

The role of nuclear power generation in aspects of the foreign currency outflow

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1. Introduction

Korea has little domestic energy resources and so imported almost all of the primary energy consumed from the foreign countries, with the foreign energy dependency being about more than 97% in recent years. In the meantime, the import amount of energy together with the rapid economic growth has increased continuously during the past 30 years to be 49.6 billion dollar in 2004 while the Current Account Balance was 27.6 billion dollar in the same year. Especially, the growth rate of electric consumption greatly surpassed ones in GDP and primary energy over the past 20 years.

Nuclear power generation has played an important role in Korean society by supporting the industrial development as well as stabilizing downward the electricity price. The steady progress in the localization of nuclear construction has decreased the amount of foreign currency outflow by the nuclear power plant construction. In addition, nuclear fuel cost is the most competitive among those of the other fossil fuel power sources, so that this situation resulted in the large decrease of foreign currency outflow in power sector.

In this thesis, we focused on the savings effect in foreign currency outflow by nuclear power generation using the scenario method. We tried to evaluate what amount of foreign currency has been saved by the introduction of nuclear power plant instead of the other fossil fuel power plants.

2. Assumptions and Results

In this section, the basic assumptions and scenarios used in the analysis are described. The results also are summarized and are shown in the graphic form by period.

2.1 Assumptions

Since the commercial operation of the Korea's first nuclear unit 1 in April 1978, the time when nuclear power generation was begun actively is around the year 1986 that Kori 3,4 units began to operate commercially. Considering this situation, the year 1986 is chosen as the beginning year of this analysis and the year 2017 when is the last year in "The secondary basic plan of the electric demand /supply" published by MOCIE is adopted as the ending year of this study.

In order to evaluate the foreign currency's saving effects by nuclear generation, the total four scenarios are considered as follows : 1) BAU(Business As Usual) scenario which the past power mix and generations are maintained as they were and the future power mix in

"The secondary basic plan of the electric demand /supply" is adopted, 2) "Bitumin" scenario which nuclear power in BAU is substituted by the bituminous coal power only, 3) "Bitumin & LNG" scenario which nuclear power in BAU is substituted by the bituminous coal and LNG Combined Cycle power by the share of the respective actual or scheduled generations, 4) "Bitumin & LNG & REN" scenario which nuclear power generation in BAU is substituted by the bituminous coal power and LNG Combined Cycle power and renewable power generations by the shares of the respective actual or scheduled generations. The graphic presentation of the above scenarios is shown in figure 1.

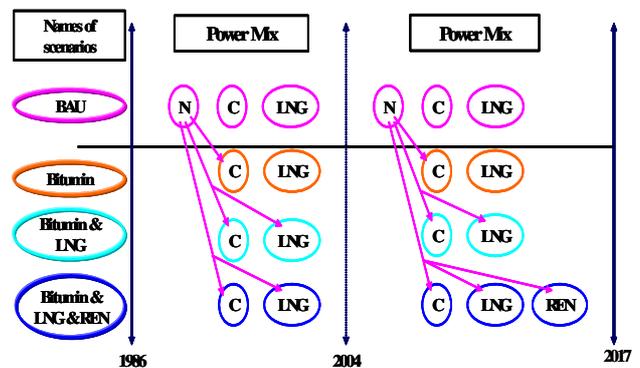


Figure 1. The characteristics of scenarios used in the study

The other assumptions used here are as follows.

- All cost data is expressed in constant price of 2004 by GDP deflators.
- The fuel prices after 2005 are equal to the one in 2004.
- Considering the uncertain energy situation in the future, the additional scenario which the coal and LNG fuel prices after 2005 are increased by 3% per year is separately analyzed.
- Total effect over the full period consists of two parts, one for the period of 1986 to 2004 and the other for the period of 2005 to 2017.
- The localization rates in nuclear construction are referred from the actual published data.

Table 1. Localization rates in nuclear construction

		Kori 3,4	Uljin 1,2	W.S. 3,4	Y.G. 5,6	After U.J. 5,6
Local Rate (%)	Equip.	29.4	40.2	69.0	78.6	78.6
	D. E.	37.3	46.0	55.9	95.0	95.0
	Const.	97.5	98.3	100	100	100
Foreign Currency outflow in construction (%)		62.4	55.5	34.2	23.6	21.6

- The full localizations in the fuel fabrications of PHWR and PWR are assumed to be performed in 1987 and 1990 respectively.

2.2 The main results

As said in the above, the period of result evaluation consists of two periods, the first one is standing for the actual result experienced and the second one for the expected result in the future.

The amounts of additional foreign expenditures by the alternative scenarios compared to the BAU scenario are shown in figure 2 and 3. The figure 2 is based on the total sum of foreign expenditures disbursed additionally to the BAU scenario and the figure 3 is showing the yearly mean cost of the total sum in figure 2. We can see that the additional cost in the future is more than the one in the past period due to the increase of nuclear generation in the future even though the future period is shorter than the past one. The result also informing us that “Bitumin” scenario in figure 2, the least additional cost scenario among the alternatives, which records the additional cost of more than 18 trillion won is not economical when considering the fact that the foreign currency outflow by BAU in the future period is about 10 trillion won.

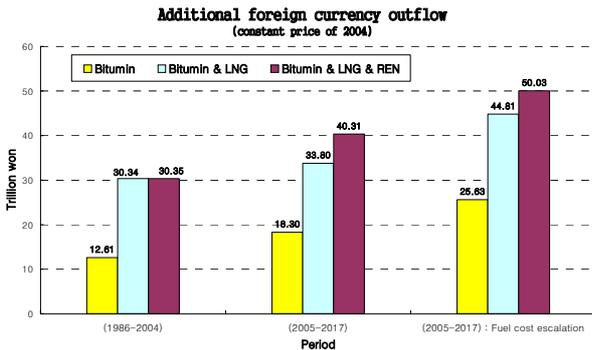


Figure 2. Additional foreign expenditures by scenario by period

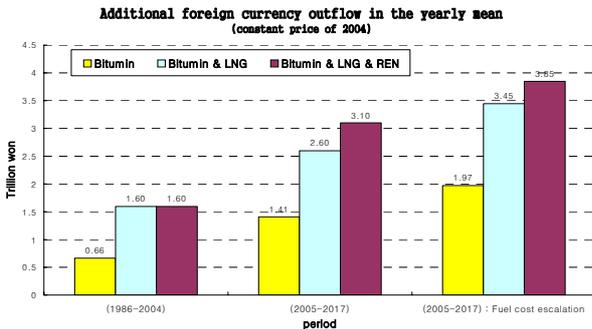


Figure 3. Additional foreign expenditures in the yearly mean by scenario by period

The figure 4 shows the case that the additional foreign expenditures in the yearly mean by scenario are compared to the Current Account Balance and the Energy Import by year. We can see the fact in this figure that the contribution of nuclear generation to the

Current Account Balance in the yearly mean cost amounts to be about 20% in the maximum during the period of 1986 to 2004.

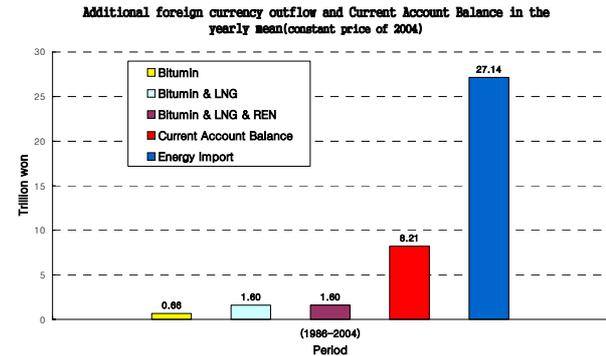


Figure 4. Additional foreign expenditures Current Account Balance in the yearly mean

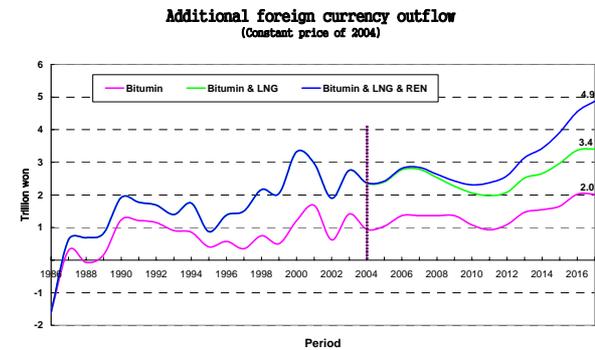


Figure 5. Additional foreign expenditures by year compared to BAU scenario

As seen from the figure 5, the additional foreign currency outflows to BAU scenario are expected to be about 1 to 5 trillion won since the year 2000. Especially the expansion of renewable energy share is supposed to accelerate the foreign currency outflow in the electricity section.

3. Conclusion

When considering the situation of energy resources in Korea, the lessening of energy import rather than the enlargement of export might be more crucial to Korean economy in the aspects of the sustainable and economically stable development. The savings of foreign currency outflow by nuclear power generation was considerably large when compared to the case of being substituted by the other power technologies. This savings might have been used in the production of other domestic industries and have induced the additional value added.

REFERENCES

[1] MOCIE, Statistics in The Electricity Section, 1997.
 [2] MOCIE, Yearbook of Energy Statistics, 2004.