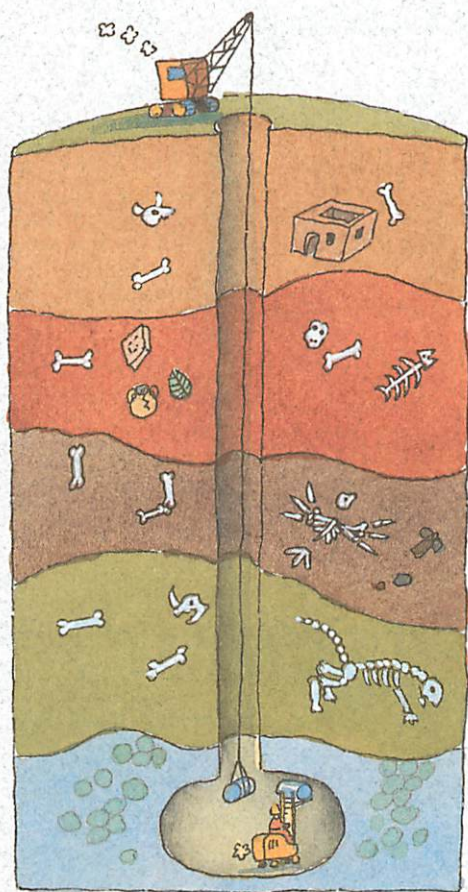


High-Level Waste:



- ▶ What will we do with used nuclear fuel?

Today, we Americans get more electricity from nuclear energy than from any other source, except coal.

One of the nice things about getting 20 percent of our electricity from nuclear energy is that it's kind to the environment. America's nuclear power plants help keep the countryside clean. No air pollution. No greenhouse gases.

So when you flick on a light switch, turn the kids loose on a computer game or defrost a dinner in the microwave, you may be using pollution-free elec-

tricity from one of more than 100 nuclear power plants across the country.

Why pollution-free? Because nuclear power plants don't burn anything. Instead, they make heat to drive the plant by splitting uranium atoms. As the uranium fuel releases its energy in the form of heat, it becomes radioactive.

When all its energy is gone, the used fuel must be safely stored.

And it is safely stored. In fact, it's been safely stored for more than 30 years. And we have the means of safely storing



Nuclear power plants provide clean electricity without air pollution.

it for hundreds—even thousands—of years. But because used fuel stays radioactive for a long time, many people are concerned about its safe handling and storage.

You may have questions about used fuel—also called high-level waste—after reading newspaper articles or seeing television reports about it. This brochure provides some answers.

What Does High-level Waste Look Like?

It's not a green ooze or a colorless gas. It's a solid. In fact, used fuel looks exactly the same as it did when it was first put into the reactor.

The fuel is made up of small uranium pellets, about as big as the end of your finger. These pellets are a tough, dense, ceramic material. They're placed end to end inside long metal tubes called fuel rods. The fuel rods are then grouped together into bundles.

Because it is a solid, used fuel can't spill or leak the way a liquid or a gas could. And because of its physical and chemical characteristics, fuel—whether used or brand new—cannot explode.

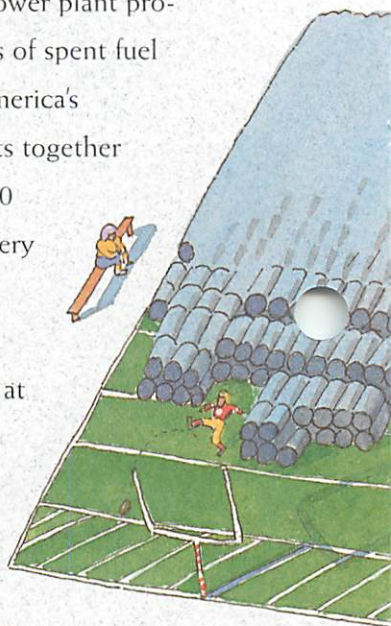
Because of its radioactivity, used fuel must be handled with great care.



Are We Being Overrun By High-level Waste?

No. There's actually a fairly small amount. A typical nuclear power plant produces about 20 tons of spent fuel each year. All of America's nuclear power plants together produce about 2,000 tons of used fuel every year. And about 28,000 tons of used fuel are now stored at about 70 nuclear plant sites around the country.

Two thousand tons a year may sound like a lot of waste. But imagine an area the size of a football field. If you put on that field all the used fuel produced by America's nuclear power plants since the first one started operating more than 30 years ago, it would only be about three yards high.



All the used fuel from all our nuclear power plants would only cover a football field three yards deep.

Is The High-level Waste Safely Handled And Stored?

Used fuel is always handled by remote control, with lots of shielding to contain the

radiation. After it is removed from the reactor, used fuel is stored in steel-lined, concrete pools filled with water.

The water cools the fuel and acts as a shield, to protect workers from radiation. Seven to 10 feet of water is enough to provide protection.

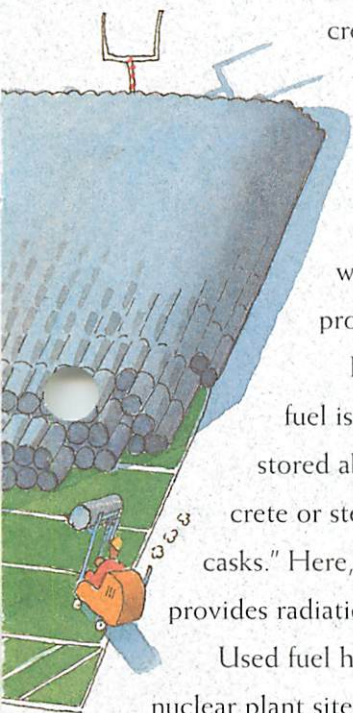
In some cases, after the used fuel is cooled for 10 years, it is stored above ground in huge concrete or steel containers called "dry casks." Here, it's the steel or concrete that provides radiation protection.

Used fuel has been stored safely at nuclear plant sites since the late 1950s. This form of storage is safe—there has never been a release of radioactivity—but it was never intended to be permanent.

Why Can't The Waste Just Stay At The Plants?

While used fuel is safely stored at nuclear plant sites today, the storage facilities are only temporary. They are not designed to be permanent.

The ideal permanent disposal is deep underground. Scientists may not agree on all things, but they do agree on deep geologic



disposal. For years, independent scientific organizations around the world have recommended that used fuel be put deep underground, in a repository that safely isolates it from people and the environment.

Are We Building A Place To Put Used Fuel?

The government has taken the first step. But as you can imagine, doing something for the first time isn't easy. And we've never built a permanent repository for high-level waste before.

Congress passed legislation in 1982—the Nuclear Waste Policy Act—that created a program for building the nation's first underground high-level waste

repository. In 1987, Congress picked Yucca Mountain, in a remote part of the Nevada desert, for study as a possible location. If Yucca Mountain is suitable, a repository will be built about 1,000 feet underground.

The U.S. Department of Energy is in

The safety of a permanent disposal facility will be checked and rechecked by independent scientists.



charge of the high-level waste program, including the study of Yucca Mountain. The cost of the program is paid for by a special fee on all nuclear electricity.

DOE is spending billions of dollars for comprehensive studies of Yucca Mountain.

The studies, carried out by scientists from such organizations as the U.S. Geological Survey and Los Alamos National Laboratory, are focusing on three key issues: volcanoes, earthquakes and the time it takes water to

travel through the mountain. DOE needs this information to determine whether the site is a safe place for a repository.

Not surprisingly, DOE's work has attracted both political and scientific controversy. But

the studies continue, and if the site is found suitable, DOE will apply to the U.S. Nuclear Regulatory Commission for a license to build a repository. Only when the NRC is satisfied that the repository will be safe will it issue a license.

**Independent
scientific
organizations
say used
nuclear fuel
should be
isolated deep
underground.**



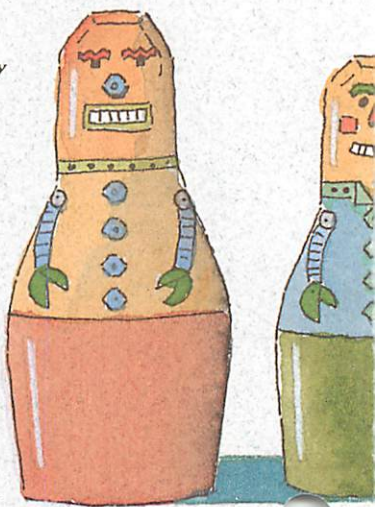
DOE's current timetable calls for it to complete the Yucca Mountain studies early in the next century. Between now and then, plenty of organizations will be checking on its work, including:

- ▶ the National Academy of Sciences
- ▶ the Nuclear Waste Technical Review Board (an independent group of presidentially appointed experts)
- ▶ the Nuclear Regulatory Commission
- ▶ the Environmental Protection Agency
- ▶ the General Accounting Office
- ▶ the electric utility industry
- ▶ numerous congressional committees
- ▶ state utility regulators
- ▶ the state of Nevada itself.

How Do I Know A Repository Will Be Safe?

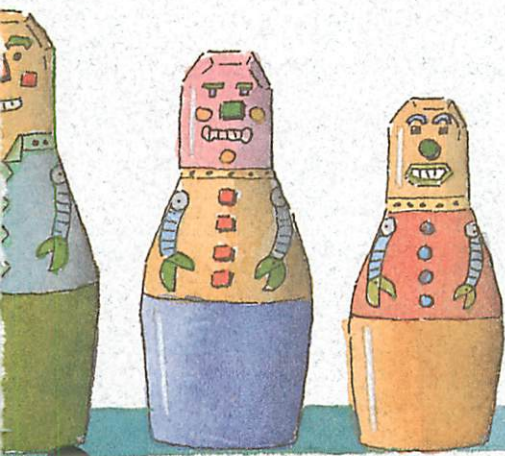
Scientists and engineers know that systems can sometimes fail. So they're designing a high-level waste repository with backups—lots of them.

Scientists have been studying radiation for at least 100 years. They know how to detect,



measure and control even the smallest amounts. And they know that as time passes, most radioactive elements become harmless. But until then, radioactive waste could be dangerous if it got into our air, drinking water or food. The only way this could happen would be if groundwater somehow entered the repository, dissolved some of the waste and carried it to the surface.

As time passes, radioactive elements lose their radioactivity and become harmless.



Like nesting dolls, used fuel will be isolated inside multiple containers so radioactivity can't escape.

Scientists and engineers know how to prevent this from ever happening. First they choose a site like Yucca Mountain with

minimal rainfall and a deep water table. Then, they build a repository with multiple barriers—both natural and man-made—to isolate the waste far from our environment.

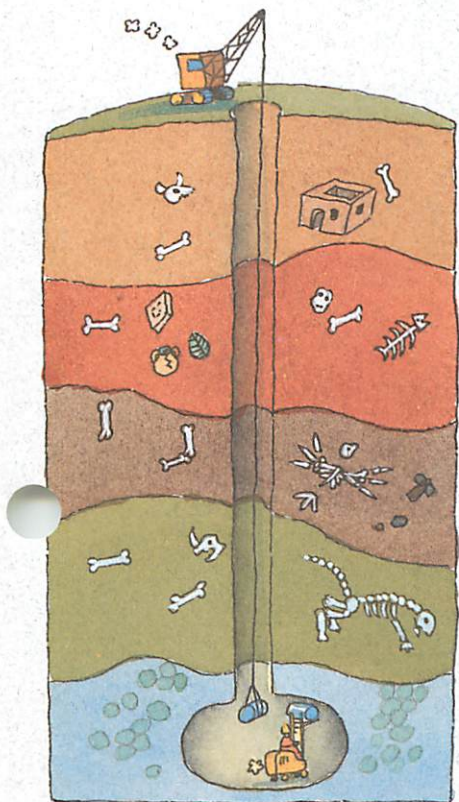
Disposal facilities for used nuclear fuel will be monitored continually to detect any radiation.

The radioactive used fuel—in the form of pellets—is locked inside the metal fuel rods. Next, the rods are sealed inside a thick-walled, steel container, which is placed inside another container, then placed in the repository. All these man-made barriers ensure that the radioactivity remains safely locked away.

The containers are buried about 1,000 feet underground, where nature adds her own protections: an arid climate, rock that inhibits water movement, and a water table that's 1,800 feet below the surface. In addition, highly trained engineers using sophisticated instruments will monitor the repository to make sure it remains safe.

We enjoy the benefits of clean electricity from nuclear energy. We must also manage the waste by-products.





Used nuclear fuel will be isolated deep underground in a stable rock formation.

Why Should I Care About High-level Waste Disposal?

We all use electricity every day, and some of that electricity is generated by nuclear power plants. So it makes sense that we should help dispose of the waste produced in generating that electricity.

We know how to dispose of used fuel safely. The techniques and practices have been developed and proven. It's our responsibility to solve this problem—not leave it for our children.



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