



Community consultation and engagement by Canada's Nuclear Waste Management Organization (NWMO).
Source: NWMO



The Onkalo deep geological repository in Okiluoto, Finland.
Source: Posiva

WASTE MANAGEMENT

Trust and two billion year-old bedrock

To safely store waste from nuclear reactors, countries are turning to community-driven processes built on trust, collaboration, and rock-solid science.

At a time when the first signs of life on earth were making their debut, underground veins of uranium in what is now Oklo, Gabon began to fission. The same fission reaction occurs in a modern nuclear reactor, but in Oklo it occurred all by itself—a self-sustaining nuclear chain reaction that lasted for several hundred thousand years.

This completely natural reactor produced tonnes of what we would call nuclear waste if it were produced by a power plant. Due to the stability of the rock formation, that “waste” has remained immobile and isolated from the biosphere over billions of years.

Today, the construction of deep geological repositories to deposit the waste produced by nuclear reactors—as is being completed in Olkiluoto, Finland—in many ways is an analogue to the isolation experienced by Oklo’s natural waste, but with a few extra barriers thanks to modern engineering.

“It’s dusty and dark. It just looks like a mine,” says Kai Hämäläinen of the Finnish Radiation and Nuclear Safety Authority, the country’s nuclear regulator.

At Olkiluoto, spent nuclear fuel is to be deposited half a kilometre deep in the almost 2-billion-year-old bedrock. Studies have confirmed that this ancient bedrock has been stable all that time—despite earthquakes and ice ages—and claim that it will continue to be so.

In addition to the bedrock, bentonite clay will be used in the tunnels to protect the fuel even if any jolts were to happen. The fuel will be packed into a cast iron canister and placed in a copper sleeve. Copper is one of the most stable substances on earth, and does not corrode over time the same way other materials do. Metallurgists say that the copper sleeve will last at least a million years under the conditions at Olkiluoto.

And even if all other barriers fail, the fuel itself is in a ceramic form that would take millions of years to break down in water—long after the radioactive material inside ceases to present any health risks.

How can the local community trust these assessments? A combination of rigorous verification with external third parties and a long-standing relationship with the regulator built on trust. “We have been very open and active in the community,” Kai says, stressing that the process started as far back as 1983.

“People are used to a nuclear plant and feel kind of responsible for the waste created on this site, but it’s also important to have independent verification”. It’s about trust in the regulator, he says. “It wouldn’t work if we were on the same side as the licensee [the operator of the nuclear plant].”

You might wonder if Finland is an exception. After all, who would want to locate a nuclear waste repository in their backyard? But this community-driven, collaborative approach is being adopted in other parts of the world.

In Canada, for example, 22 communities voluntarily responded to a call to learn more about hosting a repository for the country’s spent fuel. Today, after narrowing its focus through study and engagement, Canada’s Nuclear Waste Management Organization is working with five communities to select a preferred site. The communities can opt out at any time, but they choose to remain involved because they see benefits and want to learn more.

This community-driven collaborative process has been a democratic policy innovation as crucial as any advance in engineering and technology to making a permanent solution for nuclear waste a reality.