More on High Level Waste

After 3 to 5 years in the reactor, one-third of the fuel assemblies are removed and stored in storage pools for typically about 10 to 20 years. During this period, the fuel loses much of its radioactivity and heat. After that period, the fuel can be stored in large sealed metal casks that can be cooled by air. The spent fuel assemblies are legally referred to as ***Spent Nuclear Fuel***. If the fuel assemblies are reprocessed, the resulting waste is called ***High Level Waste***.

Currently most spent fuel is being stored (over 29,000 metric tons) at the reactor sites. Very little (~750 tons) is being stored at 3 other storage facilities (West Valley, Morris Fuel Reprocessing Plant, Idaho National Engineering Laboratory). In 1977, the reprocessing option was disallowed by President Carter because of concern about nuclear proliferation.

1. Graphics/photos showing typical PWR fuel assemblies (BWR assemblies are smaller and weigh less)
2. Spent fuel storage facilities - pools, casks - various methods used
3. Behavior of radioactivity and thermal power produced as a function of time for fuel discharged from a reactor.

Typically a 1000 MWe reactor will discharge about 2 metric tons of high level waste each refueling. A 1000 MWe reactor has about 100 metric tons of uranium dioxide fuel, of which 3 to 5 tons consist of the fissile U-235. A PWR will discharge 40 to 70 fuel assemblies; a BWR will discharge 120 to 200 fuel assemblies.

1. Locations where spent fuel is currently being stored in the United States.
2. Annual amounts of spent fuel expected to be discharged from 1995 through 2030
3. Table giving specifics of typical characteristics of BWR and PWR Fuel Assemblies
4. Cumulative amount of spent fuel discharged through 1995.
5. Terminology used - acronyms, abbreviations
6. Glossary of Terms

The United States' Department of Energy (DOE) has prepared very informative on line annual Integrated Database Reports - CY 1995, CY 1996 - that provide detailed information, including tables and figures showing the history and projections of spent nuclear waste generation. The DOE report deals with both government (including military) and commercially generated spent nuclear fuel and waste. Reports for other years have been archived and are not accessible from DOE except possibly by request.

To put the volume of the high level waste into perspective-if all the current waste were stored as a single mass, it would occupy a space 140 feet x 140 feet x 10 foot high. Realistically, the actual space will be larger because the high level waste will be converted into a less dense vitrified (or glass form).

There is another way of looking at the spent fuel waste - How much area would ALL of the fuel assemblies for the 110 nuclear power plants of 500 to 1100 MWe occupy if they were placed side by side? Based on DOE projections, there would ~232,000 fuel assemblies discharged through 2030. These would occupy an area of ~100,000 ft^2, the area corresponding to about 1 city block -a very small area. Of course, the actual area would be larger because the spent fuel would be shielded and separated into smaller storage containers.

How much area would be needed for coal ash storage? We can look at this 2 ways -

- 3 small 20 MWe units operating for just 10 years would require a landfill equivalent to 20 city blocks. A rule of thumb is that 10% of the fuel results as ash.
- According to IAEA, a 1000 MWe plant generates 300,000 metric tons of ash per year. The density of ash is 55 lb per cubic foot. Based on this, the landfill required to handle each year's ash output would have to be 14 foot high and area of 857,000 ft^2 (equivalent to 8.5 city blocks)
- By comparison, a 22 square foot area would be needed for the fuel assemblies required to run a reactor for a year.

For more on the proposed long term storage location, please visit DOE's Yucca Mountain information site.

Please visit the Current Hot Topics page for information on proposed private fuel storage and transportation of nuclear waste.
