

Fuelling the Barakah Nuclear Energy Plant

مؤسسة الإمارات للطاقة النووية
Emirates Nuclear Energy Corporation

شركة براكة للطاقة
Barakah One Company PJSC



شركة نawah للطاقة
Nawah Energy Company



Nuclear Fuel Manufacturing

What is nuclear fuel made of?

Uranium is a naturally occurring, mildly radioactive element that fuels many nuclear energy plants. Uranium-235 is an isotope, or form, of the element that can undergo fission, the process of splitting an atom. This makes it an ideal fuel for nuclear reactors.

How is nuclear fuel made?

Just like oil and coal, the material for nuclear fuel, called uranium ore, comes from underground. It is found in mines in nearly 20 countries around the world. After it is mined, uranium ore goes through several processes. This includes separating it from other substances, changing it into a material that is usable for nuclear fuel, and manufacturing fuel pellets.

The fuel pellets are about the size and shape of a pencil eraser or an adult fingernail. They are loaded into metal tubes. These tubes, called fuel rods, are about four meters long. When bundled together, the rods create a fuel assembly.

Nuclear Fuel in Reactors

How much fuel does a nuclear reactor use?

A nuclear reactor can use more than 200 fuel assemblies at one time, depending on the design. The APR-1400, the reactor design used at Barakah, operates using 241 fuel assemblies. Each fuel assembly weighs about 650 kg.

What happens during Fuel Load?

Fuel Load is the safety-led process that involves filling a nuclear reactor with Uranium, the fuel that is used as a source of heat to generate electricity. As part of the Fuel Load process, Nawah's expert operators and fuel handlers will transfer 241 fuel-assemblies, one-by-one, into the reactor of Unit 1.

With safety being the overriding priority at every stage, the carefully planned task takes roughly 14 days to complete. With all the fuel assemblies loaded, the reactor vessel at Unit 1 of the Barakah Plant contains 241 nuclear fuel assemblies. Each pellet contains enough energy to produce electricity for one Emirati household for up to four months, with zero carbon emissions.

Does nuclear fuel need to be replaced?

Each fuel assembly can last up to six years in a reactor. Workers replace the fuel assemblies when they no longer produce enough heat. They replace about one-third of a reactor's fuel every 12 to 24 months.

At Barakah, refueling will take place every 18 months but our engineers are working to improve the efficiency of the reactor and the fuel being used in order to move to a 24-month operating cycle. This will ensure the reliable delivery of continuous and clean electricity to the UAE for two years before a reactor has to be shut down to be refueled.



Used Nuclear Fuel

What happens to nuclear fuel once it's removed from a reactor?

Once it is removed from a reactor, used nuclear fuel is stored in concrete and steel-lined pools located adjacent to the reactor building for about five years. Cool water circulates through the pools to remove heat from the fuel until it is cool enough to move to long-term storage or to reprocess.

What happens after the used fuel is cool?

When the used fuel is cool, it is moved 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.

As part of its commitment to non-proliferation, the UAE decided to forgo reprocessing from the start of the nation's peaceful nuclear energy program.

Radioactivity

Is fresh fuel radioactive?

New fuel assemblies have a low level of radioactivity. A person can stand next to a fuel assembly without threat to their health. During the process of manufacturing of fuel assemblies, workers wear special gloves to protect the tubes and components of the assembly from the oils and moisture which accumulate on a person's skin.

When they are brought to the site, fuel assemblies are transported in specially designed shipping casks. These casks are secure and robust, and made primarily of stainless steel. They are designed to protect the fuel from damage during transport.

Is used fuel radioactive?

Used fuel is highly radioactive. Countries around the world have safely transported and stored used fuel for decades. Carefully designed containers are used to store and to transport used fuel, and prevent the release of radioactive material into the environment. The UAE is committed to ensuring the implementation of the highest international standards of quality and safety when handling used nuclear fuel to protect employees, the public and the environment.

