Chapter 4

Major Findings and Next Step

Study on the Development of an Energy Security Index and an Assessment of Energy Security for East Asian Countries Working Group

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CHAPTER 4

Major Findings and Next Step

1. Key Findings

This year's study found the following.

1. Measuring the effects of policy is extremely important as a reference for future policy planning and for effectively allocating limited budgetary resources. In this sense, despite various restrictions, this research carries with it great significance because it attempts to qualitatively measure the existence of policy effects.

2. One ESI consists of multiple policies effect, making it difficult to qualitatively assess what effect which of these policies had on ESI changes. For example, changes in the TPES per GDP used to assess energy efficiency are affected by changes in energy consumption as well as changes in industrial structure.

3. However, when examining both ESI changes averaged out over a long period of time, such as five or ten years, and the existence of policy thought to be correlated to such changes, assessments showed a correlation existed between several policies and ESI.
   - Resource development promotion policy and R/C ratio
   - Oil dependence reduction policy and diversity in primary energy as well s power supply
   - Commercial energy supply policy or electrification rate improvement policy and commercial energy supply ratio or electrification rate
   - Energy saving policy and energy efficiency
   - Oil stock policy and oil stock amounts

Table 4-1 Correlation between policy and ESI

ESI	Number of Yes *	% of Yes ***
TPES self-sufficiency	6/12	50
Coal self-sufficiency	7/11	64
Crude oil self-sufficiency	4/6	**67**
Natural gas self-sufficiency	4/7	*57*
Coal R/P	6/8	**75**
Crude oil R/P	2/4	50
Natural gas R/P	1/6	*17*
Coal R/C	7/8	**88**
Crude oil R/C	5/5	**100**
Natural gas R/C	5/6	**83**
Coal import source country diversity	2/2	**
Crude oil import source country diversity	1/3	*33*
Natural gas import source country diversity	1/2	**
TPES diversity	9/10	**90**
Power generation fuel diversity	8/10	**80**
Crude oil Middle East dependence	0/3	*0*
Natural gas Middle East dependence	1/1	**
Reserve margin of generation capacity	5/9	*56*
Power outage frequency	4/5	**80**
Power outage duration	3/5	**60**
Commercial energy access	9/12	**75**
Electrification	9/9	**100**
TPES / GDP	10/11	**91**
TFEC / GDP	10/11	**91**
Days of on-land oil stocks	4/5	**80**
CO_2 Emissions / TPES	3/12	*25*
CO_2 Emissions / Fossil fuel	2/12	*17*
CO_2 Emissions / GDP	3/12	*25*
CO_2 Emissions / Population	1/12	*8*

* See Table 2-4-1 for the detail. "Yes" means that the country is assessed as there was a correlation between policy and ESI. Denominator represents number of countries which has relevant policy.
** sample country 2 or less.
*** **Bold** type number shows percentage of two third or more.
Italic type number shows percentage of one third or less.

4. Generally, policy requires a long period of time before it causes changes in the country's actual energy supply-demand situation. This is because investments in equipment and devices that use energy are typically large in nature, while such equipment and devices have a long service life, meaning that it is difficult to change energy supply-demand situation over a short period of time.

For example, several countries are implementing policy on climate change, and such policy has only been rolled out recently. Consequently, enough time has yet to pass until such policy has made changes in the energy supply-demand situation, making it impossible to verify the effects.

5. Conversely, there are also policy effects that cannot be verified even after a sufficient amount of time has passed since the policy was implemented. One example is dependence on the Middle East for oil supply. The study could not verify declines in dependence despite the existence of policy for such purposes. This is believed to be due to geographic reasons, or the fact that large amounts of crude oil are existing in the Middle East and that there is no other supply source in the Asia Pacific region large enough to replace the Middle East. Therefore, essentially policy effects are difficult to obtain.

6. A combination of multiple indirect methods is believed to be useful toward achieving targets for which policy has a difficulty exerting effects. For example, in the case of dependence on the Middle East for oil supply mentioned above, the fundamental purpose of policy is to avoid the serious geopolitical risks posed by the Middle East. This purpose can be achieved to a some extent by implementing multiple layers of policy, including reducing the use of oil for which the country depends on Middle East imports, preparing for supply interruption risk with the use of oil stocks, and providing support aimed at long-term stability in the Middle East.

7. The strength of regulations on the energy industries or energy markets is an important element that determines the effects of energy policy. The strength of such regulations become weaker in order of the following situations: (1) monopoly by state-owned enterprises; (2) private-sector companies play a leading role but business regulations are in place; and (3) private-sector companies play a leading role and deregulation has been implemented (market oversight remains in place using environmental / safety regulations or government administration)

   The situation where state-owned enterprises have a monopoly over energy markets in which regulations are strong is believed to be the easiest way to reflect policy intention more directly in the market over a comparatively shorter period of time. In many of the countries studied, all or certain important parts of energy markets where monopolized by state-owned enterprises and this proved to be effective in terms of the ease of implementing energy policy.

   In situations with strong regulations, however, the screening and management ability of the market regulator, government, largely determines market efficiency and the level of services provided to end consumers. Caution should also be heeded regarding the possibility that the heavy involvement of politics that typically occurs in such situations could inhibit policy execution.

8. Generally, it is believed that leaving the markets to open competition among private-

sector companies will result in more diverse services at a lower cost. However, it is important to note that private-sector companies essentially do not take action beyond economic rationalities.

For example, in the selection of power sources, if attempting purely to fulfill economic rationalities, most private-sector companies would choose subcritical pressure coal-fired power plants. However, this carries with it the potential to go against the requirements of energy security, which include risk dispersion through energy source diversification, reduced demand through improved energy efficiency, and environmental impact reductions. Energy security is a requirement of the nation that exceeds corporate behavior. As such, it is impossible to completely eliminate the involvement of the national government in a country's energy markets.

However, it is a proven fact that incorporating the capital, human resources and innovation of private-sector companies into energy markets will provide profits for the energy markets. Consequently, an appropriate balance should be struck between the government and private-sector companies depending on the unique situation of each country.

2. Next Step

This year's study looked into the past correlation between policy and ESI changes. It found that if ESI data can be obtained and organized, calculations can be made even for future situations. This means that ESI can be used to also measure the effects policy will have on the future. If the type of changes a certain policy will have on future ESI, or energy security, can be assessed, such information will be useful in making an informed decision when selecting policy.

In the next step, the first action will be to forecast demand using a measurement model and create a timeline of data that is extrapolated into the future. The demand forecast will incorporate the effects of policy implemented in the future. This will make it demand data for the future based on certain existing policy. Following this, these data will be used to calculate future ESI and analyze what type of changes policy based on demand forecasts will have on future energy security.

In selecting future policy, changes in the external environment and their impacts will need to be considered. The following are believed to be the external elements that will affect the energy security of East Asian countries in the future.

Economy

- Full recovery of the global economy and its impact
  - Will the global economy experience full recovery? When?
  - Will an economic recovery create tighter energy supply-demand conditions and cause energy prices to increase?

Supply

- Increase in unconventional oil and gas production and its impact
  - Will North America export large amounts of LNG to outside the region?
    → Will this bring about a loosened supply-demand balance in the global LNG market and lower prices?
  - Will other countries outside of North America, especially China, successfully develop unconventional natural gas?

Environment

- New post-Kyoto GHG emission reduction framework and its impact
  - Can a new and stronger framework be created? What status will East Asian countries be given?
  - To what extent will the greater use of non-fossil fuel energy (renewable energy and nuclear power) be encouraged?

The next important step will be to create a scenario on the changes that these external environmental factors will have and analyze the changes that future policy will have on future energy security. Based on this analysis, policy recommendations can be issued on further improving energy security of East Asian countries in the future.

Figure 4-1 Flow chart of calculation of future ESI