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DOE Tries To Change The Rules On Nuclear Waste Disposal

The United States Department of Energy is trying to change the rules on nuclear waste disposal – for the better.

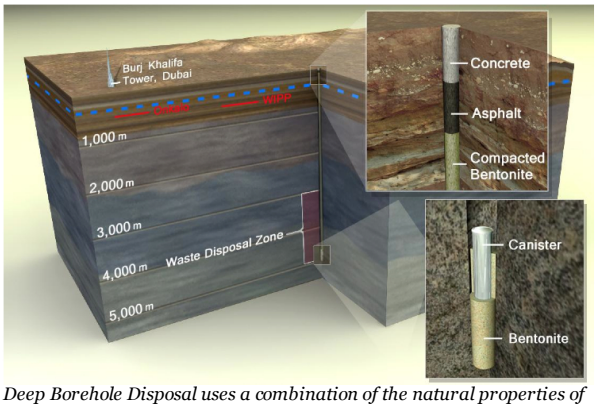
Instead of the old top-down decision-making, DOE is going to implement a consent-based strategy. This means that instead of ordering some individual state like Nevada to take all of the Nation's high level nuclear waste, whether they like it or not, we'll instead ask "Who would like to take this waste? It will create fantastic jobs, will bring huge economic benefit to the region and, contrary to popular opinion, it's safer than putting in a Mall."

This new strategy comes from the failure of our previous disposal program that ended in the suspension of the Yucca Mountain site, the proposed nuclear repository that came out of the 1987 Amendment to the 1982 Nuclear Waste Policy Act. This suspension was not a bad thing since the Yucca Mountain tuff really is such a lousy rock that the level of re-engineering required would make the project way too expensive, about $100 billion too expensive.

In an earlier related action, Energy Secretary Dr. Ernest Moniz announced that DOE is moving forward with planning for a repository for defense-generated nuclear waste. Concurrently, DOE is also taking steps toward the siting and licensing of a larger interim storage facility for commercial spent nuclear fuel and high-level radioactive waste, using a phased, adaptive and also consent-based approach.

And now DOE is funding a study to drill a borehole more than 3 miles deep into the Earth's crust below North Dakota to test a disposal method for radioactive waste called Deep Borehole Disposal. In this scenario, waste would be placed in the lower mile of the borehole in crystalline rock that would isolate the waste from the surface and shallow environments.

The borehole would then be filled up with some special layers, including asphalt, bentonite, concrete and crushed rock that will isolate the waste for geologic time. The borehole would need a diameter of at least 17 inches at the bottom for placing containers, and would be lined with steel casing. Future boreholes will be wider as the technology evolves, which is has been doing lately.



Deep Borehole Disposal uses a combination of the natural properties of deep crustal rocks plus engineered barriers like asphalt, bentonite and concrete to isolate waste for geologic time. At these depths, you're so deep in the crust that the overlying rocks don't matter. The water table doesn't matter. The climate doesn't matter. Human activities don't matter. Because of its size, it will take more technological advances for most of our nuclear waste, but some waste is small and perfect for this approach. Source: Sandia

These developments follow directly the recommendations of President Obama's Blue Ribbon Commission on America's Nuclear Future, and followed up in the President's Memorandum on disposal of Defense High-Level Waste and the 2013 Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste. Conca and Wright (2012) provide background on nuclear waste and interpretation of the three BRC recommendations pertaining to nuclear waste disposal that has led to these changes.

But the basic strategy of this new disposal initiative is:

- **Separate nuclear bomb waste from commercial high-level waste and find a separate disposal path for each.** Whether in

a single deep geologic repository for each in salt, or a series of deep boreholes, separating these two very different waste streams is essential and resolves the so-called co-mingling issue.

- **Expand the existing bomb waste repository in salt to accept all bomb waste.** This existing repository is located near Carlsbad, New Mexico and is called WIPP. WIPP is presently permitted only for a subset of bomb waste called transuranic waste even though it was designed for all nuclear waste of any type. A minor leak shut down the site in 2014, but the site should open this year with no lasting effect.

- **Find an interim storage site for commercial high-level waste dry casks.** Dry casks perform for well over 100 years, until the final repository is chosen or the waste is burned in our future fast reactors that will get over ten times more energy out of them than the original reactor and whose waste is then much easier to dispose.

The deep borehole project is particularly interesting because almost anywhere you look in America, there are deep rocks perfect for this method. Every state can have its own borehole repository, much to some of these state's annoyance, since most political leaders would rather foist their waste off on someone else and claim victory for their constituents.

This plethora of good borehole spots follows from the deep borehole going well into the Earth's crust and into what we call crystalline basement rocks. These basement rocks are below the upper rocks that cover most of our world – below the sedimentary rocks and other formations that often are leaky and not very dense, those that host our drinking water aquifers, most of the oil and gas deposits and other things we think of when we think of the rocks beneath our feet.

The deep borehole goes down so deep in the crust that the overlying rocks don't matter. The water table doesn't matter. The climate doesn't matter. Human activities don't matter. And it takes millions of years, if ever, for anything to get up to the surface from that depth in the Earth's crust.

At these depths, the pressures are quite high, exceeding 15,000 psi for target sites, so most pores are closed and many formation waters are not mobile. And the path lengths needed for travel of contaminants to the shallow crust, where they can enter aquifers and the environment, are incredibly long.

Since no single borehole can hold all the commercial nuclear waste we have, there would be many boreholes around the country, ideally some in every state that has nuclear power. Plus a few more for other types of waste including some defense waste like cesium and strontium capsules at Hanford that are particularly optimal for borehole disposal and that this announced test by DOE is all about.

The deep borehole option is actually democratic with a small *d*. It gets around the problem of a single state complaining, "Why should we take everyone else's waste?" since any state that has a nuclear power plant would have many opportune deep borehole sites and the waste wouldn't have to leave that state at all.

But Congress doesn't exactly like the deep borehole idea because they would not be able to gang up on one state and force it down their throat. Each state would have its own deep nuclear disposal boreholes and wouldn't be able to promise their citizens that the nuclear waste would ever leave their state, although at 3 miles deep in the Earth's crust, it really would have left the state.

Of course, the problem with consent-based siting is that it seems it needs everyone's consent, even those without much of a stake in the decision, or those who live really far away from the proposed site, like anti-nuke activists. In the past, it seemed as though these far-away ideological people had more say than those who lived right near the site, which is another way to politicize the process.

So a true consent-based program more heavily weights the opinions of those who live closer to the proposed site, as it should be. And this idea has gotten traction in our Nation's capital.

Whatever happens in the short term, we only have three realistic final options for disposal of nuclear waste:

1) we let everything stay right where it is

2) we expand the use of massive salt as a deep geologic repository

3) we dispose of the waste in deep boreholes in the Earth's crust

Of course, it will be some combination of all three. And the new goals of DOE will move us forward in this critical nuclear issue so we can more quickly achieve a just and sustainable energy mix that includes all non-fossil energy sources.

Follow me on Twitter @jimconca and see my book with Dr. Judith Wright at Amazon.com