Trends in Japanese Energy Policy & the "Innovative Energy Strategy"

Author Keigo Akimoto

By Keigo Akimoto

Introduction

As a consequence of the Great East Japan Earthquake of March 11, 2011 and the resulting accident at Fukushima Daiichi Nuclear Power Plant, the public lost faith in nuclear power; it was inevitable that Japan's energy and global warming policies would undergo a major change in direction. Reflecting on the Fukushima Daiichi accident and applying the lessons learned, efforts to improve the safety of nuclear power must be continued. At the same time, modern civilization is based on energy and it is critical, both to ensure international industrial competitiveness and to sustain our affluent lifestyle, that energy be supplied stably and inexpensively. Consideration for the environment is also an important factor related to energy use. Approved by the Cabinet in April 2014, the first post-earthquake Strategic Energy Plan stressed the importance of seeking a balance among energy security, economic efficiency, and the environment based on the premise of safety assurance (3E+S). In accordance with the basic policies outlined in the plan, the Long-term Energy Supply and Demand Outlook — a forecast of the energy supply-and-demand structure for 2030 and a vision of the ideal energy mix — was finalized in July 2015.

At the same time, progress has been made in reforming the electric power system since the accident at the Fukushima plant; entry into the retail electricity sector, including residential, was liberalized in April 2016, while the legal unbundling of electricity transmission and distribution and the abolition of retail price controls are scheduled to occur in April 2020. Because uncertainty about income from future electricity sales will grow as electricity liberalization leads to a tougher competitive environment, electric power providers tend to choose investment activities that seek relatively short-term profits. In addition, there is greater uncertainty about energy policy, nuclear power policy, and nuclear power regulation now than before the earthquake and nuclear crisis; this creates greater risk for electric power providers, including those that generate nuclear power. Further, the government of Japan, as a means to counter climate change, has submitted a draft commitment to the United Nations Framework Convention on Climate Change (UNFCCC) to achieve, by 2030, a 26% reduction in greenhouse gas emissions compared with fiscal 2013 levels. In the midst of electric power liberalization and growing risks for the nuclear power business, there is also a need to move forward with large-scale reductions in greenhouse gas emissions.

In this context, on April 18, 2016, the Japanese government established the Innovative Energy Strategy to prepare comprehensive policy measures for achieving the determined energy mix. This paper presents an overview of this strategy, taking its background into consideration, and discusses issues for the future.

Strategic Energy Plan & Long-term Energy Supply & Demand Outlook

Strategic Energy Plan

The introduction to the Strategic Energy Plan as approved by the Cabinet in April 2014 notes that energy security is an issue of ongoing importance for Japan due to the country's reliance on overseas sources for fossil fuels, and commits to confronting the despair felt by those affected by the Fukushima nuclear accident — to stand with them in making every effort to bring about Fukushima's reconstruction and recovery.

In addition, in Chapter 2, Section 1.1 the document confirms the basic viewpoint of 3E+S — energy security (stable supply), economic efficiency (low-cost energy supply through improved efficiency), environmental compatibility, and safety — while also noting the importance of incorporating both international and economic growth perspectives when planning energy policy. It then lays out the aim of taking advantage of the strengths of each energy source, while supplementing the weaknesses of each, to achieve a realistic, multilayered energy supply and demand structure.

Chapter 3, Section 3 notes that renewable energy is a promising, diverse, and important source of domestically produced energy, and that the government is accelerating its adoption of renewable energy for a period of three years and will continue to promote it energetically beyond that term.

Nuclear power — because it offers outstanding efficiency and stability of supply, has low operating costs with little fluctuation, and emits no greenhouse gases during operation — is positioned as an important base-load power source that contributes, based on the premise of safety assurance, to a stable energy supply and demand structure. In addition, based on the premise that safety is the highest priority and that every effort will be made to alleviate the concerns of the people, the plan addresses the safety of nuclear power by indicating that the government will defer to the expert judgment of the Nuclear Regulation Authority (NRA) and work to restart those nuclear power plants that the NRA has determined conform to

regulatory standards that are the most stringent in the world. Dependency on nuclear power will be reduced as much as possible through energy conservation, the adoption of renewable energy, and improved efficiency of thermal power generation.

Long-term Energy Supply & Demand Outlook

In July 2015, based on the Strategic Energy Plan, the government settled on a Long-term Energy Supply and Demand Outlook that indicates a specific energy mix for 2030. Major principles in drawing up this energy mix include, based on 3E+S and the premise of safety assurance: 1) raising the energy self-sufficiency rate to a level higher than prior to the Great East Japan Earthquake (roughly 25%); 2) lowering the cost of electric power below current levels; and 3) setting a target for the reduction of greenhouse gases comparable to those of Europe and the United States. Thoroughgoing energy conservation efforts and promotion of the adoption of renewable energy will be used to reduce the level of dependency on nuclear power as much as possible.

Anticipating an annual GDP growth rate of 1.7%, the document estimates a 13% reduction in final energy consumption, and a 17% reduction in electricity demand, compared to before the implementation of energy conservation and global warming response measures *(Chart 1)*. It anticipates energy conservation and emissions reductions to be particularly substantial from the commercial and residential sectors *(Chart 2)*. The power source mix presented includes 26% coal, 27% LNG, 20–22% nuclear, and 22–24% renewables. This energy mix can also be seen as designed to fit within the narrow domain that simultaneously satisfies each of conditions 1–3 above. Cost increases associated with this energy mix are anticipated to be relatively large with respect to renewables, but there is an overall balance that prevents costs from rising too much *(Chart 3)*.

Innovative Energy Strategy

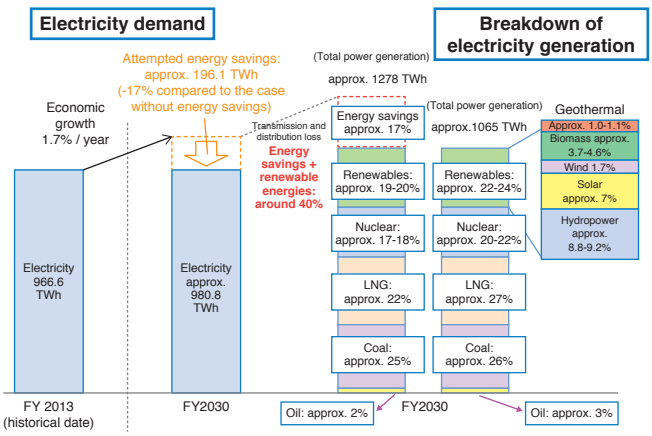
The government of Japan finalized its Innovative Energy Strategy in April 2016. This follows from the recognition that achieving the above energy mix in an environment of across-the-board retail electricity liberalization requires that the government, rather than leaving things to operators, develop comprehensive and well-balanced policy measures that integrate energy conservation, renewable energy, and related systems. As a result, the government committed to enable expansion of energy-related investment in areas such as energy conservation and renewable energy, to encourage efficiency improvements, and to contribute to reaching the Abenomics target of bringing GDP to 600 trillion yen while reducing CO_2 emissions in check.

The Innovative Energy Strategy Perspective

The Innovative Energy Strategy establishes the goals of: 1) promoting intangible as well as tangible forms of "technological innovation" (adoption of new technology) such as innovation that seeks further efficiencies through high-level control by enabling real-

CHART 1

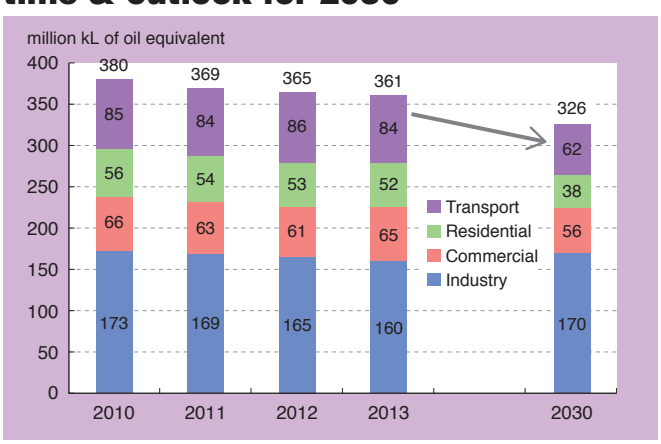
Electricity demand in the long-term energy supply & demand outlook



Source: Long-term Energy Supply and Demand Outlook

CHART 2

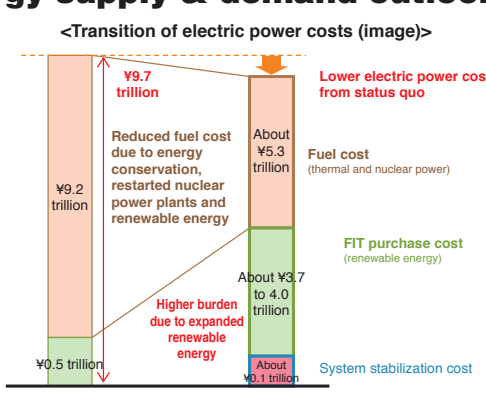
Japan's final energy consumption over time & outlook for 2030



Source: Long-term Energy Supply and Demand Outlook

CHART 3

Electricity costs in the long-term energy supply & demand outlook



Note: Renewable energy introduction costs budget purchase cost. This includes escapable cost, but fuel cost is reduced for that.
Power generation fuel cost is estimated based on the power generation fuel input (private power generation included) in the comprehensive energy statistics and the fuel import prices in the trade statistics.
Data Source: Long-term Energy Supply and Demand Outlook

time communication between consumers and suppliers using smart meters or Internet of Things (IoT) technology; 2) encouraging "player innovation" (the appearance of new players in the energy industry) by furthering energy system reforms including retail electricity liberalization that will lead to new entrants and to collaborations across different types of business, stimulate the move toward more diverse rates and services, and expand investment in energy; and 3) furthering "structural innovation" (new approaches grounded in actual conditions) by not only bolstering energy conservation within each industrial sector but also further promoting integrated energy conservation efforts that span all industries — including distribution and services and whole supply chains from large corporations to small- and medium-sized enterprises (SME) — as well as energy conservation efforts, including traffic flow measures, in the transport sector that go beyond merely improving automobile fuel efficiency.

Examples of Concrete Measures

There is a wide range of possibilities for energy conservation, which demands fine-grained measures and policies. In order to achieve thoroughgoing energy conservation, both in each sector and across sectors, the government is engaged in a variety of energy conservation measures organized under the comprehensive Innovative Energy Strategy. A number of examples are described below.

(1) Expansion of the Top Runner Program

A high level of energy conservation has already been achieved in the industrial sector, dramatically improving energy consumption per unit of GDP, but in order to encourage more businesses to try to achieve Top Runner levels of energy conservation in their own industry the government has committed to expanding the benchmark system to include the distribution and services industries and to deepen the benchmark system for those industries that already have one.

(2) Bolstering Energy Conservation for SMEs, Residences, and Transport

In order to promote investment in energy conservation by SMEs, the government will provide support, in addition to existing subsidies for energy conservation by workplace unit, in the form of subsidies for energy conservation investment by equipment unit. It will also develop a platform for establishing a national-scale contact point for supporting energy conservation efforts.

Also, in order to raise energy conservation performance for existing homes, it will support, as part of efforts to invigorate the home remodeling market, insulation repairs such as the installation of high-performance windows, sashes, and insulation, doubling energy conservation renovations by 2020. At the same time, the government will also require that newly built homes and other buildings be in compliance, phased in through 2020, with energy conservation standards.

In the transport sector, in addition to subsidizing part of the purchase cost of fuel-cell vehicles (FCV) and electric vehicles (EV), the government will also support preparation of charging infrastructure for EVs and plug-in hybrid automobiles as well as hydrogen stations for FCVs.

(3) Expansion of Renewable Energy

With respect to the feed-in tariff (FIT) scheme for renewable energy, a focus on mega-solar projects has led to growing costs to the public even as grid constraints have limited the adoption of other forms of renewable energy. As a result, the government has been reviewing its approval scheme and addressing projects that have not yet gone into operation. In addition, in order to ensure cost-effective adoption and an expansion of energy sources that have longer lead-times, the government has reviewed FIT and related schemes and recently submitted a reform bill to the 2016 ordinary Diet session.

The government has committed to working to accelerate the environmental assessment screening process for wind and geothermal power projects, and also to take a long-term perspective in identifying — and targeting for research and development support — promising next-generation alternative energy sources such as offshore wind power and ocean energy.

(4) Efforts to Reduce CO_2 Emissions from Electric Power

Under across-the-board retail electricity liberalization, it is necessary to design a system that promotes investment in power sources by new entrants while also reducing CO_2 emissions. So far, major operators in the electric power industry have announced a voluntary framework and a commitment to a low-carbon society (targeting an electricity emissions factor of 0.37 kg-CO_2/kWh, consistent with the energy mix). The Electricity Business Council for a Low Carbon Society was also launched, creating a framework for implementing the PCDA (Plan-Do-Check-Act) cycle. Fundamentally, the idea is that the target be achieved within this voluntary framework, but the government has also decided to implement support measures such as, at the power generation stage, improving power generation efficiency under the Energy Conservation Act and, at the retail stage, establishing through the Act on the Rational Use of Energy the target of deriving 44% of electric power sold from non-fossil fuel sources.

Examples of New Developments

In the Innovative Energy Strategy, the government commits to implementing the kind of measures described above and also to working toward new developments such the following. 1) In a paradigm shift in energy conservation policy, and in order to achieve economic growth (1.7%/year) and energy conservation simultaneously, the government focuses on developing measures that support improving energy consumption per unit of GDP. It also commits to undertaking measures to improve selection of appropriate equipment to ensure that energy-using devices do not exceed specifications. 2) To create a low-carbon electricity market and restructure the renewable energy industry, the government is

working to create an environment that fosters continuity in stable renewable energy over the long term by, for example, seeking a shift in solar power generation from businesses centered on the adoption stage toward those with more comprehensive operations that incorporate sustainable management and are focused on supplying stable electric power over the long term. 3) In terms of energy industry innovation utilizing the IoT, the strategy mentions efforts to reduce the cost of storage batteries and to improve telecommunications standards for the remote control of energy devices. 4) As a means of building a strategy for the post-2030 hydrogen society, the strategy commits to pursuing research and development and demonstrations related to the construction of a hydrogen supply chain, including the import from overseas of CO_2-free hydrogen derived from renewable or unutilized energy and the utilization of Power-to-Gas technology to expand adoption of hydrogen power sources and renewable energy. 5) To make the "Fukushima new energy society initiative" a reality, the strategy includes measures such as the adoption of renewable energy, the acceleration of research and development, and hydrogen demonstrations.

Conclusions & Issues

Energy policy has regained a sense of cool-headedness under the current administration and the Strategic Energy Plan and Long-term Energy Supply and Demand Outlook are moving in a positive direction. The Innovative Energy Strategy, too, makes generally reasonable assumptions and on the whole constitutes a positively-oriented strategy. However, the situation concerning Japan's current energy policy, including the Innovative Energy Strategy, involves many concerns that must be kept in mind, some of which I wish to outline below.

A variety of measures are available including regulations, taxation, subsidies, and voluntary efforts (including those induced by the prospect of regulation). It is important to engage in comprehensive efforts and to select the method appropriate for each energy-related field. In this sense, the Innovative Energy Strategy seeks to incorporate a variety of methods in appropriate ways and generally holds up well to evaluation. In particular, as the energy system undergoes reform there will be a need to create fine-grained measures going forward, a need the strategy consciously seeks to address.

Government measures to respond to failures of the market can, however, become government failures if they are excessive or inappropriate. FIT, with its inappropriate market design, might be called a classic example. In order to prevent creating new government failures, it is important to deliberate cautiously to avoid excessive market intervention and to leave room for flexibility in reviewing measures once implemented.

The Innovative Energy Strategy emphasizes a response that seeks to balance energy conservation with economic growth but there are questions about whether it is really possible to accomplish this under the given strategy. In particular, there has been a strong positive correlation between economic growth and demand for electric power in Japan in the past, and this can also be seen recently around the world. Indeed, the Innovative Energy Strategy itself does not necessarily make a convincing case that annual economic growth of 1.7%, as indicated in the energy mix, can be achieved together with a 17% saving in power consumption.

Energy is a product that is difficult to differentiate. This tends to make cost the most important factor when making a selection and encourages substitution rather than the expansion of new value. The strategy anticipates 28 trillion yen in energy-related investment in energy conservation, renewable energy and the like in 2030, including 1 trillion yen in hydrogen-related investment, but investment capability is something generated by a favorable economic environment.

In order to create such a favorable economic environment is it critical to invest effectively not just in energy but also in the economy as a whole. Among those countries where energy has already spread, some question whether investing in the energy field, where differentiation is difficult, is really a better investment than other fields.

In other words, there are concerns about whether we are in a situation where social utility in the energy field is greater than in other fields, or whether can we expect such a situation to occur in the future, and it seems we need to think about this carefully and dispassionately as we keep an eye on trends in technical innovation. In any case, it is important to create a positive economic cycle while encouraging investment in energy conservation.

In closing, I would like to touch on the issue of nuclear power under reform of the electric power system. Although the Innovative Energy Strategy includes reference to a framework for encouraging low-carbon electric power, it barely mentions nuclear power itself. Nuclear power generation is an inexpensive source of power when it operates stably over the long term. The more competitive environment brought about by reform of the electric power system, however, creates uncertainty about whether electricity produced in the future can actually be sold, which encourages relatively short-term investment decisions.

This could lead to a failure of the market that has an especially large impact on sources of power such as nuclear power that require large initial investments and long-term operation. This is even more the case in an environment where there is enormous uncertainty about nuclear power regulations and other aspects of nuclear power policy.

The government, therefore, in order to rectify possible failures of the market, needs to develop appropriate policy measures, and should do so quickly. JS

Keigo Akimoto is chief researcher and systems analysis group leader at the Research Institute of Innovative Technology for the Earth (RITE).