

Comparison of National Policies in Germany, France and Taiwan to reduce Nuclear Energy

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1. Introduction

On June 19, 2017, at the proclamation ceremony of Kori Unit 1 permanent shutdown, the President Moon announced a plan to phase out nuclear energy, including halting the construction of a new nuclear power plant.

After then, the government is driving the nuclear phase out policy such as announcing detailed implementation plans in government projects and planning to gather public opinions on the construction of Shin-Kori Unit 5 and Unit 6.

The main purpose of this paper is to derive policy implications by comparing nuclear energy reduction policies of Germany, France and Taiwan which are currently phasing out or reducing nuclear energy.

2. National Policies to reduce Nuclear Energy

2.1. Germany

2.1.1. Background

After the Fukushima Daiichi NPP accident on March 11th, 2011, Germany decided to completely shut down all NPPs by 2022.

In Germany, anti-nuclear movement began since the 1970's and the coalition government formed after the 1998 federal elections had the phasing-out nuclear energy as a feature of its policy.

In June 2001, an agreement including contents limiting the operational lifespan of the reactors to an average of 32 years was reached between the government and the four main energy companies, and since then, a legal basis was prepared by the amendment of Acts related to nuclear energy.

However, in consideration of side effects such as the achievement of greenhouse gas reduction target and the increase of the electricity fee, the new coalition government elected in September 2009 was committed to rescinding the phase out policy.

In September 2010, a new agreement was reached, to give 8-year life extensions for reactors built before 1980, and 14-year extensions for later ones.

After then the government faced severe opposition movements of civil society, and due to the Fukushima accident occurred in 2011, the government again decided to shut down all NPPs permanently by 2022.

2.1.2. Decision Process

After the Fukushima accident in 2011, Germany carried out the procedure of the safety verification of

their own nuclear power plants together with discussing social value against nuclear energy.

First of all, the plant-specific safety assessment of all nuclear installations was carried out reflecting the lessons of the Fukushima accident by the RSK(Reactor Safety Commission) which is an advisory body of BMU(The Federal Environment Ministry). As a result, the RSK reported all German reactors were basically sound and safe.

Besides the technical discussions in the RSK, the socio-political aspects were discussed within the Ethics Commission for a Safety Energy Supply, which is composed of experts in various fields of society, set up in April 2011.

The Ethics Commission carefully considered through not only internal discussions but also through public discussion with the public whether the degree of risk within nuclear energy can be relatively evaluated and can be gradually improved or, we cannot considered the risk as 'residual risk' and the nuclear accident fundamentally does not satisfy gradual improvement due to its characteristics.

The Commission, without requiring both sides to change their views, agreed that it is desirable for nuclear energy in Germany to perform only the cross-linking role of energy and to convert it to the appropriate energy source as quickly as possible.

2.1.3. Challenges and Plans

At the time of the second revision of the nuclear energy related law, after the Fukushima accident, the NPP operators raised a lawsuit to demand compensation in shortening the life span of their NPPs caused by the government's sudden policy change. As a result, on December 6, 2016, Germany's highest court ordered the government to compensate the NPP operators for losses caused by the changed policy.

Because of the phase out policy, nuclear energy related organizations, such as the BMUB, GRS, LAA, etc., have difficulty securing budget and specialized human resources. In order to solve these problem, nuclear energy related organizations and universities are making efforts to maintain the latest expertise by establishing various education programs and obligating to complete the courses.

As an alternative to nuclear energy, Germany began exploring the possibility of using renewable energy since the late 1970s. The so-called Energy Package laws, which was approved in 2011, contain contents on renewable energy development support and energy efficiency improvement. In the Climate Action Plan

announced in 2016, Germany is aiming for complete decarbonization of energy supply by 2050 and planning to utilize wind and solar power generation for electric power production.

2.2. France

2.2.1. Background

In October 2014, based on the presidential election pledge of President Hollande, the energy transition for green growth bill, known as the "TECV Act", which includes contents of reducing the proportion of nuclear power generation to 50% by 2025 and enhancing the utilization of renewable energy, was passed by the National Assembly.

France had maintained nuclear energy-centered energy policies on an ongoing basis and devoted more than 75% of the total electricity production to nuclear power, but after the Fukushima accident, the issue of trust in nuclear safety occurred, and the necessity of new energy policy formulation was raised.

2.2.2. Decision Process

France, acting as the chair of the 2015 United Nations Climate Change Conference, COP21, promoted energy transition to demonstrate a commendable practice through its own case in climate matters.

France enacted its Energy Transition for Green Growth bill, known as the "TECV Act", on August 17, 2015 following an initial presentation at the 2012 environmental conference and a nation-wide public consultation in 2013.

Under this bill, the authority of the Local Information Committees (CLI) was strengthened and in the case of an important change in the nuclear facilities, it is necessary to gather public opinions. Thus, civic participation was strengthened in the regulatory decision process of ASN (French Nuclear Safety Authority).

Furthermore, the ordinance reinforces regulation authority of the ASN by giving more graduated tools such as fixed penalties and daily fines through setting up a sanctions committee and also creates new obligation for the physical protection of radioactive sources in order to prevent theft and its malicious usage.

IRSN(French Institute for Radiation Protection and Nuclear Safety) is an industrial and commercial public institution (EPIC), whose missions are now defined by the "TECV Act", composed of French public expert in nuclear and radiological risks.

2.2.3. Challenges and Plans

The "TECV Act" sets long-term targets to increase the share of renewables to 40% of electricity production, as an alternative of the nuclear energy. And the France's final energy consumption will be halved by 2050 compared with 2012.

Furthermore, in order to reduce greenhouse gas emissions and procure long-term investment funds for renewable energy generation, a bill to raise the tax against carbon caused by the use of fossil fuels was adopted by the National Assembly in July 2015.

2.3. Taiwan

2.3.1. Background

The amendment of the Electricity Act, which defines all NPPs will be permanently shut down by 2025, was passed in January 2017.

Currently, the design lifespan of each of the six NPPs operating in Taiwan (40 years each) is scheduled to finish in order between in 2018-2025, and the NPPs are not planned to extend the lifespan of them. The construction of the Lungmen NPP is decided to be permanently stopped. Therefore, the amendment of the Electricity Act actually means not to allow continued operation of the currently operating NPPs.

Due to the geological characteristics of Taiwan, large-scale earthquakes and tsunamis occurring frequently, demands of the public for the nuclear phasing out have been steadily raised.

The Lungmen NPPs, suspended at present, was originally planned to finish construction by 2004. But the construction was delayed several times due to changes in policies accompanying changes in government, litigation accompanying cancellation of contract with designer, large-scale anti-nuclear demonstration of civil society, etc. Furthermore, the cost caused by these several postponement has occurred excessively.

Especially after the accident in Fukushima, the public's concern over large-scale earthquakes and tsunami was further amplified and citizen groups strongly insisted on phasing out nuclear energy. At the end of the large anti-nuclear demonstration in 2014, the government suspended the construction of the Lungmen NPP, which was almost in the completion stage (process rate: 97.8%), for three years.

In the end, Tsai Ing-wen, who had a pledge of phasing out nuclear energy by 2025, was elected president in 2016, and the amendment of the Electric Act, which includes the content of phasing out nuclear energy, was passed.

2.3.2. Decision Process

The decision process of Taiwan is characterized by several referendums on whether to resume construction of the Lungmen NPP.

The Lungmen NPP was delayed in construction due to various reasons before the Fukushima accident, causing the large financial loss, and after the accident, the sense of national uneasiness was amplified and several referendums were held on whether to resume the construction in 2012 - 2014.

However, the referendum failed to obtain the effectiveness of the result due to lack of voters, linguistic confusion written on the ballot paper, and was not applied as policy.

After the Lungmen NPP interruption decision in 2014, Taipower, the NPP operator finished the safety assessment of Lungmen Unit 1 in June 2016, but the government suspended all plans deciding to confirm public opinion through a referendum and finally announced that Lungmen NPP will be permanently shut down by amending the Electricity Act in January 2017.

2.3.3. Challenges and Plans

According to the amended Electricity Act, the government decided to raise the electricity generation of renewable energy, which is currently at 4% level, to the 20% level as a countermeasure against the nuclear phase out by 2025. The government considers solar energy and wind power as the main sources of renewable energy.

Established as a regulatory body in 1955, AEC is in charge of nuclear safety regulations, but has experienced difficulties in securing the authority as a regulatory body. As an example, their decision making was overturned by the government.

For example, in 2007, AEC announced that as a result of the safety assessment of the Chinshan reactor it is possible to extend the lifespan of 20 years after the expiration of the design life in 2017, but in 2011 it was invalidated by the government's new energy policy.

In the case of Kuosheng and Jinshan NPP, the construction permit of the dry cask storage was completed by AEC in August 2015 and the construction was finished, but its operation was refused by Taipei's city government. As a result, Kuosheong Unit 1 in November 2016 and Jinshan Unit 2 in 2017 were temporarily shut down due to lack of storage capacity of spent fuel.

Although Taiwan is promoting the nuclear phase out, electricity supply problems are continuously occurring accompanying the damage such as the record-breaking heat waves of the last summer and the collapse of power transmission tower caused by typhoons.

In June 2017, the Kuosheng Unit 1 and Maanshan Unit 2 which had been stopped were restarted as emergency measures because the electricity reserve ratio dropped. On August 15, the power supply was eventually suspended without prior notice and a massive power blackout occurred.

Cause of the massive blackout was because of the power loss of 4 million kW due to a human technical error at state-owned gas supplier CPC Corp. that affected the operations of a state-owned Taipower power plant in northwestern Taoyuan. But many experts said that failure of the overall management of the electricity reserve rate is the fundamental cause.

This massive blackout affecting 64% of the total number of households of Taiwan caused great

inconvenience and confusion. As a result, Taiwan's Economic Affairs Minister Lee Chih-kung resigned. However, it is expected that there will be a great brake on the government's policy to phase out nuclear energy.

3. Conclusion

Starting with the first commercial operation of Kori Unit 1 in April 1978, Korea has expanded the expansion policy of nuclear energy for about 40 years, but the new government is promoting nuclear phase out policy, suspending licensing renewal of operating NPPs.

It is predicted that practically complete removal of nuclear power will be done by 2079 when the design life of Shin-Kori Unit 4 is expired, and it is planned to gather public opinions on the construction of Shin Kori Unit 5 and Unit 6, of which present construction process rate is about 30%.

Although the phase out policy is a plan at the stage where a lot of time remains to completely shut down all NPPs and we cannot know how long the policy will be promoted, it is very important matter of national energy transition therefore it is considered that sufficient research and a prudent approach are necessary for the settlement for the direction of policy. In this point of view, the example of German decision making to phase out nuclear energy in which the two-way approach of technical discussions and social value discussion was executed can be a reference. It is important for experts to examine objectively about the safety of nuclear power plants, power demand and supply measures, cost problems, environmental problems, and so on, as well as it seems that social and ethical consideration should be accompanied by whether the 'risk' within nuclear energy can be acceptable to the public socially.

In the case of the construction of Shin Kori Unit 5 and Unit 6, a nation-wide public consultation which French Government conducted in 2013 for energy transition, can be a measure to gather public opinions. In addition, even though it was not applied as a policy, a referendum in Taiwan can be another method. However, reflecting the lessons of the cases in Taiwan, there must be a more rational process taking account of the effectiveness of the voting result.

If the construction is permanently suspended, the compensation problem for the operator will be highlighted. The German highest court's judgment on the compensation made in December 2016 can be a reference in that case.

Even if the phase out nuclear energy is promoted on a continuous basis, it cannot be denied that nuclear safety is the most important value.

Recently, it was announced that the government will strengthen the authority and independence of the Nuclear Safety and Security Commission (NSSC) and improve the safety management system in the national projects and the government administration 5-year plan, but specific implementation plans are still being discussed.

Nationally important decisions on use of nuclear energy such as nuclear energy promotion and closure have to be made at the government level reflecting the public opinion, but the technical judgments of nuclear safety regulatory body must not be swayed by the government's policy.

The authority and status of the regulatory body in the process of promoting nuclear phase out should be further strengthened, as well as the independence has to be secured so that appropriate technical judgment can be made irrespective of government policy.

Also, in order to ensure and maintain the highest expertise of nuclear energy-related organizations, it is necessary to work closely with government, institutions and universities to recruit talented personnel and prepare adequate educational programs.

Although many factors of energy policies such as public acceptance on energy use, geographical environment, power supply and demand situation, degree of development of alternative energy technology, investment resources, etc., are different from other countries, there is a lot of time to completely shut down all NPPs in Korea.

This paper has significance in that, with references to problems arising during the policy promotion process and countermeasures of other countries, we have to properly benchmark according to our circumstances, in order to realize stable and successful energy transition.

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