

Positioning of a Peaceful Use of Nuclear Technology in National Security Aspects

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1. Introduction

Many cases have shown that a peaceful use of nuclear technology should play an important role in national securities such as energy, economic and science & technology securities, etc. It would be interesting to know what the positioning of the peaceful use of nuclear technology is in the national security aspects. In this paper, a positioning of nuclear power on various national security components is intended by using a positioning process that has been widely used for marketing. Findings can be used for directing further R&Ds to develop nuclear power technology.

2. Approach

2.1 Positioning

Positioning method was developed as a kind of marketing strategy. This method is aimed at strengthening the competitiveness of a product through identifying its position on the positioning map to discriminate its uniqueness from competing ones.

Jack Trout firstly used a positioning concept in his paper of the Journal of Industrial Marketing in 1969 [1]. This concept has been popularized since Jack Trout and his colleague Al Rices co-wrote the book of "Positioning - The Battle for Your Mind" [2], and then positioning concept has heavily affected an advertising market.

Positioning process can be applied to develop a nation's policy by comparing its uniqueness and effectiveness with a portfolio of policy options. Positioning would help find the best policy among various options to effectively achieve the policy goal. Furthermore action items identified by positioning would contribute to improving the quality and value of the policy.

2.2 National security concepts

National security is usually defined as protecting or enhancing all of the nation's values needed to achieve the national goal against various military or nonmilitary threats that can be possibly aroused domestically or abroad. To ensure a national security, appropriate measures should be taken against such threats through an integral operation of political means encompassing politics, diplomacy, society, culture, economics, defense, intelligence, science & technology and environment [3].

As mentioned above, a national security consists of various security components. A military security has been traditionally considered the most important component of national security, but not the sole. To achieve a true national security today, a nation needs other components of security, such as political security, economic security, social security, cultural

security, environmental security, and science & technology security [4].

The peaceful use of nuclear technology has affected various components of national security. For example, a stable supply of electric power by nuclear power plants has affected the national energy security, and an advancement of nuclear technology has contributed to the national science & technology security, etc.

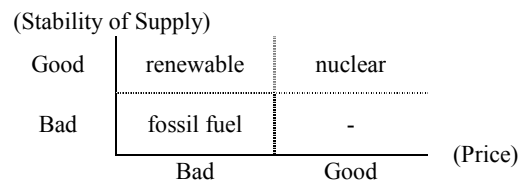
2.3 Application to electric power sector

This study only covers an area of electric power production by nuclear power plant. Fossil fuel and renewable power production systems were chosen as competitors. In order to do positioning, nuclear power was compared to competitors on four components of national security: economic security, science & technology security, environmental security and social security. Other components such as defense and political security were excepted because they are little affected by a peaceful use of nuclear technology.

For position mapping, proper attributes were selected for each security component such as electricity price and supply stability for economic security, technology-localization level and contribution to a green technology for science & technology security, contribution to the emission reduction of green house gas and public perception as a green energy for environmental security, and public acceptance and public perception of safe operation for social security. Comparison and mapping was implemented on the base of quantified data.

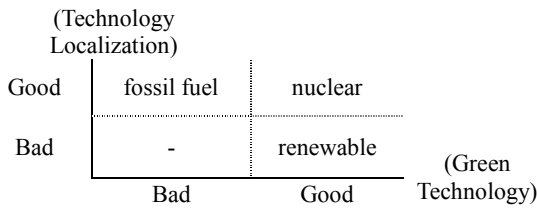
3. Results and Discussion

As shown in the Figure 1, nuclear power system has better position in terms of electricity price and supply stability than renewable and fossil fuel power systems. Renewable and nuclear energy could be considered non-imported energy resources while fossil fuel is almost imported abroad. Thus supply stability of renewable and nuclear power system is better than the fossil fuel power system. Regarding electricity price, nuclear power system has produced cheaper electricity than competitors [5].



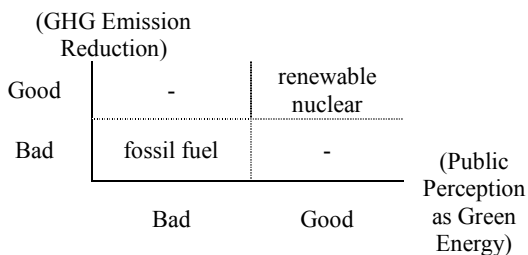
<Fig. 1> Positioning of Nuclear Power System in Economic Security Aspect

Figure 2 shows the positioning result of nuclear power system in science & technology security aspect. Nuclear power system has better position than renewable and fossil fuel power. Nowadays nuclear and fossil power plants are exportable technologies but renewable power system is not fully localized yet. In the view of a green technology, nuclear and renewable power technologies are recognized as new green technologies that are much contributable to future national economic growth because of their technological advancement[6]. Fossil fuel technology is almost fully localized but not an advanced green technology.



<Fig. 2> Positioning of Nuclear Power System in Science & Technology Security Aspect

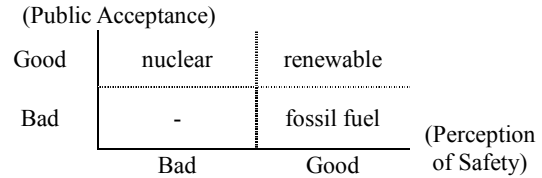
Figure 3 shows that nuclear and renewable power systems have better positions than fossil fuel in terms of an environmental security. Renewable energy is usually perceived as most environment-friendly one. So it is generally believed that renewable energy should devote to reduce the emission of green house gases (GHGs), i.e. carbon dioxide. In most studies on Life Cycle Assessment of energy sector on carbon dioxide emission, nuclear power should be the most to reduce GHGs emission [7]. Meanwhile nuclear power system has been sometimes a controversial issue regarding spent fuel management, and it has affected negatively the public perception of nuclear power as to green energy. The survey on future electric power system in the USA in 2009, however, showed that nuclear power might be more preferred to fossil fuel as means of future electric power supply [8].



<Fig. 3> Positioning of Nuclear Power System in Environmental Security Aspect

As shown in Figure 4, nuclear power system has worse position than renewable system with respect to a public acceptance but better than fossil fuel system. The opinion survey on necessity of nuclear power in 2009 [8] showed that 87% of Korean people replied nuclear power should be necessary for a stable supply of electricity. But this did not reflect the emotional environment on the consequence of Fukushima nuclear accident occurred in 2011.

Regarding perception of safe operation, nuclear power system has not shown such a good reputation in many surveys on public perception of nuclear safety [8]. So nuclear power system has worse position than renewable and fossil fuel systems.



<Fig. 3> Positioning of Nuclear Power System in Social Security Aspect

4. Conclusion

Key messages for enhancing positions of nuclear power system in national security aspects were derived as followings;

- Nuclear R&D should be more focused on development of safe and efficient operation technology of nuclear power plant for better positioning in economic security aspect;
- Active participation in uranium mining abroad should be considered to secure nuclear fuel resource for better positioning in economic security aspect;
- Spent fuel recycling technology should be developed as soon as possible for better positioning in economic, science & technological, environmental and social security aspects;
- Future nuclear technologies, such as Gen IV, SMART, etc., should be developed for new nuclear energy market worldwide for better positioning in science & technology security aspect;
- More efforts should be made to acquire more intellectual property rights in course of international nuclear R&D cooperation in better positioning in science & technology security aspect; and
- R&D on severe accident of nuclear power plant should be emphasized and carried out for better positioning in social security aspect.

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