

TEPCO Must Restore Nuclear Power to the State (Taisei Hokan,) and the Government Must Have Courage in Presenting Its Vision of Nuclear Power

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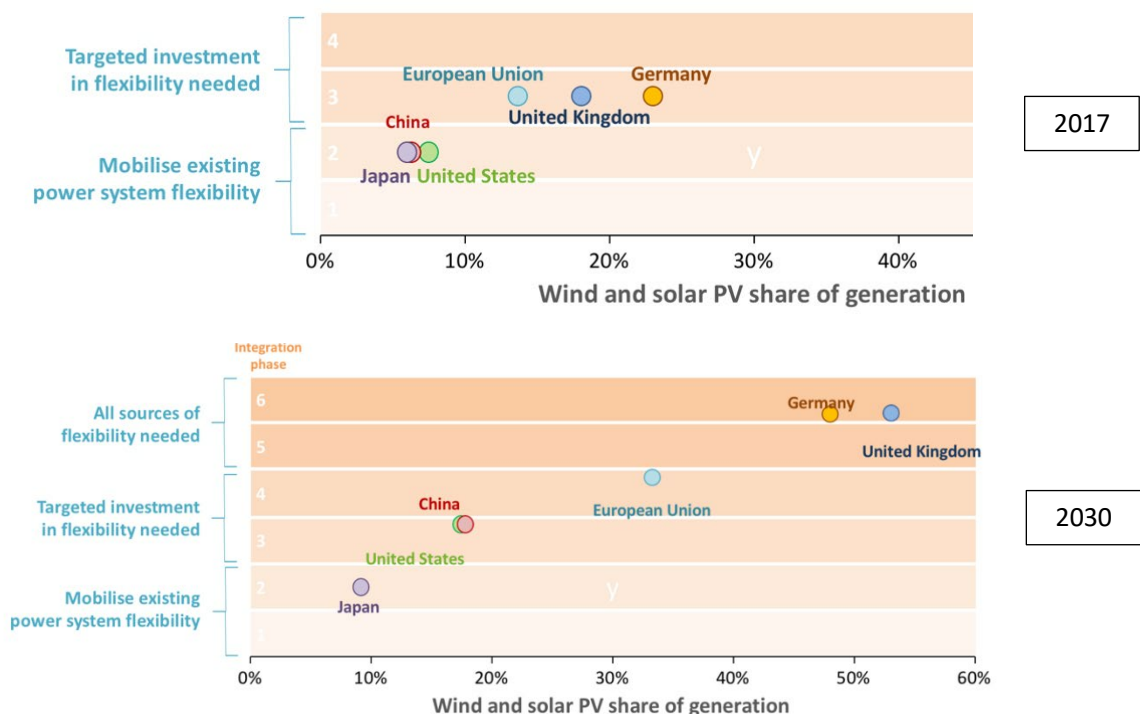
Japan needs to completely transform its energy system. The first reason is related to energy security, or in other words the need to reduce imports of oil and gas from the Middle East. The second reason is because of the need for global warming countermeasures, including achieving significant decarbonization by 2050. To that end, in the short-term, there is a need to substitute oil and coal for natural gas, which is relatively cleaner and is supplied by various countries; in the medium- to long-term, it is necessary to carry out major reforms on the energy supply structure by reducing the supply of import-dependent fossil fuels and increasing the supply of nuclear power and renewable energy, which are produced domestically.

In reality, the cost of renewable energy has fallen rapidly as a result of technological advancements and growth in demand. According to the International Energy Agency (IEA), solar power will become the cheapest new power source in many countries in the future. To be sure, in places such as Texas and the Middle East, the cost of solar power generation can fall below 2 cents per Kwh. The problem, however, lies in fluctuations due to time and seasons. According to IEA's World Energy Outlook for 2018, the flexibility of the electrical market holds the key to reducing costs by using a large volume of fluctuating renewable energy. Minor adjustments to the daily electrical supply operations are adequate at the earlier stages of implementation; however, in the later stages that usage increases, it is necessary to mobilize all the available technologies and systems before wind and solar power can supply all the electricity needed. This includes strengthening the connectivity for electrical power grid lines, developing the wholesale power market and electricity storage technology, as well as a Smart Grid system that electronically carries out the management of demand. At higher stages than that, IEA points out that it will even be necessary to make significant changes to the entire energy supply system in addition to the power system. Fig. 1 shows changes in each country until 2030, based on forecasts drawn up by IEA. Europe is taking the lead by changing the system across the whole of Europe (EU Energy Union) in order to further expand the use of wind and solar power on a large-scale, while the United States and China (as well as India) are gradually changing their direction toward the mass use of renewable energy. Japan is lagging behind significantly. IEA estimates that dependency on wind and solar power will not reach 10% even by 2030. The background behind this situation lies in the lack of incentives for electric utilities to purchase more wind and solar power, despite many plans

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to install solar and wind power generation facilities through high feed-in tariff schemes. This is due to factors such as an absence of system connectivity and the cost of putting in new connections, and the need to secure power transmission capacity in preparation for the resumption of nuclear power generation facilities that have been shut down. Electric power companies that have a power generation department reduce cost by using existing power generation capacity to the maximum degree, and are not interested in purchasing electricity from other companies. Although the government has promoted the unbundling of electrical power production from its distribution and transmission, there is a need to achieve more complete ownership unbundling. I think that it is necessary for Tokyo Electric Power Company (TEPCO) to completely separate its power generation divisions and become the only one electrical transmission company in Japan. Already, the thermal power division has been separated, and merged with Chubu Electric Power to form the joint venture JERA. The next step will be the separation of the nuclear power generation division. The expansion of a geographically-distributed electrical system can also promote the use of renewable energy. There is a need to skillfully incorporate into the overall system, power options that match the characteristics of regional energy demand and supply instead of the conventional centralized structure.

Fig. 1 Level of Introduction and Integration of Fluctuating Renewable Energy, and Forecasts of Wind and Solar Power Share of Power Generated (2017 and 2030) (IEA WEO 2018)



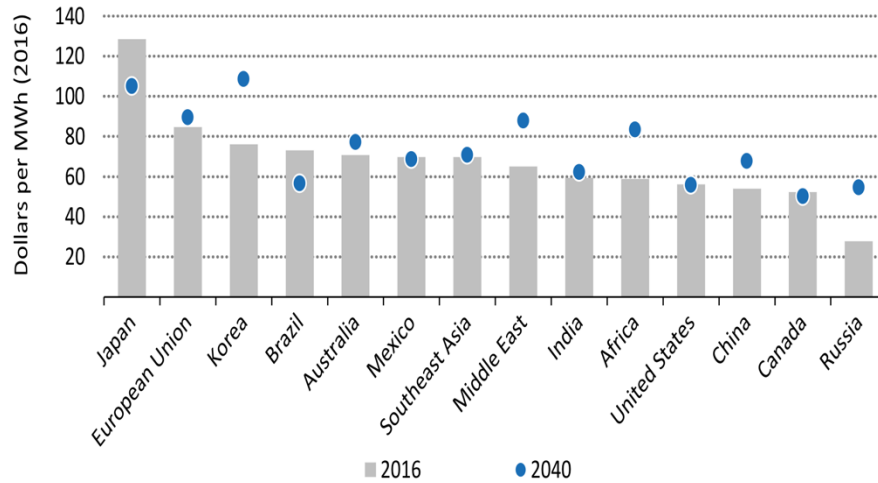
It will also be possible to import wind and solar power more cheaply if the European model of collective energy security and sustainability could be introduced and the electrical power systems

were connected to enable the exchange of power with neighboring countries. According to a report by the Asia Super Grid Study Group of the Renewable Energy Institute, it is possible to procure sufficiently competitive electricity by importing cheap electricity generated through wind and solar power generation via China and Korea, which have power systems that are connected with Mongolia, or by importing electricity generated through hydropower from Russia. There are also those who are of the view that Korea, China, and Russia cannot be trusted, and that Japan would be in trouble if its power supply were to be cut off by these countries. However, when Fukushima Daiichi Nuclear Power Station was damaged in the Great East Japan Earthquake and tsunami, resulting in power outages for areas supplied by TEPCO, the shortfall could not be sufficiently covered due to the lack of sufficient system interconnectivity with Chubu Electric Power, and electricity could not be transmitted even though there was sufficient surplus power in the west. In the Hokkaido Eastern Iburi Earthquake that occurred in September 2018, a power outage hit the entire prefecture. This should have been fully preventable if the power grid system between Hokkaido and Honshu had been expanded. If Japan persistently achieves no progress in linking up its power grid system domestically, it will be able to reduce the risk of power outages by linking up with power systems overseas. Cooperating with Korea and China should be able to prevent power outages through the Nankai megathrust earthquake and tsunami that would probably occur in the future. The risk of electricity supply shortage does not lie overseas, but in fact lies within Japan itself.

According to the IEA, Japan has the highest electricity costs in the world. (Fig. 2) That is due to the delay in resuming operation of its nuclear power facilities, and the mass procurement of gas from overseas. This is equivalent to transferring close to 1 trillion yen of national wealth overseas every year. Going forward, it is necessary to both expand wind and solar power, which will be cheaper options, and at the same time resume nuclear power generation. However, it is unfortunate that since the shutdown of nuclear power plant operations after the TEPCO Fukushima Daiichi Nuclear Power Plant incident that happened in 2011, only nine reactors have resumed operations. Despite efforts by the respective nuclear power companies to strengthen disaster prevention measures, resumption has been slow with little progress made. This is due to the sense of distrust by the citizens toward TEPCO and the government, which has been difficult to erase. Many of the citizens feel that TEPCO, which caused such a serious accident, does not seem to be taking responsibility for it in a visible manner. In view of this, how about stripping TEPCO of its qualifications as a nuclear power operator and returning the operation of nuclear power facilities to the state? The government can establish a nuclear power company that consolidates all nuclear power operations based on Kansai Electric Power Company and Japan Atomic Power Company, while TEPCO can take over the power grid of Kansai Electric Power Company and be reborn as Japan's only one electricity transmission company. The share prices of the newly established TEPCO will rise, and it will probably be possible to sell government-held stocks at a high price in the market. The President of TEPCO, like Tokugawa Yoshinobu who attempted to reform the shogunate, will take the lead in this "restoration of nuclear power to the state (Taisei Hokan,)" and hopefully take the

first step forward in the energy renaissance of Japan in the Reiwa era.

Fig. 2 Comparison of the Cost of Total Power Generation in Main Countries (2016 and 2040), IEA WEO2017



The government’s explanation that nuclear power is a clean, cheap, and safe power source could no longer be accepted after the Fukushima accident and the solar power revolution. It is not economical to replace aging reactors with expensive, large-scale light water reactors. There is no other choice but to gradually decommission the existing large-scale light water reactors. However, the question of what to do with the spent fuel at each nuclear power plant and Rokkasho as well as the debris in Fukushima remains a problem. When the debris at Fukushima Daiichi Nuclear Power Station can be removed, it would be impossible to transfer it to other prefectures. To discard it as it is, it would be necessary to search for a place within Fukushima Prefecture that can remain geologically stable for 300,000 years. This is an extremely difficult task. However, technology that can convert this debris into waste that can be non-toxic in 300 years’ time already exists. This is the Integral Fast Reactor (IFR) technology, for which the Japanese and U.S. governments recently signed a memorandum of agreement to cooperate on the construction of a versatile test reactor (VTR). I once had a chance to talk about this reactor in a certain location in Fukushima Prefecture. Someone in the audience had said, “Since the accident, I have been opposed to nuclear power. However, if there is such a technology, I definitely hope for it to be trialed on Fukushima Nuclear Power Station. Why didn’t anyone tell us this earlier?” The government’s response, regardless, had been to avoid thinking about the next step forward as long as there was no prospect of removing the debris. Yet, Fukushima Daiichi Nuclear Power station holds large amounts of spent fuel that is exposed to the seawater and contaminated with radiation. It is difficult for the reprocessing facility at Rokkasho village to accept this fuel, leaving no other options but to process it in Fukushima Prefecture. For the immediate future, even if it were to be kept away in a dry cask storage facility and disposed of directly, it would become waste that will not reduce toxicity for 300,000 years. The IFR system is able to process such spent fuel, and it would be ideal to construct a test facility, begin

processing this spent fuel, and thereafter also carry out the processing of the debris when it is eventually removed from the ruined reactors. This IFR can also be used to process the spent fuel from other nuclear power plants. In the present day when large-scale light water reactors have lost their competitiveness, the favorite among nuclear reactors in the future would probably be the nuclear waste incinerator, a small-modular fast reactor that are able to process waste while generating power. Furthermore, a small-modular reactor would be able to adjust output frequently, and is also a geographically-distributed source of nuclear power that can complement regional wind and solar power generation.

Furthermore, this reactor can also become a “diplomatic card” for nuclear nonproliferation. If North Korea is serious about complete denuclearization, it would be good for Japan to purchase the 40 kg of plutonium that North Korea holds, and burn it in the plutonium thermal programs or incinerate it in this reactor. Japan holds as much as 47 tons of plutonium, and is suspected of diverting it for military use. In view of this, the Sasakawa Peace Foundation had compiled a proposal of placing this remaining plutonium under the international custody of IAEA. Even if Japan were to take over the plutonium resources of North Korea, it would, of course, be necessary to place it under international management. On the other hand, the Republic of Korea (ROK) can take over the highly enriched uranium held by the North and incinerate it in a light water reactor, thereby participating in the denuclearization of the Korean Peninsula. ROK is already conducting research on pyroprocessing for the IFR with the United States. It is said that it is difficult to divert radioactive materials for military uses through this system. Japan and the United States have just begun to cooperate in this area; going forward, joint development between Japan, the United States, and ROK aimed at realizing a model of peaceful nuclear power use alongside with nuclear nonproliferation rules, is also a possibility. Furthermore, if countries such as Iran and Saudi Arabia could be invited together with denuclearized North Korea to join this framework based on the condition of commitment to the peaceful use of nuclear power, Japan will be able to develop its diplomacy by taking the lead in the peaceful use of nuclear power. Japan’s nuclear power can contribute to resolving diplomatic issues faced by the world, such as North Korea and Iran.

The Sasakawa Peace Foundation has conducted a feasibility study on the Fukushima debris processing using this system. Cost estimates were also drawn up with the help of nuclear experts. The system will be able to reduce the transuranic element in the debris by a third over 25 years, and the cost of constructing the facility ranges from 200 to 300 billion yen (US\$2 to 3 billion.) If we were to consider the fact that close to 1 trillion yen is being spent on decontamination every year, it cannot be difficult to cover this construction costs. How about using the Fukushima Daini (Second) Nuclear Power Station, which will be decommissioned, to conduct tests on the new technology? The Daini Nuclear Power Station had overcome the fierce tsunami and proven that it is the safest nuclear power station in Japan. Using that facility to conduct tests on IFR for the future of Fukushima can, I believe, help to create a “dedicated Fukushima” (“tsukusu-shima Fukushima”) to replace the lost “beautiful Fukushima” (“utsuku-shima Fukushima”). These were the words of

a former teacher from Fukushima Prefecture who had listened to my lecture. I present lectures around the world, but have never heard such a touching comment. I admire the courage of this lady, but TEPCO, the government, and the media should all learn from her, and present a courageous future vision of nuclear power to the people of Japan.

Writer's Profile

Nobuo Tanaka

Mr. Tanaka has decades of experience with energy and finance since he joined the Ministry of International Trade and Industry (MITI; presently METI) in 1973. He has also worked for Japanese Embassy in Washington, D.C., and OECD. He served as Executive Director of the International Energy Agency (IEA) from 2007 to 2011. Joined IEEJ as Global Associate in 2011. Since 2015, he holds current position. He holds MBA from Case Western Reserve University, US.