KEMENTERIAN TENAGA DAN SUMBER ASLI

KERATAN SURAT KHABAR

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Considering fission power

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Power trips

In February 2020, then Prime Minister Tun Dr Mahathir Mohamad announced that Malaysia would not use nuclear energy, primarily because the world had yet to find the best and safest way to dispose of the generated radioactive waste.

For Universiti Tenaga Nasional senior lecturer Dr Mohd Syukri Yahya, however, nuclear power should not be left out of consideration by the government and the public, and should certainly become part of the national energy mix.

His peer, Dr Azrudi Mustapha, who has a PhD in nuclear engineering from the Imperial College of London, points out that while nuclear waste is indeed a problem, it's been made to be a bigger problem than it actually is.

While nuclear waste is hazardous, it is not dangerous, he explains.

"First of all, there is no recorded harm from civilian nuclear power waste anywhere in the world in over six decades of nuclear power history," he says.

He attributes this to effective waste management and mitigating techniques currently practised by the industry.

Citing statistics from Our World in Data, the duo says nuclear technology has been "the safest and consistently remains among the safest sources" of energy until today in terms of death rates, pollution and carbon emissions (see graphic on Page 3).

The waste is manageable because of its solid form; fossil fuel plants, on the other hand, release their waste products into the atmosphere – including, of course, carbon, the global warming gas.

"Managing solid waste is much easier than managing carbon emissions. Nuclear waste itself is not an unsolvable problem technically but it presents itself as a political problem," says Azrudi.

Western countries are not the only ones pouring money into nuclear energy: China, Japan (which is still dealing with a tsunami-damaged Fukushima nuclear plant) and South Korea continue to improve on and build or export reactors. And despite Chernobyl, Russia also continues to do so.

In Siberia, Russia, the remote town of Pevek is now testing heating residential water with nuclear power generated from a small reactor onboard a ship berthed in the nearby Arctic Ocean.

TerraPower, which is backed by Gates' coalition of billionaires, is developing a new reactor design that burns fuel made from depleted uranium, which is less radioactive than naturally occurring uranium.

And earlier this month, scientists in Britain made a major breakthrough when they managed to harness power from nuclear fusion. Current nuclear plants use nuclear fission technology, which splits atoms to generate high amounts of heat that in turn generate electricity via steam turbines; fusion works by fusing atoms instead, and is seen as safer as it doesn't create a chain reaction or radioactive waste. It will be some time, however, before nuclear fusion can be used reliably.

In the meantime, nuclear technology has not changed in general, says Mohd Syukri, who has a PhD in nuclear engineering from the Korea Advanced Institute of Science and Technology.

"However, designs of commercial nuclear reactors are continuously improved with higher emphasis on reactor safety, automation and modularity.

"There are also growing calls for advanced and innovative nuclear reactors, such as those that possibly breed more fuel and/or run on spent nuclear fuels, for example the Gates-funded TerraPower reactor design, and those with small and modular concepts," he says.

Bringing to light

Public attitudes have changed, says Mohd Syukri, partly due to climate change, with more people seeing nuclear power as a realistic source of energy for power generation that is "green, reliable and scalable".

At the same time, in some countries, investments in fossil fuel power plants, even for repairs, have stalled after the global financial sector pledged to stop such financing as part of its commitment to mitigate the climate crisis.

More people are also now realising and recognising the unreliability of present forms of renewable energy, as demonstrated by recent blackouts in California and Texas, points out Mohd Syukri.

"This is further cemented by the recognition that the price of end-user electricity has been increasing although the price of solar and wind technology has been decreasing in the same period.

"This reveals that the price of electricity depends on energy availability rather than the cost of the generating technology," he says.



A decommissioned nuclear power station in south-west England. The British government this month presented a new energy security strategy after the war in Ukraine and soaring inflation increased fuel prices, with a greater focus on nuclear power and renewable energy. – AFP

So just how much power does a nuclear energy plant have to generate to make it worthwhile for Malaysians to consider the risk?

According to the US Energy Information and Administration, the country's smallest nuclear power plant with a single 582 megawatt (mW) reactor – the R.E. Ginna in Ontario, New York state – produced 4.727 billion kilowatts per hour (kWh) in 2021. In contrast, a standard 500mW coal plant has an annual production of 3.5 billion kWh.

Only 40% of thermal energy from coal is converted to electricity, however; the rest is lost in emissions, the consequences of which the world is grappling with now.

Overall, the US Energy Department estimates that one nuclear plant produces around 1 gigawatt of power; it would take 3.125 million solar photovoltaic panels or 431 utility-scale wind turbines to generate the same amount of energy.

Heated up

Energy consultant Utility Bidder has projected that by 2032, Malaysia will be ranked the world's third biggest contributor of CO2 emissions at 481.1 metric tonnes if we continue our current forms of energy generation and usage. This projection is based on the 7.16% annual increase that Malaysia saw in carbon emissions between 1959 and 2019. Only Saudi Arabia and Thailand are expected to rank ahead of Malaysia by then.

Hence, there is no question that Malaysia has to decarbonise quickly to achieve its pledge of becoming carbon neutral by 2050 – quite a feat considering that coal generated over 50% of the country's electricity in 2017.

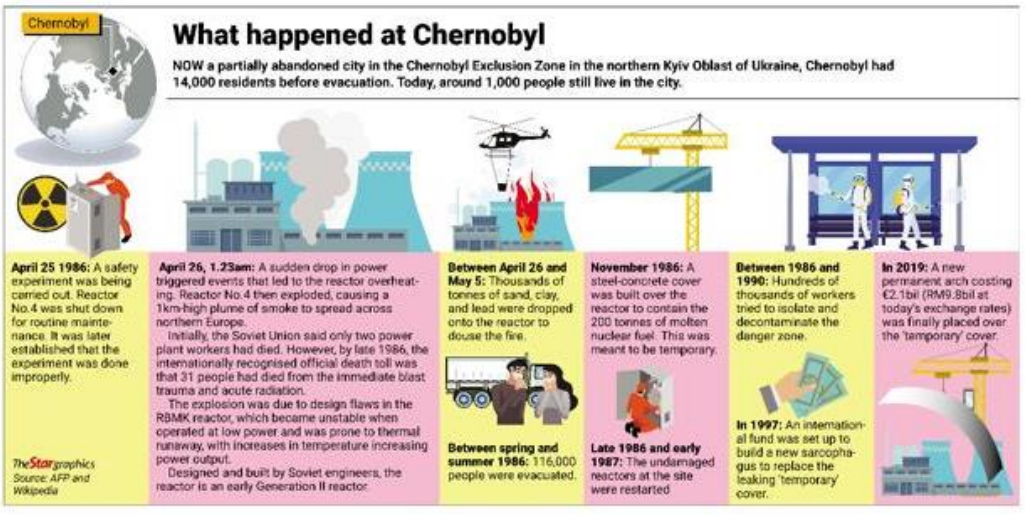
Mohd Syukri points out that the country's current energy transition path involves an enormous investment in solar photovoltaic panels and grid infrastructure as well as increasing gas-fired generation.

"This would produce expensive end-user electricity, as has been demonstrated in Germany and California. We should thus reconsider our current strategy to escape from being trapped by the 'romanticism' of RE [renewable energy]," he says.

He believes it would perhaps be more advantageous to "marry nuclear and RE" in Malaysia's efforts to mitigate the worst consequences of climate change.

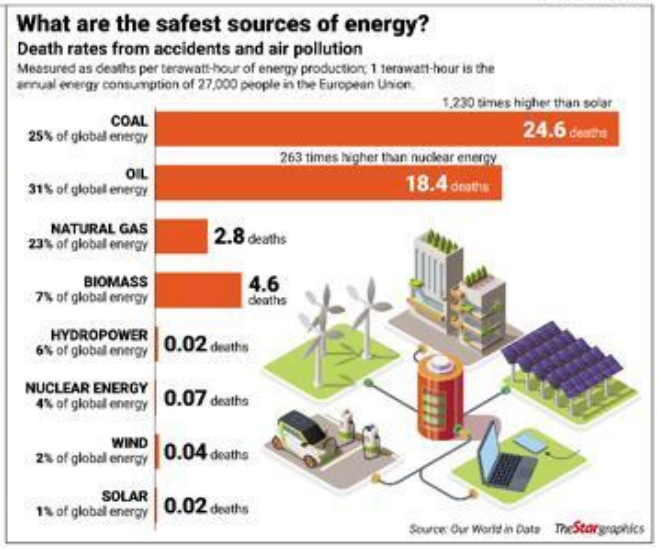
Azrudi calculates that a plant the size of the 5,600mW Barakah Nuclear Power Station in the United Arab Emirates would supply 30% of Malaysia's maximum demand while generating very little emissions.

"If this displaces gas, it would also reduce our overall electricity price due to the way that energy costs in Malaysia are calculated," he says.





Spent nuclear fuel storage containers at the San Onofre Nuclear Generating Station in California. Experts say nuclear waste is a political issue while environmentalist say it's a pollution issue. – Reuters



Getting reactive

For Sahabat Alam Malaysia president Meenakshi Raman, however, going nuclear is not the way for Malaysia to decarbonise quickly.

She says that research shows that the cost of new nuclear power generation on average is about five times more than the cost of onshore wind power per kWh, depending upon location and integration issues.

"One 2008 report suggests that construction cost estimates for new nuclear power plants are very uncertain and have increased significantly in recent years, ranging from US$6bil to US$9bil (RM25.53bil to RM38.29bil) for each 1,100mW plant," she adds.

Not to mention the long lag time between planning and operation: it can take between five and 17 years to get going, and it is said that this would produce 23 times the emissions per unit of electricity generated.

"So if the intention is to rapidly scale down emissions, having such a long lag time between planning and operation does not help," she points out.

The high cost does not include the expense of storing nuclear waste, which can last for "hundreds of thousands of years" and which can run up to US$500mil (RM2.14bil) annually because of safety measures required to deal with the waste from 100 plants.

"As the waste continues to accumulate, the cost will mount and once the power plants retire, expenses will continue for thousands of years – even when there is no revenue generated from electricity sales," she says.

(Uranium used to generate nuclear power has a half-life – the amount of time it takes to decay – of billions of years.)

While a study shows that to date, only 1.5% of all nuclear power plants ever built have melted down to some degree, when such incidents do happen, they can be either catastrophic or seriously damaging, Meenakshi adds.

"The nuclear industry has claimed that there are new reactor designs which are safer but these have generally not been tested, and there is definitely no guarantee that the reactors will be designed, built, and operated properly or will not be impacted by natural disasters, or even climate impacts, or accidents which can result in a very major catastrophe," she says, pointing to Chernobyl as well as the Fukushima Daiichi incident in Japan in 2011.

The Tohoku earthquake on March 11, 2011, spawned a massive tsunami that caused the generators pumping coolant around the reactors to fail.

Furthermore, the mining of uranium has been associated with lung cancer.

"It does not make economic or environmental sense to invest in nuclear energy. No right-thinking, environmentally-sound activist will support the use of nuclear power for energy," says Meenakshi, adding that it is "foolhardy to invest billions and billions of ringgit in such dangerous and risky technology".

Rather, to decarbonise, it would be better for Malaysia to invest more in wind and solar power, as well as mini-hydros in rural communities in addition to implementing measures to enhance energy efficiency and reduce demand, she says.

Nimby (not in my backyard)

Even without a nuclear plant of our own, Malaysia already has experience dealing with radioactive waste stemming from projects like the Asian Rare Earth mine in Bukit Merah, Perak, and Lynas in Gebeng, Pahang. And it has been a controversial experience.

The mines are owned by foreign companies and gather rare earths like yttrium, praseodymium and neodymium that are used in the production of electronics like handphones and cameras. They have faced considerable headwinds due to the low-level radioactive waste the mining generates.

The failure to close the Lynas plant, for example, has often been cited by political analysts as one of the reasons for the public's disillusionment with the Pakatan Harapan government which came into power in 2018 and was toppled two years later.

"So even with rare earth plants we have faced controversy, what more from nuclear power plants which will be much worse, knowing what we know from Fukushima and Chernobyl," says Meenakshi.

"The public will fear this and nobody will want such plants in their backyard."

It seems that, for the moment, it won't be newer or safer technology or even the climate emergency that will dictate any decision on finally ushering in nuclear power in Malaysia. The biggest converter still looks to be public opinion.



The shelter above the sarcophagus covering the exploded reactor at the Chernobyl nuclear power plant in Ukraine. Russian forces occupied the plant in the earliest hours of the invasion of Ukraine in February, churning up highly contaminated soil from the site of the world's worst nuclear disaster. – AP

