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Issue Brief

Civil Nuclear Energy in GCC Countries

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March 05, 2025

S*ummary*

The GCC are seeking to enhance their energy security, stimulate economic growth and play a significant role in the global transition towards a low-carbon future by investing in civil nuclear energy.

Introduction

The Gulf Cooperation Council (GCC), which includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates (UAE), account for 2.7 per cent of global greenhouse gas emissions despite making up roughly 0.71 per cent of the global population.¹ GCC countries are key producers of oil and natural gas, and possess around 30 per cent of the globe's confirmed oil reserves and 23.6 per cent of its proven natural gas reserves.² The swift industrial growth in the GCC led to a significant influx of migrant workers. Additionally, the combination of a high birth rate, enhanced living conditions and greater reliance on seawater desalination has contributed to a surge in energy demand.³

The GCC countries rank as some of the top electricity consumers per capita globally, with usage levels ranging from 103 per cent to 430 per cent higher than the global average of 3.5 Megawatt hours (MWh) per capita.⁴ In addition, peak electricity demand is projected to grow at a Compound Annual Growth Rate (CAGR) of 7.5 per cent, rising from the current 122 Gigawatts (GW) to more than 250 GW by 2030. This presents the additional challenge of balancing the need to generate more electricity with efforts to reduce greenhouse gas emissions in the future.⁵ In 2022, the total energy consumed in the GCC states was 3.2 billion barrels of oil equivalent (BOE), of which more than 99 per cent was oil and gas. Consumption is expected to reach 4.8 billion BOE by 2025.⁶

Previously, all the GCC countries depended on oil and natural gas to meet energy demands. As a result, greenhouse gas emissions more than doubled from 2000 to 2020, positioning the GCC nations as some of the largest per capita emitters of CO₂ globally.⁷ Since the 26th UN Climate Change Conference in 2021, energy policies including those in GCC countries, have increasingly focused on shifting away from carbon-based energy sources. GCC countries have announced their decarbonisation commitments. The main drivers behind this shift are the goals set by the United Nations Framework Convention on Climate Change (UNFCCC) to reduce CO₂ emissions and limit the global temperature increase to below 1.5°C.

The GCC countries are also exploring nuclear energy as a potential alternative to meet both growing electricity demands and their net-zero emissions goals. According

¹ [“Pathways to Faster Decarbonization in the GCC’s Power Sector”](#), General Electric Company.

² A. Sakhrieh, [“Energy Analysis for GCC Countries”](#), Gcreeder, April 2016.

³ Abdullah Al-Badi, [“Growing Energy Demand in the GCC Countries”](#), Arab Journal of Basic and Applied Sciences, Vol. 26, No. 1, pp. 488–496, 2019.

⁴ [“Pathways to Faster Decarbonization in the GCC’s Power Sector”](#), no. 1.

⁵ Ibid.

⁶ Osamah Alsayegh, [“Ensure GCC’s Energy Future by Reconsidering Joint Nuclear Plant Collaboration”](#), Baker Institute for Public Policy, 19 December 2024.

⁷ [“Renewable Energy Markets: GCC 2023”](#), International Renewable Energy Agency, Abu Dhabi.

to the International Atomic Energy Agency (IAEA), using nuclear power can significantly lower greenhouse gas emissions, with a single nuclear reactor capable of preventing roughly 3 to 4 million tons of CO₂ emissions annually. Since 2010, many GCC countries have been pursuing independent nuclear energy programmes. All GCC nations have signed the Non-proliferation Treaty, ensuring that their nuclear facilities are subject to oversight by the IAEA.

Why Nuclear Energy?

The GCC nations have significant solar energy potential, particularly for solar photovoltaics. Specific areas, notably in Oman and Saudi Arabia, are well-suited for concentrated solar power due to their favourable conditions. Key challenges however include the need for infrastructure upgrades to integrate solar power with existing grid systems, high initial costs and water use for cleaning solar panels in GCC countries due to the region's arid climate and water scarcity. The wind energy potential in the area is not as high as that of solar, but remains promising, and an increasing number of wind projects are currently being developed in the region.

The GCC nations have set ambitious goals for sustainable energy in the future. So far, five countries in the region have committed to achieving net zero by 2050–2060, though these pledges have not yet been fully reflected in actionable policies and specific milestones.⁸ The GCC countries are adopting a diversified energy mix approach to better meet electricity demand. This strategy aims to enhance energy security and sustainability while accommodating their specific economic and environmental contexts. Nuclear energy is a clean, emissions-free power source that plays a vital role in combating climate change. With its minimal carbon impact and consistent energy output, it serves as a valuable solution for achieving net-zero carbon emissions and advancing the transition to clean energy. Wind and solar are variable energy sources that depend on the weather and time of the day.

Civil Nuclear Energy in GCC Countries: Recent Developments

The United Arab Emirates

The UAE's energy plan aims to achieve a mix of 44 per cent renewable energy, 6 per cent nuclear energy, 38 per cent natural gas, and 12 per cent super-critical clean

⁸ [Ibid.](#)

coal.⁹ At the core of the UAE Energy 2050 plan is the goal of delivering clean and affordable energy to lower carbon emissions, improve energy efficiency, drive economic growth and prepare for a future beyond oil.¹⁰ The UAE Peaceful Nuclear Energy Program is carried out by the Federal Authority for Nuclear Regulation (FANR), the Emirates Nuclear Energy Corporation (ENEC), Korea Electric Power Corporation (KEPCO), Nawah Energy Company (Nawah) and Barakah One Company.¹¹

The Barakah Nuclear Power Plant, situated 230 km west of Abu Dhabi in the Al Dhafra region, is the UAE's inaugural nuclear power facility and is also the first of its kind in the Arab world, beginning its operations in 2020.¹² Now fully functional, the plant's four reactors generate approximately 25 per cent of the nation's electricity, which is sufficient to supply power to over half a million homes.¹³ This plant is expected to operate for 60 to 80 years before it may be dismantled.¹⁴ Significantly, the plant is expected to reduce greenhouse gas emissions by more than 22 million tonnes yearly,¹⁵ comparable to the emissions from almost five million vehicles. This contribution plays a key role in helping the UAE meet its emission reduction targets set by the Paris Agreement.¹⁶

In addition, ENEC has finalised its initial commercial agreement for uranium fuel supply with Kazakhstan's National Atomic Company, Kazatomprom JSC. This contract is essential for maintaining a consistent and reliable fuel source for the Barakah plant.¹⁷ This agreement enhances ENEC's strategy to diversify its fuel sourcing, as ENEC had previously established contracts with other global suppliers since 2012. Adding to this strategy, the UAE has finalised a Nuclear Cooperation Agreement with Australia, under which Australia will provide uranium for the UAE's nuclear programme, with provisions established to ensure the peaceful use and security of the supplied uranium.¹⁸ In August 2023, it was announced that KEPCO, KHNP and ENEC initiated talks about the potential addition of two more

⁹ [“UAE Renewable Energy Strategy”](#), United Arab Emirates Ministry of Climate Change and Environment.

¹⁰ [“UAE Energy Strategy 2050”](#), United Arab Emirates Government Portal.

¹¹ [“United Arab Emirates Updated 2022”](#), International Atomic Energy Agency.

¹² [“Nuclear Power in the United Arab Emirates”](#), World Nuclear Association, 5 September 2024.

¹³ [“Nuclear Power in the Gulf Region: Balancing Sustainability with Strategic Growth”](#), Damona, 7 August 2024.

¹⁴ [“Preparing 60 Years in Advance: The UAE's First Nuclear Power Plant and Plans for Future Decommissioning”](#), International Atomic Energy Agency, April 2023.

¹⁵ Ashwani Kumar, [“Barakah Nuclear Power Plant to Cut More Carbon Emissions Than Expected”](#), *Khaleej Times*, 20 January 2023.

¹⁶ Ibid.

¹⁷ [“ENEC Signs Commercial Uranium Contract with World's Largest Uranium Producer”](#), Emirates Nuclear Energy Company, 4 December 2023.

¹⁸ [“Australia-India and Australia-UAE Nuclear Cooperation Agreements”](#), Minister for Foreign Affairs Australia, 25 November 2015.

APR-1400 nuclear reactors at the Barakah location, to be named Barakah-5 and Barakah-6.

Table 1. Status and Performance of Nuclear Power Plants

Reactor Unit	Type	Net Capacity [MW(e)]	Operational Status	Model	Operator	Reactor Supplier
BARAKAH-1	PWR	1417	August 2020	APR-1400	NAWAH	KEPCO
BARAKAH-2	PWR	1345	September 2021	APR-1400	NAWAH	KEPCO
BARAKAH-3	PWR	1345	October 2022	APR-1400	NAWAH	KEPCO
BARAKAH-4	PWR	1345	March 2024	APR-1400	NAWAH	KEPCO

Source: Power Reactor Information System (PRIS), IAEA¹⁹

(PWR: Pressurized Water Reactor; APR: Advanced Power Plant; NAWAH: Nawah Energy Company; KEPCO: Korean Electric Power Corporation)

Saudi Arabia

In 2010, Saudi Arabia founded the King Abdullah Center for Atomic and Renewable Energy (KAcare) to drive advancements in the peaceful use of atomic and renewable energy technologies. At the 67th IAEA General Conference, Energy Minister Prince Abdulaziz Bin Salman reiterated Saudi Arabia's dedication to advancing peaceful nuclear energy applications under the Saudi National Atomic Energy Project.²⁰ This initiative includes plans to construct a nuclear power facility that aligns with sustainable development objectives. Additionally, Saudi Arabia has set an ambitious goal of deriving 50 per cent of its energy from renewable sources by 2030, demonstrating its commitment to diversifying its energy resources and decreasing dependence on fossil fuels.

Saudi Arabia is advancing its nuclear energy programme by moving closer to securing US support through a protocol that allows the IAEA to operate legally within the country. This comes as a small research reactor near Riyadh is set to become operational soon, and there are ongoing plans to construct a commercial nuclear power plant at Duwaiheen, currently open for bids.²¹

¹⁹ [“Country Nuclear Power Profiles 2022 Edition”](#), International Atomic Energy Agency.

²⁰ [“Saudi Arabia Reiterates Plans for Nuclear Energy”](#), *World Nuclear News*, 28 September 2023.

²¹ Andrew Hammond, [“Saudi Arabia Signs IAEA Protocol as Nuclear Plans Advance”](#), *Arabian Gulf Business Insight*, 9 August 2024.

Prince Abdulaziz Bin Salman, Saudi Arabia's Minister of Energy, has emphasised the kingdom's significant uranium reserves, stating that they will be exploited commercially in a transparent manner.²² He highlighted the intent to enrich uranium and produce yellowcake, reflecting the country's ambition to develop a self-sufficient nuclear energy sector.

KAcare has solicited proposals from South Korea, China, Russia and Japan for 2.9 GW of nuclear capacity.²³ In 2018, Saudi Arabia launched a project to construct a research reactor and is investigating Small Modular Reactors (SMRs) through partnerships with the Korea Atomic Energy Research Institute, Argentina's INVAP and the China Nuclear Engineering Corporation.²⁴ Additionally, the Kingdom is creating a nuclear energy framework programme that spans from 2022 to 2027.

Kuwait

In 2009, Kuwait formed a national nuclear energy committee that conducted technical studies and pinpointed potential sites for nuclear power, including Bubiyan Island, Failaka Island, and a location on the southern coast.²⁵ However, these plans were abandoned in 2011 following the Fukushima disaster in Japan. To date, Kuwait has not established an official nuclear energy programme for electricity generation. However, the country remains committed to cutting carbon emissions, as demonstrated by its pledges at the United Nations Climate Conference (COP27), with a target of achieving net-zero emissions by 2050 in the oil sector and by 2060 in other sectors.²⁶

Kuwait is committed to collaborating with the IAEA to harness nuclear energy for safe and impactful projects that promote social and economic development. Ambassador Talal Sulaiman Al-Fassam stated that Kuwait prioritises continuous collaboration in diverse nuclear technical fields such as advancements in the oil sector, the development of genetically modified crops, and the investigation of small reactors for power generation.²⁷ This multifaceted approach aims to advance Kuwait's energy capabilities to support innovation and overall economic growth.

²² [“Saudi Arabia to Use Domestic Uranium for Nuclear Development”](#), Nuclear Engineering International, 19 January 2023.

²³ [“Nuclear Power in Saudi Arabia”](#), World Nuclear Association, 28 March 2024.

²⁴ [“Small Nuclear Power Reactors”](#), World Nuclear Association, 16 February 2024.

²⁵ [“Kuwait Shortlists Three Sites for Nuclear Plants”](#), Middle East Business Intelligence, 8 February 2011.

²⁶ [“KISR Explores the Role of Nuclear Energy in Achieving Carbon Neutrality”](#), *Times Kuwait*, 25 January 2024.

²⁷ Ahmadomar, [“Kuwait Emphasizes IAEA's Pivotal Role in Transferring Nuclear Knowledge, Strengthening Security”](#), *Kuwait Times*, 27 September 2023.

Oman

Oman established the Oman Electricity Transmission Company (OETC) and the Nuclear Regulatory Authority (NRA) to manage the safety and regulatory aspects of nuclear energy development. The NRA was created to ensure adherence to international safety standards.

Oman does not possess any nuclear power plants or facilities associated with the operation of such plants, either directly or indirectly.²⁸ At present, the country has no plans to initiate a nuclear power programme or to construct any research or test reactors. The country is considering the potential of SMRs, which are viewed as safer and more suited to its specific requirements. The political and security implications, along with domestic safety concerns, have contributed to the hesitance in developing a nuclear technology programme.

Qatar

Qatar has highlighted the significance of non-electric nuclear energy applications, such as improving food security, boosting healthcare, advancing agricultural practices and desalinating water.²⁹ These initiatives are in line with the objectives of the 2030 Sustainable Development Agenda and the related United Nations framework. The country has also recognised the global shift towards SMRs and advocated for increased support for this technology. SMRs are valued for their cost efficiency, enhanced safety compared to larger nuclear plants and adaptability to non-electric uses. Qatar envisions utilising these reactors for desalinating seawater and providing energy to remote areas without electrical infrastructure.

The Qatar Investment Authority (QIA) has announced a significant investment of GBP 85 million to acquire a 10 per cent shareholding in Rolls-Royce SMR Ltd.³⁰ This decision is consistent with QIA's dedication to promoting the energy transition and funding technologies that support the generation of low-carbon electricity. Mansoor bin Ebrahim Al-Mahmoud, the CEO of QIA, emphasised the importance of this investment in promoting sustainable energy solutions and contributing to a greener future.³¹

²⁸ [“The Convention on Nuclear Safety”](#), Foreign Ministry, The Sultanate of Oman, 27 July 2022.

²⁹ [“Qatar Praises IAEA in the Transfer of Nuclear Technology for Peaceful Uses”](#), Ministry of Foreign Affairs, State of Qatar.

³⁰ [“QIA and Rolls-Royce PLC Announce Agreement to Invest in New Low Carbon Nuclear Power Business”](#), Qatar Investment Authority, 20 December 2021.

³¹ Ibid.

Bahrain

Bahrain is pursuing the construction of a Nuclear Power Plant through its Electricity and Water Authority (EWA).³² The EWA has received a proposal from the French energy company EDF to evaluate the nation's nuclear energy initiative. If chosen, EDF will offer technical assistance in shaping Bahrain's Nuclear Energy Policy and development plan. While Bahrain initially planned to launch nuclear power plants by 2017, these plans have been delayed, mainly due to significant costs.³³

Way Forward

Gulf countries such as Kuwait have thus far been unable to overcome the political and structural obstacles to adopting nuclear energy. This could change in the coming decades, however, if SMRs, currently in development, become available on the global market. These reactors can be manufactured in a factory and then transported to designated sites, simplifying construction, improving safety and lowering infrastructure expenses. SMRs are more efficient as they use less water and need less frequent refuelling, leading to a reduction in nuclear waste. Their compact design and mobility make them easier to secure, ideal for industrial uses and suitable for providing power in remote regions.

Bahrain, Qatar and Saudi Arabia have shown interest in obtaining SMRs once they are accessible.³⁴ SMRs are designed to be more secure and flexible, allowing for easier integration into existing energy systems and a reduced environmental footprint. According to the World Nuclear Association, SMRs use advanced materials and innovative safety systems that not only improve operational efficiency but also minimise risks.

Civil nuclear energy offers a crucial solution for GCC countries working towards their net-zero carbon objectives. As these nations face the challenges of climate change and the urgent need to cut carbon emissions, incorporating nuclear energy into their energy portfolios becomes an essential approach. Advancements in nuclear technology have led to enhanced safety and security measures in reactor design, addressing historical concerns associated with nuclear energy. By investing in civil nuclear technology, the GCC countries are seeking to enhance their energy security, stimulate economic growth through the creation of high-tech jobs, and play a significant role in the global transition towards a low-carbon future.

³² [“Bahrain Reviews Nuclear Energy Plans as Project Receives Bid”](#), *Zawya*, 17 September 2019.

³³ *Ibid.*

³⁴ Amnah Ibraheem, [“The Nuclear-Energy Option in the Arab Gulf States”](#), International Institute for Strategic Studies, 9 November 2022.

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