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 EmiratesNuclearEnergyCorporation

EXPLORING NUCLEAR ENERGY

مؤسسة الإمارات للطاقة النووية
Emirates Nuclear Energy Corporation 

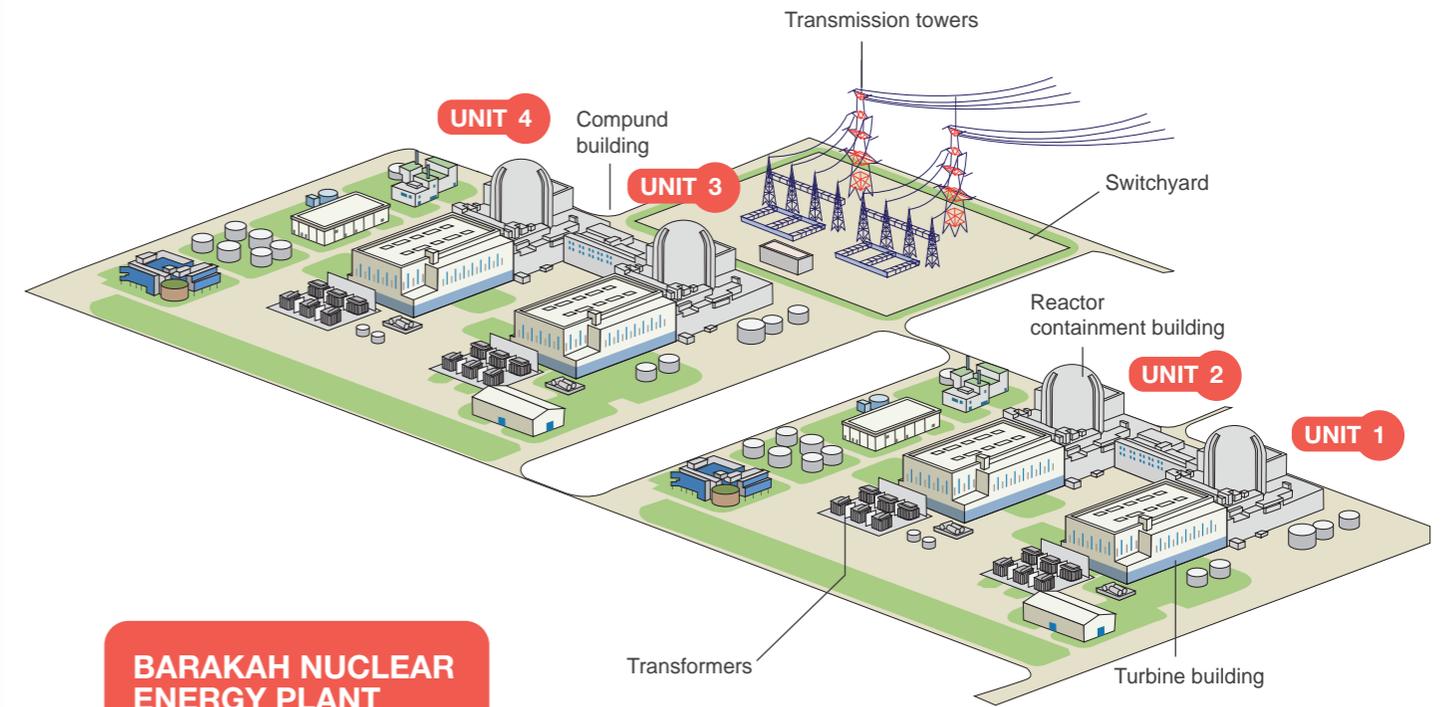
شركة براكة الأولى ش.م.خ
Barakah One Company PJSC 

شركة نواة للطاقة
Nawah Energy Company 

The UAE is growing quickly and energy demand is increasing at a rapid rate to support growth and development in our nation. To ensure a secure supply of electricity, we have embarked on an ambitious, visionary and peaceful nuclear energy program. The Barakah Nuclear Energy Plant, the first in the region, will power the UAE's social and economic growth for decades to come, and support the development of a high-tech workforce.

Read on to learn more about nuclear energy and opportunities to support our pioneering program!

BARAKAH NUCLEAR ENERGY PLANT



OUR GROWING DEMAND FOR ELECTRICITY

Our nation's demand for electricity is growing rapidly.

For the next two minutes, think about your day – from the time you wake up in the morning through the end of the day. List all of the ways that you use electricity.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

How many did you list?
Was that more or less than you expected?



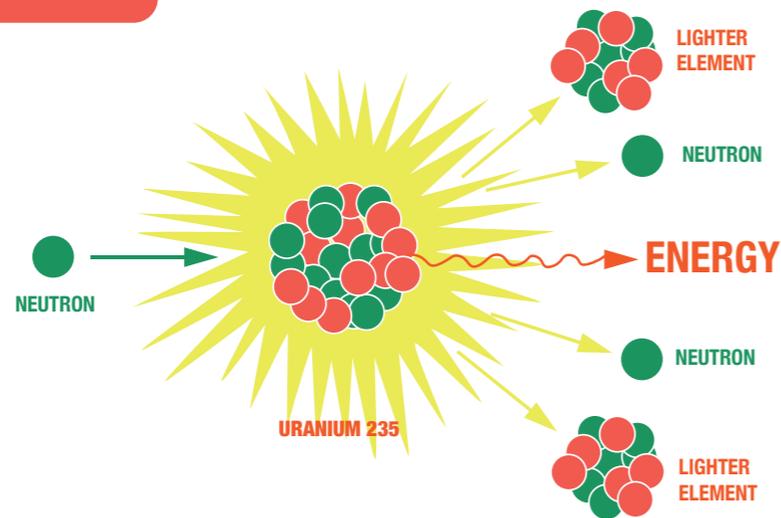
WHAT IS NUCLEAR ENERGY?

A nuclear energy plant uses uranium in the form of cylindrical pellets as fuel to generate heat. This is possible due to a reaction called 'nuclear fission' where a uranium atom splits into two, smaller atoms, and releases large amounts of heat. This happens over and over again, and is known as a chain reaction. The heat is then used to make steam and generate electricity, just like in a gas or coal plant.

Nuclear generation is the only source of electricity that can reliably produce a constant supply of energy – known as baseload – without emitting greenhouse gases.

Nuclear energy has one of the lowest environmental impacts on land and natural resources of any electricity source.

EXPLANATION OF FISSION



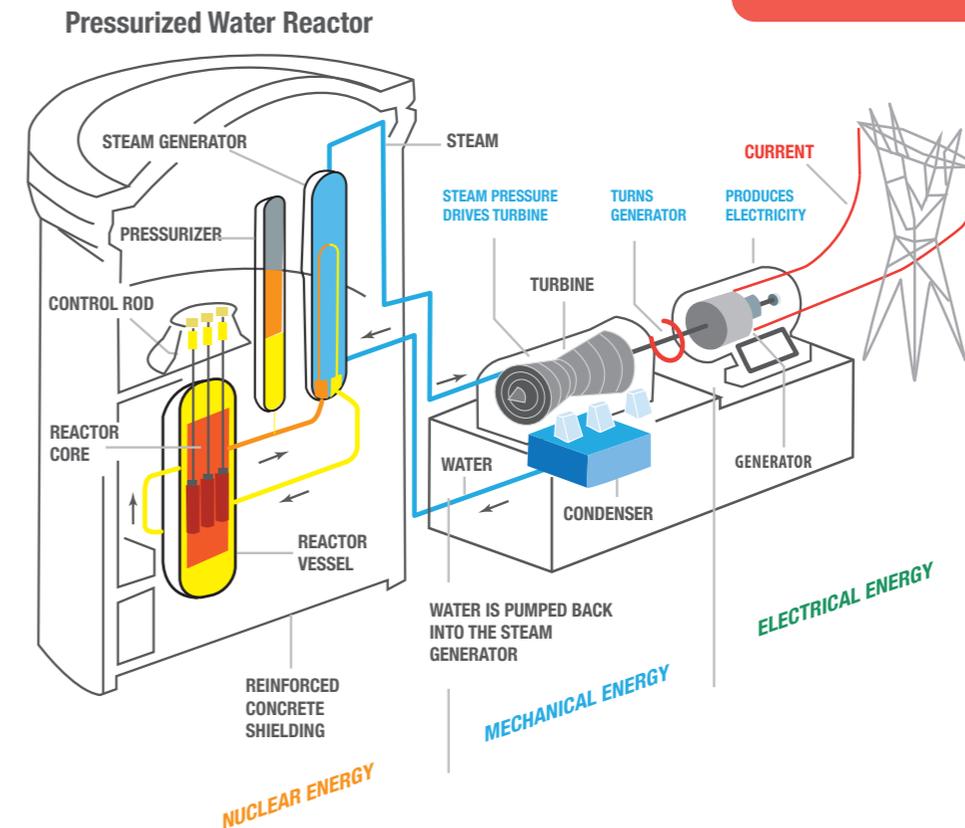
HOW DOES IT WORK?

The nuclear chain reaction in the reactor core produces energy in the form of heat, which is used to turn water into steam. The pressure of the steam turns a generator, which produces electricity.

In a Pressurized Water Reactor (PWR) – the type of reactor being used in the UAE – high pressure prevents water in the reactor vessel from boiling. The super-heated water is carried to a steam generator, which acts as a heat exchanger turning a second, separate, supply of water to steam. This is in turn used to drive the turbine.

The water from the reactor is pumped back into the reactor vessel and reheated by the fission reaction. The steam from the turbine is cooled in a condenser and this water is sent back to the steam generator to be used again.

PARTS OF A REACTOR UNIT



LAYERS OF RADIATION PROTECTION IN A NUCLEAR ENERGY PLANT

The uranium fuel pellets, which are about the size of a pencil eraser, sit inside metal rods, which are bundled together to form fuel assemblies. There are over 21 million pellets inside the fuel assemblies of a reactor at any one time.

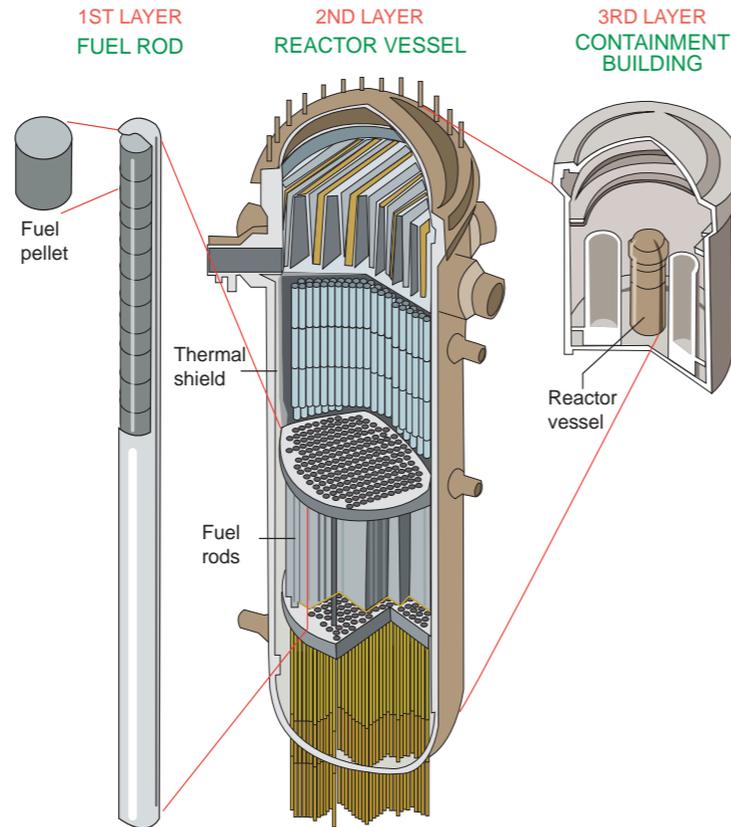
While natural uranium is mildly radioactive and not dangerous, after it is used in a nuclear reactor it becomes highly radioactive.

WHAT IS RADIATION?

Radiation is energy that travels in invisible waves or rays. Exposure to radiation is an everyday occurrence – in fact, it has always been a part of life on Earth. Radiation can be natural such as from the sun or man-made such as X-rays or microwaves.

LAYERS OF PROTECTION

Nuclear energy plants have multiple layers of protection designed to contain radiation. These layers include the fuel rod, reactor vessel and containment building. The fuel assemblies are also submerged in water which contains chemicals that absorb radiation, acting as another layer of protection. All layers are in place to protect the public, employees and the environment.



"After graduating from the Energy Pioneers program, I joined the UAE nuclear industry to help meet the nation's current and future needs for a clean and reliable energy supply. I personally endeavor to contribute effectively to the UAE's vision in developing long-term energy sustainability."

**- MARYAM QASEM
ENERGY PIONEER**



TEST YOUR KNOWLEDGE ABOUT NUCLEAR ENERGY!

Fill in the blanks in the 10 statements below using what you have learned about nuclear energy so far.

- 01) Nuclear energy facilities use to generate electricity.
- 02) Fission is the of atoms.
- 03) A is the rate of nuclear fission.
- 04) In a nuclear energy plant, the turbine's blades turn the steam's energy into energy.
- 05) In the generator, magnets create an electrical
- 06) Reactor operators can control the chain reaction using
- 07) Radiation is energy that travels in waves or rays.
- 08) Radiation can be or
- 09) Nuclear energy plants are designed to radiation.
- 10) At a nuclear energy plant, the, and are layers of protection that protect the employees, public and the environment.

ANSWER KEY

- | | |
|-----------------------|-----------------------|
| 1. uranium | 6. control rods |
| 2. splitting | 5. current |
| 3. chain reaction | 4. mechanical |
| 4. mechanical | 3. contain |
| 5. current | 2. natural or manmade |
| 6. control rods | 1. invisible |
| 7. invisible | 10. fuel rods, |
| 8. natural or manmade | 9. reactor vessel, |
| 9. contain | containment building |
| 10. fuel rods, | |



"When choosing what to study and what career to pursue, I looked for a subject that will help address the challenges of growing energy demand, climate change and environmental impact. I decided to become a nuclear engineer because it addresses all three issues."

**- KHALED ALSHEHHI
ENERGY PIONEER**



United Arab Emirates
الإمارات العربية المتحدة

Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy

UAE NUCLEAR ENERGY 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.

In 2009, the government established two institutions for our Program: the Federal Authority for Nuclear Regulation (FANR)

as the independent regulator for all nuclear-related activities, and the Emirates Nuclear Energy Corporation (ENEC) as the company mandated to develop the peaceful nuclear energy sector in the UAE.

In 2016, ENEC, along with its joint venture partner, the Korea Electric Power Corporation (KEPCO), established two subsidiary companies – Nawah Energy Company and Barakah One Company.

The engineers at Nawah will operate and maintain the Barakah plant. They will ensure that electricity is generated in the most efficient, reliable and clean way.

Barakah One Company represents the commercial interests of the Barakah project. It ensures that the financing of the project and that the revenue from electricity generation are managed responsibly.



OUR NATION'S NUCLEAR ENERGY PROGRAM

Our nation's demand for electricity is growing rapidly. Our government has determined that more electricity generation is needed to meet future demand.

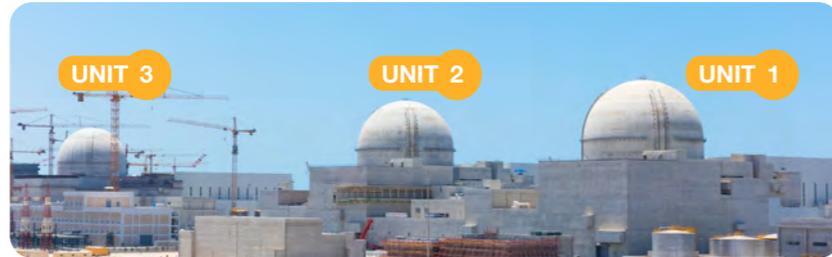
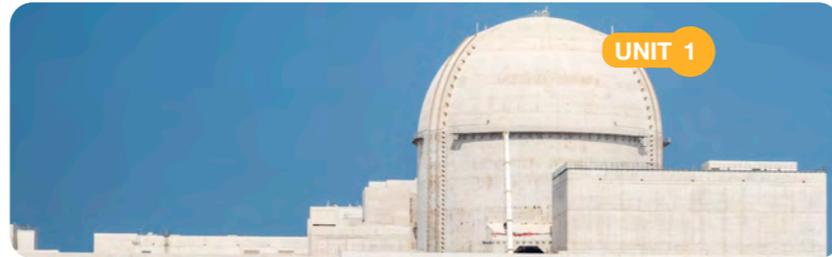
After considering a number of options our government decided to construct a nuclear energy plant to help support our nation's growth.

Nuclear energy has been used around the world for decades and generates 11 percent of the world's electricity. It is an efficient, reliable and clean technology that will provide our nation with a long-term and reliable source of electricity for the entire 21st Century.

THE BARAKAH NUCLEAR ENERGY PLANT

The Barakah Nuclear Energy Plant is located in the Western Region known as 'Al Dhafra', in the Emirate of Abu Dhabi, approximately 53 kilometers west-southwest of the city of Ruwais.

Working with KEPCO, ENEC is constructing four nuclear reactors after obtaining all required construction approvals and licenses from FANR. The reactor design used is one of the most technologically advanced designs in the world and meets the highest international standards for nuclear quality and safety.

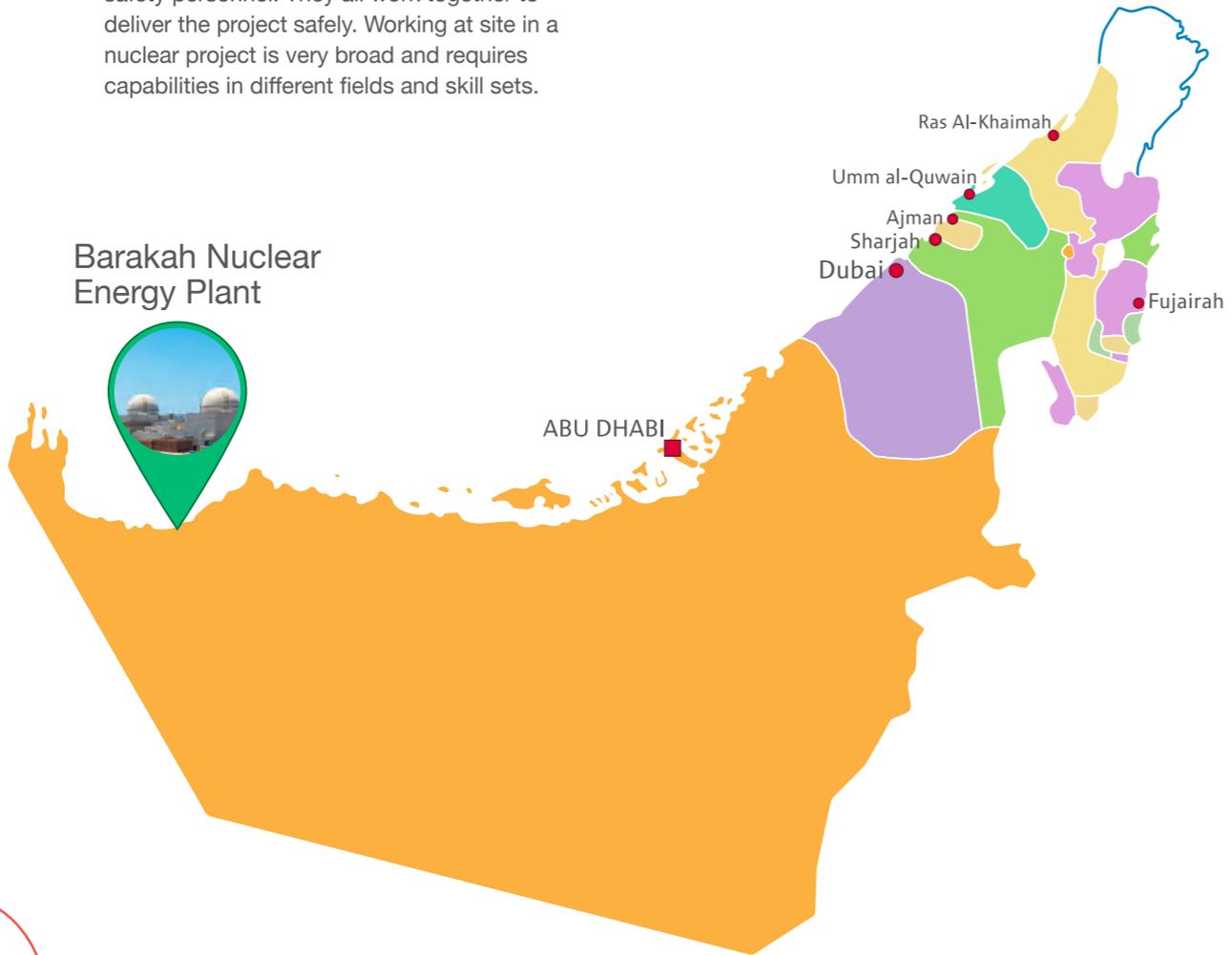


"The UAE Peaceful Nuclear Energy Program needs many young and dedicated Emiratis. I decided to join the program and contribute to its success and the future growth and prosperity of the nation."

**- KALTHAM AL ALI
ENERGY PIONEER**

PROFESSIONS AT SITE

Working in Barakah is very dynamic. It requires people from different specialties, including engineers, reactor operators, senior reactor operators, coordinators, communication specialists, health and safety personnel. They all work together to deliver the project safely. Working at site in a nuclear project is very broad and requires capabilities in different fields and skill sets.



NUCLEAR FACTS

01) Nuclear energy is being used in more than 30 countries around the world and even powers the Mars rovers and NASA deep space probes!



02) The Galileo spacecraft orbited Jupiter 35 times over two years and continues to work. It is powered by a small nuclear generator.



03) One person's electricity needs for 70 years, if supplied by nuclear power, would only produce enough waste to fit into a soda can.

04) Uranium is a source of today's nuclear fuel. In the 19th Century, craftspeople used it to color ceramic plates yellow or certain shades of green.



05) Uranium is 500 times more abundant than gold.



06) A single uranium fuel pellet can produce as much energy as 1,780 pounds of coal or 149 gallons of oil.



07) The UAE's Barakah Nuclear Energy Plant will prevent the release of 21 million tonnes of greenhouse gasses every year. This is the equivalent of removing 3.2 million cars from the UAE's roads.

08) One uranium pellet contains as much energy as one ton of coal or 481 cubic meters of natural gas.



09) Nuclear energy does not produce greenhouse gasses. France relies on nuclear energy for over 80% of its electricity and has the highest air quality in Europe.



10) Whereas radiation exposure levels are very low, the coal cycle contributed more than half of the total radiation dose to the global population from electricity generation, while nuclear only accounts for one-fifth.



11) In many parts of the world, agricultural workers use safe doses of radiation to reduce the numbers of pests and bugs. This helps to protect crops and increase food supply.

12) Bananas contain a small amount of the radioactive isotope potassium. Humans need potassium for muscles and nerves to work properly. However, you would need to eat 10 million bananas at once for this to be a problem!



13) Due to cosmic radiation from the sun, airplane pilots and flight attendants are exposed to more radiation in a year than some nuclear energy plant workers. For this reason, they are officially classified as 'radiation workers'.

14) Nuclear medicine is used to diagnose and treat many different diseases. It uses isotopes to explore the body.



15) Smoke detectors rely on a tiny radioactive source to sound an alarm when smoke is present.

16) Sunshine is one of the most familiar forms of radiation. We limit its effect on us with sunglasses and sunscreen.





ENVIRONMENTAL AND ECONOMIC BENEFITS OF NUCLEAR ENERGY

Nuclear energy is an environmentally friendly form of electricity production that does not emit greenhouse gases. The UAE Peaceful Nuclear Energy Program, along with renewable energy sources like wind and solar, has an important role to play as we work to reduce carbon emissions. Nuclear energy will also help to power the future prosperity of our nation by developing our economy and driving the growth of a high-tech industry that will create new, specialized jobs.

To support our nuclear energy program, we develop our nation's technical capabilities in nuclear energy. This opens up new job and career opportunities. In fact, hundreds of students are already pursuing advanced degrees in science, technology, engineering and math so they can get involved.



"I decided to pursue a career in nuclear energy because it is a new and exciting industry in the UAE. We need a lot of engineers and I am proud to be part of the first generation of Emirati nuclear engineers. We are all dedicating to delivering safe, clean, efficient and reliable electricity to our nation."

**- MOHAMMED AL AMERI
ENERGY PIONEER**

ENEC ENERGY PIONEERS

Our nation's pursuit of nuclear energy has prompted an important shift in our workforce. To develop technical capabilities in nuclear energy, ENEC established the Energy Pioneers program.

This program aims to develop skilled Emirati talent as the nuclear energy program grows. It is designed to attract the best and brightest science students, engineering graduates and experienced professionals, and train them to become leaders in our nation's growing nuclear energy sector. The Energy Pioneers will have an important role in the success of the nuclear energy program and they will receive training of the highest international standards from the industry's leading global experts.

Our nation also funds a scholarship program for Emirati students to attend some of the world's finest universities and pursue studies in engineering and nuclear sciences fields. There are scholarships for students pursuing the Bachelor's and Master's degrees in the UAE and abroad, as well as the Higher Diploma in Nuclear Technology (HDNT) at Abu Dhabi Polytechnic. Scan the QR code to learn more!

To learn more about the Energy Pioneers program and scholarship opportunities, visit www.enec.gov.ae

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CAREER OPPORTUNITIES

The ongoing success of ENEC and the UAE Peaceful Nuclear Energy Program relies on talented people working together to deliver safe, clean, efficient and reliable electricity to our nation.

This is an exciting time to pursue a career in nuclear energy. It's an industry that is committed to continuously investing in the education and growth of its employees, and provides a rewarding career. Most importantly, the nuclear energy industry can offer you an opportunity to play a major role in the growth of our nation.

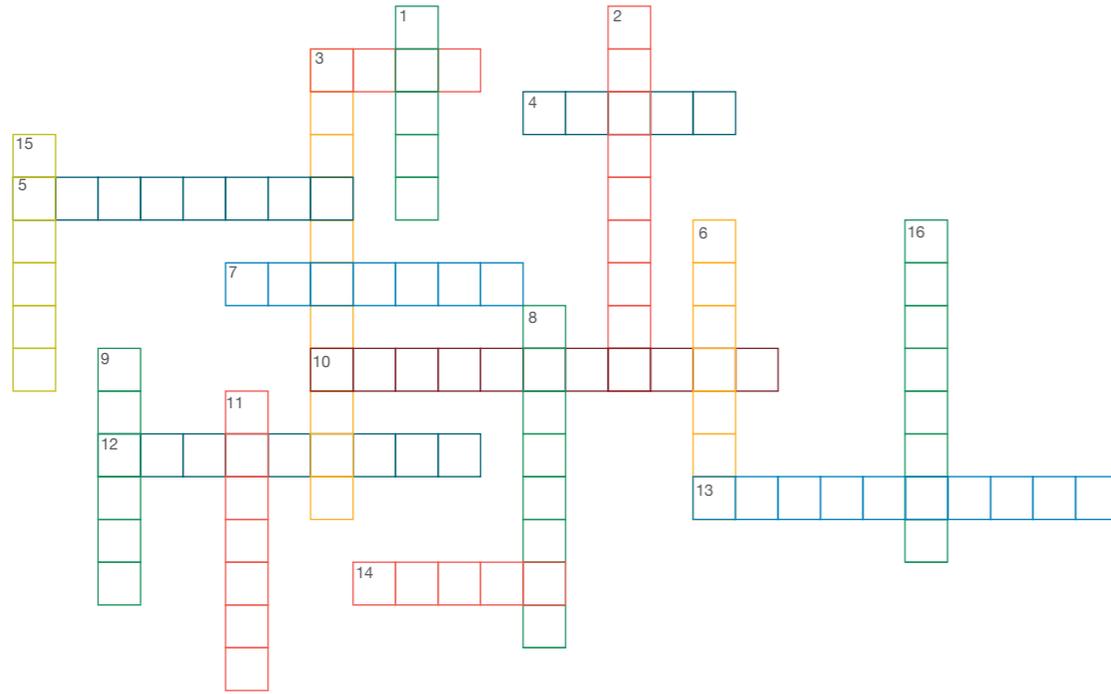
Opportunities range from working at the Barakah Nuclear Energy Plant to the headquarters in Abu Dhabi. If you are interested in learning more about career opportunities at ENEC, visit www.enec.gov.ae



HAVE YOU
THOUGHT
ABOUT A
CAREER IN
NUCLEAR
ENERGY?

NUCLEAR ENERGY CROSSWORD

Solve this crossword puzzle below using everything you've learned about nuclear energy and the UAE Peaceful Nuclear Energy Program!



→ ACROSS

03. Entity established by the UAE government to build nation's first nuclear energy plant
04. This material in a control rod absorbs neutrons
05. The UAE's pursuit of nuclear energy will power its social and _____ growth
07. Name of the UAE's first nuclear energy plant
10. The _____ building is one layer of protection that contains radiation at a plant
12. Energy that travels in invisible waves or rays
13. The turbine in a nuclear energy plant turns steam into _____ energy
14. Like wind, this is also a renewable source of energy

↓ DOWN

01. South Korean company helping to develop the UAE's first nuclear energy plant
02. Fuel rods are made of this material, which resists very high temperatures
03. The Barakah Nuclear Energy Plant will provide up to 25 percent of _____ for the UAE
06. Atom used as fuel in many nuclear energy plants
08. The Energy _____ program develops talent for our nation's nuclear energy program
09. Nuclear energy will help reduce these emissions
11. Splitting of atoms
15. One uranium fuel ----- can produce 149 gallons of oil
16. One of the most familiar forms of radiation

ANSWER KEY

Across	01. KEPCO 02. Zirconium
Down	03. Electricity 06. Uranium
	07. Barakah 10. Containment
	08. Pioneers 09. Carbon
	11. Fission 15. Pellet
	16. Sunshine
	12. Radiation 13. Mechanical
	14. Solar
	03. ENEC 04. Boron 05. Economic