

# The Emirates Nuclear Energy Corporation (ENEC) and the Barakah Nuclear Energy Plant

مؤسسة الإمارات للطاقة النووية  
Emirates Nuclear Energy Corporation



شركة برقة للطاقة  
Barakah One Company PJSC



شركة نواح للطاقة  
Nawah Energy Company



## About ENEC

- The Emirates Nuclear Energy Corporation (ENEC) is working to deliver safe, clean, efficient and reliable electricity to the UAE grid, using peaceful nuclear energy technology while developing Emirati talent and building a sustainable civil nuclear energy sector.
- Established by a decree in December 2009 from His Highness Sheikh Khalifa Bin Zayed Al Nahyan, President of the United Arab Emirates, ENEC is leading the UAE Peaceful Nuclear Energy Program, which will support the UAE's social and economic growth.
- This new and abundant source of clean electricity will:
  - Diversify the nation's energy supply.
  - Support energy security.
  - Help to power the future growth and prosperity of the UAE through clean electricity 24/7.
  - Support the nation's transition to a knowledge-based economy.
  - Further enable the decarbonization of energy production.
  - Support electrification throughout the UAE.
- Peaceful nuclear energy will also complement the introduction of increasing levels of renewables connected to the UAE's grid, sustainably powering the growth of the country, in line with the UAE Energy Strategy 2050.
  - The Strategy calls for a reduction in carbon dioxide emissions by 70 percent, an increase in clean energy use by 50 percent and a 40 percent improvement in energy efficiency.

## Safety, security, transparency and non-proliferation

- Driven by a Culture of Safety, ENEC's overriding priority is to ensure the safety of the UAE community, employees and the environment.
- The UAE Peaceful Nuclear Energy Program adheres to the highest international standards of safety, security, quality, transparency and non-proliferation.
  - This commitment has contributed to the UAE program being recognized as a role model for all countries seeking to start new peaceful nuclear energy programs.

- ENEC implements the following layers of safety and security:
  - The modern plant design with the latest safety systems. The APR1400 reactor design is certified by the US-based Nuclear Regulatory Commission
  - 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
- ENEC's Barakah Nuclear Energy Plant has achieved a number of safety milestones, including:
  - More than 3,900 safety-dedicated training sessions.
  - More than 88,000 attendees have been trained on ENEC's safety standards.
  - More than 3.8 million man-hours have been dedicated to performing rigorous quality audits on all aspects of the Barakah plant.
- ENEC and its partners have achieved 90 million safety work hours without a Lost Time Injury (LTI) during the development of the Barakah plant.

## UAE-Korea Nuclear Energy Partnership

The Korea Electric Power Corporation (KEPCO), South Korea's single largest public power electric utility, was awarded the Prime Contract in 2009 to design, build and help operate the Barakah Nuclear Energy Plant. KEPCO, with more than 40 years of nuclear experience, was chosen following an exhaustive evaluation conducted by a team of 75 international experts.

In 2016, ENEC and KEPCO signed a Joint Venture (JV) agreement for a long-term partnership to become joint owners of the Nawah Energy Company and Barakah One Company, with ENEC owning 82% of both firms and KEPCO holding an 18% ownership stake.

## About the Barakah Nuclear Energy Plant

The Barakah Nuclear Energy Plant is the first peaceful nuclear energy plant to be developed in the Arab World and is being developed by ENEC as part of the UAE Peaceful Nuclear Energy Program.

The Barakah plant consists of four identical reactors housed in four separate units, with a total generating capacity of up to 5,600MW. Once the four units are fully operational, they will provide up to 25% of the UAE's energy.

The Barakah plant is located in the Al Dhafra Region of Abu Dhabi Emirate on the Arabian Gulf coast, approximately 53 kilometers south-west of the city of Ruwais.

### Technology

ENEC selected KEPCO's APR1400 design – a Generation III, 1,400 Megawatt Pressurized Water Reactor (PWR) with an operating life of 60 years.

The APR-1400 combines the latest developments in safety and performance with technology proven over decades of operations and is based on the System 80+ design, certified by the Nuclear Regulatory Commission (NRC) in the USA. The APR1400 design has been certified by the nuclear regulatory authorities in Korea, the UAE and the USA.

ENEC's Barakah plant design has been adapted to suit the UAE's unique climate conditions and the requirements of the UAE's independent nuclear safety regulator, the Federal Authority for Nuclear Regulation (FANR).

### Program Status:

- The Barakah Nuclear Energy Plant commenced operations this year, delivering clean and abundant electricity to power the nation's growth.
- Following Nawah's receipt of the Operating License for Unit 1 from FANR in February, Nawah completed the first fuel load, which is a momentous milestone for the program.
- In July 2020, Nawah successfully completed the startup of Unit 1, initiating the fission process at the Arab World's first peaceful nuclear energy plant.
- In August 2020, Unit 1 was successfully connected to the UAE grid, delivering the first megawatts of clean electricity produced by peaceful nuclear energy to the nation's homes and businesses.

### Construction progress on Barakah Units 2-4:

- The construction of the Barakah Nuclear Energy Plant represents one of the largest nuclear construction programs in the world today, and one of the most ambitious mega projects in the UAE's history.
- The remaining Units at the Barakah Nuclear Energy Plant are progressing well, with Unit 2 completing construction in June 2020. Unit 3 is more than 93% complete, and Unit 4 is more than 87% complete.
- To date, the project as a whole, units 1-4 and the associated buildings, is more than 95% complete.

### - Construction highlights:

- More than 2.5 million cubic yards of concrete have been used in the construction of all four units
- More than 325 million man-hours have been invested in the construction of all four units
- More than 279,000 tons of reinforced steel have been used in the construction of all four units
- 11,301 kilometers of cable has been installed in the Barakah plant – more than the distance between Abu Dhabi and New York
- More than 25,000 staff worked on the Barakah plant during the peak of construction

### Site selection

The Barakah site was selected based on an evaluation of a range of environmental, technical and commercial factors, including:

- Seismic history
- Distance from large population centers
- Proximity to large supplies of water
- Proximity to existing electrical power
- Proximity to infrastructure
- Favorable construction environment
- Security
- Evacuation route conditions
- Ability to minimize environmental impact

The Barakah site obtained the endorsement of the IAEA's Site and External Events Design (SEED) Review Mission, who verified that the site studies and selection process conducted for Barakah followed international criteria and best practices.

### Human Capacity Development

The UAE's burgeoning nuclear energy industry is now a major employer in the UAE. Together, ENEC, Nawah and Barakah One Company currently employ more than 3,000 people:

- More than 60% of these are UAE Nationals
- More than 20% are female
- Our employees represent more than 50 different nationalities

Developing the next generation of nuclear energy leaders is one of the most important priorities for ENEC and Nawah, and as a result, ENEC launched the Energy Pioneers program in 2009.

The program aims to attract and train the country's most talented science students, engineering graduates and experienced professionals and provide them with an opportunity to become pioneers of the UAE's growing nuclear energy sector.

There are currently 124 ENEC sponsored students studying in the UAE and abroad, and more than 350 Energy Pioneers have graduated from the program to date.

In addition, ENEC and Nawah developed a training program according to the regulations set out by FANR. The training program combines hands-on experience from some of the industry's leading engineering and nuclear energy experts with a discipline-focused curriculum, to ensure the students enter the UAE's nuclear energy industry with world-class training.

In July 2019, FANR certified the first group of 15 UAE National Senior Reactor Operators (SROs) and Reactor Operators (ROs) at Nawah.

- This first group of SROs and ROs had the opportunity to train in the Republic of Korea, the USA, South Africa, and the UAE.
- To date Nawah has 72 certified SROs and ROs, 30 of which are UAE Nationals – and three of whom are women.

## Industrial Development

An important objective in establishing a nuclear energy program in the UAE is to support the growth of the UAE's economy, and specifically to support the development of a local nuclear energy industry supply chain.

ENEC's dedicated Industrial Development Team has been working alongside UAE companies to ensure they meet the strict quality and technical standards required to tender for contracts for the country's nuclear energy program.

More than 2,000 local companies are involved in our program, with contracts totaling more than 17.5 billion AED (4.8 billion US dollars). These companies include DESCON Engineering, Bin Asheer, National Marine Dredging Company, the Western Bainoona Group, Emirates Steel and Dubai Cable Company Ltd. (Ducab).

International studies have shown that every dirham spent by an average nuclear energy plant results in the creation of 1.04 dirhams in the local community and about 1.87 dirhams in the nation's economy.

## Environment and Sustainability

The Barakah Nuclear Energy Plant's four units, once operational, will prevent the release of 21 million tons of CO<sub>2</sub> annually – equivalent to removing 3.2 million cars from the UAE's roads every year.

One uranium pellet the size of a fingertip produces enough electricity to power one household for up to 4 months – it would take 1 ton of coal or 474 litres of oil to produce the same amount of electricity.

The pellets are loaded in nuclear fuel assemblies. Once nuclear fuel assemblies are loaded into a nuclear reactor, it can produce constant, uninterrupted electricity for up to 18 months at up to 90% capacity – producing stable volumes of clean, baseload electricity 24 hours a day.

## ENEC's subsidiary companies

### About Nawah Energy Company

Nawah Energy Company (Nawah) is a Joint Venture company co-owned by ENEC (82%) and the Korea Electric Power Corporation (KEPCO - 18%). Nawah is in charge of operating and maintaining Barakah Units 1-4 and is the holder of the Operating Licenses, granted by the Federal Authority for Nuclear Regulation (FANR).

It is the newest plant operator to join the global peaceful nuclear energy industry. Formally established by ENEC and KEPCO in 2016, the company is mandated to operate and maintain the Barakah Plant. Nawah aims to become a globally-recognized nuclear utility and a UAE employer of choice.

### About Barakah One Company

Barakah One Company (BOC) is a Joint Venture Company co-owned by ENEC (82%) and KEPCO (18%), and is responsible for managing the financial and commercial aspects of the Barakah project.

The company is in charge of selling electricity generated at the Barakah plant to the Emirates Water and Electricity Company (EWEC) through a Power Purchase Agreement (PPA).

