Japan's Energy Mix Debate and Its Implications for the World

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In April 2014, the Cabinet decided on the fourth Strategic Energy Plan spelling out Japan's basic energy policy guidelines. In July 2015, the government released a long-term energy supply and demand outlook (energy mix) based on the strategic plan. Discussions through the decision on the strategic plan and subsequent actions include useful factors for other countries. The following summarizes major relevant issues:

Energy Policy Challenges Japan Faced after the Earthquake Disaster

The latest strategic plan is based on the concept of "S" plus the traditional "3 Es": **safety, energy security, economic efficiency and environment.** Energy security is always important for resource-poor country such as Japan. That's why Japan rapidly expanded the use of nuclear power as a quasi-domestic energy source after the oil crises.

The previous strategic plan, which was prepared in 2010 with consideration given to global warming prevention, called for increasing clean electricity sources' share to 70% by 2030 under the assumption of progress in electrification. In the latest plan, nuclear energy has to be revised as it was set to account for 50% of total electricity generation as a part of the 70% in the previous plan.

The biggest point for reconsideration was the myth of safety regarding nuclear technology. Designers of the plan called for basing nuclear energy management on the principle that no technology can be completely safe (free from risks) as far as humans engage in operating technologies. Given the creation of the Nuclear Regulation Authority as an independent regulatory agency, meeting international standards and the preparation of particularly tough safety standards, nuclear safety was adopted as the base of the approach for the latest plan.

Energy security is indispensable for Japan that heavily depends on imports for energy sources required to support our economic and social activities. The strategic energy plan aims for the long-term, comprehensive and systematic implementation of energy policy for Japan plagued with such vulnerability. Major environmental changes in Japan and the rest of the world prompted the strategic plan to be adjusted substantially. In Japan, the nuclear power plant shutdown has forced fossil fuel imports to rapidly increase, causing the trade deficit to expand. Concerns have grown over rising costs, negative impacts at the macroeconomic level and the increase in vulnerability of fossil fuel supply. Energy resources exporters including the Middle East and North Africa have continued to suffer from destabilization. Therefore, the latest plan reaffirmed the importance of diversifying energy sources and suppliers and also recognized the need for making Japan's

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domestic energy supply networks more resilient by enhancing emergency supply arrangements and securing flexible electricity supply including wide-area grid connectivity.

Substantial energy cost reduction (**economic efficiency improvement)** is another pillar of the strategic plan and energy mix. International cost gaps greatly affect the international competiveness of enterprises, Japan's industrial structure and economic growth. In addition to the restart of nuclear power plants, the creation of an Asian liquefied natural gas market for improving the liquidity and transparency of LNG transactions, the improvement of the feed-in-tariff system for renewable energy and other efforts are being implemented to reduce costs.

Similarly important is energy conservation and the further improvement of energy efficiency. While Japan has already achieved one of the highest energy use efficiency levels in the world, the energy mix assumes substantial gains in energy savings equivalent to those of the 20 years that followed the first oil crisis. Not only the manufacturing sector, but the services sector and households are required to further improve energy use efficiency. Important for an effective energy conservation program is that users understand their energy consumption data and take actions based on specific information. While information and communication technologies may be necessary for optimizing energy use, it is important for consumers to make choices according to their needs based on their respective knowledge, as the range of options for consumers is expanding owing to market reforms. Overall efficiency improvements at the systems level are also required.

For the enhancement of the "**environment**," Japan has dramatically expanded its renewable energy power generation capacity, mainly solar, on the strength of the FIT system launched in 2012 after the March 2011 Great East Japan Earthquake. Renewable energy rivals nuclear power as a clean energy source. As the government came up with a policy of reducing its dependence on nuclear power, including restrictions on nuclear plants that are more than 40 years old, it is important for Japan to expand the renewable energy use. Meanwhile, incorporating large amounts of electricity generated from volatile energy sources, such as solar and wind, into regional grids has entailed various problems, increasing the cost burdens on citizens. Continuous considerations are required for specific measures to support electricity supply and for balancing supply and demand, after completion of the electricity system reforms including the deregulation of the retail market.

Safety, energy security, economic efficiency and environmental adaptation are important for Japan. Specific initiatives will continue to pursue these challenges and secure safe energy supplies in line with the energy mix given as a target based on the strategic plan.

Implications for the World

The world's energy mix cannot be considered without each country's national circumstances and conditions being taken into account. Priority orders of energy sources differ from country to country, depending on resources endowments, development phases, and economic and social systems. The following summarizes key points for the world under the concept of "S plus 3 Es" as is the case with Japan.

【Safety】

It is natural to base any technology use on safety. A lesson learned from the Fukushima incident was one of complacency with the “myth of safety”, indicating that overconfidence in nuclear technology could cause dangerous and great problems. Japan has reaffirmed that it should depart from overconfidence, assume the absence of absolute safety, consider and prepare for emergency situations from various angles and conduct “probabilistic risk assessment” to assess the probability of risks. Careful risk communications are required for the ordinary citizens to gain an understanding of highly specialized information. It is even more important to promote a correct understanding of the energy issues while departing from the myth of safety. While people grew interested in nuclear energy on concerns over electricity shortages, Japan plunged into a dilemma where as more experts explained about the necessity of nuclear power, the more listeners distrusted nuclear energy.

People must always have sufficient knowledge to make objective decisions in energy debates. It is also important to share a culture of reducing risks to tolerable levels rather than that of the “zero related risk”. Consumers in any country should be interested in energy and enhance their understanding for their choices.

【Energy security】

As an event tends to instantly affect all national economies amid the economic globalization, securing stable energy supply is indispensable for energy consuming countries that heavily depend on energy imports. Based on oil crisis experiences, oil-related initiatives have made progress, including the development of systems for emergency stock piling and flexible supply, and the regularization of information sharing meetings between oil producing and consuming countries. For gas, whose consumption will continue increasing, preparations for emergency situations are urgently required in addition to cooperation between gas consuming countries and talks between gas producing and consuming countries.

【Economic efficiency】

Efficient energy supply is indispensable even for energy producing countries with growing domestic demand and developing countries with energy access problems. The termination of energy subsidies and the conservation of energy can lead to energy use by more people, investment and cost savings and greater energy efficiency with waste held down. Many countries have accumulated energy conservation policy experiences. Enterprises have accumulated know-how for efficient energy use and continue to develop relevant technologies. Global energy conservation potential is huge, including the development of energy-saving products for low-income people in emerging and developing countries and assistance for planning cost-effective policies to promote energy conservation in growing countries,

【Environmental adaptation】

Global cooperation is required to cope with global warming that will affect us for centuries.

Greenhouse gas emission reduction targets given by more than 190 countries before the 21st Conference of Parties to the United Nations Framework Convention on Climate Change indicate that summation of these reduction targets do not meet the level required to achieve the two-degree target. However, the large number of participants in the reduction is appreciable.

The latest report by the Intergovernmental Panel on Climate Change calls for global GHG to be eliminated by 2070. While countries tackle energy strategies and climate change measures, the report indicates a level (i.e. negative emissions past 2070) that cannot be accomplished with technologies which are currently expected to become available alone. Countries will have to promote the development and diffusion of innovative technologies in a manner harmonized with economic growth through international cooperation over a long term.

Conclusion

Japan has reaffirmed the importance of diversifying energy supply sources as a result of the latest great earthquake disaster. Desirable energy sources differ from country to country, depending on development stages, energy use conditions and domestic resources. However, the importance of using various energy sources in a balanced manner will remain unchanged in the absence of any versatile energy source.

Energy security is a globally common challenge. While uncertainties grow about energy and environment problems, relevant challenges grow complicated with changes accelerated. Countries are required to share information on innovative policy initiatives, learn from other countries' ideas and failures and cooperate in diffusing existing technologies. Thus, international cooperation is growing more important.

The world is expected to depend on fossil fuels for more than 70% of energy needs even in 2050. The reduction of energy-related carbon dioxide emissions holds the key to resolving the global warming problem while some countries are still required to tackle air pollution. Energy consuming and producing countries, and emerging and developed countries must cooperate in developing and diffusing innovative technologies to solve challenges such as sustainable energy use harmonized with economic and social activities and cleaner use of fossil fuels.

Writer's Profile

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Yukari Yamashita is a Board Member for the Institute and Director in Charge of the Energy Data and Modelling Center. Yamashita is responsible for quantitative and qualitative analyses on energy policy issues. In the aftermath of the tsunami and nuclear incident, her team's analyses and recommendations contributed greatly to the electricity saving campaign and continue to this day to contribute to the debate regarding a national energy mix for Japan. She has been serving as a member of various government councils and committees in the fields of energy and science & technologies. She has been leading miscellaneous international and regional programs in the area of energy cooperation through IEA, APEC, ERIA and IPEEC.