

Toward Choosing Energy Mix

Background and problems

Long-term strategy is important for resource-poor Japan

The Cabinet approved a new “Basic Energy Plan” in April 2014 after the plan was revised with no quantitative energy mix being depicted. The absence of quantitative energy mix picture, however, hinders proper energy investments and causes grave concern regarding sustainable economic growth and social development. We would like to appreciate the establishment of the Subcommittee on Long-term Energy Supply-demand Outlook to specify energy mix and the energy supply and demand balance structure in the future.

Japan features an extremely low self-sufficiency ratio in energy supply and depends almost entirely on imports for fossil fuel supply. Japan must build an appropriate long-term energy strategy to maintain a stable society without being shaken by growing international turmoil. To this end, Japan must work out an outlook based on data and clarify its impacts.

Energy supply and demand in 2030

Dependence on high-cost electricity sources will damage society

We conducted a quantitative analysis of an energy supply and demand picture that Japan can strategically select for 2030, using an econometric model with some uncertainties taken into account. Particularly, we developed four scenarios with attention paid to a power generation mix influenced strongly by renewables and nuclear use policies (Table 1).

Table 1 | Outline of scenarios and power generation mix (2030)

| | Scenario I | Scenario II | Scenario III | Scenario IV |
|------------------------------|------------|-------------|--------------|-------------|
| Renewables | 35% | 30% | 25% | 20% |
| Thermal | 65% | 55% | 50% | 50% |
| Nuclear | 0% | 15% | 25% | 30% |
| Electricity generation (PWh) | 1.1 | 1.2 | 1.2 | 1.2 |

The energy mix for the power generation sector accounting for 30% of energy consumption can greatly influence the economy and environment as well as energy supply and demand.

Adverse impacts on the economy will be remarkable in the *Scenarios I* and *II* where Japan will increase its dependence on high-cost electricity sources (Table 2). This means that electricity price rises and growing fossil fuel import spending will harm Japan’s competitiveness and purchasing power. As a result, the maximum gap in real gross domestic product between the scenarios for 2030 could be JPY10 trillion. In the *Scenario I* where Japan will depend only on fossil fuels and renewables, 5% of the future GDP growth in the *Scenario III* utilising nuclear will be lost.

Table 2 | Comparison of impacts

| | | 2010 | 2013 | 2030 | | | |
|-----------------|---|------|------|------------|-------------|--------------|-------------|
| | | | | Scenario I | Scenario II | Scenario III | Scenario IV |
| Economy | Power generation-related costs (JPY/kWh) | 8.6 | 14.8 | 21.0 | 19.0 | 16.4 | 14.8 |
| | Real GDP (JPY2005 trillion) | 512 | 531 | 684 | 690 | 693 | 694 |
| | Fossil fuel imports (JPY trillion) | 17.8 | 28.1 | 33.7 | 32.2 | 31.6 | 32.0 |
| Environment | CO ₂ emissions (percent change from FY2005) | -7 | 2 | -20 | -24 | -26 | -26 |
| Energy security | Energy self-sufficiency ratio (%) | 18 | 7 | 19 | 25 | 28 | 28 |
| | LNG imports (Mt) | 70.6 | 87.7 | 84.4 | 69.7 | 65.3 | 70.0 |

These macroeconomic impacts will spill over to the employment situation and household budgets. Unemployment in the *Scenario I* will amount to 300 thousand people more than in the *Scenario III*. For workers free from unemployment, the average wage will be JPY40,000 less. The income decline will coincide with electric rate rises.

Energy-related carbon dioxide emissions will be the lowest level among the scenarios in the *Scenarios III* and *IV* where renewables and nuclear as zero-emission power sources will account for 50% of electricity generation. At the same time, security will be ensured most, because renewables and nuclear are domestic or quasi-domestic resources. From the viewpoint of environment and security, it is important to appropriately use both renewables and nuclear rather than exclusively choosing renewables or nuclear.

Choosing energy mix

Desirable energy mix and policy direction

The energy mix set by the government should be a target backed by policy measures. The government should fully take into account long lead times and lifetimes peculiar to energy and environment technologies and equipment, technological innovation speed, and physical, social and political constraints on the introduction of these technologies. Based on these factors, the government should work out a feasible energy mix. The government should also regularly review policy progress and timely revise the target energy mix in consideration of domestic and overseas energy, economic and environmental situations.

The principle of “Three Es and S” (energy security, environment, economic efficiency and safety) for energy policy is an everlasting evaluation standard. Fossil fuel conservation and the expansion of the self-motivating energy ratio will be indispensable since energy security and climate change measures should be continuously enhanced. The government should timely implement an appropriate policy for achieving goals in a manner to minimise costs for society.