CHAPTER 1

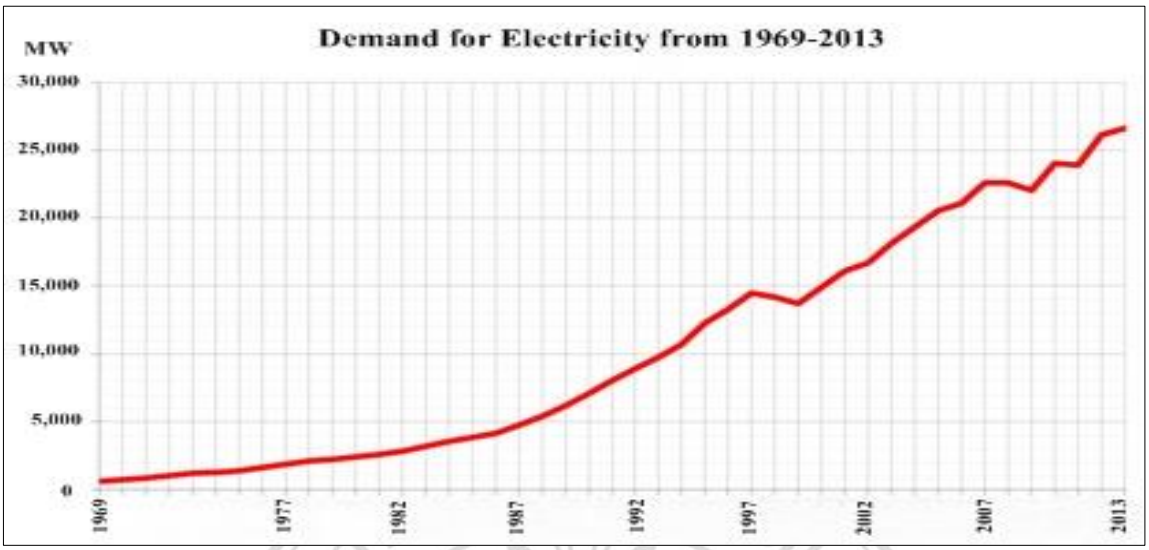
Introduction

1.1 Principle and Rational of the Study

Electric energy is not only the heart of goods production and services but also economic growth, and Thailand needs it increasingly. The average growth of national income is about 4 percent and the need of electricity is about 4.2percent. Thus, having enough electrical resources is very essential.

While the tendency of electrical need has been increasing, plans of electrical resource selection have become very important. The major factors of suitable selection of electrical resources are investments that can make cheaper unit costs, electrical production from clean renewable energy, and long-term usage. It seems that the most effective electricity plant is the nuclear power plant.

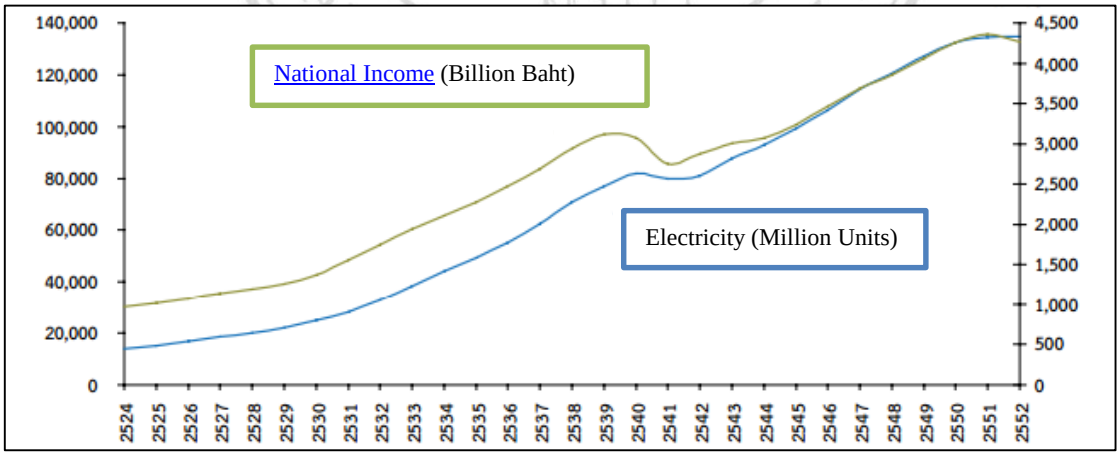
Electricity in Thailand has expanded according to the annual statistical report from the Electricity Generating Authority of Thailand. The report found that the demand for electricity in Thailand is increasing every year. The maximum demand for electricity is mainly in the period from March to May. And the demand for electricity in Thailand is increasing steadily every year.



Source: Annual statistics from Electricity Generating Authority of Thailand

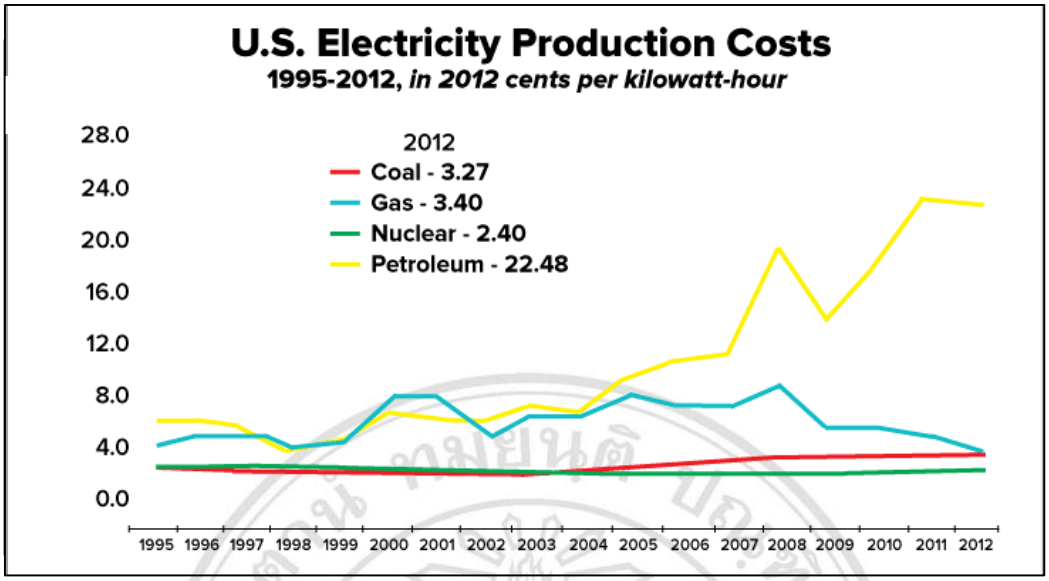
Figure1.1: Show the demand for electricity from 1969-2013

During the years 1981 to 2009, Thailand's GDP growth rate averaged about 4percent, and the average rate of consumption of electricity was about 4.2percent. At the same time, economic growth also stimulates the demand for electricity. Thailand must have enough fuel reserves, and fuel prices must be reasonable and stable.



Source: Energy Policy and Planning Office, Ministry of Energy, Thailand. From report topic "Electricity consumption and electricity management in Thailand".

Figure1.2: Shows GDP growth rate and demand for electricity from 1981-2009



Source: Nuclear Energy Institute U.S. Electricity Production Costs.

Figure1.3:U.S. Electricity Production Costs 1995-2012.

The electric energy used these days may be divided into 2 kinds: nonrenewable energy and renewable energy. The nonrenewable energy is the energy that can be used up such as coal, oil, petroleum, fuel, nuclear power, and natural gas. Renewable energy includes hydro power, power from biomass, power from garbage, geothermal energy, solar energy, wind energy and waves. Here are advantages and disadvantages of the mentioned energy (Energy Policy and Planning Office, Ministry of Energy, Thailand, 2011).

Using natural gas in electrical production

Advantages

- Natural gas is highly effective petroleum and has perfect burn.
- Natural gas can be found in Thailand that helps reduce the import of energy and other fuels.

Disadvantages

- The amount of natural gas in Thailand is limited.
- The price of natural gas is flexible, depending on oil price.

Using coal in electrical production

Advantages

- The cost of coal in electric production is lower.
- There is a lot of reserved coal.

Disadvantages

- The coal is imported.
- The burning of coal causes air pollution, so it is necessary to use highly expensive technology to control air pollution.

Using biomass as fuel in electrical production

Advantages

- Using waste from agricultural process is used as renewable energy to produce electricity.
- Electrical production from biomass is environmentally friendly.

Disadvantages

- The amount of biomass is not certain because it is from agricultural process.
- The price of biomass is flexible and its tendency is higher.

Using solar energy in electrical production

Advantages

- Solar energy is a huge resource that can be used endlessly.
- It is a clean resource that does not cause any pollution.
- It can be used in faraway lands.
- There are no expenses of fuel.

Disadvantages

- The intensity of sunlight is not stable, depending on the weather.
- Solar modules and equipment are expensive.
- The period of collecting energy in the battery is too short.

Using hydro power in electrical production

Advantages

- It is a clean resource that does not cause any pollution.
- It is a huge resource of electrical production.

Disadvantages

- It has a huge construction requirement.
- The expense of dam construction is very high.

Using wind power in electrical production

Advantages

- There are no expenses of fuel.
- It is a clean resource that does not cause any pollution.

Disadvantages

- It depends on the weather.
- The battery is expensive.
- The speed of wind in Thailand is quite low and insufficient for electrical production.

Table 1.1: The Radioactive Estimates from sources of electrical production

Radioactive Estimates	
Coal	4%
Nuclear	2.5%
Geothermal Energy	2%
Oil	0.5%
Natural Gas	0.03%

Source: Energy Policy and Planning Office, Ministry of Energy

The table 1.1 shows the radioactive estimates of people in electric production from various kinds of fuels. Nuclear power releases less radio activity than coal power. From the study, the result reveals that inhabitants living near an electric plant using coal get radioactivity 100 times of residents living near a nuclear power plant. Besides, the E-ray film of breasts shows 80 times of radioactivity compared to people living close to a nuclear power plant.

When the nuclear power plant is mentioned, how many people want it to be built in their community? That is the nature of human beings who do not want any dangers coming into their places, even the nuclear power plant. Nowadays, nuclear power plants are located in 30 countries throughout the world. Moreover, the tendency of nuclear power plants will be enlarged in the future so that it can be the most popular alternative energy. As of 21 January 2015, the IAEA report, there are 439 nuclear power reactors operating in 33 countries.

The construction of nuclear power plants in Thailand has been discussed. Most Thai people believe that nuclear power plant scare highly dangerous; compare to the atomic bomb is the asymmetric information. That is why a nuclear power plant has not been constructed in Thailand. However, the Energy Policy and Planning Office under the Ministry of Energy and state enterprises under the Electricity Generating Authority of Thailand (EGAT) are the main offices that have tried to push the construction of a nuclear power plant. The given example is the energy crisis depending on too much natural gas in electrical production. The electrical plants in Thailand use over 70 percent of natural gas. Other plants use coal. Dam construction for electrical production has been protested.

In fact, the nuclear power plant is a giant boiling pot so that its steam can be used to turn turbines to produce electricity. The fuel used in the process is not coal or oil from fossils. But it is very dangerous nuclear fuel. The reason why nuclear fuel is used in the pot is that a lot of times oil or coal can create heat power, and it causes a lot of pollution.

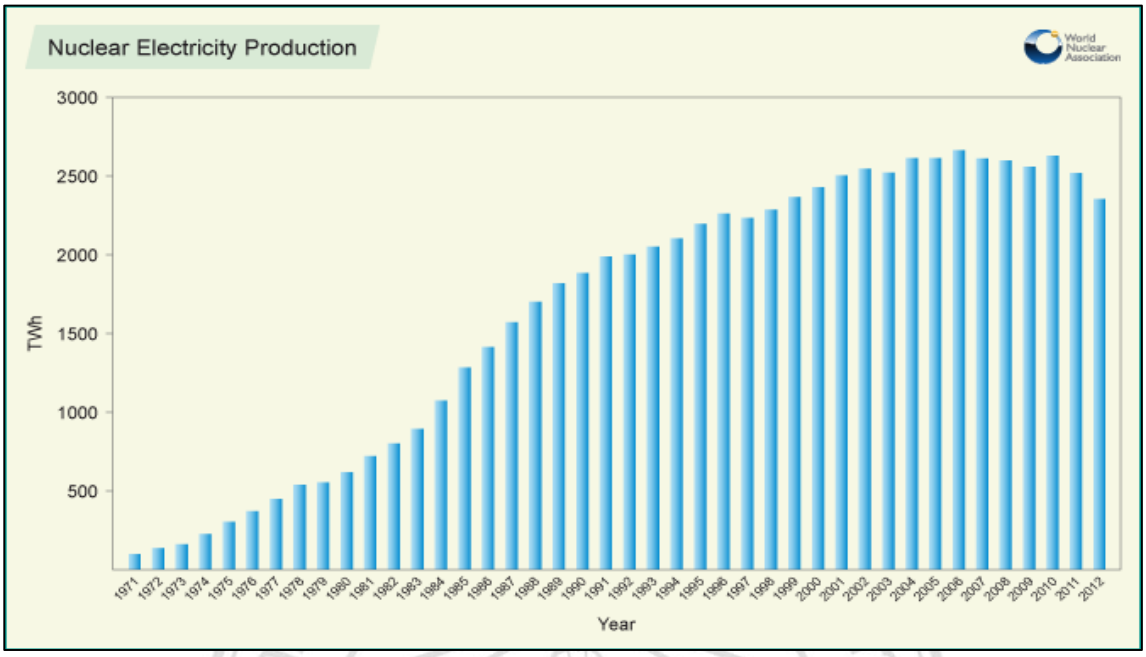
The advantages of nuclear power plants are various. First, the capital of electrical production is cheaper when compared to other plants that use other kinds of fuel. Second, nuclear power is clean and accepted by Green Peace. The smoke released from nuclear power plants is only steam without any carbon dioxide and pollution. Third, using nuclear fuel is safe and does not cause Green House effect or acid rain that is harmful to other living things. Fourth, it does not cause global warming. Finally, the construction area is less than other plants. The areas of forest are not damaged.

These days, the construction of nuclear power plants must be certified by the global organization called the International Atomic Energy Agency (IAEA) that has standard control sets over the security of nuclear power plant. However, the Chernobyl Nuclear Station in Russia was not taken care of by IAEA. Thus, we are sure that technology and standards of safety of nuclear power plant are internationally safe.

Table 1.2: Nuclear power plants world-wide, in operation and under construction

Country	In operation		Under construction	
	Number	**Electric net output (MW)**	**Number**	**Electric net output (MW)**
Argentina	3	1,627	1	25
Armenia	1	375	-	-
Belarus	-	-	2	2.218
Belgium	7	5,927	-	-
Brazil	2	1,884	1	1,245
Bulgaria	2	1,906	-	-
Canada	19	13,500	-	-
China	24	20,056	25	24,756
Czech Republic	6	3,884	-	-
Finland	4	2,752	1	1,600
France	58	63,130	1	1,630
Germany	9	12,068	-	-
Hungary	4	1,889	-	-
India	21	5,308	6	3,907
Iran	1	915	-	-
Japan	48	42,388	2	1.325
Korea, Republic	23	20,721	5	6,370
Mexico	2	1,330	-	-
Netherlands	1	482	-	-
Pakistan	3	690	2	630
Romania	2	1,300	-	-
Russian Federation	34	24,654	9	7,371
Slovakian Republic	4	1,815	2	880
Slovenia	1	688	-	-
South Africa	2	1,860	-	-
Spain	7	7,121	-	-
Sweden	10	9,470	-	-
Switzerland	5	3,333	-	-
Taiwan, China	6	5,032	2	2,600
Ukraine	15	13,107	2	1,900
United Arab Emirates	-	-	3	4,035
United Kingdom	16	9,243	-	-
USA	99	98,476	5	5,633
Total	**439**	**376,931**	**69**	**66,125**

Source: European Nuclear Society



Source: World Nuclear Association

Figure1.4: Nuclear Electricity Production

The data from IAEA dated on 23 April 2014 showed that there were 435 nuclear reactors in 31 countries worldwide producing one sixth of the world's electricity. The United States of America has the most nuclear power plants followed by France. (Source: http://www.iaea.org/pris/)

From the above information, the nuclear power plant is an interesting resource of Thailand, and Thailand has had a project to build it in the Economic Development Plan. However, the Seven National Economic and Social Development Plan (1992-1996) identified the energy development "with proper education, consideration of nuclear energy is the utilization of electricity, both economic, technology and security…"

However, nuclear power plant needs a high investment for eliminated in a safe place. And we need specialist to manage nuclear power plant. The radioactive waste needs to be eliminated in a safe place because it is very dangerous. Its can leak If stored incorrectly and can be used to make nuclear weapons as well.

For example of the devastating consequences of the nuclear disaster is Fukushima Daiichi. Energy was an accident that occurred at the nuclear power plant Fukushima Daiichi. The accident was occurred at the Fukushima Daiichi nuclear power plant and

the preliminary results from tsunami and earthquake in the Tohoku (2011).Tsunami damage cooling equipment makes 3 in 6 reactors lack of coolant. The extremely high heat causes nuclear meltdown and release radioactive. This nuclear disaster is the most severe since the disaster at Chernobyl in 1 9 8 6 , but more complicated because the reactors are all affected. Fukushima power plant had to release radioactive 10%to 30% of the Chernobyl power plant.

Thus, to make sure that if the selection of building a nuclear power plant is used to solve the energy problems of Thailand, will it be the right decision? The economic safety and environmental factors should be considered.

Most Thai people disagree with the construction of a nuclear power plant because of the lack of knowledge and understanding about it. They may be concerned about the danger if it would explode. This study aims to check changes of decision of nuclear power plant construction that may be built in Thailand in the future after Thai people understand how nuclear power plants work.

1.2 Purpose of the Study

1.2.1 To investigate the understanding, attitude, and decision of Thais on nuclear power plants before and after the reception of information about nuclear power plant.

1.2.2 To examine the effect of asymmetric information on the decision of Thais to vote for or against the construction of a nuclear power plant in Thailand.

1.3 Advantage of the Study

This study will be the first in Thailand to construct a panel data of the Thai people before and after the delivery and reception of information on nuclear power plants and to examine the understanding, attitude, and decision, pro or against, the nuclear power plant in Thailand. Although the sample size is not so large that may or may not represent Thais in the whole country, the study will reflect the direction of the decision. By how much the attempt to make the Thai people more understanding about the nuclear power plant, but if they receive such information and completely understand and still vote against the plant, the country has to accept that decision. In contrast, more information fed to the public may change their minds to vote for the plant. This is the

effect of the asymmetric information on the decision. Until now, it cannot predict how the results will reveal. This has to be watched closely by the end of this study. It will surely guide the way that the Thai people make public decisions on the nuclear power plant.

1.4 Definition

Nuclear energy is energy from the core of an atom. Atoms are tiny molecules that create everything in the universe. There is a huge energy between the bonds that catch atoms together. Nuclear energy can make electricity.

Nuclear Fission is the nuclear reaction broken down from heavy elements. The reaction is shoots neutrons into nucleus of heavy atoms. Then the nucleus splits into two equal parts. In this reaction, some nucleus will be lower and release 2 or 3 neutrons.

Nuclear Fusion is the nuclear reaction affected by the broken nucleus of light elements becoming heavy elements and releasing power.

Nuclear power plant is a heat power plant by using heat energy to produce electricity from nuclear power reactors. In the production process, nuclear reactions cause high pressure steam turbines to produce electricity.

Radioactivity is a phenomenon of substance that created from radiation itself.
The radioactivity is divided into three kinds: alpha ray, beta ray and gamma ray.

Asymmetric Information is a situation where there is imperfect information. Specifically, it occurs where one party has different information to another. This situation could be harmful because one party can take advantages from the other party's lack of knowledge.

Chi – Square is used to test whether the frequency observed is different from the expected frequency or not.

T-Testis used to test the differences or compare averages of two sampling groups. It is used for the normal distribution. The characteristic of these two sampling groups are independent samples and related samples.

1.5 Scope of the Study

This case study is about decision making on nuclear power plant policy in Thailand under asymmetric information. The population to study was a random sample of 400 participants by the using an online questionnaires to collect data.