

Construction of Nuclear Power Plants in UK and its Implications

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1. Introduction

UK was the nuclear leading country operating the world's first commercial nuclear power plant (hereafter NPP), Calder Hall, in 1956. After the privatization of the power industry in 1989, the economic feasibility of NPPs deteriorated and the construction was suspended for more than 20 years with the cancellation of 1995 construction plan. At the time, UK had enough energy-rich resources, including oil and gas from the North Sea.

Since the mid-2000s, the UK government has begun to review the role of nuclear power to ensure stable supply of electricity and response to climate change. With the gradual closure of old coal-fired power plants and the NPPs reaching the end of design lifetime in the UK, the UK government expresses its willingness to expand its use of nuclear power.

South Korea is in an energy security environment where it lacks energy resources and has difficulty in connecting the power grid with foreign countries. The reason why the UK has resumed the construction of new NPPs for the proper proportion of renewable energy and nuclear power even in a relatively good energy supply environment than South Korea needs to be examined closely and reflected into the South Korea's national energy policy. This paper examines the background and progress of the UK's resumption of construction of new NPPs, and draws out the implications for South Korea's energy policy.

2. Changes in Nuclear Use Environment

The UK government began the first civilian NPP in 1956. Under the Electricity Act, they decided to privatize the power industry in 1989. The UK government stated that the privatization of nuclear power would be beneficial to nuclear industry and consumers, and the governmental subsidies for new NPPs would be inadequate in the 1995 UK's Nuclear Review.

After the subsidy for construction of new NPPs was suspended, the discount rate was expected to be increased from 5% up to 11% due to the uncertainty of the construction project. For that reason, its economic feasibility was evaluated to be low and the construction of Hinkley Point C was canceled in 1995. Since then, the construction of new NPPs was halted until the UK government reaffirmed the role of nuclear power in the 2006 Energy Review.

The UK government was concerned about the diversification of its energy mix in the case of coal

power and nuclear power plants shutdown when replaced by only gas. They valued nuclear power as a source of low CO₂ emissions per unit of electricity production with little change in unit price. As a result, the UK government stated that new NPPs would be competitive in terms of carbon emissions reduction and power supply stability and make an important contribution to national energy policy objectives.

The Department of Energy & Climate Change (DECC) announced in November 2015 that nuclear power is an important source of energy for future energy security. They anticipated that nuclear power would supply 30% of low-carbon power by 2030 and create 30,000 jobs.

3. Factors for cancellation of NPPs

With the privatization of the power industry, the UK government has suspended subsidies for new NPPs. Accordingly, the economic feasibility was expected to deteriorate, because it was evaluated that the discount rate would rise and the estimated unit electricity price of nuclear power would be higher than natural gas and coal. After the privatization, it was a great burden to generate profit from the NPPs construction project. In the end, all NPP construction plans including Hinkley Point C were canceled in 1995.

In the early 1990s, the UK's oil and gas production in the North Sea had increased, and the available reserves were abundant, making it less burdensome to secure alternative power sources instead of nuclear power when the NPPs construction plans were canceled. In particular, in the UK, gas production increased rapidly, and the proportion of gas power generation from 1990 to 2000 went up from 2% to 39%.

The major reason for the cancellation of NPP construction plans was the negative evaluation on its economic feasibility after the privatization and retention of the abundant and relatively low-cost alternative energy resources such as oil and gas.

4. Factors for new NPPs construction

The main reason why the UK encouraged the private energy companies to invest in new NPPs and resumed their construction is that nuclear power is needed for energy security and climate change response.

First, in terms of energy security, the UK government expects a drastic reduction in the power generation capacity as old coal-fired power plants shut down gradually and the lifetime of existing NPPs is close to expiration. With the need for a new capacity to replace

it, the UK government plans to build new gas-fired power plants and thirteen NPPs (Total 17GWe). In addition, the UK's dependence on energy imports is increasing as the North Sea oil and gas in the UK are gradually depleted. Electricity imports and exports in the UK are also limited since the UK has connected with fewer countries on the power grid than France and Germany. Since the Fukushima accident, gas price has risen due to an increase of LNG demand in Japan and other countries, which has affected gas supply in Europe including the UK. Therefore, the need to secure power generation sources available for their stable supply is increasing.

In terms of responding to climate change, the UK's 2008 Climate Change Act aims to reduce greenhouse gas emissions by 34% by 2020 and by 80% by 2050 compared to 1990. The UK government accordingly introduced the Carbon Price Floor (CPF) in April 2013 to increase the cost of fossil fuel power generation to provide incentives for low-carbon technology development. In addition, the UK government has strengthened the Emissions Performance Standard (EPS) to regulate the amount of greenhouse gas that new power plants can produce per unit. The UK is reducing the use of fossil fuels in electric power generation, but in order to achieve the 2020 emission reduction target (34%), low-carbon power generation sources such as nuclear power, renewable energy and coal-fired with carbon capture technology will have to expand.

Therefore, the UK is pursuing the construction of new NPPs as a way to secure a stable supply source that can replace NPPs, the lifetime of which will expire soon, and to achieve a goal of reducing GHG emissions while mitigating reliance on energy imports.

5. Conclusions

It seems that the UK would try to reduce the portion of coal power generation while expanding nuclear and renewable energy, which are low-carbon power generation sources, in the future, thereby minimizing greenhouse gas emissions while ensuring a stable power supply. The proportion of nuclear and renewable energy power generation are expected to increase from 22% in 2016 to 36% in 2035 and from 25% to 46%, respectively.

South Korea aims to reduce its greenhouse gas emissions by 37% compared to Business As Usual (BAU) by 2030 in order to actively contribute to global climate change in an adverse energy security environment that imports more than 95% of energy from overseas. Therefore, the UK's efforts to respond to climate change and energy security through the construction of NPPs would be meaningful to Korea. Considering the situation in Korea where there is not enough alternative energy sources including renewable

energy, the role and contribution of nuclear power in energy security and climate change would need to be closely evaluated.

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