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Malaysia edges toward nuclear but readiness still in doubt

The Malaysian Reserve, Malaysia

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The country would benefit from a stronger liability framework that meets international standards if it chooses to develop nuclear power

TMRgraphic

by AUFA MARDHIAH

MALAYSIA'S revamped atomic energy laws and quiet preparations for nuclear power, while representing an important step forward, need further strengthening as the country moves closer to considering commercial nuclear power.

Universiti Tenaga Nasional (Uniten) Institute of Nuclear Engineering director Dr Mohd Syukri Yahya said recent amendments to the Atomic Energy Act, along with institutional changes, form a strong foundation for future development.

However, as with all newcomer countries, additional refinements are needed to safely host a nuclear power plant.

"At this point, our legal and regulatory framework is evolving and aligns with Malaysia's current stage of readiness. Like all newcomers, further enhancements are part of the normal journey as we progress.

"We still need to strengthen areas like nuclear liability and safeguards before we can think about operating a plant safely," he told *The Malaysian Reserve (TMR)*.

Laws Updated but Questions Remain

In August 2025, the Dewan Rakyat passed amendments to the Atomic Energy Licensing Act 1984 (Act 304) for the first time in 41 years, aimed at strengthening and modernising Malaysia's atomic energy laws to cover safety, security and usage control in line with current technology.

Science, Technology and Innovation (MOSTI) Minister Chang Lih Kang said the changes are meant to give Malaysia the domestic legal basis to sign and ratify several outstanding international instruments on atomic energy, signalling preparations for the possible use of nuclear energy for electricity generation after 2030.

MOSTI documents describe the amended Act 304 as modernising institutional functions, strengthening safety and security measures and aligning Malaysia with international atomic energy standards, thereby laying the foundation for potential nuclear energy deployment after 2030 and supporting the country's net zero 2050 goals.

In November 2025, the Energy Transition and Water Transformation Ministry (PETRA) told the Dewan Rakyat that it was planning further amendments

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to Act 304 so that Malaysia can ratify additional international instruments on nuclear safety and regulation, and eventually allow nuclear to be used as a source of electricity.

The ministry said the government is conducting a phased, comprehensive assessment of nuclear energy as one of the options in the national energy mix, in line with the net zero emissions target by 2050.

PETRA also said MyPower has been appointed as the Nuclear Energy Programme Implementing Organisation (NEPIO), tasked with laying the groundwork for nuclear power through policy development, legal framework strengthening and technical studies on suitable reactor technologies.

The bill also establishes an Atomic Energy Advisory Council and introduces a new section on offences and penalties for the malicious use of radioactive or nuclear material causing death, serious injury or significant damage.

Additionally, the revised law provides for the establishment of a radioactive waste management fund and adjusts liability limits for nuclear incidents.

With the amendments, Mohd Syukri noted that operating licences can now run for up to 40 years, with periodic safety assessments required through conditions set by the regulator, replacing the previous system of more frequent renewals.

The old licensing board structure has been dissolved and replaced with an advisory council, while licensing authority now rests with the Atomic Energy Department DG.

These moves are designed to give investors more certainty, reduce administrative friction and allow regulators to focus on long-term safety oversight rather than continual paperwork.

However, Mohd Syukri stressed that these reforms are only one part of what is needed for a credible nuclear regime, and should be seen as a foundation rather than a green light for construction.

"The amendments are a strong foundational step, but as with all countries introducing nuclear power, additional phases of regulatory strengthening will be needed as we move toward potential deployment," he said.

Liability, Safeguards still the Missing Pieces

Beyond licence tenure and organisational changes, the biggest gaps lie in nuclear liability, safeguards and long-term governance.

Malaysia still needs a clear and robust liability regime that sets out responsibilities in the event of a nuclear incident, including limits, timelines and treatment of cross-border effects.

Although the amendments increase, Mohd Syukri told *TMR* that Malaysia would eventually benefit from a more comprehensive liability framework aligned with international conventions should the country decide to pursue nuclear power.

He also highlighted the value of progressively strengthening domestic implementation of international safeguards and conventions, so that treaty commitments are fully reflected in local law and enforceable in Malaysian courts.

Regulatory independence is another consideration. Many newcomer nuclear countries gradually enhance the independence of their regulators as their programmes mature, and Malaysia can adopt similar measures over time in line with international best practice.

"There are a few things — the Act is good, the implementation is good, the government is supportive. But to go for nuclear power, continued strengthening would be normal and expected," he said.

Mohd Syukri argued that governance and legal strength must come first, and that Malaysia should not move into construction without fully addressing these questions.

Quiet Groundwork for Nuclear Option

While the legal framework continues to evolve, Malaysia is already doing substantial groundwork to keep nuclear on the table as a future option.

The 13th Malaysia Plan (MP13) states that the country will explore nuclear power and, if feasible, operate a plant by 2031, with a national nuclear energy programme office tasked to coordinate preparatory work.

In the same chapter, nuclear power is ranked as the fifth potential high-growth, high-value industry under MP13, with MyPower's mandate extending beyond policy coordination into communication and public awareness, infrastructure investment, research and development, talent-building and international collaboration.

Under the International Atomic Energy Agency (IAEA) milestones approach, Malaysia remains in Phase 1 ("considering nuclear"), but is not starting from zero.

Previous roadmaps, a prior NEPIO and an IAEA Integrated Nuclear Infrastructure Review (INIR) mission mean that Malaysia is building on earlier studies rather than beginning anew.

Meanwhile, Tenaga Nasional Bhd (TNB) has set up a temporary nuclear project management office to prepare for the possibility that it may act as a project company if the government gives the go-ahead.

The unit is focused on evaluating technology options, business models and tariff implications, and preparing for regulatory interfacing and public engagement.

Workforce planning is also underway, with estimates that Malaysia may eventually require a specialised nuclear workforce of around 1,000 people if it proceeds.

Apart from that, universities and training institutes such as Uniten and TNB Integrated Learning Solutions (ILSAS) have begun developing power-plant-specific nuclear courses.

MP13 also calls for a national radioactive waste repository, signalling long-term planning for waste management.

Malaysia's official position remains "technology agnostic", with large reactors, small modular reactors (SMRs), including floating concepts and microreactors being studied as options.

However, from a system and risk perspective, Mohd Syukri believes the first Malaysian project would need to rely on a proven, widely-deployed reactor design, rather than an untested configuration.

"For the first nuclear power project in Malaysia, we want to minimise the risk as much as possible. To do that, we need a proven reactor. We cannot do experiments," he said.

He noted that similar designs have been operated safely in China, South Korea, France and Russia, with extensive fleets and post-Fukushima safety upgrades.

SMRs and floating concepts may play a role later, especially for industrial applications, but commercial experience is still maturing.

Mohd Syukri said land availability is not the primary constraint. A site of around one kilometres (km) by two km can host several units, though selecting appropriate locations requires consideration of geology, cooling water and population density, among others.

Financing, Geopolitics Complicate the Plans

Financing and geopolitics add another layer of complexity. Nuclear is currently excluded from the Asean Green Taxonomy, but recent international moves such as the European Union's (EU) recognition of certain nuclear generation as sustainable and the World Bank's move to re-engage with nuclear financing may shape regional thinking.

Malaysia must also balance cost and geopolitics when selecting a vendor. Chinese and Korean suppliers are seen as competitive due to scale and supply chains, while some recent Western projects have faced delays and overruns.

Existing economic agreements also give certain partners a form of priority consideration.

This suggests that any first plant may lock Malaysia into a long-term relationship with its vendor, making strong domestic rules on liability governance and oversight even more critical.

Public Trust hinges on Stronger Protections

Malaysia's renewed interest in nuclear energy is driven by structural pressures. Coal plants are being phased out over time while natural gas faces emission and supply challenges, and renewables, though expanding, remain intermittent.

Internal analysis presented by TNB projects that electricity demand could triple by 2050, with coal fully phased out by 2045, and natural gas as the only baseload fuel. Without additional firm capacity, Malaysia could face challenges in energy security, affordability and grid stability.

Nuclear is being positioned as a low-carbon, reliable baseload option and could eventually support industries such as data centres seeking 24/7 green power.

Even so, Mohd Syukri stressed that public trust will depend on whether Malaysians feel adequately protected by law, governance and regulatory institutions.

"Public acceptance does not require unanimous support, but it does require a broad sense of confidence that the safeguards, governance and oversight are strong," he said.

For now, the government maintains that it is still studying nuclear energy, even as agencies quietly build capacity to move quickly if a political approval is given.

Whether Malaysia ultimately joins the ranks of nuclear-powered nations, he suggested, will depend on how seriously it continues to strengthen its law, clarify liability and demonstrate regulatory independence — proving that its regulators can say no, and not just yes, when safety is on the line.

Malaysia is Closer on Paper Than in Practice

Concurrently, energy sector expert who is also Clean Energy Xpeditors Sdn Bhd director Dr Azrudi Mustapha believes that Malaysia is closer to being "nuclear-ready" on paper than in practice.

The recent amendments to Act 304 (RUU-TA) are a positive step that tightens oversight and provides a better legal base, but true readiness is not just about having laws and documents in place.

In his view, it also means demonstrated institutional capability — a regulator that can independently license and inspect facilities, credible siting and emergency planning arrangements, and a funded pipeline of trained specialists across the safety chain.

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SMRs may play a role later, especially for industrial applications

Bloomberg

Pic courtesy of Dr Mohd Syukri Yahya

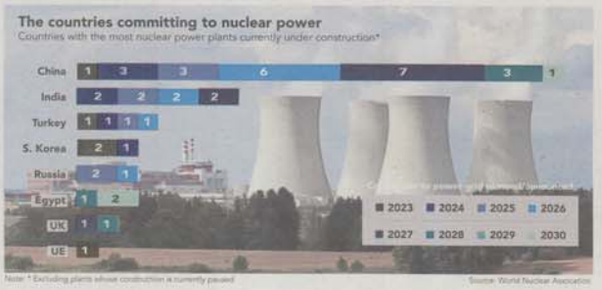
Recent amendments to the Atomic Energy Act and related institutions provide a solid foundation for future development, says Mohd Syukri

Source: parliament.gov.my

According to Chang, the changes aim to give Malaysia the legal basis to sign and ratify key international atomic energy

Pic courtesy of Dr Azrudi Mustapha

Malaysia should focus on building strong technical support with the help of universities and specialised institutions, opines Azrudi



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The biggest gaps, in his assessment, remain capacity, governance and proving readiness through real exercises and drills, rather than relying solely on drafted frameworks.

Beyond Radiological Safety

On liability, safeguards and emergency preparedness, Malaysia currently has a general radiological control baseline, but a nuclear power programme requires an orders-of-magnitude increase in capability.

A robust regime, in his view, rests on three pillars. The first is clear nuclear liability, with strict liability channelled to the operator, mandatory financial security and a workable pathway for cross-border claims in the event of an accident.

The second pillar is safeguards and security, including credible state systems for accounting and control of nuclear material, physical protection aligned with IAEA recommendations, and trained interfaces with international verification bodies.

The third pillar is emergency preparedness: Tested off-site emergency plans, reliable public alerting, medical surge capacity, environmental monitoring and clear cross-border notification protocols if an incident has regional implications.

"Malaysia has a foundation in radiological regulation, but a full-scale power programme would require a major step-up in depth, funding and demonstrated performance across all three pillars," he said.

Independent, Credible Regulator

On the regulator side, independence alone is not seen as sufficient.

Azrudi noted that regulators need years of prior training and investment to properly verify vendor safety claims and assess complex reactor technologies, and that capability has to be built ahead of any firm commitment to a project.

He believes an independent regulator should listen to input from all participants in the sector but derive its decisions internally, acting first and foremost on behalf of the public.

Competence, in this context, is demonstrated through confidence including the ability to assertively question, test and evaluate vendor safety submissions.

A trustworthy independent regulator is one with legal separation from the owner-operator, access to protected multi-year funding, and the ability to make decisions without influence from its funding source or political masters.

For Malaysia, he said priority should go to building a strong technical support ecosystem with universities and specialised institutions, and to making regulatory decision-making transparent enough to earn public trust.

Safety, Capacity Before Commitments

On NEPIO and early project studies, Azrudi highlighted three top safety-related questions that should be resolved in the initial phase.

First is credible locating — identifying where a plant can realistically be located, given external hazards and the realities of off-site emergency planning.

Second is a funded plan to build regulator and independent review capability tailored to the chosen technology, so that safety claims can be assessed in-house rather than outsourced to vendors.

Third is a clear national model for off-site emergency governance, including who makes key decisions, how the public is informed in an incident, and how regular drills are used to prove readiness before any fuel arrives on site.

Institutional haste is flagged as a safety risk in itself. Malaysia has previously abandoned its nuclear programme and rebuilding capability takes time.

If early studies are accelerated without commensurate investment in the regulator and technical expertise, there is a danger of over-reliance on vendor-led training and external goodwill.

By comparison, Azrudi pointed out that Singapore has dedicated S$66 million (RM205.13 million) in funding to build a competent nuclear safety workforce, while Malaysia's current allocation remains modest.

"If the programme is to be expedited safely, this gap needs to be addressed explicitly through paid training, independent technical support and sustained human-capital investment, rather than treated as an afterthought," he added.

Mature Gen III+ Designs the Most Realistic 1st Step

On technology choices, Azrudi said the most realistic option for a first Malaysian project is a mature, widely licensed Gen III+ water-cooled design which is essentially the same class of nuclear power reactor that Mohd Syukri mentioned earlier.

This could be either in the form of a large conventional reactor or an SMR, but in both cases priority should go to technologies where global operating experience, standards, training pathways and regulatory precedents are already deep.

More novel concepts, such as many Gen IV designs, may be promising on paper and incorporate safety features by design, but they also increase first-of-a-kind licensing burden and overall programme risk at a time when Malaysia is still building its institutional base.

Gen III+ water-cooled reactors are evolutionary designs that build directly on more than 60 years of experience operating Gen I and Gen II water-cooled reactors, whereas many Gen IV reactors represent a more revolutionary approach with less long-term operating data.

Azrudi also noted that Gen III+ large conventional reactors are well-suited to feeding reliable clean electricity into Peninsular Malaysia's extensively developed grid, while Gen IV reactors are often optimised for constrained space or co-location with specific industrial loads.

In Sabah and Sarawak, and for certain niche industries, there may be cases where Gen IV reactors are desirable, but they are unlikely to be the most realistic choice for a first national project.

Transparency Must be Treated As Culture

Azrudi argued that public trust requires proactive transparency rather than reactive communication.

This includes publishing citing criteria and safety case summaries in plain language, running open consultations with published responses, and routinely disclosing inspection outcomes and event reports.

Engagement, in his view, has to be continuous and two-way, starting before sitting, continuing through licensing and maintained throughout operations.

Emergency drills should involve local communities directly, with after-action reports made public so people can see how lessons are identified and acted upon.

From his observation of international practice, the most trusted nuclear operators and regulators are those that treat transparency as part of their institutional culture, rather than as a communications KPI or a narrow crisis-response tool.

Taken together, Malaysia's path to nuclear power is less about a single Cabinet decision and more about the slower work of building institutions that can withstand pressure.

The laws have moved, the studies are under way and the technology options are clearer. However, the real test will be whether the country is willing to invest in regulators, liability rules and transparency at the same pace as it courts megawatts.

Only then will "nuclear-ready" mean more than a line in a plan.