



Lessons From Fukushima and 9/11—Used Fuel Pools Are Safe, Resilient and Robust

- At-reactor used fuel storage pools are steel-lined concrete structures typically 40 feet deep, with the used fuel at least 20 feet below the surface. To prevent leaks, the pools have no drains in their floors. These sturdy structures are designed to withstand all severe natural events including floods, tornadoes, earthquakes, tsunamis and hurricanes.
- Public health and safety are assured by strictly regulated design features as well as operational practices that maintain appropriate fuel temperatures and radiation shielding, prevent fuel damage and unintended nuclear reactions in the pools.
- The March 2011 accident at Fukushima Daiichi was a dramatic demonstration of the robust protection provided by these specially designed pools. Despite a level 9.0 earthquake—the strongest in modern Japanese history—and a 45 foot-high tsunami, all seven used fuel pools withstood the earthquake and tsunami and protected the used fuel. In spite of hydrogen explosions at three of the reactors, and although active cooling capability was lost for several days, the integrity of the pools were never compromised and the fuel stored in them remained safe, as they do to this day. Later analysis showed that all the plant systems survived the earthquake alone—the subsequent tsunami was what caused the loss of onsite power and cooling capability. Teams of U.S. industry executives and experts visiting the Fukushima site to lend support gained first-hand knowledge of the situation and confirmed that the pools' integrity remained intact.
- A U.S. Nuclear Regulatory Commission (NRC) analysis conducted after Fukushima determined that even in the event of an extremely severe hypothetical beyond-design-basis accident—an earthquake four to eight times more powerful than one a nuclear power is designed to withstand—there is a “very low” likelihood of a radioactivity release from a used fuel pool. The NRC concluded that “there is no pressing safety or security reason” to require expedited removal of used fuel from reactor storage pools to dry casks. The analysis confirmed the results of post-9/11 studies on the ability of used fuel pools to withstand large fires and explosions.
- Following the Fukushima accident, the U.S. nuclear energy industry coordinated its response based on lessons learned from the event, adding backups to the existing safety backups. Among the safety enhancements implemented include a detailed reevaluation of seismic and flooding risks for all U.S. nuclear power plants and verification that earthquake and flood protections are more than adequate for even scenarios more severe than those considered in the design of the plants. The industry invested \$4 billion to put in place additional layers of backup safety and a flexible response capability at each U.S. reactor and across the industry. The NRC separately conducted an independent assessment to ensure that agency regulations reflect lessons learned from Fukushima. These enhancements resulted in making an already safe industry even safer.

Seeking Used Fuel Solutions—A Moral and Legal Obligation, But Not for Safety’s Sake

- The nuclear energy industry has clearly demonstrated over the past several decades that it is safely storing used fuel in pools or dry casks, and will continue to do so for as long as is necessary. However, as Energy Secretary Rick Perry has recently stated, the United States government has an urgent moral obligation to remove used fuel from reactor sites, for the following reasons:
 - **The taxpayer liability is enormous.**

The Department of Energy has failed to honor its contractual and statutory obligation to remove used fuel from reactor sites from 1998. As a result, the federal government has paid out more than \$6 billion in damages for this failure. This federal liability continues to grow at a rate of about \$800 million a year, or \$2.2 million per day. This is on top of the \$36 billion that already has been committed to the Nuclear Waste Fund. American citizens are thus paying twice for a service that has yet to be delivered.
 - **Stranding used fuel at shutdown reactors is not what taxpayers were promised.**

Many commercial power reactors are reaching the end of their operational lives. When a reactor shuts down, the used fuel becomes stranded at that location until DOE is able to remove it. Already 14 reactor sites in 11 states are in this status. These sites have become de facto interim storage locations, where the land remains unavailable for other uses and costs the surrounding communities significant economic opportunity (especially in areas where used fuel is stored on prime coastal real estate).
 - **National security concerns.**

The nuclear materials in used fuel can most effectively and efficiently be protected if they are stored in one isolated location as opposed to numerous scattered commercial reactor and federal sites such as Hanford, Savannah River, and the Idaho National Laboratory. A geologic repository deep beneath Yucca Mountain (where the NRC has found that these materials can be isolated in a safe and environmentally sound manner for a million years), or storage locations in the remote deserts of West Texas or Southeast New Mexico using proven storage cask technologies for commercial used fuel, are simply the most secure places for these materials.