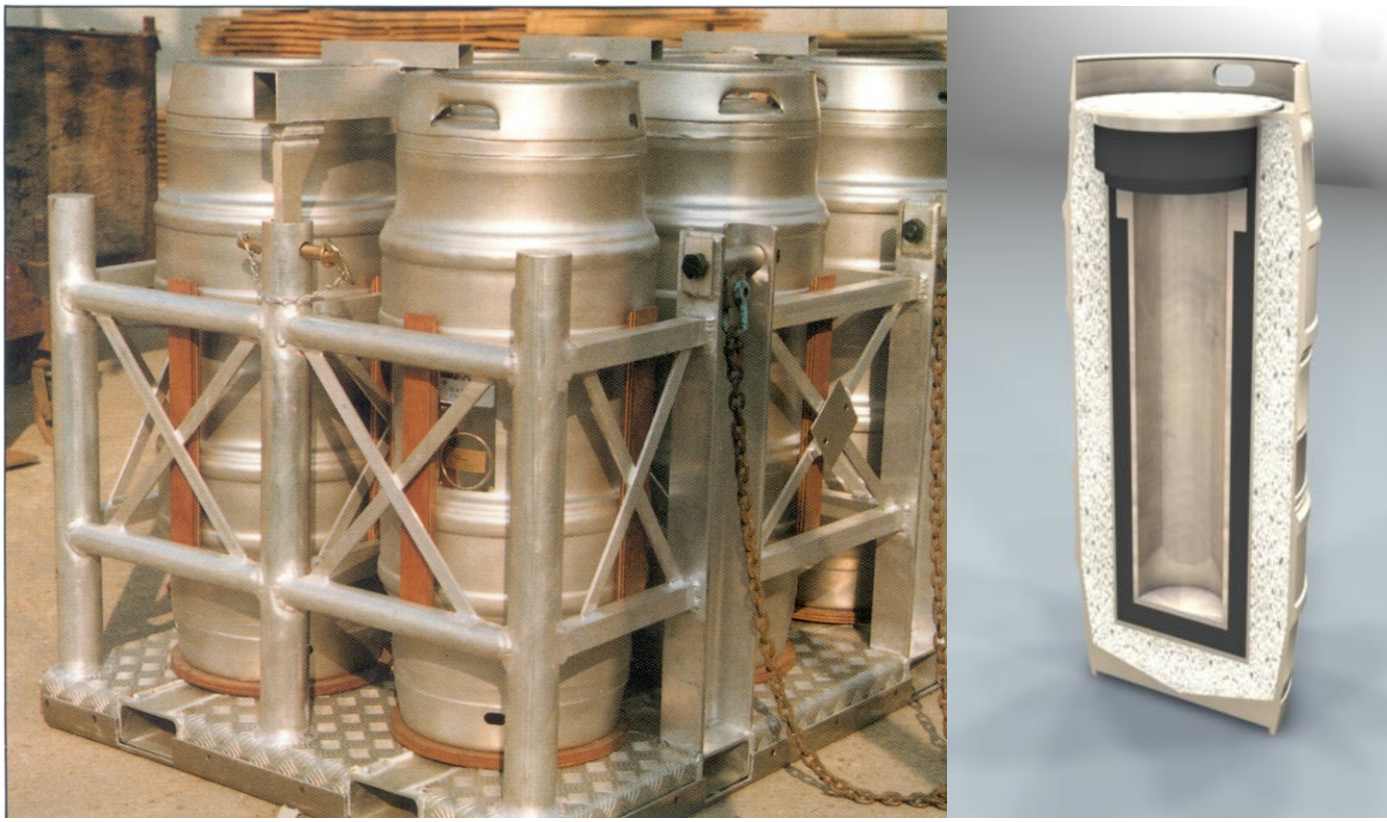
International Nuclear Services

Transporting nuclear materials – the cargo



SAFKEG containers used to transport plutonium

Plutonium

Plutonium is produced when uranium fuel is burnt in conventional nuclear reactors, so it is present in used nuclear fuel when it leaves the reactor. If we reprocess the used fuel, we can recycle 96% that is uranium and 1% that is plutonium to generate electricity. The reprocessing of used fuel also separates out the remaining 3% which is waste.

Plutonium is a valuable source of energy - one gram of plutonium used in a conventional nuclear reactor has the same energy value as over two tonnes of coal.

Plutonium is radioactive, but the main type of radiation it gives off (alpha particles) is not very penetrating and does not pass through even thin layers of materials, such as rubber gloves. However it is highly toxic if you breathe it or eat it. We implement stringent protection measures at each stage of the handling process to make sure that the plutonium doesn't get into the body, by breathing it or eating it, or through cuts in the skin.

There are materials in nature which give off more radiation than plutonium, such as the natural gas Radon, but they are generally less toxic than plutonium because of the way that the body deals with those material compared to plutonium. There are also many well known substances used everyday (like asbestos and hydrofluoric acid) which are very toxic and can be dangerous if they are not handled properly.

Why do we need to transport plutonium?

Plutonium is separated during the reprocessing of used fuel and can then be made into Mixed Oxide (MOX) fuel. Sellafield Ltd has contracts with European customers to supply MOX fuel for use in their nuclear reactors.

To meet customer delivery requirements it has been necessary for us to sub-contract some MOX fuel business from our Sellafield MOX Plant (SMP) to European MOX fuel suppliers. The supplier uses its existing plutonium stocks for the contract. This is called a plutonium loan and is a recognised occurrence in the nuclear industry. We must replace this loan with plutonium taken from our own stocks.

How is it transported?

Plutonium is transported as oxide powder or as MOX fuel in specially designed containers. If it is transported as an oxide powder, it will be contained in a package called a SAFKEG. The SAFKEG is made up of an outer stainless steel container with a bolted stainless steel lid. Inside, there is another stainless steel container with a re-sealable leak proof-lid. It is the inner container, which holds the sealed, double-walled plutonium cans. The space in between them is filled with a cork-like substance for shock absorbtion and insulation.

How safe is it to transport plutonium?

Before the containers can be used to carry radioactive materials, they must undergo extensive testing to meet the International Atomic Energy Authority (IAEA) Regulations for the Safe Transport of Radioactive Materials and be certified to meet the UK Competent Authority standards. Strict rules have been enforced for the design of all transport containers. These rules are laid down by the International Atomic Energy Authority (IAEA). The IAEA regulations set the standards for impact and fire tests to check that the containers can withstand the most serious accident and that no radioactivity will escape. These tests include:

- Drop tests, during which the lid seal must remain intact after being dropped one metre onto a concrete and steel reinforced spike, and a nine metre drop onto an unyielding surface, all performed at angles which ensure the maximum impact on the container
- Fire testing, requiring the container to withstand an engulfing fire of 800 degrees Celsius for 30 minutes - a test far more destructive than any real fire on board a vessel
- Pressure tests, in which the container must withstand pressure of at least 15 metres of water - in fact the containers are able to withstand the pressures created by submersion in considerable depths of water

SAFKEG undergoes a drop test

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