

The Obvious Answer to the nuclear fuel waste problem

As a chemist working in the Nuclear Fuel Manufacturing industry the answer to the question "What should we do with our commercial nuclear reactor waste?" is obvious to me.

The Obvious Answer

All those spent nuclear fuel assemblies at the 103 power plants in the US should be reprocessed. Reprocessing would separate the uranium, and plutonium from the used fuel (about 95% of the mass). These portions would contain the fissionable material useful in "Mixed Oxide" nuclear fuel for use in nuclear power plants. The remaining 5% would contain the concentrated radioactive components in a much more manageable size and would not contain the fissionable material.

This material could be further processed to extract elements which contain the radio-active isotopes with useful medical and industrial function. The remainder could be analyzed for their chemical and isotopic content, vitrified into stable "glass logs" with known properties, including known half lives, and then could be shipped to the Yucca Mountain Repository. Each log would have a predictable heat generation profile based on its isotopic analysis. The heat is generated at a rate based on the half life of the isotopes it contained at the time it was separated, and will start out producing more heat at first and eventually will cool.

These glass logs would first need to be stored in a hot room for a few years then could be moved to the cooler rooms for final storage after they reach a specified rate of heat generation. Having removed all fissionable material, and with the analysis of the starting material, the predictability of the decay rates should be very easy, providing a very high confidence in the ability of Yucca Mountain to maintain them in a safe status for millennia to come.

I will defer to others like Dr. Brady Hanson to discuss the reasons that Yucca Mountain is the ideal storage location for these glass logs relative to the silicate levels in any water that might eventually trickle into the mountain.

Reprocessing Solution

Getting back to the reprocessing of nuclear fuel, we should consider the economics, and what is going to drive reprocessing.

The older spent nuclear fuel assemblies are not going to contain as much of the industrial, and medically useful isotopes as freshly removed fuel will contain, and so the economics of the reprocessing of the old assemblies will likely not be profitable, requiring some other funding source to get those reprocessed. The fuel value in most used nuclear fuel is marginal for conversion to new Mixed Oxide fuel, and it is the industrial and medical isotopes that may provide additional economic stimulus

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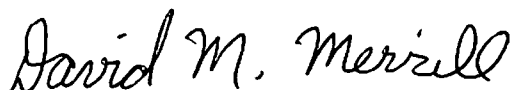
to make it potentially profitable someday. On the other hand reprocessing to characterize and vitrify the waste should be one of the objectives of reprocessing nuclear fuel.

AREVA has been successfully operating a nuclear fuel reprocessing center in France for many years. The technology is available, and you may have noticed AREVA has a nuclear fuel manufacturing facility at the north end of Richland just across the street from Hanford. Bringing this technology and capability to the United States is very possible with one exception.

I believe the United States made some agreement with foreign countries a while ago, and in those agreements called "non-proliferation" stated that we would not reprocess our nuclear material. It is true that if we reprocess our nuclear material we could extract the plutonium, and there is the potential to convert that material into nuclear weapons. In order to change the "Non-Proliferation Agreement", I am sure we would need to maintain a nuclear inventory management system auditable by those foreign countries to assure we were not directing the material to weapons generation. Our facility here in Richland has a Nuclear Inventory Management System, which might be used as an example to assure other nations that we would track all nuclear material and assure all plutonium is directed to mixed oxide fuel manufacturing.

I believe AREVA can be an integral resource to reprocessing nuclear fuel and providing characterized vitrified waste logs that could be stored for millennia in Yucca Mountain.

I agree that Yucca mountain should not be used as a final repository for spent nuclear fuel in its original zirconium cladding. This form of waste would be much too susceptible to corrosion and leaching. The Yucca Mountain facility would however be an ideal location to store the nuclear vitrified waste from a nuclear reprocessing facility. Although the commission is directed to not consider Yucca Mountain for storage of current nuclear waste, I believe it is within your ability to recommend the use of Yucca Mountain to store only characterized vitrified waste.



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