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Confidence -- What Does It Mean For Nuclear Waste?

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Can we be *confident* that we can handle our nuclear waste in America? On Tuesday, the Nuclear Regulatory Commission said – yes. The NRC made a small but incredibly important decision about nuclear waste that could finally get nuclear energy moving forward again.

In response to a 2012 ruling by the U.S. Court of Appeals, the NRC approved a generic environmental impact statement that clears the way for storing spent nuclear fuel for a hundred years or more (NRC Ruling). New nuclear power plants can now be built without waiting for a final nuclear waste repository to be built.

This is indeed a very good thing.

Nuclear power plants in the United States have safely stored spent nuclear fuel for decades in spent fuel pools of water and, later, in concrete dry casks. There has never been a problem.

But the centerpiece of our nuclear waste program has always been the idea of a deep geologic repository as the final resting place for nuclear waste.

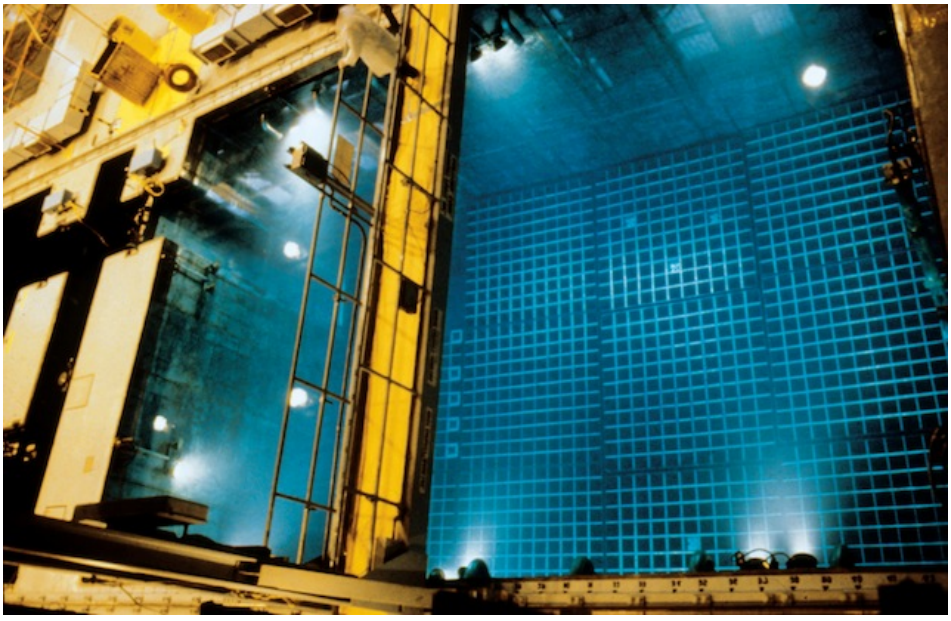
Therefore, when the Yucca Mountain deep geologic repository project was essentially canned in 2009 (killed for similar political reasons it was born from), it was a blow to the country's *confidence* in our ability to handle our spent nuclear fuel. We had never thought about storing this stuff forever.

Specifically, the 2012 Court struck down what's called the NRC *Waste Confidence Decision*, which stated:

- "*reasonable assurance exists that sufficient geologic repository capacity will be available for disposal of…spent nuclear fuel when necessary*", and

- "*reasonable assurance exists that…spent fuel can be stored safely without significant environmental impacts…in spent fuel pools and…dry cask storage systems.*"

As a result of this court ruling, the NRC decided to stop all nuclear licensing activities (CLI-12-016) while it developed a Waste Confidence Generic Environmental Impact Statement that would address these issues, even the possibility that a permanent geologic repository might never be built. This generic EIS would not have to be redone over and over for every site or every license.



Wet storage of spent nuclear fuel in pools of water. When spent fuel is removed from the reactor it requires about five years in water to cool off and allow the short-lived really hot radionuclides to decay away completely. It can then transferred to dry cask storage (below) until needed, e.g., burned in Generation IV or V fast reactors in the near-future, or just disposed of in a deep geologic repository. It is safe in Dry Cask for over a hundred years while the fuel cools off. Source: NEI and NRC File Photos

The GEIS examined land use, air and water quality, historic and cultural resources over three timeframes: 60 years (short-term), 100 years after the short-term scenario (long-term) and indefinitely. It also analyzed spent fuel pool leaks and fires.

So Tuesday's approval by the NRC of this new rule on the environmental effects of long-term storage of spent nuclear fuel was enormously important. It restores the confidence that was called into question and let's new nuclear builds and activities to go forward, once the final rule becomes effective, 30 days after publication in the *Federal Register*.

The *waste confidence* issue is not just a touchy-feely notion. It has practical and economic ramifications. If the NRC, the agency that regulates the commercial nuclear industry, does not feel *confident* that the industry can take care of its waste, then they will not issue any new licenses to build any new nuclear power plants, disposal sites or any other nuclear facilities, and will not extend licenses for existing power plants.

But the game-changer of this ruling is it recognizes storing spent fuel for long periods in dry casks is incredibly safe and cheap. Dry casks completely contain all radiation. They effortlessly manage the heat. And they prevent nuclear fission (see figure). The casks resist earthquakes, projectiles, tornadoes, floods, temperature extremes and any other event we can think of, including tsunamis (NRC Casks).

Cooling in the casks is passive, and the heat coming off of a loaded spent fuel cask is less than that given off by the average home-heating system. The heat and radioactivity simply decrease over time without the need of fans or pumps, or any action on our part. The only operational cost is the constant monitoring we carry out on the casks.

The United States has about 80,000 tons each of spent nuclear fuel (SNF) from commercial nuclear power plants making electricity, and high-level nuclear waste (HLW) from making nuclear weapons. SNF from reactors is in a solid form that is easily handled and easily stored in dry casks once it is removed from the cooling pools after about five years. HLW is in different liquid, sludge and solid forms in various containments at Department of Energy facilities and has nothing to do with commercial SNF, contrary to the goo that seems to always ooze out on the Simpons.

With this NRC ruling, we may finally be getting away from the "rush-to-dispose" paradigm of the 1970s that led to our present broken nuclear disposal program. After 1974, there was an administrative decision to throw spent fuel away as fast as possible, an unfortunate and costly decree.

The rush-to-dispose ended up politicizing the process even more than usual. It also introduced the idea of having to retrieve the waste if we decided to use it again (because we were rushing into it). This, in turn, led to the regrettable decision to reject massive salt as the repository host rock and to choose, instead, the fractured, leaky and oxidizing volcanic tuff of Yucca Mountain.

Worse, this decision was coupled to waste confidence and new reactor builds. In other words, if you don't build the repository and start filling it, you shouldn't build any new reactors.

Which is ironic, since one of the best things you can do with spent nuclear fuel is let it sit for a hundred years. A hundred years is a few half-lives of the two bad players – the uranium fission products cesium-137 and strontium-90. Each of these nuclides has a 30-year half-life, so after 100 years, 90% of each will have decayed away, and the waste will be much, much cooler and easier to handle, no matter what you end up doing with it.

If you end up burning old spent fuel in new GenIV fast reactors, like General Atomics' EM2 reactor, or the reactor Bill Gates is building (TerraPower), you get ten times more energy out of the fuel as you get from the first round of burning. And the new waste is radioactive for a much shorter time. If you end up just throwing the spent fuel away, it's still relatively cool and the disposal is easier and cheaper.

There just isn't any downside to long-term dry cask storage of spent nuclear fuel.

This new rule does not itself license or permit nuclear power plants to store spent fuel for any length of time, but it was necessary to allow these licenses to go forward under separate actions.

Ironically, this final rule was renamed, from *waste confidence* to *continued storage of spent nuclear fuel*. The public wanted a name that more accurately reflected the nature of the ruling and is more understandable.

But we all know it's about *being confident* that we can handle this waste. And yes, we can.

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