



Energy Security and Strategic Ambition: Evaluating the UAE's Nuclear Journey

By

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When the Barakah Nuclear Energy Plant began delivering electricity to the national grid in [2021](#), it marked more than a technical achievement. It signalled a strategic reorientation in how the United Arab Emirates (UAE) understands energy security, economic competitiveness, and regional leadership in advanced technologies.

The first commercial nuclear power plant in the Arab world is now fully operational, with all four units online and providing roughly a quarter of the country's electricity. In a region traditionally defined by oil wealth, Barakah represents an intentional shift toward a diversified, low-carbon economy aligned with long-term sustainability goals.

The urgency behind this shift stems from rising domestic energy demand, climate commitments, and the need to hedge against volatility in fossil fuel markets. The UAE's strategy positions nuclear power not as a replacement for hydrocarbons, but as a stabilising foundation within a broader clean-energy system. With global competition intensifying over clean-technology leadership, the UAE's nuclear program has become a key pillar of national planning, industrial policy, and diplomatic signalling.

Barakah's completion is notable in a world where many nuclear projects are delayed or cancelled. Built with South Korea's [KEPCO](#) and operated by Nawah Energy Company, the reactors were brought online between [2021 and 2024](#) on a timeline that compares favourably with international benchmarks.

The program is overseen by the Federal Authority for Nuclear Regulation ([FANR](#)), which maintains a comprehensive regulatory framework and publishes transparent safety and inspection assessments. This regulatory credibility underpins both domestic public confidence and international recognition, distinguishing the UAE's program from states whose nuclear ambitions raise proliferation concerns.

The impact on decarbonisation is already measurable. According to the Emirates Nuclear Energy Corporation (ENEC), Barakah currently avoids around [22.4 million tons of carbon](#) emissions annually, equivalent to removing nearly 4.8 million cars from the road. This mitigation supports the UAE's net zero by 2050 [Strategic Initiative](#).

This forms part of wider clean-energy planning that includes hydrogen, expanded solar capacity, and carbon-efficient industrial development. Nuclear power provides stable baseload output that complements intermittent renewables and stabilizes the electricity system as demand grows.

The UAE's nuclear program is also a catalyst for scientific and industrial capabilities. Prior to Barakah's commissioning, the UAE invested in human capital through institutions such as [Khalifa University](#), which established the Emirates Nuclear Technology Centre ([ENTC](#)) to support reactor safety, radiation science, and advanced materials research. Alongside operator training and regulatory capacity building, these programs expand domestic expertise in high-value sectors that extend beyond power generation. Over time, these skills contribute to cybersecurity, digital instrumentation, robotics for plant inspection, and reactor systems modelling.

This knowledge base has spillover effects in multiple fields. In nuclear medicine, investments in radiopharmaceutical production and imaging facilities have strengthened diagnostic and therapeutic services, enabling the UAE to become a regional hub for advanced cancer treatment. In agriculture, the application of nuclear techniques such as the sterile insect technique ([SIT](#)) has supported integrated pest management, reducing chemical



pesticide use and improving food security. In industry, nuclear-powered low-carbon aluminium production demonstrates how nuclear energy can decarbonize energy-intensive exports, positioning the UAE competitively as global markets introduce carbon border adjustment mechanisms.

However, several longer-term challenges require sustained policy focus. First, the [UAE's nonproliferation model](#), which commits to no enrichment and no reprocessing, enhances international trust but requires resilient fuel-cycle logistics. Ensuring diversified fuel suppliers and clearly articulated strategies for spent-fuel management will be essential over the fleet's 60- to 80-year operational life.

Second, as more renewable energy is integrated into the grid, nuclear power plants will need to operate flexibly to maintain system stability. This will require advanced forecasting, large-scale storage solutions, and coordinated dispatch strategies.

A third challenge is ensuring that the nuclear workforce remains locally grounded and resilient. While Emiratization in the sector has advanced, retaining specialised talent requires clear career progression pathways, applied research opportunities, and continued collaboration with global operators, research laboratories, and regulatory bodies. Sustaining this talent pipeline is vital not only for Barakah's long-term success but also for future reactor projects or advanced nuclear applications.

These considerations are particularly important as the UAE explores a potential second nuclear plant, which has been signalled in government discussions and energy planning reports. A second site could reinforce fleet-level operations, enhance outage scheduling, expand industrial applications, and deepen domestic supply-chain maturity. If pursued, the contracting and technology-selection process will become a significant geopolitical signal in the Gulf energy landscape, particularly as other states in the region show growing interest in nuclear power.

The UAE is now uniquely positioned to shape the trajectory of civil nuclear development in the Gulf Cooperation Council (GCC). Establishing a GCC [Nuclear Regulation and Safety Forum](#), anchored in FANR's experience, could enable shared emergency preparedness frameworks, cybersecurity standards, and safety culture norms. Similarly, coordinating research networks in radiopharmaceutical production, nuclear-enabled agriculture, and advanced reactor technologies could support regional industrial integration. These collaborative frameworks would not only enhance security and performance standards but also reduce duplication of effort among neighboring states.

Looking ahead, discussions around [small modular reactors](#) (SMR) and microreactors are expanding globally. These technologies offer potential applications for district cooling, desalination, and off-grid industrial clusters. For the UAE, SMRs could complement rather than replace large-scale reactors. Any adoption pathway must be grounded in demonstrated vendor maturity, regulatory readiness, supply-chain localization, and long-term cost predictability. The UAE's existing regulatory and operational foundation gives it a comparative advantage in evaluating such options pragmatically rather than rhetorically.

The UAE's experience demonstrates that new nuclear programmes can be delivered on time, integrated into a national climate strategy, and used to catalyse broader scientific and economic development. The challenge now is to advance from successful construction to strategic expansion, ensuring fuel-cycle resilience, embedding research translation, supporting workforce depth, and strengthening regional cooperation mechanisms. If these next steps are taken with the same planning discipline that characterised the first phase, the UAE will not only retain its role as the GCC's leader in civil nuclear power but also provide a model for how emerging economies can balance energy security with strategic ambition in a decarbonizing world.



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