Spent Fuel: Myths & Facts

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The Honorable Jeffrey S. Merrifield was first appointed as a Commissioner to the U.S. Nuclear Regulatory Commission (NRC) on October 23, 1998. He was sworn in for a second term on August 5, 2002. Mr. Merrifield received his Bachelor of Arts degree from Tufts University in 1985, and his Juris Doctorate degree from the Georgetown University Law Center in 1992.

At the dawn of the nuclear era in the 1950's, few members of Congress or other branches of the government were focused on what would happen to spent nuclear materials generated at commercial power facilities or from our atomic weapons program. Most of the scientific community was caught up in the excitement of the new technology and its possible applications. The Atomic Energy Commission, driven by our nation's aggressive Cold War footing, was directed to increase our nuclear weapons stores at "all costs." This headstrong effort sowed the seeds of a significant and long lasting environmental legacy at a variety of sites around the country.

The public, whose views of nuclear power were principally framed by visions of exploding atomic weapons, was understandably nervous about what would happen with the materials needed for this new source of power. Disposal options for spent fuel and radioactive waste were not widely discussed in public fora, and those that were considered would have done little to comfort the fears of the public. The first option involved commercial boats hauling metal drums filled with waste out to sea to be dumped overboard. The second option involved disposal in a geologic repository, an option that is still debated today. The third option was reprocessing, which received the most public discussion and support from the scientific community. "Rest assured" the scientists stated, we can reprocess the material and reuse it in existing reactors. I think it is safe to say, however, that the U.S. had embarked down the nuclear path with no solid answer to the question of how to store and dispose of spent fuel.

A PR Nightmare

By the mid 1970's, the public consciousness had focused more critically on the environmental effects associated with nuclear power and spent fuel. Environmental concerns, first awakened by Rachel Carson's book "Silent Spring," fostered an environmental movement that engendered increasing public disfavor with industrial practices contaminating underground and surface waters, soil, and the air. This new consciousness, combined with the increasing reluctance of communities to host nuclear-related activities, was a dramatic reversal from the earlier days of the nuclear renaissance. Nuclear power plants, long considered a harbinger of high quality jobs and increasing tax base, no longer received an unquestioning, open-armed greeting from potential host communities.

What happened? Well, in addition to gaining a new environmental awareness, the public lost confidence that the government, industry and "bright scientists" would do the right thing to protect their neighborhoods. Some of this loss can be attributed to a failure to communicate with the public in a straightforward, common sense fashion. It can also be attributed to fear mongering efforts to quash nuclear power. While those who unquestioningly supported nuclear power can appropriately be criticized for wearing rose-colored glasses when describing this technology, some of the more radical individuals who opposed nuclear power, used smoke colored lenses to paint an overly grim picture of the potential consequences that could result from the use of nuclear technologies. Polemics, not sound science, became the battle tool of the 70's and 80's. Add to this the fact that the public witnessed a series of events where people who "knew better than them" simply were not candid about contamination and its consequences, and the nuclear industry faced a public relations nightmare when it came to spent fuel issues.

NRC Plays "myth buster"

In my mind, much of the discontent related to spent fuel issues can be attributed to failure on the part of the government and the scientific community to engage in an honest conversation with the public about spent fuel and its transportation. As a result of this failure, a number of myths have sprung up regarding the dangers and health risks associated with spent fuel. Now, without passing judgment on particular sites or plans, I would like to try and dispel some of these urban legends by discussing the stringent standards we have in place to protect public health and safety and the environment.

Myth #1–"Individuals living near a spent fuel repository will be exposed to deadly levels of radiation."

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This excerpt is from a speech given by Commissioner Merrifield at the at the 2006 Regulatory Information Conference in Rockville, MD on March 8, 2006.

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This particular statement is one I have encountered many times during my seven and one-half years of service on the Commission. While I understand there will be fears about the safety of any repository, this statement simply is not true. The regulatory standards applicable to a high-level waste repository are very protective of those residing near the repository location. During the first 10,000 years after the repository site is closed, a person at the site boundary can receive a dose of no more than 15 millirem per year from all pathways and four millirem per year from the groundwater pathway. These levels of exposure are fully protective of the public health, safety, and the environment. For the time period between 10,000 years and one million years after site closure, EPA has proposed a rule which would state that a person at the site boundary would be exposed to no more than 350 millirem per year. This 350 millirem a year value is well within the range of natural background levels of radiation found in states such as North and South Dakota. If we as a nation believe that such levels of exposure are not acceptable, people should not be allowed to reside in these states right now.

Myth #2–"Spent fuel shipments are the equivalent of 'mobile Chernobyls,' and an accident involving one of these shipments could endanger hundreds of thousands of people."

One of the biggest concerns about spent fuel deals with the shipping of fuel from the reactor to an interim storage facility or permanent repository. Opponents of such shipments rally around a battle cry that the transportation casks are "mobile Chernobyls" which could cause catastrophic accidents anywhere in the United States. Proponents of this myth claim a scientific basis which is well beyond credibility. Typically, they assume that the entire contents of the fuel package instantaneously vaporize, and that this cloud of radioactive material then blows across the nation causing death and destruction in its path. First, it is physically impossible for fuel in a transportation cask to explode as a nuclear reaction. Energy for such vaporization would have to come from an external source. Second, the fuel is in a robust form encased in a robust structure. It is entirely unrealistic to assume that enough energy is released under any plausible scenario to vaporize the entire contents of a transportation cask.

Indeed, Sandia National Laboratory has thoroughly tested spent fuel casks through a variety of scenarios, including impact from locomotives traveling at 80 miles per hour, engulfing them in a jet fuel fire, and dropping them from 30 feet onto a concrete surface. The shipping containers withstood all of these tests intact. A very large conventional explosion coupled with a fire might result in the release of a minute amount of radiation, but a majority of the fuel would remain in the general area of the initiating event. In fact, a recently released report by the National Academies of Science concluded that transport by highway and rail is a low radiological risk with manageable consequences when conducted in adherence with existing regulations. Clearly, a transportation event would not result in a "Chernobyl-like" accident.

This fear is also unfounded given the nation's track record for transporting spent fuel. In the last half century, the Navy has shipped more than 750 containers of spent fuel over hundreds of thousands of miles without any major accidents. Similarly, since receiving its first shipment in 1999, more than four thousand waste shipments have been shipped to the Waste Isolation Pilot Project without any incident of significance. These numbers are representative of my belief that spent fuel can be transported safely and securely if necessary.

Additionally, more than 1,300 spent fuel shipments regulated by the Nuclear Regulatory Commission have been safely delivered in the U.S. during the past 25 years. Although there were four transportation accidents involving those shipments, it must be noted that none of these accidents resulted in a release of radioactive material. In fact, I rode on the train during one shipment and can testify that the security arrangements and safety procedures were excellent. When you contrast this collective picture of spent fuel transportation with the approximately 800,000 shipments of hazardous materials each day in the U.S., which result in at least two serious accidents per year and 1.6 evacuations per year, it is clear that spent fuel shipments are among the least of our worries.

Myth #3–"Spent fuel is so dangerous that it cannot be moved" versus "Spent fuel is so dangerous it must be moved to one location."

This myth highlights a debate between the two conflicting schools of thought related to relocation of spent fuel. In line with the statement discussed above, one portion of society believes that spent fuel is too dangerous to move, and consequently, must remain at the originating power reactor. Other members of the public believe that spent fuel must be taken immediately from individual reactor sites and moved to a safer, centralized location. To a certain extent, both of these arguments fail. With regard to the first argument, as mentioned above, we have demonstrated that spent fuel can be transported in a safe fashion. With regard to the second argument, it has been demonstrated that spent fuel can be stored safely onsite in spent fuel pools or dry storage casks. While there have been limited leaks at a small number of facilities, overall these spent fuel pools have served well as the principal storage areas for fuel dating back to the early days of the nuclear fleet. Having said all this, there remains a uniform belief that at the end of the day, we cannot have permanent repositories for this fuel at every nuclear generating site.

So where do we go from here? Wherever it is, we need to revisit our communications strategies and work diligently to answer the concerns of the public using plain language and sound science.

A Few Answers

It is my belief that building a high-level waste repository is not the only answer to our spent fuel conundrum. As a member of the Commission, I stand firmly behind the concept of storage in a deep, geologic repository. In the meantime, however, there are a number of other options available to remedy concerns that we can provide safe and reliable storage in the near term. As I mentioned above, onsite pools have proven to be safe storage areas for spent fuel, and as a result of re-racking these pools, a larger number of fuel assemblies have been and will be accommodated onsite.

Independent Spent Fuel Storage Installations, or ISFSIs, are a longer term option. In the late 1970's and early 1980's, the nuclear industry began to recognize that spent fuel pools were filling up, and other storage options needed to be found. The ISFSI alternative involves placing the fuel in

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a spent fuel cannister, removing it from the pool, and placing it on an onsite spent fuel storage pad. First utilized at the Surry site in 1986, the Commission initially licensed these facilities for 20 years, but recently authorized 40 year extensions for two sites. To date, we have licensed dry cask storage at 38 sites, and approved approximately 15 different cask designs. In my mind, ISFSIs are a remarkable development in the spent fuel story. Such facilities were not conceived of when we initially licensed the currently operating fleet of reactors. But this option now exists, demonstrating once again that time and technological advancements can provide solutions to long-standing problems.

One private company is taking the ISFSI concept to the next level. The brainchild behind the Private Fuel Storage site was to create an interim storage site in a very isolated area, the purpose of which was to keep the stored spent fuel in a remote area. The PFS site, proposed to be located in Skull Valley, Utah, is intended to host 4,000 spent fuel storage casks. After a significant period of litigation, the Commission recently issued a license to construct this facility, thereby providing an alternative to onsite ISFSI storage. While some political fights may remain for this facility, our Agency spent a lot of time and effort determining that this site is a technologically safe location to store spent fuel.

Obviously, these are not permanent solutions, and a geologic repository should be a priority. Nevertheless, a facility like PFS could provide a safe method of storing fuel for 60 to 100 years into the future. In addition, having such stored spent fuel available for future use may be key to meeting our nation's energy needs. Considering projections that the world's uranium supply will be depleted in the next 100 to 150 years and given the increasing rate of energy consumption, I believe that it is absolutely unreasonable to consider spent fuel stores as anything other than a potential future energy reserve.

Such considerations were a driving force behind last month's announcement of President Bush's "Global Nuclear Energy Partnership." One goal of this initiative is to enable expanded use of nuclear energy by demonstrating new technologies to recycle nuclear fuel and minimize waste. Consideration of a return to reprocessing could be the next important step in resolution of spent fuel issues. Yet, a return to reprocessing will raise concerns with regard to nuclear non-proliferation, cost, and environmental consequences. But debate on these issues will be necessary if our nation wants to continue nuclear power generation in the future. Clearly, the Administration's initiative will engender significant interest, and I would expect further Congressional hearings and debates on this latest proposal to deal with a vexing public policy issue.

Yucca Mountain

Given these options, where do we stand with regard to Yucca Mountain and the construction of new reactors? Like the ill-fated facility in Kansas, the Yucca Mountain site sometimes appears to be a story with no end. Whether this agency can ultimately approve an application to build a repository at this site is an open question. What is not an open question is that our government has spent an excessive amount of time and money to characterize this site, a track record shared by Administrations of both political parties.

A more pressing question is the matter of whether new reactors can be built given the lack of a permanent repository. I would envision that stakeholders across the board will look for an answer to this question within the context of our Waste Confidence Decision. Most recently reaffirmed by the Commission in 2005, at its core, the Waste Confidence Decision embraces the view that there is reasonable assurance that disposal in a geologic repository is technically feasible and that such a repository will be available by 2025. It also includes findings that spent fuel will be managed safely until a repository is available, that spent fuel can be stored safely onsite without significant environmental impact for an extended period of time, and that onsite or offsite storage capacity will be available if necessary.

I believe that the issues I have discussed today are a further affirmation that the Waste Confidence Decision is still valid. Spent nuclear fuel is and will be safely stored under the regulatory framework created by the Nuclear Regulatory Commission, now and for the reasonable foreseeable future. In my view this not only applies to the current nuclear fleet, but also for any reactors that may be built in the coming years. And given the advancements in technology, it would

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not surprise me if additional options for the safe storage or reuse of spent fuel present themselves in the near future.

Final Thoughts

As we all move forward into this nuclear renaissance, I believe it will be critical to address concerns on spent fuel issues and conduct a national debate on this matter. We need to shed our Sergeant Schultz mentality and focus our attention on the following areas:

First. We must do a better job of explaining to stakeholders the honest facts about spent fuel.

Second. We must overcome the hysteria about the dangers of transporting spent fuel, and use real facts to provide real answers to questions.

Third. We must reassure stakeholders that spent fuel can be safely stored, whether it is temporarily stored onsite or offsite, or in a permanent repository.

Fourth. The Waste Confidence Decision remains valid for both the currently operating reactors and future reactors.

In sum, while there may be political battles ahead, the technical issues associated with the storage, transportation, and disposition of spent fuel are resolvable. What we need is a straightforward debate using facts, rather than myths, as a basis. The public has a right to learn more about these issues, and our government, including the Nuclear Regulatory Commission, should take a more proactive role in these discussions.

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