Is transporting radioactive materials safe?

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Discover. Discuss. Decide.

Each year, about 20 million loads of radioactive waste are transported worldwide.
The Nuclear Fuel Cycle Royal Commission found that radioactive materials – such as hospital waste, used nuclear fuel and mined uranium – are **transported safely around the world** via rail, road, sea and air.

Strict international regulations govern the transport of radioactive material to ensure the safety of the public and the environment.

Australia's radioactive material is transported under national and international rules developed by experts and the International Atomic Energy Agency (IAEA). The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has adopted the IAEA's regulations, and these are used by all jurisdictions in Australia.

What is transported in Australia now?

The Australian Nuclear Science and Technology Organisation (ANSTO) delivers around **9,600 nuclear medicine orders across Australia each year** – primarily for cancer treatment.

Low and intermediate level waste from ANSTO's research reactor at Lucas Heights, NSW, represents about **5%** of Australia's total transport activity.

Uranium from mining sites in South Australia is regularly transferred via rail and road for export in ships from Port Adelaide.

There are also thousands of movements of other radioactive sources used in industry, agriculture, medicine and research around Australia every year.

Is transporting radioactive material safe?

FINDINGS FROM THE NUCLEAR FUEL CYCLE ROYAL COMMISSION REPORT.

There are concerns about the safety of used fuel shipments and the risk that an accident would harm people and the environment through radiation exposure.

While accidents have occurred during shipments of used fuel globally, none have resulted in either a break of the packages containing the radioactive material or any harmful effects due to radiation.

Loads are inspected through the transport process, with any incidents being reported, regardless of how minor.

The Royal Commission also found that in Australia there has not been any incident involving damage to containers or drums of UOC that has resulted in the release of radiation which adversely affected workers, the public or the environment. They have generally only resulted in minor damage to the packaging containing the UOC, without compromising its integrity.

Damage to UOC shipping and packaging containers. Images courtesy of Frank Boulton, Class 7 International.

How are different types of radioactive material currently transported in Australia?

FINDINGS FROM THE NUCLEAR FUEL CYCLE ROYAL COMMISSION REPORT.

4000 TONNES
OF URANIUM OXIDE CONCENTRATE (UOC) PRODUCED IN SA IN 2014/15.

UOC HAS A LOW LEVEL OF RADIOACTIVITY
AND IS CHEMICALLY STABLE.

IT IS PACKAGED AT THE MINE SITE,
PLACED IN 200Ltr DRUMS
AND SEALED WITH A SECURE LID, THEN PACKED INTO A SHIPPING CONTAINER AND SECURED.

THE RADIOACTIVITY
OF EACH CONSIGNMENT
IS MEASURED
BEFORE IT LEAVES A MINE SITE.

PACKAGES ARE INSPECTED
THROUGHOUT THE TRANSPORT PROCESS ANY ISSUES, LIKE DAMAGE, ARE REPORTED.

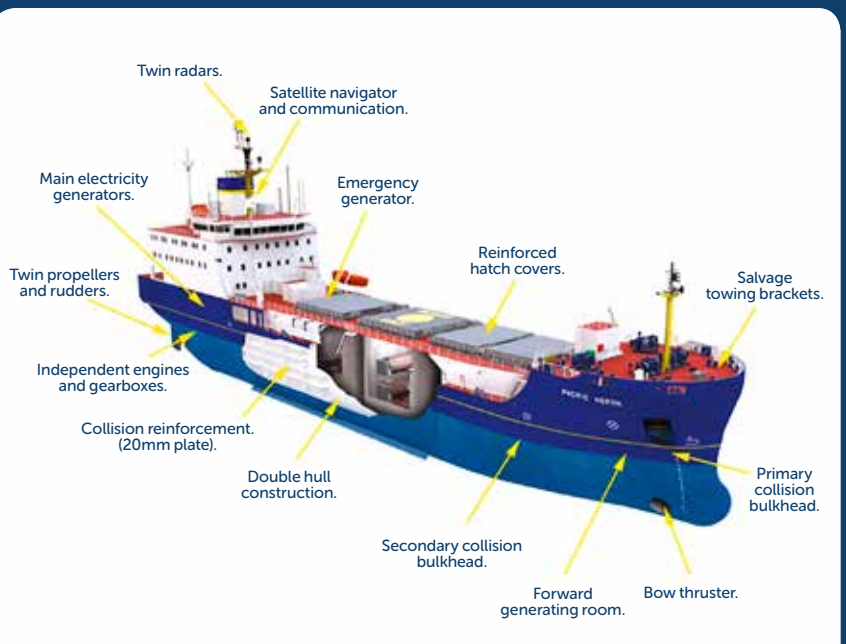
11,000+ CONTAINERS
OF UOC EXPORTED FROM AUSTRALIA IN THE LAST 30 YEARS.

Other material – such as the low and intermediate level waste resulting from science, medicine and industry – generally require containment and isolation before transport.

These are categorised according to IAEA regulations into five categories prior to transfer, in a process co-ordinated by the Commonwealth regulator ARPANSA.

What about used fuel – how safe is it to transport?

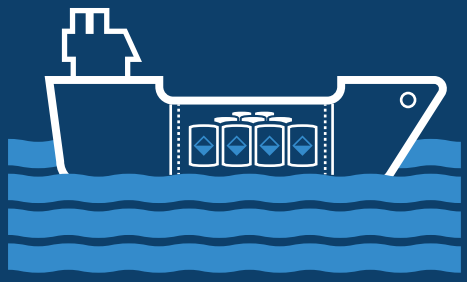
- Used nuclear fuel is **transported in specially designed packages.**
- Each weigh more than **100 tonnes** when filled.
- Transported in **specially designed ships** that must meet international safety and security standards with features including double hulls, reinforced hatch covers, collision bulkheads, and emergency power.
- Used fuel packages are **designed to withstand enormous force**.
- **Rigorous testing** is undertaken to ensure they contain the radioactive materials inside; even in the case of severe accidents or fire.



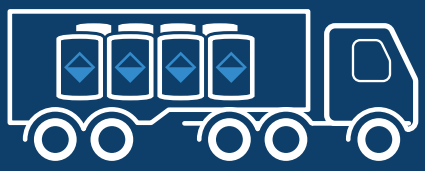
Potential life cycle of used fuel from a nuclear reactor into a geological disposal facility in South Australia.

The casks are also able to be carried by road or rail, with the Royal Commission finding that dedicated port, rail and road infrastructure would further limit the potential for any serious incidents and their radiological consequences.

Packed into transport canisters.

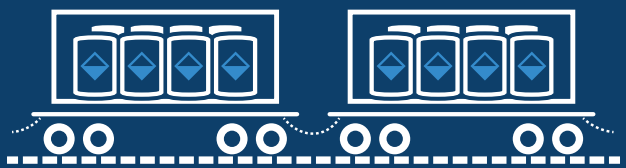


Transported by a double hulled ship to a port in SA.

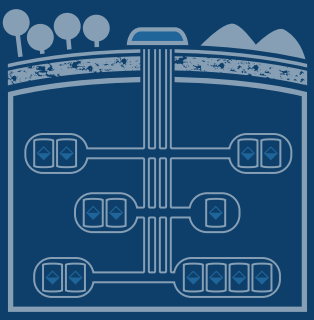


Transported by truck to an interim storage facility.

Placed into an above ground interim storage facility for 30-40 years.



Transported by railway to GDF.



Encapsulated and placed permanently in the GDF.

Transportation package testing.

FINDINGS FROM THE NUCLEAR FUEL CYCLE ROYAL COMMISSION REPORT.

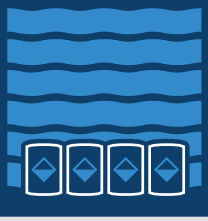
Used nuclear fuel is transported in highly engineered transport casks, typically featuring multiple levels of containment. During transport, either via sea, rail or road, a full cask may weigh around 100 tonnes. Transport casks are constructed to be sufficiently robust to ensure they maintain their structural integrity in a diverse range of operational conditions and accident scenarios.

Transportation packages undergo rigorous testing to ensure they meet international safety standards including:

Dropping the package from a height of 9 metres on to a solid surface and a steel vertical bar.

Submerging the package under 15m of water for 8hrs

Submerging the package under 200m of water for 1+hrs.



Engulfing the package in fire at 800°C for 30 mins.

Did you know?

Transport casks are required to undergo significant impact testing in order to be licenced. This can include simulating the impact of a crashing aircraft. Several transport cask manufacturers have undertaken this testing including one that fired a large projectile at nearly 1000 km/h into a transport cask. The transport cask survived the impact with no breach of the containment of the cask.

How can we be sure the risks of transporting used fuel are managed?

A multi-layered approach to the safety is adopted when transporting used fuel.

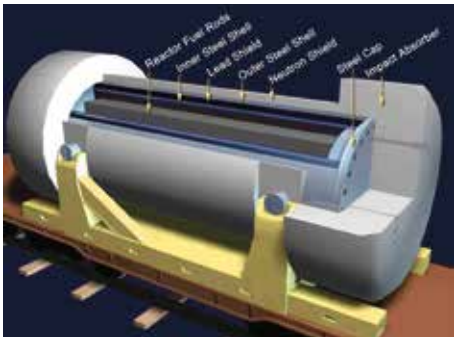
By integrating a number of engineered, transportation and regulatory controls, the Royal Commission Report concluded that the shipments of used nuclear fuel is routine, and undertaken safely in accordance with international requirements.

If facilities were to be established in South Australia for the storage and disposal of used nuclear fuel, dedicated planning, including a series of accident scenarios, would need to occur to further limit the potential for any serious incidents and their radiological consequences.

This might include dedicated infrastructure and routes to reduce the likelihood of accidents by:

- reducing interaction with other road users and railway lines.
- eliminating transport of mixed cargoes.
- reducing interaction between routes and existing urban centres or towns.

References: ANSTO and NFCRC.



A generic Type B transportation cask on a rail bogie. Image courtesy of Nuclear Energy Institute.

Every South Australian has an opportunity to learn more about the nuclear fuel cycle by discovering the facts, understanding the choices, and providing their views on the Royal Commission's Report. This is a discussion about the state's future that all South Australians can have, and will help guide SA Government's decision making on the next steps.

Visit nuclear.sa.gov.au to find out more.

Government of South Australia