Management of radioactive waste from decommissioning

During decommissioning, radioactive materials and objects contaminated with radioactivity — from protective clothing to parts of a reactor — are characterized and sorted to ensure waste prevention and waste minimization, reuse and recycling.

Radioactive materials and objects are subject to regulatory control. However, most of the material resulting from decommissioning is cleared from regulatory control, owing to its very low level of radioactivity.

Radioactive materials not suitable for recycling are sorted and packaged for temporary storage before disposal in purpose-built facilities — the final step in the management of radioactive waste.

The waste hierarchy

1 Waste prevention
2 Waste minimization
3 Reuse
4 Recycling
5 Disposal

The waste hierarchy, a key element in the implementation of sustainable decommissioning and waste management, sets the priority for managing waste. By taking decommissioning into account during the design phase of a nuclear facility, the creation of waste is prevented and minimized.

A priority is to minimize the generation of radioactive waste.
The classification of radioactive waste may vary from country to country. 

**Very low level waste (VLLW)**
Concrete, soil, rubble...

- Suitable for disposal in near surface landfills.

**Low level waste (LLW)**
Personal protective equipment, wipes, auxiliary systems for decontaminating and dismantling structures...

- Suitable for disposal in near surface facilities; requires isolation and containment for up to several hundred years.

**Intermediate level waste (ILW)**
Reactor primary circuit components, highly contaminated metals...

- Suitable for disposal at greater depths in geological repositories; requires isolation and containment for several thousand years.

**High level waste (HLW)**
Spent fuel, spent fuel cladding hulls, vitrified waste from reprocessing...

- Suitable for disposal in deep geological formations several hundred metres below the surface; requires isolation and containment for several thousand years.

Disposal facilities for radioactive waste provide isolation and containment based on multiple barriers and safety functions.

The range of waste resulting from decommissioning varies widely in terms of quantity and radioactivity. About 5% of the material resulting from decommissioning a nuclear power plant is radioactive at levels that mean it must be managed as radioactive waste (see classification below).

About 95% of waste is not radioactive.

About 5% is categorized as radioactive waste.

Of the radioactive waste, about 95% is very low level and low level waste.

About 5% is intermediate level and high level waste.

To reduce the amount of radioactive waste, facility components are often decontaminated.

About 95% of waste is not radioactive.

About 5% is categorized as radioactive waste.

Of the radioactive waste, about 95% is very low level and low level waste.

About 5% is intermediate level and high level waste.

The classification of radioactive waste may vary from country to country.
Reuse and recycling of materials cleared from regulatory control

Metal can be decontaminated and recycled, e.g. for the production of steel.

Concrete debris and rubble can be reused, e.g. for road construction.

Disposal options based on the class of radioactive waste

A significant volume of material is reused or recycled after decontamination or melting.
Radioactive waste is managed by qualified and experienced personnel. Access is strictly controlled to the sites where radioactive waste is managed. Radioactive waste is managed by qualified and experienced personnel.

In accordance with strict procedures, the safety of radioactive waste management is the prime responsibility of the operator and is overseen by independent regulators. Regulatory authorization of waste management facilities and activities is based on a safety case and detailed safety assessments.

There have been several decades of research, development and demonstration of the safe disposal of radioactive waste.

How is radioactive waste safely managed?

How does the safe management of radioactive waste contribute to the UN Sustainable Development Goals (SDGs)?

Safe management of radioactive waste, environmental releases, decommissioning and remediation protects life on land and life below water.

Safe management of radioactive waste, environmental releases, decommissioning and remediation contributes to recycling and reuse of materials, objects and sites.

Nuclear technologies are sustainable when safe throughout their lifetime including safe management of radioactive waste, environmental releases and decommissioning.

Sustainable use of nuclear technologies contributes directly to nine SDGs.