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Naval Nuclear Reactor Shipments

Naval Nuclear Reactor Compartment Shipments on the Columbia River

Since 1986, the U.S. Navy has disposed of reactor compartments from deactivated nuclear-powered submarines 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, which forms Oregon's northern border. Oregon's involvement is to assure the safe transport of the reactor compartments.

Beginning in 1999, the Navy also began the disposal at Hanford of reactor compartments from nuclear-powered cruisers. These reductions in the nuclear fleet are the result of the retirement of aging weapon 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 in Bremerton, Washington. The Navy selected Puget Sound for the job partly because it is near Hanford.

The Hanford Site occupies 586 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 about seven miles from the Columbia River. Eventually, the pit will be covered with dirt.

Through September 2007, 117 reactor compartments have been taken to Hanford. On average, between six and eight shipments had been made each year; however, in recent years, that has dropped to only one or two each year, with no shipments in 2005, one in 2006 and two in 2007.

The reactor 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. The Navy also considered disposing of the compartments by sinking them in the ocean. After evaluating the costs and environmental impacts of both ocean disposal and land burial, the Navy determined that land burial at Hanford was the preferred option.

Submarine Deactivation

The reactor compartment is located in the middle of the submarine. It consists of 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 and pipes are sealed. The fuel travels by rail through Washington and Oregon to the Idaho National Engineering and Environmental Laboratory, near Idaho Falls, Idaho, where it is inspected and stored.

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. It takes the Navy six to eight months to prepare each compartment for transport.

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Need Further Information?

For more information about Naval Nuclear Reactor compartment shipments on the Columbia River, please contact:

[Ken Niles](#)

Oregon Department of Energy
Nuclear Safety Division
625 Marion Street NE,
Salem, OR 97301-3737

Phone: 1-800-221-8035
(in Oregon) or 503-378-4906

After the first six submarine reactor compartment shipments were complete, the Navy discovered that sound dampening material used on some older submarines contained PCBs. PCBs can cause cancer and are considered a hazardous material. The Navy removed the PCB-bearing material from the six compartments already at Hanford. That material is now removed from the compartments before they leave the shipyard. Residual amounts of PCBs, widely distributed within electrical cables and components, remain in the compartments.

In 1997, the Navy disposed of its first reactor compartment from a "Los Angeles" class submarine. Until then, the submarine reactor compartments had all been about 33 feet high, 40 feet long and weighed about 1,130 tons. The Los Angeles class compartments are slightly longer and considerably heavier, at about 1,680 tons. Eventually, the Navy may deactivate its "Ohio" class submarines in the same manner. Compartments from those boats would be much larger (42 feet high and 55 feet long) and nearly twice as heavy (2,750 tons).

Cruiser Deactivation

The Navy's nine nuclear-powered cruisers have two reactor compartments each. Deactivation is similar to the submarines -- spent fuel is removed, fluids are drained and pipes are sealed. The compartments are then cut from the ship and sealed.

Reactor compartments from U.S.S. Long Beach are larger and heavier than those from the other eight cruisers. The Long Beach compartments are rectangular -- about 37 by 38 feet on the sides and 42 feet high. They will weigh about 2,250 tons. The other cruiser compartments are cylindrical, 37 feet high and 31 feet in diameter. They are similar in size to submarine reactor compartments. They weigh about 1,400 tons each.

Transport Safety

The Navy must comply with U.S. Department of Transportation (DOT) regulations when shipping the reactor compartments. Radiation levels must meet DOT limits. These limits are to protect workers involved with shipping the reactor compartments, the public and the environment. The external radiation levels of the reactor compartments are so low they are not detectable more than a few yards away.

The Navy performs radiation surveys of each reactor compartment before it leaves for Hanford. The Washington Department of Health and the Oregon State Health Division survey some of the shipments as an independent verification.

The reactor compartments are shipped on barges modified by the Navy to increase barge strength and stability. The compartment is welded to the barge for transport. A flooding detection system alerts the tug crews if the barge begins to take on water. The barges are periodically inspected by the American Bureau of Shipping and the U.S. Coast Guard.

If a barge should sink, transponders automatically activate to allow response crews to locate the barge. A salvage buoy also automatically deploys to help 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 all salvage efforts.

The barges are towed by a commercial tug boat. A backup tug and a Navy or Coast Guard escort vessel also accompany each shipment.

The barges use normal commercial towing lanes. Shipments leave the Naval shipyard in Bremerton, travel north through Puget Sound and out to sea. The route turns south along the Washington coast to the mouth of the Columbia River. There, a Columbia River Bar Pilot boards the towing vessel and guides it onto the river. The shipment is not permitted to cross the bar without a bar pilot.

River pilots guide the shipment during the entire trip along the Columbia to the Port of Benton in Richland, Washington. There, the reactor compartment is transferred from the barge to a large trailer and the remainder of the trip to Hanford is made overland. The entire trip usually takes about four days.

The Navy notifies the State of Oregon before each shipment leaves

Bremerton. The state then notifies county emergency managers along the Columbia.

The Navy monitors the weather closely before each shipment and will delay shipment to avoid bad weather along the shipping route. No shipments are made from November through February, typically the stormy season when seas are rough. Shipments are also normally suspended from mid-April to late July because the water level may be too high at the Port of Benton to unload the shipments.

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 DOT regulations. In the fall of 1992, the Transport Committee of Oregon's Hanford Waste Board reviewed the transport safety plan. The Hanford Waste Board is made up of citizens and legislators who help develop policy for Oregon's activities on Hanford issues. The Transport Committee found the Navy's transport safety program sound.

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