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Asia-Pacific keeps faith with nuclear power

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▲ Taishan nuclear power plant, Guangdong, China

Photo: EDF Energy

While Europe is abuzz with policy discussions about extending the life of

existing nuclear power plants due to growing concerns around the need to wean the continent from its dependence on Russian fossil fuels, nuclear continues to enjoy support in the Asia-Pacific. Jens Kastner, Julian Ryall, Paul Cochrane and Keith Nuthall report.

China is a case in point. It had 53 nuclear power plants at the end of 2021, with a total generating capacity of about 55 GW. While that amounted to a little over 2% of the nation's total power generating capacity, this share is set to grow.

With the government keen to reduce CO₂ emissions and worried by many provinces and regions suffering power shortages in 2H2021, China's 14th five-year energy plan, released in March 2022, sets a target of 70 GW from nuclear by 2025, with an aspirational goal of 120 GW by 2030.

China's nuclear power sector received zero approvals between 2016 and 2018 and the government did not restart the approval work for any new units until 2019. From that year to 2021 it approved 13 new units.

Moreover, this April, the Chinese government approved the construction of six reactors in one fell swoop. Three nuclear power plants in the coastal provinces of Shandong, Zhejiang and Guangdong will each receive two new reactors, according to local media. Construction costs are estimated at Chinese Yuan Renminbi 120bn (\$19bn) for all six reactors combined.

However, when speaking to observers, *New Energy World* was told that things are not as straightforward for China's nuclear sector as they may

seem.

Gang He, an Assistant Professor at the Department of Technology and Society for Stony Brook University, Long Island, New York, US, claims China's energy planning is an evolving endeavour, affected by many moving factors.

'In the 13th five-year plan [2016–2020] period, nuclear has missed its planned goal by 7 GW, with safety regulations and checks being the main reason,' says He. 'Renewables are a totally different story, as reflected in the 13th five-year plan period for solar and wind seeing solar more than doubling its target and a 30% overshoot of its wind target, to reach 250 GW and 280 GW respectively,' He adds.

He points out that if such trends continue, clean energy may play an increasingly significant role in the Chinese electricity and energy mix, with renewables getting cheaper. He refers to a recent paper he co-authored for *Nature Communications* explaining that the costs for solar, wind and battery storage have dropped markedly since 2010 and are expected to decline further in the near future. This might impact China's nuclear sector expansion in future.

Also, political support for nuclear power is still feeling pressure from the powerful coal sector, despite its high carbon emissions. Mark Hibbs, a Senior Fellow at the US-based Carnegie Nuclear Policy Programme, notes that China's recent haste in building up nuclear capacity has much to do with the dynamics between the central government in Beijing and local governments.

'The local government favours nuclear projects as they benefit from investment money and participate in the profit, but China's coal industry has very deep pockets and many employees,' Hibbs comments. 'In China, there is a lot of talk about commitments to eliminate carbon emissions, but it is hard

to see how things move forward as long as the coal industry remains as powerful as it is today.’

Hibbs adds that an important unknown remains the speed of the electricity market deregulation, as a hands-off approach on prices by the government would probably reduce the nuclear sector’s competitiveness versus coal.

‘If prices are not subject to government decision-making, it is not clear how the nuclear sector will escape the price pressures,’ Hibbs says.

Japan’s new nuclear ambitions

Such political pressures are felt everywhere, and nuclear power supporters always have to contend with safety concerns. This is most notable in Japan where, 11 years after the second-worst nuclear accident in history, public support has finally swung back in favour of operating nuclear power plants. That is a great relief to a government that is seeking to reduce a historical reliance on fossil fuels from the unstable Middle East and Russia, now perceived as an unreliable partner given its invasion of Ukraine.



Fukushima Dai-ichi nuclear plant, Japan, after the explosion caused by the 2011 earthquake and tsunami

Photo: IAEA

The government is also concerned that renewable energy sources are still insufficient to meet domestic demand.

In the immediate aftermath of the March 2011 disaster at the Fukushima Dai-ichi plant, public opinion turned decisively against nuclear energy, with a poll by the *Nikkei* economic newspaper as recently as October 2016 revealing that 56% of Japanese people opposed a resumption of the nation's reactors, and just 28% were in favour.

The latest *Nikkei* opinion poll puts support for restarts at 53%, with just 38% against. Two reactors restarted in 2015 and eight more have restarted since then, with 16 reactors undergoing restart assessments, according to the World Nuclear Association (WNA).

These approvals could now be granted with more public support. 'There has been a sea-change in public opinion, even in the last six months,' says Paul Scalise, formerly a Professor at the IN-EAST School of Advanced Studies at the University of Duisberg-Essen, Germany, and now an Energy Sector Analyst with research company Codrington Japan.

'That shift is a result of growing climate change concerns, which have accelerated since 2018, but more recently the conflict in Ukraine, which has had a serious impact on fossil fuel prices.'

Japan currently imports nearly 92% of its primary energy, according to the Institute of Energy Economics Japan (IEEJ), but it is making efforts to

diversify import sources under its 'S+3E' policy, representing safety, energy security, environment and economic efficiency.

Japan's medium-term energy plan aims to increase the primary energy share of renewables to between 36% and 38% by 2030, raising nuclear to 22%, with the remaining total made up of oil, natural gas, coal, zero carbon hydrogen or ammonia. By 2050, renewables are forecast to account for as much as 60%; thermal power, including nuclear, for between 30% and 40%; and around 10% hydrogen and ammonia.

***'Stable use of nuclear power will be promoted on the major premise that public trust in nuclear power should be gained, and that safety should be secured.'* – The Japanese government in its 6th Strategic Energy Plan, released in October 2021**

Progress in Japan

Bringing the nation's nuclear plants back online is critical to these plans. Prior to the Fukushima disaster, 54 power plants operated nationwide and the IEEJ estimates that 27 plants are required to meet the government's 2030 target.

The problem for nuclear plant operators has not been regulatory approval from the Japan Nuclear Regulation Authority, Scalise points out, but that local authorities must also give permission for a facility to resume operations. Local residents and environmental groups have used legal manoeuvres to delay many restarts, although the apparent shift in attitudes towards nuclear power may help to change this.

Along with the crippled reactors at Fukushima Dai-ichi, other plants around Japan will never be restarted due to their age and the high cost of new safety

measures, meaning that the government and the domestic nuclear industry are eyeing a new generation of facilities.

In its 6th Strategic Energy Plan, released in October 2021, the government states: 'Stable use of nuclear power will be promoted on the major premise that public trust in nuclear power should be gained, and that safety should be secured.'

The policies of the ruling Liberal Democratic Party – frequently accused of close ties to influential power firms – are driven by Japan's need to dramatically reduce CO₂ emissions and to secure independent energy sources.

Tomoko Murakami, Head of the Nuclear Energy Department at the IEEJ, points out that the Japan Atomic Energy Agency (JAEA) and Mitsubishi Heavy Industries are working with US nuclear energy start-up TerraPower to develop advanced fast reactors.

For instance, the Japanese government is investing Japanese Yen JPY 900mn (\$7.8mn) to upgrade the AtheNa sodium experimental plant for fast reactor research in Ibaraki Prefecture, north of Tokyo.

The plant is designed to generate power by extracting heat from a reactor core with liquid sodium, to help develop a next-generation fast reactor with the US. Work is under way at another site, Joyo, where a test nuclear reactor utilises sodium as a coolant.

Nuclear developments in the Middle East

Japan's R&D strengths in nuclear are also seen in neighbouring South Korea, where 24 reactors provide about one-third of South Korea's electricity, with 23 GW output. South Korea exports its nuclear technology widely, with a particularly high-profile project being the Barakah nuclear power plant in Abu

Dhabi, United Arab Emirates (UAE). Construction started in 2012 and is now 96% complete, with all four reactors due to be operational in 2024, according to the Emirates Nuclear Energy Corporation (ENEC).



Barakah nuclear power plant in Abu Dhabi, United Arab Emirates, under construction – the project is now approaching completion

Photo: Wikiemirati

In March 2021, commercial operations started at the Barakah 1 plant (or Unit 1), and in March 2022, the Barakah 2 plant commenced operations, bringing online capacity to 2.8 GW. Construction of Unit 3 is completed while Unit 4 is still under construction.

In April 2022, the UAE's Federal Authority for Nuclear Regulation (FANR) released its 2023–2026 strategy, confirming that Unit 1 is undergoing a regular nuclear refuelling and maintenance phase while Unit 2 is commercially operating. FANR is reviewing the operating licence application for Unit 3, with a licence expected to be issued in 2022 to current operator

Nawah Energy Company, a subsidiary of ENEC and the Korea Electric Power Corporation (KEPCO).

With completion of the fourth reactor, the plant will generate some 5.6 GW, equivalent to 25% of the UAE's energy needs: 'Construction is going to plan, which is a bit unusual for nuclear power plant construction, even in developed countries,' reflects Dr Justin Dargin, an energy expert at Oxford University. The Emiratis 'are doing everything by the book to get this done, not just in how they approached construction, but also in the way they portrayed their nuclear power ambitions, which has been able to alleviate issues about a Middle Eastern country pursuing nuclear energy', he comments.

While most countries in the Middle East and North Africa (MENA) announced intentions to develop nuclear energy in the mid-2000s, only the UAE, Israel and Iran currently have nuclear power plants. Dargin says that plans have been put on hold due to the economic costs as well as the push for renewable energy, particularly photovoltaic, in the MENA region.

Saudi Arabia, however, seems set to develop a nuclear power programme centred around the King Abdullah City for Atomic and Renewable Energy research and science zone in Riyadh. 'Saudi Arabia will move ahead with nuclear power. Having just established the Saudi Nuclear Energy Holding Company [in March 2022], it is a prelude to structuring contracts,' says Dargin.

With government backing and technological advances, especially in improving safety, the prospects of nuclear power in the Asia-Pacific and the Middle East look secure.



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