

# The Global Energy Crisis and Climate Crisis: Japan's Contribution Through the Sustainable Use of Nuclear Power

Nobuo Tanaka \*

Dr. Fatih Birol, Executive Director of the International Energy Agency (IEA) says that the world is in the middle of its first truly global energy crisis, triggered by the military operations in Ukraine by Russia, the world's largest producer of fossil fuels. IEA was founded in 1974 during the first oil crisis, but the current crisis involves not only oil, but also natural gas, coal, and electricity, with the prices of each rising rapidly to historical highs. Energy security has emerged as an issue of top priority for all countries.

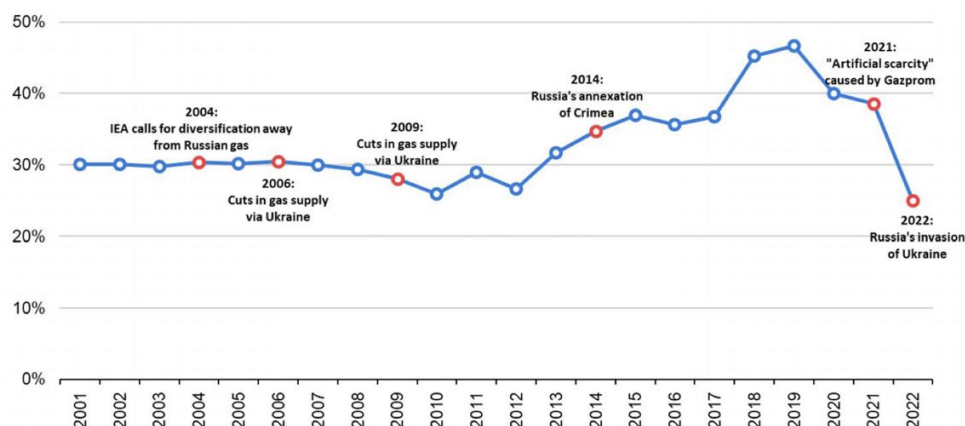
Europe and Russia are verging on becoming embroiled in an energy war. Europe strengthened sanctions on Russia for its military operations in Ukraine, and banned the import of oil and coal from Russia. In retaliation, Russia is gradually tightening its natural gas exports to Europe. Europe is Russia's largest customer for fossil fuels. In particular, natural gas is supplied in large volumes through pipelines, and 75% of that is bound for Europe. On the other hand, even after the annexation of Crimea, Europe increased its dependence on Russia through Nord Stream 1, relying on Russia for close to 50% of its domestic demand at one point and even starting work on Nord Stream 2. This is believed to have emboldened President Putin of Russia. (Graph 1) Angela Merkel,

Gas Market Report Q3 2022

Gas 2022

## The European Union's reliance on Russian gas increased steadily over the last decade

Share of EU gas demand met by Russian supply, 2001-2022



Sources: IEA analysis based on IEA Energy Data Centre and various external sources.

IEA 2022. All rights reserved.

\* Distinguished Fellow, IEEJ

former Chancellor of Germany, was the one who had pushed for this. She procured cheap and stable energy sources for the country until the autumn of 2020, and the German economy achieved prominent success within Europe. However, she also committed to reducing the use of coal in response to calls from many German citizens for strong global environmental measures. She also frequently changed policies on the use of nuclear power based on the response from the citizens. In 2008, I was invited to the energy policy dialogue with Chancellor Merkel and German industrial leaders at the German Chancellery. (Photograph) When I asked her why Germany did not proactively use nuclear power, she replied, “Mr. Tanaka, I am a scientist. I am well aware of the importance of nuclear power, and how to utilize it. But I need votes to do so in Germany.” That was during the era of the grand coalition with the Social Democratic Party, which was anti-nuclear power, so she changed the policy direction to reduce dependence on nuclear power. However, after she won the general elections the following year, Merkel formed a small coalition with the Free Democratic Party and revived the use of nuclear power. In 2011, the Fukushima Daiichi Nuclear Power Plant accident occurred, stirring strong public reactions against nuclear power. Merkel changed her policy once again, and decided to phase out nuclear power by the end of 2022. She is a wise politician rather than a good scientist. While this led her to retain political control for the period of 16 years, the choice to move away from coal and nuclear power and depend instead on gas from Russia brought about Germany’s over-reliance on Russia, which in turn gave President Putin too much confidence. Hence, we can probably say that Merkel’s decisions had brought about the Russia-Ukraine crisis today, which is the most severe geopolitical crisis in the postwar era.



But the global energy crisis may subside in 10 years. The looming climate crisis and nuclear war could perhaps be more serious. According to Yuval Noah Harari, the author of *Sapiens: A Brief History of Humankind*, what wipes out humankind in the end will not be viruses, but a nuclear war, climate crisis, or algorithms. Harari says that all these crises are global and cannot be resolved through the efforts of any one country. On the other hand, in the current political climate around the world, populism and nationalism that puts the interests of one's own country above all, are taking great strides forward, while global values such as democracy and liberalism are in a state of crisis. This is a grave situation, says Harari, and politicians with a global identity are needed to address this crisis to humankind. Former Prime Minister Abe, who was killed by an assassin, was one of these rare politicians. The fact that his state funeral was attended by many world leaders attests to the relationships of trust that he had built. His death is truly regrettable. (Photograph of former Prime Minister Abe at ICEF 2019. He was the founder of ICEF.)

#### ICEF 2019 / Green Innovation Summit 2019-10-9



What should Japan do in the face of the current nuclear war crisis in Ukraine, the global energy crisis, and further, the climate crisis? I believe one of the answers is the peaceful use of nuclear power. If we were to look at Merkel's failure, it is clear how important nuclear power is to energy security. The operation of one nuclear power plant with a capacity of 1 Giga watts can help to save 1 million tons of LNG consumption per year. Putting 10 nuclear power plants back into operation, as Prime Minister Kishida declared, will then save 10 million tons. With that, Japan would not face any power shortage even if the gas supply from Russia to Japan were cut off. Germany would appreciate it if the surplus were passed on to them. It would be an international contribution that costs nothing. Furthermore, nuclear power plants, which do not emit carbon dioxide, also contribute to global warming measures. Restarting nuclear reactors that had been shut down is also cost-effective, so it would probably be the right choice to restart them after putting in place the strongest safety measures, followed by a review of the extension of their operating period

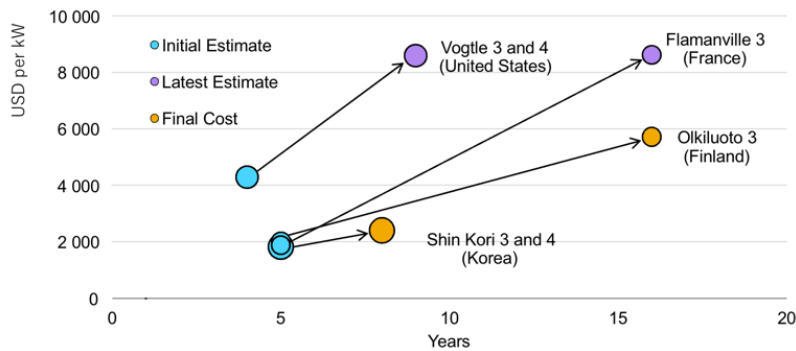
from 40 years to 60 years, or even to 80 years as observed in the United States. Nevertheless, as the citizens have taken an extremely critical view of nuclear power after the Fukushima nuclear accident, the operation of nuclear power plants is a political issue. If an accident occurs at a nuclear power plant, it could cause serious damage as in the case of Fukushima. Even if the most stringent safety standards were applied after the accident, there is no absolute guarantee of safety. Particularly in the case of large-scale reactors, even if safety were enhanced, it would still be necessary to secure a large emergency evacuation area. Hence, the risks are still high in the event of an emergency. In comparison, for small modular reactors (SMRs), it could be possible to contain the evacuation area within the plant premises, depending on the design. In addition, it will reduce the initial construction costs and the passive safety design will further enhance the reduction of the risk. Since SMRs are flexible power generation and heating systems aimed at fulfilling local demand, it should be possible to incorporate the views of the local community from the design phase. Social acceptance should also increase significantly. Compared to large-scale light water reactors, SMRs may raise concerns of high unit cost for power generation. However, the cost of large-scale reactors to date have been double or triple that of the initial planned cost due to factors such as extended construction period and changes to safety specifications. Instead, building many reactors of the same type and standardizing them is a way to reduce costs. SMRs are an innovation that can achieve this. SMR can be operated as a backup to variable wind and solar power, during peak times when prices are high. This will be a paradigm shift from the current large-scale light water reactor systems, which operate large-scale reactors continuously as the base load. (Graph) The high-level radioactive waste site has not been determined so far. The back-end solution for nuclear power plants, such as spent fuel resulting from power generation activities at large-scale light water reactors including fuel debris from Fukushima, and the high-level waste after plutonium has been extracted through processing at the Rokkasho Reprocessing Plant from spent fuel, remains undetermined; this only serves to amplify the anxiety and unease among citizens. Moreover, there is the problem of proliferation risk of nuclear weapons. Ukraine has returned its nuclear weapons under the Budapest Memorandum, but if it had not, would Russia have carried out its aggression on the country? Under the circumstances, it is inevitable that an increasing number of countries, like North Korea and Iran, consider the possession of nuclear weapons the absolute security. It would not be an exaggeration to say that the nuclear nonproliferation regime is now in danger of collapsing. There is a need to develop technology to prevent diversion to nuclear weapons in countries that use nuclear power peacefully, and the security measures of IAEA, which monitors such diversion, should probably be reviewed.

For nuclear power to be sustainable, it is not sufficient for it to only be safe and to not emit CO<sub>2</sub>. The nuclear power session at this year's Innovation for Cool Earth Forum (ICEF 2022) summarized the abovementioned problems as four conditions for the sustainability of nuclear power. The first is to minimize the risks of accident by introducing SMRs and passive safety design. The second is disposal plans for high-level radioactive waste, which countries such as Finland is materializing. This is also a condition for EU's taxonomy for sustainable investment. The third is technology with low proliferation risk of nuclear weapons. The fourth and last is social and

## Delays and cost overruns have troubled the nuclear industry



Overnight cost and construction times for selected recent nuclear projects



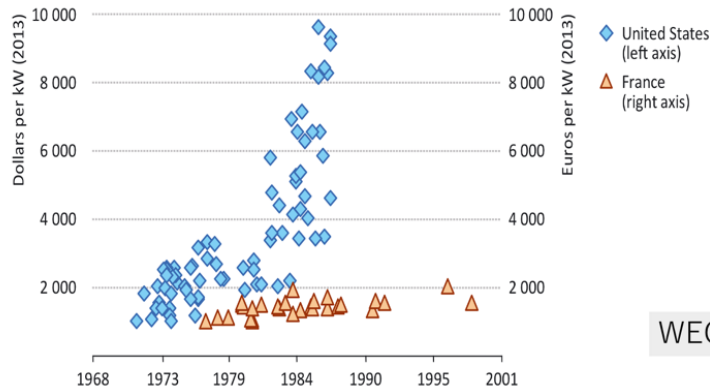
Although advanced economies have nearly 70% of global nuclear capacity, investment stalled decades ago and the latest projects are running far over budget and behind schedule.

"NuclearPower and Secure Energy Transition" by IEA 2022-6-30

50

## Standardization of reactors, NOT Size, that reduces unit construction costs.

Figure 10.6 > Historical overnight cost of construction for nuclear power plants in France and the United States



Note: Overnight costs are shown for the year in which plants came online.  
 Sources: Cour des Comptes (2012), US CBO (2008) and US DOE/EIA (1986).

WEO2014

51

political sustainability. In democratic countries in particular, there should be designs that make nuclear power acceptable to local communities. Assistant Professor Aditi Verma, one of the speakers at ICEF, called this “design justice.” In the case of SMRs, it is possible to incorporate the demands of the community at the site of construction from the initial stages of design. In Wyoming, United States, the Natrium reactor that TerraPower is planning is a sodium cooling, metallic fuel fast reactor, but its aim is to replace the old coal power generator and keep locals employed. It also enables support at peak times through a heat storage system that uses molten salt. Canada’s SMR is planned to be a heat source to melt down oil sand, and its use in the north-western part of the country is anticipated. Russia has moored a barge mounted with an SMR on the Arctic coast, which is already supplying electricity to arctic towns. The future of nuclear power lies in such flexible, locally distributed systems that fit well with renewable energy sources. Metallic fuel is ideal for

enhancing flexibility, such as frequent output adjustments. Nuclear submarines and ice breakers use metallic fuel to facilitate frequent stops and goes. On the other hand, while oxide fuel is made easy to handle through solidification, it breaks easily during output adjustment, and is therefore suitable for large-scale light water reactors that operate continuously as base load. Nuclear power innovations lie in SMRs as well as the conversion to metallic fuels. Metallic fuels are also useful for advancing waste disposal. High-level radioactive waste needs to be stored in a stable manner for more than 100,000 years because it is mixed with what is known as minor actinides (MA), which are transuranic elements such as americium and curium with extremely long half-lives. Pyroprocessing is a dry processing method by which such elements are extracted from spent fuel along with plutonium, etc. and burnt in a fast reactor. The wet processing method (purex) used at Rokkasho extracts only plutonium, so it takes more than 100,000 years to detoxify the waste; pyroprocessing, on the other hand, requires 300 years. This is also a long time, but it makes it far easier to search for disposal sites. In the future, there is also potential for the development of nuclide transformation technologies that further reduces the detoxification time for nuclear waste to a hundred years or less. Burning the plutonium and MA extracted from fuel debris from Fukushima Nuclear Power Plant in an SMR through the pyroprocessing method, can convert it into 300-year waste. Debris cannot be transported anywhere even if it were extracted from a broken reactor, for example. No prefecture would accept it. There is no other option but to process it in Fukushima, convert it into 300-year waste, and store it in Fukushima. The Canon Institute for Global Studies convened the Study Group on Next-generation Nuclear Energy Utilization to discuss what sustainable nuclear power is, and summarized their recommendations in an interim report. ([https://cigs.canon/article/20221006\\_7042.html](https://cigs.canon/article/20221006_7042.html)) Chieko Nagayama, who participated in this study group as an observer, has commented at the symposium held by the same study group in the following video link, which I would highly recommend watching. (Photograph) ([https://cigs.canon/videos/20220310\\_6639.html](https://cigs.canon/videos/20220310_6639.html))



福島からのコメント | 次世代原子力を考えるシンポジウム⑤

While teaching in Fukushima in her 20s, she was afflicted with an incurable muscular disease. Without a cure, she had no choice but to give up everything, but she continues to spread various messages proudly today. Concerning the Fukushima accident, she says that despite the loss of beautiful Fukushima, if decommissioning efforts move forward by establishing a metallic-fuelled SMR and the pyroprocessing plant in Fukushima, it would help to restore trust in Japanese technology and contribute to the peaceful use of nuclear power in the world. This would transform Fukushima into “Fukushima for service.” Although there is no path to recovery for herself, she hopes that Fukushima can stand again by contributing to the future even if it is resigned to the outcomes of the accident.

There are also countries around Japan that are skeptical of Japan’s plutonium storage and use, and suspect that it has plans to possess nuclear weapons. In this case, Japan should place its surplus plutonium under IAEA’s management, formally accede to the Treaty on the Prohibition of Nuclear Weapons, and reaffirm its commitment to the peaceful use of nuclear power. There should be no opposition from the United States if the declaration were made by Prime Minister Kishida, who comes from Hiroshima. To strengthen the nuclear nonproliferation regime, non-nuclear-weapon states should be appointed as permanent members of the UN Security Council. Japan should commit fully to the peaceful use of nuclear power and develop diplomacy that is appropriate to its position as a leader in the peaceful use of nuclear power.

Politicians are likely to claim that it would be absurd to build nuclear power facilities such as pyroprocessing facilities and fast reactors in Fukushima, and that Japan cannot possibly engage in such diplomacy under the United States’ “nuclear umbrella.” However, there are no other ways to bring about the regeneration of nuclear power. Japan should draw lessons from Ms. Nagayama’s courage and the global identity of former Prime Minister Abe, and embark on its path to next-generation nuclear power starting with Fukushima.

#### Writer’s Profile

##### Nobuo Tanaka

Mr. Tanaka is the Distinguished Fellow at the IEEJ. He is the chairman of the Steering Committee of Innovation for Cool Earth Forum (ICEF). As Executive Director of the International Energy Agency (IEA) from 2007 to 2011, he initiated a collective release of oil stocks in June 2011. He also played a crucial and personal role in the strengthening of ties with major non-Member energy players, including China and India. He began his career in 1973 in the Ministry of Economy, Trade and Industry (METI), and has served in a number of high-ranking positions, including Director-General of the Multilateral Trade System Department. He was deeply engaged in bilateral trade issues with the US as Minister for Industry, Trade and Energy at the Embassy of Japan, Washington DC. He has also served twice as Director for Science, Technology and Industry (DSTI) of the Paris-based international organization, OECD. He is currently CEO of Tanaka Global, Inc. He is also former Chairman of the Sasakawa Peace Foundation and serves as a Board member or an auditor at some corporations.