

This factsheet provides a summary of the dismantling programmes for nuclear submarines in other countries and, as far as they are applicable, the approaches these countries have taken.

It is based on reliable sources of information available in the public domain.

The following table outlines how submarine dismantling is undertaken in other countries

How is submarine dismantling undertaken in other countries?

In order to progress dismantling of the UK's defuelled submarines, the Ministry of Defence (MOD) needs to reach the following key decisions about which it is consulting the public:

- **How** we remove the radioactive waste from the submarines (the technical approach)
- **Where** we remove the radioactive waste from the submarines (the initial dismantling site(s))
- **Which type** of site we use to store the Intermediate Level Waste (ILW) that cannot be disposed of immediately (the storage solution).

	United States	Russia	France
Technical approach	Separate the Reactor Compartment	Separate the Reactor Compartment	Separate the Reactor Compartment
Initial dismantling site(s).	Defuelled submarines are taken to Puget Sound Naval Shipyard in Washington State, where the Reactor Compartment is separated. The remaining sections of the submarine have hazardous / non-recyclable materials removed for treatment / disposal, and the remaining materials recycled.	Submarines are defuelled before dismantling. Dismantling is undertaken predominantly in three shipyards (Zvezdochka, Nerpa & Zvezda), where the Reactor Compartment is separated for storage. The remaining sections of the submarine have hazardous materials removed for treatment / disposal, and the remaining materials recycled.	Defuelled submarines have the Reactor Compartment separated. The first submarine (Le Redoutable), with its Reactor Compartment separated, is maintained as a navy museum at Cherbourg.
Storage solution.	Not required.	Previously: Afloat storage of Reactor Compartments (with adjoining compartments still attached). Currently: Land storage of Reactor Compartments at Saida Bay in North West Russia.	Temporary Land Storage of Reactor Compartments within a French Naval Dockyard (currently Cherbourg).
Disposal Solution.	Reactor Compartments are transported to the Hanford Nuclear Reservation and disposed of in a large open pit which will eventually be covered.	Not known.	Currently developing process to dismantle Reactor Compartments and dispose of radioactive waste to national facilities.
Number of submarines dismantled to date.	Approx. 100.	Approx. 180.	Approx. 3.



What are the differences and similarities between the MOD's proposals and the way that submarine dismantling is undertaken in other countries?

- To date, other countries have all started the technical work of removing radioactive waste by separating the Reactor Compartment from the submarine. Whilst we have not yet discounted this option, our proposed technical option is to remove the Reactor Pressure Vessel (and other radioactive materials) from the Reactor Compartment rather than separating the entire Reactor Compartment from the submarine.
- In common with other countries, our proposals involve using established naval shipyards to undertake initial dismantling of submarines.
- The type of site used for storage of the Reactor Compartments varies between countries and may be at the point of waste generation (the initial dismantling site) or at a location that is away from the point of waste generation.

Why do UK MOD's proposals differ from the way that submarine dismantling is undertaken in other countries?

When compared to submarine dismantling programmes in other countries, there are a number of important differences that have influenced our proposals for submarine dismantling in the UK. These include differences in:

- **Size of submarine fleet:** This drives economies of scale and the economic case for different options.
- **Geography:** The UK has limited space available for nuclear sites and the storage of radioactive waste.
- **Size of nuclear industry and existing facilities:** This drives economies of scale and the economic case for different options - particularly where suitable nuclear facilities are already in existence
- **Waste categories and disposal conditions:** Under the UK radioactive waste classification system, some parts of the reactors from UK submarines will remain as Intermediate Level Waste indefinitely and must be disposed of accordingly. Other countries have different classification systems and disposal conditions.
- **End state:** The Submarine Dismantling Project (SDP) options assume that the end state for ILW arising will be the proposed Geological Disposal Facility. Other countries have their own existing or proposed end states.