Safety and the APR-1400 Reactor

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Nuclear Energy is Safe

Over **440** nuclear energy plants currently operate in more than **30** countries around the world demonstrating that nuclear energy is safe. The World Association of Nuclear Operators (WANO) tracks data about nuclear plant performance and it consistently shows positive results. In the UAE, the Federal Authority for Nuclear Regulation (FANR) plays an essential, and entirely independent role in ensuring that the Barakah Nuclear Energy Plant is safe, secure and reliable through robust regulation and oversight.

Nuclear energy is the safest and cleanest way to produce efficient, reliable, carbon-free electricity that is available **24 hours a day, seven days a week**. It currently provides **11% of the world's electricity**, preventing the release of **two Gigatons of carbon emissions** every year, equivalent to **400 million cars**. Studies consistently show that nuclear energy is one of the safest methods for producing electricity available in the world today.

Multiple Safety Layers

Every nuclear plant, including the Barakah Plant, has multiple barriers for safety. This is called the defense-in-depth safety approach. This includes:

- Multiple physical barriers that protect against accidental radiation release.
- Multiple layers of redundant and diverse plant safety systems which ensure that the reactor operates normally and shuts down automatically if necessary.
- An overarching, all-encompassing safety culture enabling all employees to raise concerns and identify safety-related risks.
- The emergency response plan, which is regulated, tested and exercised with FANR, and has been reviewed by the International Atomic Energy Agency (IAEA) as part of the Emergency Preparedness Review (EPREV) in 2015 and again in 2019.

Key facts:

- The APR1400 is a Generation III Pressurized Water Reactor (PWR) and each unit produces up to 1,400 Megawatts of electricity.
- The reactors have an operational life-span of 60 years.
- KEPCO has more than 40 years of experience in nuclear technology and know-how on operation of nuclear plants.
- Safety systems are designed to prevent or mitigate severe accidents, incorporating passive safety systems which work to ensure safe reactor shutdown, removal of decay heat, and the prevention of radioactive releases
- The design is certified for use by the national nuclear regulators in South Korea, the UAE and the United States.
- Shin Kori Units 3&4 in South Korea are APR1400 technology reactors that are the reference plants for Barakah. Unit 3 safely entered commercial operation in 2016, followed by Unit 4 in 2019.

National Regulations and International Standards

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.

To date, FANR has conducted over 335 inspections at Barakah, as well as in the USA and South Korea, ensuring that all aspects of the UAE Peaceful Nuclear Energy Program meet national regulatory requirements. The IAEA and WANO have completed 42 independent inspections and reviews of the Barakah Plant, providing objective assessments and recommendations based on robust international standards.

Key facts:

- A Pre-Operational Safety Review Team (Pre-OSART) from IAEA concluded an 18-day mission on 3 October 2019 to assess operational safety at the Barakah site in Abu Dhabi.
    - Pre-OSART missions aim to improve operational safety by objectively assessing safety performance using the IAEA's Safety Standards and proposing recommendations for improvement where appropriate.
- In January 2020, WANO confirmed that Unit 1 of the Barakah plant had cleared the Pre-Start Up Review (PSUR), and was ready to start up. In January 2021, WANO announced the same conclusion for Barakah Unit 2.
    - The PSUR is an extensive operational readiness assessment performed by an international team of nuclear industry experts from the Atlanta Center of WANO.
- In February 2020 and March 2021, FANR issued the Operating License for Barakah Unit 1 and 2, respectively, confirming that they are safe to be operated.
    - FANR reviewed the 15,000-page Operating License Application and conducted a series of comprehensive reviews and inspections before issuing the license.

Learning from International Experience

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 national nuclear regulators of Korea, the UAE and the USA have certified the APR1400 reactor design.
- Operator training and robust policies and procedures that embed safety as the overriding priority.
- Promotion of a healthy nuclear safety culture.
- Embedding safety into the plant's design, the training of people, as well as the programs, processes and procedures for the operation and maintenance of the Barakah Plant.
- Independent national and international regulatory and supervision organizations ensuring that the plant and its staff maintain the highest industry standards of safety and quality.

After the 2011 accident at the Fukushima-Daiichi plant in Japan, the APR1400 design used at Barakah underwent a significant review using the European Stress Test method. This method determined that the plant design was already fairly robust against Fukushima-type events. ENEC still implemented 18 design enhancements to provide further capability to protect the health and safety of the public and prevent release of radioactive material to the environment.

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.

Tackling Climate Change

Nuclear energy is the safest and most reliable way to generate large amounts of electricity with zero carbon emissions. Producing clean electricity around the clock directly contributes to tackling climate change while supporting economic growth. Nuclear science and technology can also be applied to other sectors such as agriculture, medicine, food and water management, and environmental protection, promoting sustainability for future generations.

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