

## **Spreading Biomass Power Generation**

### 1. Motivation behind Research Paper

Currently in Japan, there is a shortage of electricity due to a shortage of liquefied natural gas due to economic sanctions against Russia. What can we do in order to help? While my classmates and I were exploring about global warming, we found out that fossil fuels are accelerating the process of global warming, so we got interested in energy that is not fossil fuels, called biomass energy. We also wanted to know why it is not known in Japan although it is spreading all over the world. What can we do to slow down global warming? The goal of this essay is to know more about the benefits of biomass energy and what we can help to slow down global warming.

### 2. Introduction

Do you know how our electric power is made? In Japan, fire power generation accounts for 80% and water power generation accounts for 10%, other renewable energy accounts for 10%. We think that Japan should spread biomass power generation which is renewable energy, so we tried to find out what biomass power is. However, do you know what renewable energy is? The price of renewable energy is increasing alongside the soaring prices of petroleum, due to oil crises. It is technically at the stage of practical use, but due to economic reasons, it has not spread sufficiently, and it is an energy source that should be promoted. These

energies benefit because it will not use fossil fuels, so it is good for the environment. Also, another benefit is it will use energy that exists in nature. That means it will have no risk of resource depletion. Why does it not spread? The reason is some renewable energy needs a lot of funding to collect the energy. For example, solar power generation and wind power generation, geothermal power generation is now spreading in Japan because it does not need a lot of funding to make power. On the other hand, biomass energy is not spreading in Japan because it needs a big cost to make the machine that makes the power. In fact, we think the Japanese government does not have money to spend on it. Based on this hypothesis, we will investigate biomass power generation.

### 3. Results and Analysis

First, I want to explain about biomass power generation. Biomass energy represents the amount of biological resources. However, biomass power generation has three types of electricity collection methods. The first type is called the “direct combustion method”. This type of method collects energy by burning wood and making the water boil then turn a turbine with steam. It is the same style with fire power generation, so it is not good for the environment. The second type is called the “pyrolysis gasification method”. This type is the gas generated when wood is steamed and used as fuel to turn a turbine. The difference from the first type is the wood combustion temperature is relatively high, also maximising the use of combustible components of fuel. The third type is called the “biochemical gasification method.” This type is the fermentation of easily fermentable sewage sludge and livestock excrement produces gas to turn a turbine. It is an effective use of waste, high calorific value of generated gas, and high efficiency.

Next, I will talk about two advantages and two disadvantages of biomass power generation. The first good point is to generate power stably. Unlike solar power generation and wind power generation, which depend on the weather, biomass power generation can stably generate power as long as there is fuel. The second good point is that it is carbon neutral. Carbon neutral means plants emit CO<sub>2</sub> when they burn, but during the growth process they absorb CO<sub>2</sub> from the atmosphere through photosynthesis, so the plus or minus of CO<sub>2</sub> due to emissions and absorption becomes zero. This way of thinking about the carbon cycle is called carbon neutral. In other words, since the CO<sub>2</sub> emitted by burning biomass fuel is originally CO<sub>2</sub> absorbed by plants in the atmosphere, the total amount of CO<sub>2</sub> does not increase as a whole. It does not reduce carbon dioxide, but it does not increase it either, so it is considered neutral.

On the other hand it has bad points. The first negative point is biomass generation costs a lot of money. The total price will include the cost of the fuel itself, the cost of transporting the fuel, and the cost of producing wood chips. For woody biomass power generation, it is necessary to dry the wood in order to burn it efficiently, and to make it into small chips or pellets. In addition to the price of the wood itself, there are various other costs involved, such as the time and effort to transport the wood from the mountain, the time and effort to transport the wood, process it into chips, and transport it to the power plant. However, there are also examples of cost reductions achieved through measures such as installing these processes in an integrated manner or sharing them with other wood industries.

Secondly, woody biomass, which has a low combustion temperature, is inefficient in power generation alone. The energy conversion efficiency of woody biomass is considered to be around 75% in the case of "heat utilisation only" and in the case of "cogeneration" that supplies both heat and electricity, while it is as high as 25% in the case of power generation is only the percentage which is known to be lower than the usual energy conversion efficiency of around 40% in coal-fired power plants. Woody biomass fuel does not burn at very high temperatures. For this reason, the efficiency of energy utilisation is lower than that of other power generation methods, except in the case where the steam used for power generation can be effectively used, for example, in agricultural heating. By the way, the most efficient power generation method is hydroelectric power generation, which has a conversion efficiency of 80%.

So far, various efforts have been made in Japan for biomass power generation. The Ministry of Agriculture, Forestry and Fisheries and other relevant ministries will work together to implement specific initiatives and actions related to the promotion of biomass utilisation from the perspectives of preventing global warming, creating a recycling-based society, developing strategic industries, and revitalising farming, forestry and fishing villages. The plan was approved by the Cabinet in December 2002 as the "Biomass Nippon Comprehensive Strategy." Since then, the introduction of biomass power generation has actively started in various parts of Japan.

In March 2006, a review was carried out based on the status of biomass utilisation to date and the changes in the situation after the formulation of strategies

such as the Kyoto Protocol coming into effect in February 2005. We have been promoting measures to accelerate the construction of biomass towns by utilising unused biomass such as forest residue. Furthermore, in 2009, the Basic Act on Promotion of Biomass Utilisation was enacted to further accelerate the introduction of biomass power generation. Since biomass energy became subject to the feed-in tariff system (FIT system), which started in July 2012, biomass power generation has attracted a lot of attention as a renewable energy that can be operated stably. The “fixed-price purchase system for renewable energy” mentioned here is a system in which the government promises that electric power companies will purchase electricity generated by renewable energy at a fixed price for a certain period of time.

#### 4. Conclusion and Future Problems

For these reasons biomass energy power generation has a lot of benefits and it is spreading in Japan a little. In Europe, biomass power generation already has two-thirds of renewable energy. In Sweden and Finland in particular, the share of biomass power generation in the energy composition ratio is high. But why is it not so popular in Japan? For one reason, it can be mentioned that there are restrictions on the location. Japan's land is not so big, so there are not many places to use for making renewable energy from other developed countries. Also, we explained in this paper, renewable energy is high cost and difficult to introduce. Our opinion in this paper is that we cannot get too involved, so we thought about what we could do as high school students. First, we should think about power saving in our natural life. For example, unplug electrical appliances after use, set air conditioners to 28°C in summer and 20°C in winter as much as possible, and avoid leaving the TV on all the

time. Second, we should actively separate garbage. Finally we think it is very important and important to steadily do small things that can be done close to you like this.

## 5. Reflection

In addition to researching literature, we tried to contact companies which are doing biomass power generation, but we cannot do it. For this reason, in our place it does not have a company that is doing biomass power generation. It means that in Japan biomass power generation is not spreading. We think that many people should know about biomass power generation and we should do what we can do to stop global warming the way that we showed in our conclusion.

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