



IT IS TIME TO BID FAREWELL TO FUKUSHIMA

Prachi Lokhande

Research Associate, Centre for Air Power Studies



Discourse around nuclear energy is reviving. Every time there is a talk of nuclear energy the mention of Fukushima is not far behind. The incident that took place in March 2011 had managed to create a deep trough in an otherwise growing graph of nuclear energy. The nations must learn from the events at Fukushima Daiichi and expedite their nuclear safety efforts for as long as commercial nuclear reactors are in operation. The incident at Fukushima continues to haunt us, but it is time we let it go.

An Overview

Japan was hit by an earthquake followed by a devastating tsunami. The calamity severely affected the facility situated at Fukushima. In a two-punch blow to the facility, the 9.0 magnitude earthquake first disrupted the off-site electric power and the reactor shut down safely. In further events, the tsunami raised by the earthquake hit the facility and breached the plants' sea wall of defence submerging parts of the complex. It was a six-reactor complex and multiples units of the complex's control, cooling, and monitoring systems were hit by the flooding caused by the tsunami. Radioactive cores of three reactors were severely damaged and a hydrogen explosion took place in other three reactor buildings.¹

Nuclear energy was a strategic objective of Japan's national policy since the 1960s. In the aftermath of the accident, the quest for furthering nuclear energy as a substantial contributor to Japan's energy basket was abruptly abandoned. The public confidence in nuclear energy dropped to all time low and Japan shut 46 of the 50 operating power reactors. Japan relied on nuclear energy to provide 30 percent of its energy requirement.² By 2019, nuclear energy supplied only 7.5 percent of Japan's electricity. And at present, only nine nuclear powers are in operation.

In words of then Director General of the International Atomic Energy Agency, Yukiya Amano, the Japanese nuclear disaster has managed to cause “deep public anxiety throughout the world and damaged confidence in nuclear power”.³ The sentence fairly summarises what happened in the world in the aftermath of the accident. The following section analyses the changes that took place post 2011 around the world.

The accident at Fukushima Daiichi dented nuclear energy’s reputation for safety and several countries began phasing out nuclear energy in the aftermath of the accident. Building of new power plants suddenly came at a halt.

After effects of Fukushima

At the turn of the 21st century, the nuclear energy industry was under a revival owing to two factors- rising cost of fossil fuels and growing discourse around the curbing of greenhouse gas emissions. In the later half of the 20th century, the increasing global governance on climate change, beginning from Stockholm to Kyoto, established increasing links between greenhouse gas emission caused by energy related activities, and climate change. With increasing oil and coal prices owing to changes in the international system, it contributed as a series of push factors furthering a nuclear renaissance at the turn of the century. Political directions in response to the challenge of climate change were a contributing factor in the nuclear renaissance.⁴ Countries around the world understood the need for clean energy sources and nuclear energy entered the energy discourse as a source of low carbon energy which could be an answer to energy poverty and aid economic development. The accident at Fukushima Daiichi dented nuclear energy’s reputation for safety and several countries began phasing out nuclear energy in the aftermath of the accident. Building of new power plants suddenly came at a halt. The growth that seems to have continued in the aftermath was seen in countries that already had operating nuclear power plants plans. Prior to Fukushima, the International Energy Agency anticipated that by 2035, the capacity of nuclear facilities would increase by 360 gigawatts. By 2011, it estimated half as many.⁵

There were different reactions from countries all over. Countries like Germany, Italy, Switzerland, Belgium, South Korea, Venezuela, Kuwait, and Taiwan introduced a gradual phase out of nuclear energy or a moratorium altogether while others went ahead with the plans cautiously and introduced updated review system which would review the safety mechanisms of the existing and upcoming power plants. Several countries which had plans for the development of nuclear energy mainly in the Indo-pacific region abandoned the plans to do so. The accident stirred the public perception against nuclear energy and cast shadows on the future of nuclear energy.

Current scenario

By 2015, nuclear generation began expanding again. Currently, there are roughly 440 nuclear power reactors with a cumulative capacity of about 390 GWe operating in 32

nations plus Taiwan. These generated 2653 TWh in 2021, or almost 10 percent of the world's electricity. There are now 55 power reactors being built in 15 countries, mostly in China, India, Russia, and the United Arab Emirates.⁶ Over 300 additional power reactors are being proposed, and there are now about 90 power reactors with an overall gross capacity of over 90,000 MWe. In Asia, where both the economy and demand for electricity are expanding quickly, is

Energy security, climate change, and sustainable development are the three legs of a stool and the pushing factors for countries to adopt nuclear power. The current situation is different from what it was a decade ago.

where the majority of reactors are being planned. Many nations that now use nuclear energy either plan on building new power reactors or are already doing so. According to a July 2017 IAEA report on International Status and Prospects of Nuclear Power, 28 of its member states without nuclear power facilities "are exploring, planning, or commencing" nuclear power programmes at the moment. According to the report, of the 28 nations, two have begun building their first nuclear power plant, two have placed orders for their first nuclear power plant, five have decided to invest and are putting infrastructure in place, seven are actively preparing before making a final decision, and 12 are considering implementing a nuclear power programme. Additional 20 nations have reportedly expressed interest in nuclear power.⁷ While Belarus and the UAE began producing nuclear electricity last year, Bangladesh and Turkey are currently building their first reactors, highlighting the significant role that emerging nations will play in the development of nuclear power.

Energy security, climate change, and sustainable development are the three legs of a stool and the pushing factors for countries to adopt nuclear power. The current situation is different from what it was a decade ago. The changes in environment and the need for energy security are more pronounced. With the Russia-Ukraine war, the impending energy security crisis has started to slowly wipe off the memory of Fukushima.

To begin with, Europe has been the hardest hit and faces a looming energy crisis shooting the inflation levels of many countries across the continent. France's nuclear fleet is the second-largest behind the United States with 56 reactors. Around a dozen countries produce around 25 percent of the electricity in Europe using nuclear energy, with France providing more than half of it.⁸ France is also the world's largest net exporter of electricity. Due to a long-standing policy predicated on energy security, France gets around 70 percent of its electricity from nuclear power. The goal of government policy, established in 2014 under the previous administration, was to reduce nuclear power's contribution to electricity generation to 50 percent by 2025. This objective was pushed forward from 2019 to 2035.⁹ With the ongoing situation of an impending energy crisis, problems at the state nuclear operator, and the recent past ridden with policies trying to reduce the share of nuclear energy, France risks blackouts and a need for imported

power. This situation has not just affected France but has frustrated Europe's quest to quit its reliance on Russian energy as France dwindles on its supply.¹⁰ It was only recently that France's minister of energy transition stated that French electricity company EDF has committed to restarting all its nuclear reactors by this winter in order to assist the nation through the general energy crisis made worse by the conflict in Ukraine.¹¹

Asia has ventured on a path of accepting nuclear energy with open arms not just to address climate change, but to improve energy security, reduce the impact of volatile fuel prices and make their economies more competitive.

Less than three weeks after the Fukushima accident, Germany made the decision to completely phase out nuclear power by 2022. Eight of the 17 generating reactors were permanently shut down following the accident. According to the IEA, coal-fired facilities continued to be the country's main source of electricity. Nuclear power generated by six power reactors accounted for roughly 13 percent of the nation's electricity in 2021, down from around 25 percent before the Fukushima Daiichi tragedy. In September 2022, the electricity generated by nuclear energy fell to 6 percent. Of the six reactors working, three were shut at the end of 2021 and the other three are scheduled to be shut by the end of 2022 according to the 2011 phase-out plan. The three surviving nuclear reactors could be operated past their planned closing date at the end of the year, according to nuclear utilities, but it is up to the government to initiate this process.¹²

Belgium has stated that it would stop using nuclear electricity by 2025 but has made a sharp U-turn on its policies. Belgium now wants to extend the lives of two of its newest reactors with a restart in November 2026. A government-backed initiative to restart nuclear power in Italy, which had been shut down since 1990, has failed. And nations like Spain and Switzerland made the decision not to construct any new nuclear power facilities. Global nuclear capacity decreased by 48 GWe between 2011 and 2020 as a total of 65 reactors were either shut down or did not have their operating lifespan extended.

Asia has ventured on a path of accepting nuclear energy with open arms not just to address climate change, but to improve energy security, reduce the impact of volatile fuel prices and make their economies more competitive. The need for a carbon free source of sustainable energy has eclipsed the fear of nuclear safety. Asia, in true sense, is undergoing a nuclear renaissance.

Japan, the epicentre of the disaster is restarting nuclear plants that have remained inactive since the 2011 accident in order to fulfil the nation's expanding energy needs. Prime Minister Fumio Kishida has promised to have at least nine reactors operational by the start of winter. The public perception which had hitherto been ambivalent is slowly accepting the need for nuclear energy. On being asked for a comment on the changing perception of the Japanese society regarding nuclear energy, Col. Sugiyama Kimitoshi, Director, Centre for Air and Space Power Strategic Studies (CASPSS), said "In my opinion,

things are changing and the future for nuclear energy looks positive. The government is looking forward to increasing the share of nuclear energy in Japanese nuclear basket. The public opinion is also changing. People have become more understanding and thus understand the need to inculcate nuclear energy into the energy mix.”¹³ In South Korea, newly elected President Yoon Seok-Yeol has reversed his predecessor Moon Jae-in’s commitment to phase out nuclear power by restarting construction on two reactors and extending the life of those that are currently in operation. The change in public opinion has also been helpful in steering the national policies in a bid to favour nuclear energy.

The growth of nuclear power might be supported by pledges made under the Paris Agreement, Glasgow, and other initiatives, but doing so would necessitate the creation of energy laws and market structures that would encourage investments in dispatchable, low-carbon technologies.

China is leading the way in nuclear energy generation. According to the World Nuclear Association, China has at least 52 nuclear reactors under construction or planned, more than the rest of the world combined, with proposals for more than 150 additional reactors. China had imposed a year-long moratorium on new nuclear plants following the Fukushima disaster. Taiwan which had one of the most stringent resistances against nuclear energy has seen it soften over time as concerns emerge over the energy security of the island.

The Government of India has set ambitious aims to develop India's nuclear energy capacity.¹⁴ The country's 12th Five-Year Plan in 2010 aimed for total built nuclear capacity of 63 GW equivalent by 2032.¹⁵ India also expects to have 10 per cent of its energy sourced from nuclear energy by 2030.¹⁶ Nine nuclear power reactors are now under construction and should be finished by 2024-2025. In June 2017, the Government granted administrative authority and financial sanction to twelve more nuclear power reactors. Thus, 21 nuclear power reactors with a combined installed capacity of 15700 MW are now being built and are expected to be gradually completed by the year 2031.¹⁷ Additionally, India would start the construction of 10 nuclear plants in fleet mode from 2023.¹⁸

Conclusion

In a move towards adopting nuclear energy, the discourse is framed as that of energy independence. The ability to guide and govern your energy sources without being susceptible to the changes of the world's energy market gives the nations a freedom to manoeuvre in the international system without being dependent on someone. In considering the aspect of growing nuclear safety the question remains not only of national sovereignty but also of the international responsibility that comes with it. Fukushima Daiichi is a prime example of the amalgamation of responsibilities pertaining to national sovereignty and international responsibility so have been other incidents at the

Three Mile Island (1979) and Chernobyl (1986). Such incidents are a blaring reminder of taking nuclear safety more seriously. One must take both technical and non-technical factors into account when generating nuclear energy in order to ensure the safety of the people and the environment.¹⁹ The Fukushima Daiichi accident showed a range of lessons in both non-technical (i.e., behaviour, organisational, institutional, sociological, etc.) and technical (i.e., design basics, physical configuration, etc.) aspects. The need for strong, independent, and well-resourced regulators is a key lesson to be learned from Fukushima. As "there can be no basis for complacency regarding nuclear safety in any country,"²⁰ a strong, normative safety framework with the IAEA at its core is crucial. The adoption of the Vienna Declaration brought together all parties of the Convention on Nuclear Safety to reinforce its principles. The growth of nuclear power might be supported by pledges made under the Paris Agreement, Glasgow, and other initiatives, but doing so would necessitate the creation of energy laws and market structures that would encourage investments in dispatchable, low-carbon technologies. Maintaining and ensuring nuclear safety is a means to an end rather than an end in itself. The future growth and development of nuclear power depends on it. As a result, it is essential for nuclear power to fulfil its greatest promise: the capacity to contribute to climate stabilisation while enabling economies and communities to flourish owing to clean, reliable, and sustainable energy. Although Fukushima remains fresh in the memories of people, it is time that we let it go. Climate change is evident and is more pronounced than ever, the energy crunch faced by the countries owing to the short supply of fossil fuels is affecting developed and developing countries alike. Although the growth of renewable energy shows a silver lining, holding back on nuclear energy because of safety concerns would do us more harm than good. With improved safety standards and stringent review mechanisms in place, its time to bid farewell to the ghost of Fukushima.

Although the growth of renewable energy shows a silver lining, holding back on nuclear energy because of safety concerns would do us more harm than good.

Notes:

- ¹ Kiyoshi Kurakawa and Najmedin Meshkati, “10 years after Fukushima, safety is still nuclear powers greatest challenge”, *Prevention Web*, March 6, 2021, <https://www.preventionweb.net/news/10-years-after-fukushima-safety-still-nuclear-powers-greatest-challenge>. Accessed on September 22, 2022.
- ² Columbia K:1 Project, “France: A study of French nuclear policy after Fukushima”, Center for Nuclear Studies, Columbia University, July 17, 2021, <https://k1project.columbia.edu/news/french-nuclear-policy-after-fukushima#:~:text=Japan%20was%20able%20to%20shut,for%2030%25%20of%20their%20energy>. Accessed on September 10, 2012.
- ³ “IAEA sees slow nuclear growth post Japan”, *UPI*, September 23, 2011, https://www.upi.com/Business_News/Energy-Industr/2011/09/23/IAEA-sees-slow-nuclear-growth-post-Japan/UPI-87041316777856/. Accessed on September 10, 2022.
- ⁴ Mark Hibbs, “The nuclear renaissance”, Carnegie Endowment for International Peace, November 30, 2016, <https://carnegieendowment.org/2016/11/30/nuclear-renaissance-pub-66325>. Accessed on September 10, 2022.
- ⁵ “Gauging the pressure”, *The Economist*, April 28, 2011, https://www.economist.com/business/2011/04/28/gauging-the-pressure?story_id=18621367. Accessed on September 1, 2022.
- ⁶ “Plans for new reactors worldwide”, *Worldnuclear.org*, <https://world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactors-worldwide.aspx>. Accessed on September 1, 2022.
- ⁷ Board of Governors General Conference, International status, and prospect for nuclear power 2017, IAEA, GOV/INF/2017/12-GC (61)/INF/8, https://www.iaea.org/sites/default/files/gc/gc61inf-8_en.pdf. Accessed on September 20, 2022.
- ⁸ Liz Alderman, “French Nuclear Power Crisis Frustrates Europe’s Push to Quit Nuclear Energy”, *The New York Times*, June 18, 2022, <https://www.nytimes.com/2022/06/18/business/france-nuclear-power-russia.html>. Accessed on September 20, 2022.
- ⁹ “Nuclear Power in France,” *World Nuclear Association*, <https://world-nuclear.org/information-library/country-profiles/countries-a-f/france.aspx>. Accessed on September 20, 2022.
- ¹⁰ Alderman, n. 8.
- ¹¹ “France to restart all nuclear reactors by winter amid energy crunch”, *France24*, September 2, 2022, <https://www.france24.com/en/france/20220902-france-to-restart-all-nuclear-reactors-by-winter-amid-energy-crunch>. Accessed on September 20, 2022.
- ¹² “Could Germany Keep Its Nuclear Plants Running,” *Reuters*, September 2, 2022, <https://www.reuters.com/business/energy/could-germany-keep-its-nuclear-plants-running-2022-09-02/>. Accessed on September 20, 2022.
- ¹³ Col. Sugiyama Kimitoshi, [Director, Centre for Air and Space Power Strategic Studies (CASPSS)], in discussion with the author, September 2022.
- ¹⁴ United Nations, Nationally Determined Contributions Registry, “India’s Intended Nationally Determined Contributions”, <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf>. Accessed on September 5, 2022.

¹⁵ Pooran Chandra Pandey, "India Expects to Have 10% Of Its Energy Sourced to Nuclear Power In 10 Years", Climate Score Card, August 31, 2021, <https://www.climatescorecard.org/2021/08/india-expects-to-have-10-of-its-energy-sourced-to-nuclear-power-in-10-years/>. Accessed on September 20, 2022.

¹⁶ Ibid.

¹⁷ DAE, "Proposals for new atomic power plants", PIB, January 3, 2019, <https://pib.gov.in/Pressreleaseshar.aspx?PRID=155848>. Accessed on September 5, 2022.

¹⁸ "2023 construction start for Indian reactor fleet", World Nuclear News, March 28, 2022, <https://www.world-nuclear-news.org/Articles/2023-construction-start-for-Indian-reactor-fleet>. Accessed on September 5, 2022.

¹⁹ IAEA TECDOC series (1930), "Implementation and Effectiveness of Actions Taken at Nuclear Power Plants Following the Fukushima Daiichi Accident", IAEA, <https://www-pub.iaea.org/MTCD/Publications/PDF/TE-1930web.pdf>. Accessed on September 2, 2022.

²⁰ Mariano Grossi, "Ten-year anniversary of the Fukushima Daiichi nuclear power plant accident: A decade of improving nuclear safety", speech, IAEA, March 10, 2021, <https://www.iaea.org/newscenter/statements/ten-year-anniversary-of-the-fukushima-daiichi-nuclear-power-plant-accident-a-decade-of-improving-nuclear-safety>. Accessed on August 30, 2011.



Centre for Air Power Studies

The Centre for Air Power Studies (CAPS) is an independent, non-profit think tank that undertakes and promotes policy related research, study and discussion on defence and military issues, trends, and development in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Marshal Anil Chopra PVSM AVSM VM VSM (Retd).

Centre for Air Power Studies

P-284, Arjan Path, Subroto Park, New Delhi 110010

Tel: +91 11 25699130/32, Fax: +91 11 25682533

Editor: Dr Shalini Chawla e-mail: shaluchawla@yahoo.com

Formatting and Assistance: Dr Anu Sharma, Ms Mahima Duggal and Mr Rohit Singh

The views expressed in this brief are those of the author and not necessarily of the Centre or any other organisation.