

# Naval Nuclear Reactor Compartment Shipments on the Columbia River



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ENERGY

The State of Oregon found that the Navy's transportation program meets or exceeds all federal requirements.



**A Navy submarine reactor compartment on the Columbia River, heading to Hanford.**

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## **Decommissioned Naval reactor compartment disposal at Hanford**

Since 1986, the U.S. Navy has disposed of reactor compartments from deactivated nuclear-powered warships at the Hanford site in Washington state. Oregon takes an active interest in the program because the Navy ships the compartments 310 miles up the Columbia River. Oregon's involvement is to assure the safe transport of the compartments.

The Navy has retired more than 100 nuclear-powered submarines and nine nuclear-powered cruisers. These reductions in the nuclear fleet are the result of the retirement of aging weapons systems and cutbacks in the number of U.S. Navy ships in the post-Cold War era. The reactor compartments are prepared for disposal at the Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Bremerton, Wash.

The Hanford site occupies 567 square miles of south-central Washington desert. The reactor compartments are placed in a large open pit in the 200 East Area of the site, which is on a plateau and about seven miles from the Columbia River. Eventually, the pit will be covered with dirt.

Through September 2013, 125 reactor compartments were taken to Hanford. Currently, only one or two compartments are sent to Hanford each year. The compartments are classified as low-level radioactive waste. They do not contain loose radioactivity or contaminated fluids and their exteriors are not contaminated. The iron and metal alloys within the reactor vessel have become radioactive after years of reactor operations.

Before deciding on Hanford as its disposal site, the Navy considered other U.S. Department of Energy sites, and considered disposing of the compartments by sinking them in the ocean. After evaluating the costs and the environmental impacts of both ocean disposal and land burial, the Navy determined that land disposal at Hanford was the preferred option.

## **The decommissioning process**

The reactor compartments are located in the middle of the submarine. The compartments contain the reactor vessel, steam generators, pumps, valves and piping. The Navy removes the nuclear fuel from the reactor as part of the deactivation process. Fluids are drained from the reactor systems and pipes are sealed. The entire reactor compartment and some adjoining areas are then cut from the remainder of the submarine and steel plating is welded on each end to seal the compartment.



Naval reactor compartments at Hanford.

The submarine reactor compartments that have been taken to Hanford are about 33 feet high and 40 feet in length. They weigh between 1,130 and 1,680 tons. Eventually, the Navy may deactivate its *Ohio* class submarines in the same manner. Those compartments would be much larger and heavier.

The Navy's nuclear-powered cruisers have two reactor compartments each. Deactivation is similar as with the submarines – spent fuel is removed, fluids are drained and pipes are sealed. The compartments are then cut from the ship and sealed. The Navy has just recently begun the process of deactivating the carrier *Enterprise*. Eventually, its eight nuclear reactor compartments will be disposed at Hanford.

## Transport safety

The Navy must comply with U.S. Department of Transportation (USDOT) regulations when shipping the reactor compartments. Radiation levels must meet USDOT limits. The Navy performs radiation surveys of each reactor compartment before it leaves for Hanford. The Washington Department of Health and Oregon's Radiation Protection Services survey most shipments as an independent verification. The external radiation levels of the compartments are so low that they are not detectable more than a few yards away.

The reactor compartments are welded on barges that have been modified to increase their strength and stability. A flooding detection system alerts the tug crews if the barge begins to take on water. If a barge should sink, transponders automatically activate to allow response crews to locate the barge. A salvage buoy also automatically deploys to mark the barge's position. Cables or slings attached to the reactor compartment allow the compartment to be raised. The Navy and the U.S. Coast Guard would handle salvage efforts.

The barges are towed by a commercial tug boat. A backup tug and a Navy or Coast Guard escort vessel accompany each shipment. The barges use normal commercial towing lanes. After traveling north through Puget Sound and south along the Washington coast, the shipments enter the Columbia River and are guided across the Columbia River bar by a licensed bar pilot.

River pilots guide the shipment during the entire trip along the Columbia River to the Port of Benton in Richland, Wash. There, the reactor compartment is transferred from the barge to a large trailer for the trip onto the Hanford site. The entire trip usually takes about five days.

The Navy notifies the State of Oregon of each shipment. Shipments are made in the spring or fall, when ocean and river conditions are acceptable. The State of Oregon reviewed the Navy's plans for ensuring safe transport of the reactor compartments before the first shipment was made. The state found that the Navy met or exceeded all USDOT requirements.