

مؤسسة الإمارات للطاقة النووية
Emirates Nuclear Energy Corporation



شركة براكة الأولى ش.م.م.
Barakah One Company PJSC



شركة نawah للطاقة
Nawah Energy Company



The UAE Peaceful Nuclear Energy Program



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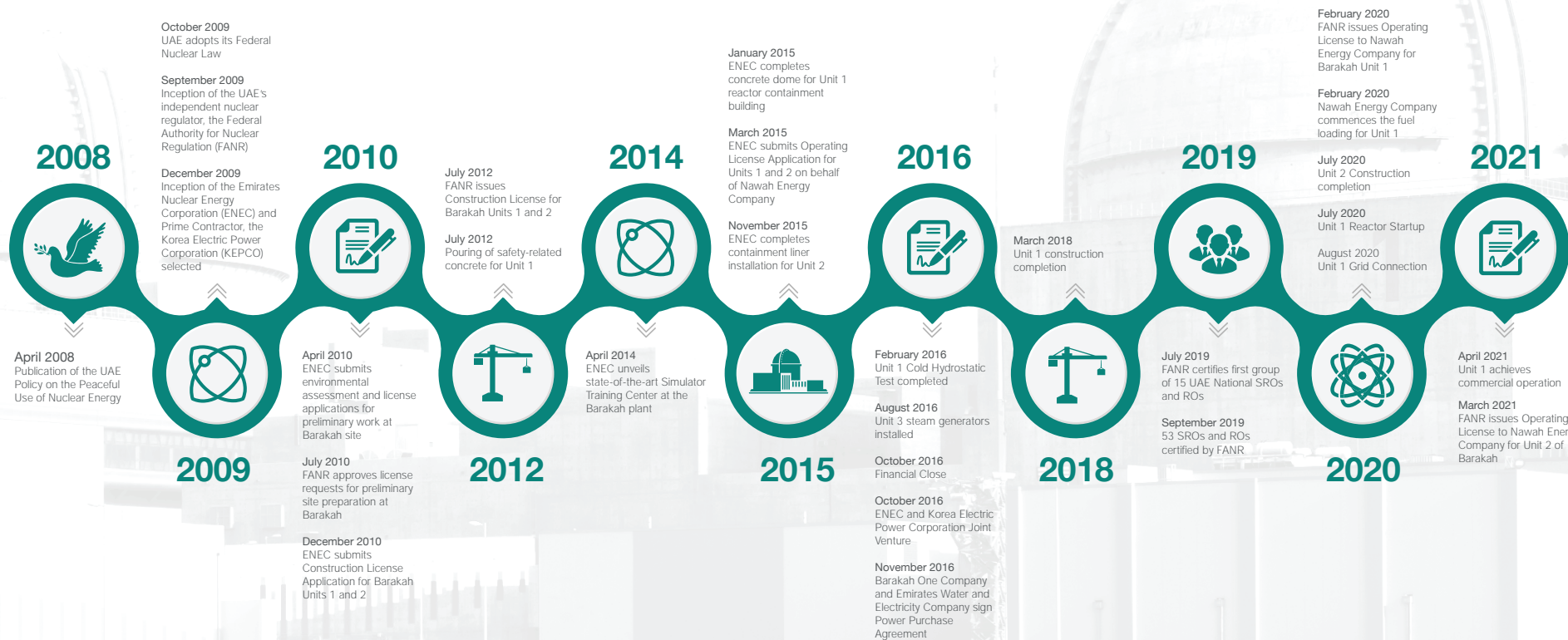
Introduction

Overview of the UAE Peaceful Nuclear Energy Program:

The UAE Peaceful Nuclear Energy Program is a strategic energy infrastructure program of national and international significance. The cornerstone of the UAE Program is the Barakah Nuclear Energy Plant. When fully operational, the plant will produce 5,600 MW of clean, baseload electricity 24/7 - preventing the release of 21 million tons of carbon emissions each year, equivalent to removing 3.2 million cars off the roads annually. Clean electricity is a key component of the solution to climate change and the Barakah plant is a positive success story, inspiring us to achieve a clean and sustainable future. The Barakah plant powers the UAE's engine of growth with 24/7 clean electricity and supports the development of new industrial sectors in the country.



Timeline for the Development of the UAE Peaceful Nuclear Energy Program



We Need Clean Electricity

The world needs clean electricity to maintain economic growth in an environmentally sustainable manner. The UAE's Barakah Plant generates large amounts of clean electricity and provides a proven solution to reduce climate change. Barakah provides the round the clock, baseload electricity required to support intermittent sources, such as solar. With this clean electricity, the UAE can achieve more by impacting less, and offers a bridge to other forms of low-carbon energy and continuing the Nation's success story on its journey to a carbon neutral economy.

Environmental impact:

- Clean electricity from the Barakah Plant supports the decarbonization of the energy sector and the electrification of industries. Reliably generated 24/7 with zero emissions, electricity from Barakah sets the UAE on a clear course to meeting the Energy Strategy 2050 targets of generating 50% of the nation's electricity from renewable and clean sources and reducing carbon dioxide emissions by 70%.

Economic impact:

- The Barakah Plant powers the UAE's engine of growth by delivering clean electricity 24/7 and supporting a new local industrial sector and supply chain. It spearheads the advancement of the intellectual wealth of the Nation and inspires the next generation to join the UAE Program to become clean energy leaders and innovators.

A Blueprint For Success

2008 national nuclear policy:

- In April 2008, the UAE released its Policy on 'The Evaluation and Potential Development of Peaceful Nuclear Energy'. This policy is built on the most exacting standards of safety, transparency and security, making the country a role model for nuclear energy development worldwide.
- The policy emphasizes six key principles:
 1. Complete operational transparency
 2. The highest standards of non-proliferation
 3. The highest standards of safety and security
 4. Working directly with the International Atomic Energy Agency (IAEA) and conforming to its standards
 5. Partnerships with responsible nations and appropriate experts
 6. Long-term sustainability.
- FANR regulates the design, siting, construction, operation and decommissioning of nuclear energy plants in the country. It also regulates all radioactive material and radiation sources used in medicine, research and other industries, and is committed to its core values of safety awareness and responsibility, competency, independence and transparency. FANR is independent of ENEC, Nawah and its employees.

International partnerships:

- From the start, the UAE has worked in conjunction with the International Atomic Energy Agency (IAEA) on its nuclear policy. Major program milestones such as fuel load can only be taken following receipt of international endorsements from the IAEA and the World Association of Nuclear Operators (WANO), and regulatory approval from FANR.

Key facts:

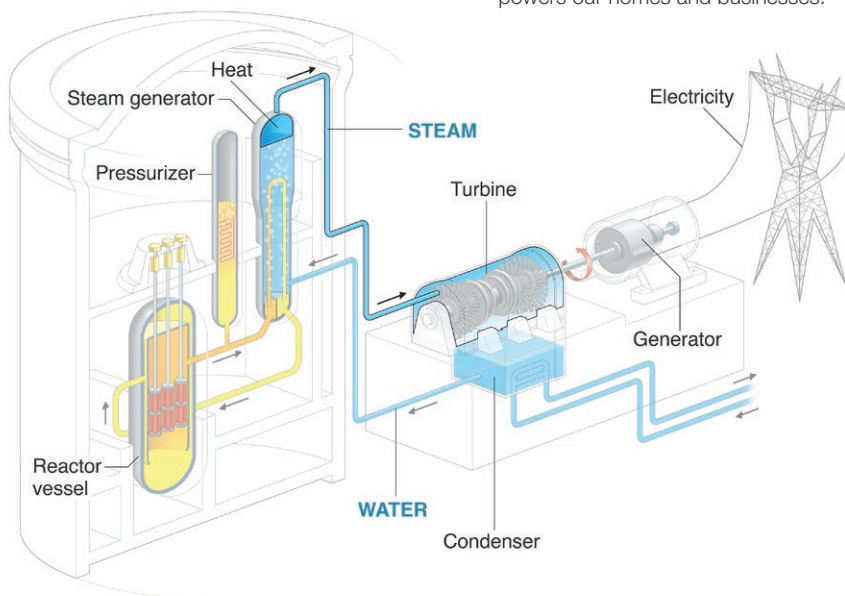
- Since 2009, ENEC and its operating subsidiary Nawah have been subject to more than 312 inspections by FANR.
- More than 42 missions and peer reviews from the World Association of Nuclear Operators (WANO) and the IAEA have been undertaken.
- All of the reviews and checks have ensured the highest international standards are met throughout the development and delivery of the UAE Program.

Regulatory oversight – FANR:

- The UAE's Federal Authority for Nuclear Regulation (FANR) is the independent regulatory body responsible for oversight of nuclear safety, security, radiation protection and safeguards, and enforcement of global agreements entered into by the UAE. FANR was established in accordance with Federal Law issued by H.H. Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE.

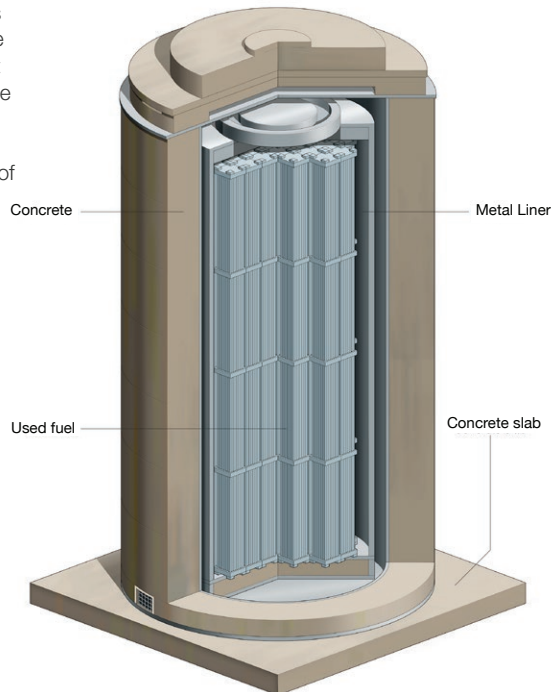
How Does A Nuclear Energy Plant Work?

- A nuclear reactor produces electricity in much the same way as other energy plants.
- The difference is how the heat is created. In a nuclear energy facility, heat is produced from splitting atoms – a process called nuclear fission. This way of making heat generates no harmful emissions, including carbon emissions, making it one of the cleanest forms of electricity generation available.
- While carefully controlled, trillions of atoms fission each second in a nuclear reactor. This chain reaction process heats water, which produces steam. The steam travels through pipes to a turbine and spins the blades.
- The turbine blades connect to a shaft that spins, turning the steam's energy into mechanical energy. The turbine shaft connects to a generator and the generator shaft spins around inside a set of electromagnets. The magnets create the electrical current that powers our homes and businesses.



What Do We Do With The Nuclear Waste?

- The generation of clean electricity at the Barakah Plant results in very little waste being produced in the form of used nuclear fuel assemblies. The plant generates radioactive waste equivalent to the size of one aspirin tablet per person per year.
- The technology for managing the used fuel exists and has been safely stored in locations around the world for decades.
- The UAE plans to store used fuel on-site at the plant while it cools in fuel pools, before moving to concrete and steel containers called dry casks. These casks can be securely stored on-site at a nuclear energy plant or at an interim or long-term storage facility. The Barakah plant spent fuel pools have storage capacity for the first 20 years of operations.
- The site for dry cask storage at the Barakah plant has undergone several years of study and investigation to prove its suitability. Once ready, it will be licensed by FANR before it can become operational.



Why Is The Barakah Plant Located in Al Dhafra?

- The Barakah plant is located in the Al Dhafra Region of the Emirate of Abu Dhabi, approximately 53 kilometers southwest of the city of Ruwais.
- This location was selected based on several factors, including environmental, technical and commercial, following a comprehensive evaluation process led by local and international experts.
- The selection process was guided by best practices and standards from FANR, the Electric Power Research Institute, the U.S. Nuclear Regulatory Commission and IAEA.
- Factors that the UAE considered when selecting the site included seismic history, distance from large population centers, proximity to large supplies of water and to existing electrical

power grid. It also took into account proximity to industrial and transportation infrastructure, favorable construction, security and evacuation route conditions and ability to minimize environmental impact.

Key facts:

- 53 kilometers southwest of Ruwais.
- The IAEA verified the site selection through its Site and External Events Design (SEED) mission.
- In July 2010, FANR and the Environment Agency - Abu Dhabi (EAD) approved two licenses for preliminary work to begin at Barakah.
- In July 2012, FANR and the EAD granted final approval for Barakah to be the site of ENEC's first nuclear energy plant.



Why The APR1400?

- From the outset, ENEC has made the safety of people, communities, environment and the plant an overriding priority. Safety always has, and always will, come first.
- ENEC's work with FANR, the IAEA, WANO and others has ensured that we have built not just a safe plant, but a safety-focused culture.
- Barakah comprises of four Generation III reactors called the APR1400.
- The APR1400 is one of the most technologically advanced nuclear reactor designs in the world and meets the highest international standards for safety and performance.

Key facts:

- Pressurized Water Reactor (PWR)
- Each reactor generates 1,400 Megawatts of power
- Operational life-span of 60 years.
- Based on the System 80+ design, which was certified by the Nuclear Regulatory Commission (NRC) in the United States of America.
- Certified by the national nuclear regulators of Korea, the UAE and the USA
- Shin Kori 3&4 are APR1400 technology reactors in South Korea that are the reference plants for the Barakah plant. Unit 3 entered commercial operation in 2016, and Unit 4 in 2019.

At the Barakah plant, ENEC has implemented a number of safety layers which would prevent anything similar to previous well-known accidents, such as Chernobyl and Fukushima from taking place. These include:

- The modern plant design with the latest safety systems. The APR1400 reactor design is certified by the independent national nuclear regulatory bodies of South Korea and the UAE, and the USA.
- Operator training and robust policies and procedures that embed safety as the overriding priority
- Promotion of a healthy nuclear safety culture
- Independent national and international regulatory and supervision organizations ensuring that the plant and its staff maintain the highest industry standards of safety and quality

Powering the UAE's Engine of Growth

- The Barakah Plant is a key source of clean electricity for the UAE, helping to enable the Nation in meeting its climate change targets to achieve a clean and sustainable future.
- Clean electricity from the Barakah Plant is delivered to consumers and industries across the Nation, supporting growth without impacting the UAE's precious environment.
- The Barakah Plant promotes the advancement of the intellectual wealth of the Nation and inspires the next generations to join the UAE Peaceful Nuclear Energy Program and become clean energy leaders.
- Nuclear science and technology drives R&D in fields like medicine, agriculture, food technology and even deep space exploration, adding significant value to society and the economy.

Key facts:

- Operating at full capacity, Barakah Unit 1 is the single largest electricity generator in the UAE, delivering clean electricity 24/7.
- Once fully operational, the Barakah Plant will prevent the release of 21 million tons of carbon emissions every year, equivalent to removing 3.2 million cars of the roads annually.
- The UAE Peaceful Nuclear Energy Program supports a new industrial sector for high quality products and services; to date, more than 2,000 UAE companies have been awarded contracts worth more than \$4.8 billion.
- ENEC has over 3,000 employees from over 50 countries around the world. 60% of staff are UAE Nationals.
- When fully operational, the Barakah Plant will prevent the same amount of yearly greenhouse gas emissions as 350 million trees would absorb over 10 years. That's the same as each person in the UAE planting 35 trees each annually!



Operational Excellence

شركة نواة للطاقة
Nawah Energy Company



Nawah Energy Company:

- Established in 2016, Nawah Energy Company (Nawah) will operate and maintain Units 1 to 4 at the Barakah Nuclear Energy Plant.
- Nawah is fully focused on the safe and sustainable operations of the four units at the Barakah plant, and ensuring a fully trained and certified team of nuclear professionals is available to undertake this important role over the next 60 years of operations.

Reactor Operators:

- Nawah has the technologically competent and highly skilled operators and engineers needed to operate the Barakah plant, delivering clean electricity to the UAE for decades to come. Having undergone years of training and certification, they will continue to undergo regular training throughout their careers to maintain their knowledge and expertise.

- There are now 72 SROs and ROs certified – with 30 Emiratis amongst this team.

Emergency preparedness:

- New plants are designed and built to counter threats, both external and internal, that could impact the safety and operations of the plant.
- ENEC has conducted regular comprehensive safety design reviews, which demonstrated an industry-leading level of plant robustness against both natural and man-made hazards.
- Emergency preparedness plans are in place to protect both plant personnel and the local public. Public notification and emergency response systems have been developed across the UAE.



Our People

- ENEC, Nawah and Barakah One Company employ more than 3,000 highly trained personnel, including the operators, engineers, technicians and support staff responsible for generation of clean electricity at the Barakah Plant. More than 60% of these employees are UAE Nationals.
- The Energy Pioneers program aims to attract and train the most talented science students and experienced professionals, inspiring the next generation of clean electricity leaders and innovators.

Key facts:

- 380 students have graduated from ENEC's Energy Pioneers Program
- More than 125 students in the pipeline to graduate
- More than 60% of these are UAE Nationals
- More than 20% are female
- Our employees represent more than 50 different nationalities

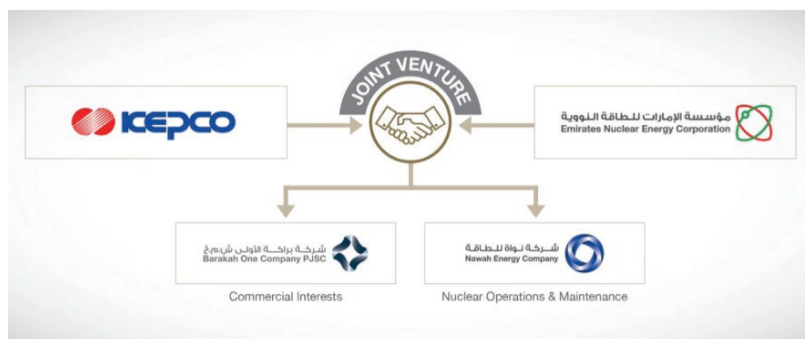


Our Partners

- KEPCO, South Korea's single largest public power electric utility, was awarded the Prime Contract in 2009 to design, build and help operate the UAE nuclear energy plant.
- In 2016, ENEC signed a Joint Venture partnership with KEPCO, and created two subsidiaries: Nawah Energy Company, the operating and maintenance subsidiary of the Barakah plant, and Barakah One Company which manages the financial and commercial interests of the project. ENEC owns 82% and KEPCO owns 18% of each company respectively.
- KEPCO is recognized by WANO as a leader in safety, plant reliability and efficiency.
- KEPCO was chosen following an exhaustive year-long evaluation conducted by a team of 75 international experts who evaluated a variety of factors, including safety, deliverability and commitment to human resource development.

Other key partnerships:

- ENEC signed an agreement with French National Radioactive Waste Management Agency (Andra) in late 2019 to explore potential collaboration in the field of radioactive waste management.
- ENEC signed an MoU with Enusa Industrias Avanzadas, S.A., S.M.E. (ENUSA), defining a framework for collaboration and the exchange of information and expertise in the field of nuclear fuel services.
- Nawah signed a long-term framework agreement with France's EDF to support Nawah in the operation and maintenance of Barakah with services in areas including operational safety, radiation protection, fuel cycle management and environmental monitoring.



Commitment To Non-Proliferation

- The UAE Peaceful Nuclear Energy Program has been developed to provide clean electricity as a solution to climate change and support emissions-free economic growth in full alignment to the Nation's Nuclear Law and its commitments to non-proliferation.
- The UAE Nuclear Law takes into account all obligations and commitments that stem from international instruments and obligations. The UAE views the application of a Comprehensive Safeguards Agreement, bolstered by the IAEA's Additional Protocol, as an important component of its model for the adoption of peaceful nuclear energy. This approach is consistent with the UAE's commitment to complete operational transparency and the highest standards of non-proliferation.
- As part of this commitment, the UAE will not enrich uranium or reprocess used fuel assemblies.



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