fodder, be burned as plant ash to be a kind of fertilizer, and as a material as papermaking and family fuel. As supplier, farmers sell straw to power plants is only one of their choices, and this choice is greatly influenced by the purchase price. Therefore, the supplier has bigger elasticity than demander.

The most important raw material for straw direct combustion power plant is straw. Although the price of raw material is influenced by the collect and purchase cost, the influence is very small. In 2013, National Energy Board announced a very strict criterion for power plants which can get the subsidy in 《"Twelfth Five Year Plan" for the development of biomass energy》. It is said that: Only

if a power plant has a Registered capital of 10,000,000 yuan, uses straw no less than 10,000t pro year, and must use 100% biomass power to generate electricity, then it can get the subsidy. It can be seen from the policy that the power plant has a very little elasticity for the demand of straw.

The analysis of this situation

Based on the demand-supply model, the horizontal axis in Fig. 2 represents the amount of straw, and the vertical one represents the price of straw.

When the government subsidy is given to the power plant and the supply curve remain unchanged, the demand curve can move from D to D' because the cost drops and the purchase of the power grid company rises.
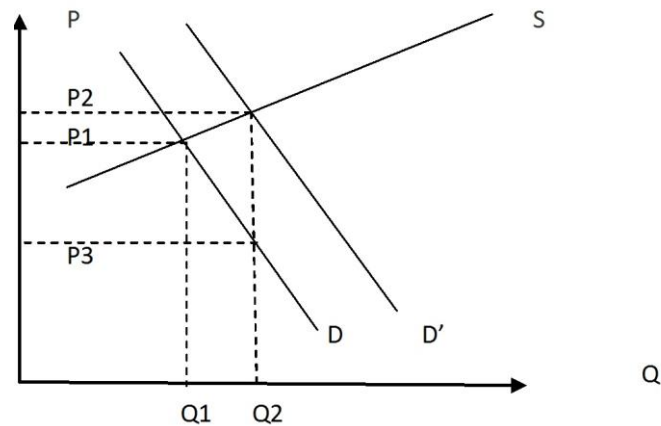

Figure 2.　Supply-demand model in raw material market when subsidy is given to power plants

As shown in Fig. 2 A (P1, Q1) represents original equilibrium price, and B(P2,Q2) represents new equilibrium price with government subsidy. The purchasing price of straw rises to P2, which is the receiving price of producer as well. Point C is the intersection between demand curve and supply curve S. P3 is the price for demander with the government subsidy and the new equilibrium quantity Q2.

|P2-P1| represents the benefit of producer, and |P1-P3| represents the benefit of demander. The level of |P1-P3| is higher than that of |P2-P1|.又 ∵ |P1-P3|>|P2-P1|

Therefore, the power generation enterprise as demander obtains more profits.

When the government subsidy is given to farmers and the supply curve remain unchanged, the supply curve can move from S to S'. Because the purchasing price rises causing the increase of sales volume of straw.
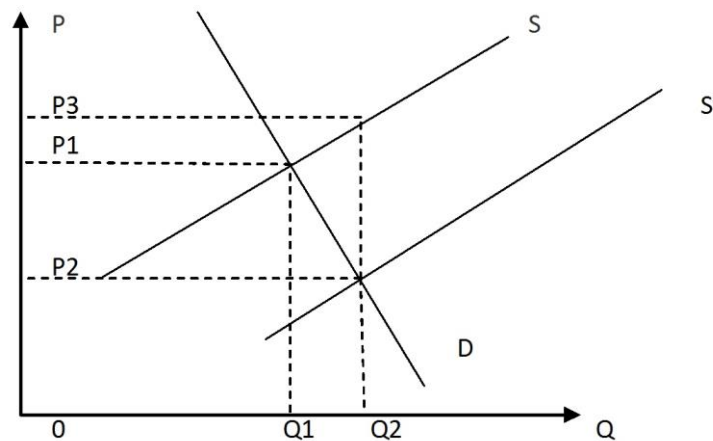

Figure 3.　Supply-demand model in raw material market when subsidy is given to farmers

As shown in Fig. 3. A (P1, Q1) represents original equilibrium price, and B (P2, Q2) represents new equilibrium price with government subsidy. The purchase price of straw drops to P2. P2 is the price for customers. Point C is the intersection between demand curve and supply curve S. P3 is the price for producer with the government subsidy and the new equilibrium quantity Q2.

|P2-P1| represents the benefit of supplier, and |P1-P3| represents the benefit of demander. The level of |P1-P2| is higher than that of |P3-P1|.又 ∵|P1-P2|>|P3-P1|

Therefore, the power plant obtains more profits.

It can be conclude that though the subsidy is given to both farmers and power plants at the same time, due to a smaller elasticity, power plants get the most of subsidy.

Conclusion

As showed from the two cases above, two conclusions can be drawn:

In electricity selling market, because of the little elasticity the straw direct combustion power plant has, the plant can get most of the subsidy.

In raw material market, although the government wants to give benefit to both farmers and power plants, the two sides have different elasticity for straw, so whoever get the subsidy as the statutory subsidy incidence, finally the subsidy will shift to the power plant who has a smaller elasticity. This conclusion can explain the reason why farmers don't think highly of the policy of selling straw to the power plant. This is also one of the reasons why it is so difficult for power plant to collect raw material.

Therefore, if the government wants to support the straw direct combustion power plant more, it must give farmers more subsidy which can't be shifted to others. Then, farmers can get more real profit, then they can really support the policy: sell their straw to power plant to generate electricity.

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