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Spent Nuclear Fuel Pools in the US: Reducing the Deadly Risks of Storage

by Robert Alvarez

The price of fixing America's nuclear vulnerabilities may be high, but the price of doing too little is incalculable.

Summary

U.S. reactors have generated about 65,000 metric tons of spent fuel, of which 75 percent is stored in pools, according to Nuclear Energy Institute data. Spent fuel rods give off about 1 million rems (10,00Sv) of radiation per hour at a distance of one foot enough radiation to kill people in a matter of seconds. There are more than 30 million such rods in U.S. spent fuel pools. No other nation has generated this much radioactivity from either nuclear power or nuclear weapons production.

Nearly 40 percent of the radioactivity in U.S. spent fuel is cesium-137 (4.5 billion curies) roughly 20 times more than released from all atmospheric nuclear weapons tests. U.S. spent pools hold about 15-30 times more cesium-137 than the Chernobyl accident released. For instance, the pool at the Vermont Yankee reactor, a BWR Mark I, currently holds nearly three times the amount of spent fuel stored at Dai-Ichi's crippled Unit 4 reactor. The Vermont Yankee reactor also holds about seven percent more radioactivity than the combined total in the pools at the four troubled reactors at the Fukushima site.

Even though they contain some of the largest concentrations of radioactivity on the planet, U.S. spent nuclear fuel pools are mostly contained in ordinary industrial structures designed to merely protect them against the elements. Some are made from materials commonly used to house big-box stores and car dealerships.

The United States has 31 boiling water reactors (BWR) with pools elevated several stories above ground, similar to those at the Fukushima Dai-Ichi station. As in Japan, all spent fuel pools at nuclear power plants do not have steel-lined, concrete barriers that cover reactor vessels to prevent the escape of radioactivity. They are not required to have back-up generators to keep used fuel rods cool, if offsite power is lost. The 69 Pressurized Water (PWR) reactors operating in the U.S. do not have elevated pools, and also lack proper containment and several have large cavities beneath them which could exacerbate leakage.

For nearly 30 years, Nuclear Regulatory Commission (NRC) waste-storage requirements have remained contingent on the opening of a permanent waste repository that has yet to materialize. Now that the Obama administration has cancelled plans to build a permanent, deep disposal site at Yucca Mountain in Nevada, spent fuel at the nation's 104 nuclear reactors will continue to accumulate and are likely remain onsite for decades to come.

According to Energy Department data:

- The spent fuel stored at 28 reactor sites have between 200-450 million curies of long-lived radioactivity;
- 19 reactor sites have generated between 100-200 million curies in spent fuel; and,
- 24 reactor sites have generated about 10-100 million curies.

Over the past 30 years, there have been at least 66 incidents at U.S. reactors in which there was a significant loss of spent fuel water. Ten have occurred since the September 11 terrorist attacks, after which the government pledged that it would reinforce nuclear safety measures. Over several decades, significant corrosion has occurred of the barriers that prevent a nuclear chain reaction in a spent fuel pool some to the point where they can no longer be credited with preventing a nuclear chain reaction. For example, in June 2010, the NRC fined Florida Power and Light $70,000 for failing to report that it had been exceeding its spent fuel pool criticality safety margin for five years at the Turkey Point reactor near Miami. Because of NRC's dependency on the industry self-reporting problems, it failed to find out that there was extensive deterioration of neutron absorbers in the Turkey Point pools and lengthy delays in having them replaced.

There are other strains being placed on crowded spent fuel pools. Systems required to keep pools cool and clean are

being overtaxed, as reactor operators generate hotter, more radioactive, and more reactive spent rods. Reactor operators have increased the level of uranium-235, a key fissionable material in nuclear fuel to allow for longer operating periods. This, in turn, can cause the cladding, the protective envelope around a spent fuel rod, to thin and become brittle. It also builds higher pressure from hydrogen and other radioactive gases within the cladding, all of which adds to the risk of failure. The cladding is less than one millimeter thick (thinner than a credit card) and is one of the most important barriers preventing the escape of radioactive materials.

The April 26, 1986 nuclear catastrophe at Chernobyl in Ukraine illustrated the damage cesium-137 can wreak. Nearly 200,000 residents from 187 settlements were permanently evacuated because of contamination by cesium-137. The total area of this radiation-control zone is huge. At more than 6,000 square miles, it is equal to about two-thirds the area of the State of New Jersey. During the following decade, the population of this area declined by almost half because of migration to areas of lower contamination.

I co-authored a report in 2003 that explained how a spent fuel pool fire in the United States could render an area uninhabitable that would be as much as 60 times larger than that created by the Chernobyl accident. If this were to happen at one of the Indian Point nuclear reactors located 25 miles from New York City, it could result in as many as 5,600 cancer deaths and $461 billion in damages.

The U.S. government should promptly take steps to reduce these risks by placing all spent nuclear fuel older than five years in dry, hardened storage casks something Germany did 25 years ago. It would take about 10 years at a cost between $3.5 and $7 billion to accomplish. If the cost were transferred to energy consumers, the expenditure would result in a marginal increase of less than 0.4 cents per kilowatt hour for consumers of nuclear-generated electricity.

Another payment option is available for securing spent nuclear fuel. Money could be allocated from $18.1 billion in unexpended funds already collected from consumers of nuclear-generated electricity under the Nuclear Waste Policy Act to establish a disposal site for high-level radioactive wastes.

After more than 50 years, the quest for permanent nuclear waste disposal remains illusory.
One thing, however, is clear, whether we like it or not: the largest concentrations of radioactivity on the planet will remain in storage at U.S. reactor sites for the indefinite future. In protecting America from nuclear catastrophe, safely securing the spent fuel by eliminating highly radioactive, crowded pools should be a public safety priority of the highest degree.

With a price tag of as much as $7 billion, the cost of fixing America's nuclear vulnerabilities may sound high, especially given the heated budget debate occurring in Washington. But the price of doing too little is incalculable."

DOE's Spent Nuclear Fuel Vulnerabilities at INL

As previously reported in these pages, an independent international panel of distinguished nuclear experts lead by Robert Alvarez issued a report called "Reducing the hazards from stored spent power-reactor fuel in the United States." [1] This lengthy technical report outlines the inherent vulnerabilities of existing commercial and DOE reactor fuel storage operations to catastrophic failure from system malfunctions and terrorist attacks. This hazard looming over the heads of Americans has spurred national attention. [2]

The report notes: "Because of the unavailability of off-site storage for spent power-reactor fuel, the [Nuclear Regulatory Commission] NRC has allowed high-density storage of spent fuel in pools originally designed to hold much smaller inventories. As a result, virtually all U.S. spent-fuel pools have been re-racked to hold spent-fuel assemblies at **densities that approach those in reactor cores**.

"In order to prevent the spent fuel from going critical, the fuel assemblies are partitioned off from each other in metal boxes whose walls contain neutron-absorbing boron. It has been known for more than two decades that in case of a loss of water in the pool, convective air cooling would be relatively ineffective in such a 'dense-packed' pool.

"Spent fuel recently discharged from a reactor could heat up relatively rapidly to temperatures at which the zircaloy [sic] fuel cladding could catch fire and the fuel's volatile fission products, including 30-year half-life cesium-137, would be released. The fire could well spread to older spent fuel. The long-term contamination consequences of such an event could be significantly worse than those from the [Russian] 1986 reactor meltdown at Chernobyl." [Emphasis added]

DOE made a programmatic policy decision in 1995 to consolidate its inventory of aluminum-clad spent nuclear fuel

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[1] *Science and Global Security*, Princeton University, written by Robert Alvarez, Jan Beyea, Klaus Janberg, Jungmin Kang, Ed Lyman, Allison Macfarlane, Gordon Thompson, and Frank N. von Hippel, 1/31/03.

[2] *New York Times*, "Threats and Responses: Nuclear Plants: Study Warns Attack on Fuel Could Pose Serious Hazards," Matthew Wald, 1/30/03

(SNF) at its Savannah River Site in South Carolina, and its zirconium and stainless steel-clad spent fuel at the Idaho National Laboratory (INL). This "centralization" plan resulted in an INL SNF inventory of 2,742 metric tons of heavy metal that includes 78 metric tons of zirconium clad fuel. [3] This inventory may be significantly understated on zirconium SNF since the Navy's inventory at INL is classified. [4]

In an effort to understate the amount of Spent Nuclear Fuel (SNF) waste, DOE developed a questionable way to account for its inventory by now showing it as metric tons heavy metal (MTHM) which only includes the estimated weight of the uranium/plutonium portion of the SNF and eliminating the total weight of the waste.

According to DOE's website; "Through the National Environmental Policy Act, a decision was made in 1995 to consolidate DOE-owned SNF at existing DOE sites that have the skills, facilities, and technologies to best handle the fuel. Based on the decisions from the associated environmental impact statement, DOE will temporarily store its SNF at the Hanford Site in Washington, the Idaho National Laboratory (INL) in Idaho, and the Savannah River Site (SRS) in South Carolina until a repository is completed. The Hanford Site will retain most of its current inventory of SNF. The remaining DOE SNF will be consolidated at either the INL or SRS, depending on the type of fuel.

"[Environmental Management] EM is currently managing approximately 2400 metric tons of heavy metal (MTHM) of SNF at the three sites: approximately 2100 MTHM at RL; about 30 MTHM at SRS and about 260 MTHM at INL.

"At INL, EM is planning to provide a SNF dry storage, packaging, and load-out capability. This capability would provide dry storage capacity for all SNF at INL and the ability to prepare and package the fuel into a "road ready" condition as well as to enable DOE to meet the Idaho Settlement Agreement dates of having all SNF in dry storage by 2023 and out of Idaho by 2035. INL also receives and stores SNF from domestic and foreign test and research reactors."

Robert Alvarez, one of the principal authors of the independent hazards report, adds: "One concern about zirconium-clad SNF is that if the water drains enough to expose the fuel and the cladding heats up to somewhere between 600 to 1,000 degrees C, it will go exothermic. If the fuel is metal, then if it gets wet, it hydrides and also catches fire."

INL INTEC CPP-666 SNF Storage

The Navel Reactor Facility (NRF) at INL receives all Navel Nuclear Propulsion SNF and conducts destructive tests on nearly all Navy SNF (predominantly zirconium clad assemblies) that involve cutting the fuel mid-section to determine how well the fuel preformed in the Navy's ships and submarines. The NRF then transfers the SNF to INL/INTEC's Fluorinel and Fuel Storage Facility (CPP-666) for storage.

The salient point being is that the NRF zirconium reactor fuel cladding is compromised due to the destructive testing and therefore more vulnerable to storage coolant malfunctions. Moreover, the cuttings from NRF testing of zirconium clad fuel are a major problem because the Navy dumps these pyrophoric wastes in the INL burial ground at the Radioactive Waste Management Complex. According to an INL worker currently employed at the burial ground Pit-9 project, 18 tons of pyrophoric zirconium cuttings are interned in INL's dump. [5]

INL is in the process of consolidating current on/off-site SNF inventories to its INTEC (CPP-666) storage pools or to dry storage units. In order to make room for the additional SNF, CPP-666 is "re-racking" and condensing the SNF packing in the storage pool. This re-racking results in spacing nearly the same as in a reactor core, so any active cooling malfunction caused by systems failure or terrorist attacks presents a huge risk counted in days if active coolant systems and/or water level is not maintained.

Alvarez adds that, "The safe storage at CPP-666 depends very much on containing the risks of criticality. It's the exothermic reaction caused by very hot zirconium in a partially drained pool (about 75% is lost) that can ignite a potentially catastrophic fire."

INTEC has experienced dozens of power grid failures as well as backup power generator failures in the last decade. [6] DOE's own quasi-independent Defense Nuclear Facilities Safety Board has issued numerous critical reports in recent years identifying INL's deficient emergency power backup systems. [7] It is uncertain if current SNF storage or re-packing at CPP-666 requires active water cooling systems, if so, the operation's vulnerability is extremely problematic.

According to DOE; "This underwater storage facility (Building CPP-666) contains spent fuel from nuclear reactors. Almost all of the fuel stored here is from nuclear submarines and nuclear surface ships of the U.S. Navy.

There are 4 main storage pools (one is not visible in this photo). The individual fuel storage vaults can just be seen in the foreground. To the left and rear are transfer channels for moving the spent fuel in and out of the pools. This facility is the newest and most modern at INL.

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[3] DOE Final Environmental Impact Statement, EIS-0203-F, Volume 1, Appendix B, page 3-7

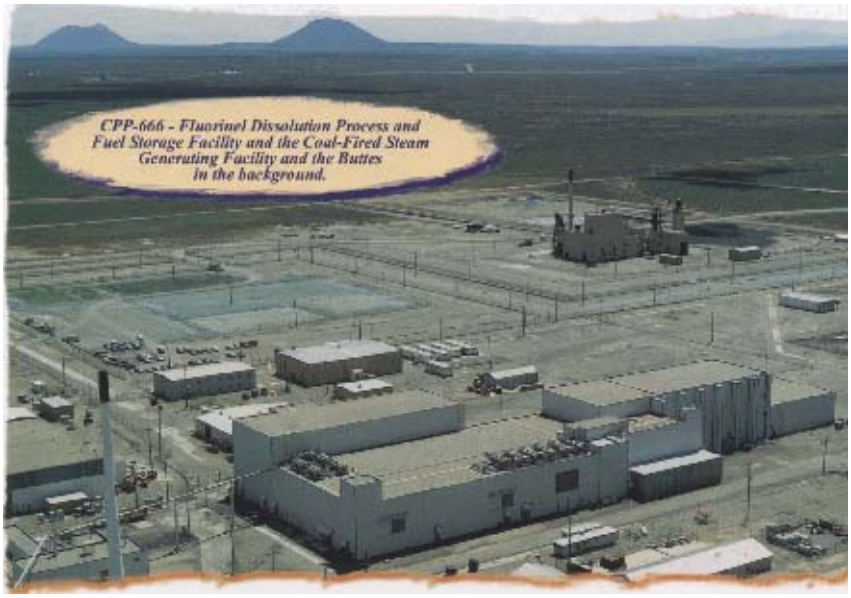
[4] Idaho Chemical Processing Plans Spent Fuel and Waste Management Technology Development Plan, 4/24/92, US DOE Operations Office

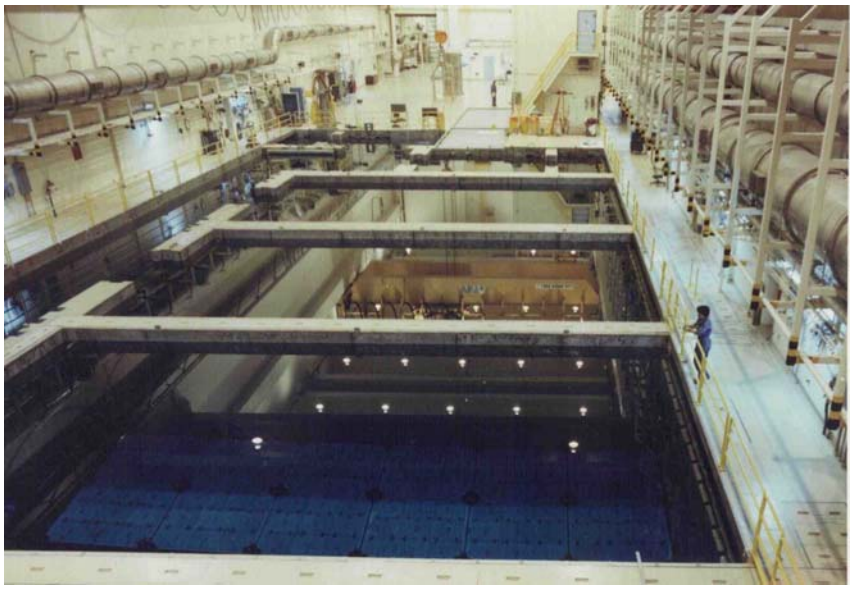
[5] U.S. Department of Energy, Idaho Operations document IDO-14532, page 50

[6] See *Citizens Guide to INL* listing of reactor melt-downs and accidents, Environmental Defense Institute.

[7] See Defense Nuclear Facilities Safety Board reports on INL at; www.dnfsb.gov

This facility was designed in 1978 to store spent fuel *temporarily* until the fuel rods could be reprocessed to extract residual uranium. The uranium was then reused for weapons programs. When reprocessing was halted in 1992, this facility became a de facto *permanent* storage facility. Spent fuel continues to come in from the Navy, but nothing leaves because there is no place for it to go. As a consequence, this pool is now filled to its design capacity and additional fuel vaults are being 'overstacked' [also called re-racked]." [8]





Additionally at INL's INTEC, the Underground Fuel Storage Facility (CPP-749) contains significant SNF that due to INTEC being in a flood zone poses significant risks. ICPP-749 Underground Storage Facility has 218 underground dry vaults, built between 1971 and 1987. One hundred twenty-eight of the 218 dry vaults contain fuel from Peach Bottom Core I and the Fermi Blanket stored in aluminum canisters. The carbon steel liners of the 61 first generation vaults have undergone significant corrosion due to seepage of moisture. Fifty-nine of these vaults contain fuel in aluminum canisters. Some of these canisters have been inspected and show moderate corrosion. Gas samples show some canisters may be

[8] DOE/EIS-0287D

breached but there is no current indication of failed fuel clad. Water that collects in these vaults may leak to ground. The dry well design offers limited confinement capabilities, since it must be opened during fuel handling and inspection. A significant hazard associated with the first generation wells is the potential for carbide-water reactions. If the fuel is damaged and water is allowed to contact it, the carbide-bearing fuels could react exothermal with water to produce acetylene and oxygen. Acetylene together with oxygen forms an explosive mixture.[DOE(a)] Other 1994 inspections found degraded Peach Bottom fuel and degrading aluminum fuel cans and baskets at ICPP-749. [DOE/SNF Vulnerability]

The following table showing dated (current data is considered classified and publicly unavailable) spent fuel storage inventories are expressed in metric tons heavy metal (MTHM), which means only the weight of the plutonium, uranium, and thorium in the fuel is noted. This MTHM nomenclature is new (post-1994) to DOE since previous fuel inventories were expressed in total mass (i.e. weight of fuel element fissile material, cladding and end caps). DOE's stated reason for this change in nomenclature is that it more accurately describes the hazardous constituents. Notwithstanding the usefulness of the MTHM number, all parts (i.e. entire assembly) of the fuel represent a significant hazard, and therefore the total mass number should be predominately used because it more accurately describes the total hazard. Inventories of spent nuclear fuel can be expressed with at least six different nomenclatures. In addition to the previously discussed MTHM and total mass, there is volume, number of storage units, uranium mass, fissile mass. Of the total (1,373 cubic meters) spent nuclear fuel volume held by DOE, INL has 53.5% as of 1994. Since then significant amounts of SNF have been shipped to INL as one of two (with Savannah River Site) designated SNF repositories. Of the total (78 metric tons) spent nuclear fuel fissile mass held by DOE, INL has 49.9%. [Hoskins 7/11/94]

Existing INL Spent Nuclear Fuel Wet Storage Facilities

ICPP/INTEC	CPP-603 (3 water basins) *	2.900 MTHM
	CPP-666 (6 water basins)	10.800 MTHM
Test Reactor Area	TRA-603 (water canal)*	0.257 MTHM
	TRA-660 (water canal)	0.231 MTHM
	TRA-670 (water canal)	0.725 MTHM
Power Burst Facility	PBF-620 (water basin)	0.834 MTHM
Test Area North	TAN-607 (water pit)**	85.200 MTHM
Argonne -West	NRSD (reactor pool)	0.010 MTHM
Naval Reactor Facility	ECF (water basin)	4.100 MTHM
	Totals	105.040 MTHM

Above figures in metric tons heavy metal (MTHM) (plutonium, uranium, and thorium) [Hoskins 7/11/94]

* spent fuel in CPP-603 has been transferred to CPP-666 under court order

** TMI fuel at TAN has been transferred to dry storage under the same court order

Existing INL Spent Nuclear Fuel Dry Storage Facilities

ICPP	CPP-603 (IFSF)*	10.00 MTHM
	CPP-749 (underground vaults)	78.40 MTHM
Test Area North	TAN-SFCTSP (above ground cask dry pad)	38.40 MTHM
Argonne-West	HFEF (hot cell)	11.90 MTHM
	RSWF (dry pit)	11.30 MTHM
	ZPPR (dry cask storage in concrete)	9.50 MTHM
	TREAT (concrete pits)	0.01 MTHM
	Total Dry Storage	159.51 MTHM
	Total Wet and Dry Storage	**264.55 MTHM**

Figures in metric tons heavy metal (plutonium, uranium, and thorium) [Hoskins 7/11/94] [9]

Test Reactor Area (TRA) currently called Reactor Test Complex, has spent fuel largely stored at the following locations; TRA-660 Advanced Reactivity Measurement Facility (ARMF), and the Coupled Fast Reactivity Measurement Facility (CFRMF), and the TRA-670 Advanced Test Reactor (ATR).

TRA-660 ARMF and the CFRMF reactors, along with the neutron radiography facility, share a single canal. The facility is not designed to support long-term storage. It lacks leak detection and water cleanup systems. Corrosion monitoring is also inadequate at ARMF. Presently, preventive maintenance and surveillance activities by the M&O contractor are being performed with limited overhead funds and staff. Because these facilities have no active programs or funding, the facility has no qualified operating personnel that can manipulate the fuel that is currently in the reactors. For similar reasons, no program office oversight was observed by DOE inspection teams.[DOE(a)]

The Test Reactor Area (TRA) is second to the Navy by INL facility areas in radioactive solid waste disposal relative to curie content. DOE summary data between 1952 and 1991 cite 5 million Ci. of solid waste disposed. [EGG-WM-10903 @6-25] TRA supports the Advanced Test Reactor, Advanced Reactor Critical Facility Reactors, Hot Cell Facility, Nuclear Physics Research Program, Advanced Reactivity Measurement Facility, and Coupled Fast Reactivity Measurement Facility Reactors. TRA also leads the list of INL facilities for radioactive liquid waste discharges (83%). Between 1952 and 1981 TRA released 50,840 Ci. to the soil. This figure does not include "short-lived radioactivity less than 2-3 day half-life. [See EDI Citizens Guide to INL References] [DOE(a)@ 14] [10]

[9] Broscious, Citizens Guide to Idaho National Laboratory, References
[10] Ibid Footnote 9

Three Mile Island Fuel Storage Modules at DOE Idaho Facility are Cracking

William Freebairn reports in Washington (Platts) 15 April 2011; "The US Department of Energy facility storing melted fuel from the Three Mile Island nuclear plant has not done enough to address crumbling concrete modules encasing the radioactive material, the US Nuclear Regulatory Commission said in a letter made public Friday.

The DOE facility at the Idaho National Laboratory holds the damaged fuel from unit 2 of the Three Mile Island Plant, which, in 1979, suffered a partial meltdown of the core, leading to the US' worst nuclear accident. The so-called spent fuel rubble is now contained in concrete storage modules located at an independent storage installation owned by DOE. The concrete modules are "showing significant cracking and degradation," even though they were built in 1999 to last for 50 years, NRC said in the letter, which is dated April 7.

DOE has analyzed the structural integrity of the modules, which have walls two feet thick, and determined that the problem is getting progressively worse, NRC said. Since the NRC inspection, DOE has identified funding to pay for repairs and will begin the work this construction season, meaning from the spring to the fall, spokeswoman Katinka Podmaniczky said in an email Friday."These cracks have no impact on the storage modules' ability to safely store spent nuclear fuel," she said.

At the time of the inspection, it was not clear whether DOE had approved or scheduled measures to stabilize the degradation, NRC said in the letter. It asked DOE to provide the regulator with information about corrective measures, a schedule for their implementation and a plan for monitoring the effectiveness of actions taken.

The degradation of the modules was likely due to "water intrusion and the annual thawing and freezing cycle," NRC said in an inspection report attached to the letter. Chunks of concrete have fallen from areas of the modules and there are signs they are no longer water-tight, NRC said.

Cracking was first recognized in 2000 but considered to be "cosmetic," NRC said. In 2008, DOE recognized that continued cracking called into question the ability of the modules to protect the fuel canisters inside from natural phenomena and shield people from the radiation of the fuel.

A recent study determined that protective caps should be installed, damaged concrete replaced and a sealant applied, but those actions have not yet been taken, the NRC inspection report said. NRC licensed DOE's Idaho Operations office in 1999 to store the damaged fuel in dry shielded stainless steel canisters, which are loaded inside the reinforced concrete modules. The 30 dry shielded canisters at the site contain melted fuel from the Three Mile Island-2 reactor core. That unit, located in Pennsylvania, experienced the melting of about half the fuel in the core during an accident. The adjacent Three Mile Island-1 continues to operate.

The NRC inspectors concluded that the storage facility continues to meet standards, but the degradation of the modules is "a concern that will be tracked in the future," agency spokesman David McIntyre said in an email.

NRC also cited DOE in the inspection report for a "deviation from a[n] NRC commitment" because it deleted certain material from an emergency plan. NRC ordered the energy agency to respond within 30 days. The deviation was minor, Podmaniczky said.

William Freebairn, william_freebairn@platts.com. EDI thanks Peter Richards for posting this article.

More Stringent, Coordinated Fukushima Fallout Monitoring Needed to Determine Radioactive Iodine Risk to U.S. Milk and Water

Food, Water and Air Monitoring Should Continue in Government Shutdown
U.S. Agency Claims on Radiation Danger and Risk Are Contradictory, Misleading

Arjun Makhijani reports in Institute for Energy and Environmental Research (IEER) 4/7/11 Press release*;* " Total releases of radioactive iodine-131 and cesium-137 from the damaged Fukushima Daiichi reactors in Japan now appear to rival Chernobyl. As a result, there is now fallout through the northern hemisphere, with hot spots appearing due to rain. For instance, rainwater in Boise, Idaho, on March 22, 2011, was reported by the Environmental Protection Agency at 242 picocuries per liter, about 80 times the U.S. drinking water standard *if the level persisted* for a prolonged time. The drinking water standard is a common reference number for water purity, even if the water is not used for drinking.

Preliminary risk calculations on the March 22, 2011, rainout event in Boise indicate that the risk from a single such event would be low, even if cows were mostly getting their feed from outdoor grazing, which may not have been the case. However, government agency measurements of milk contamination are limited and appear to be uncoordinated. Ingesting milk contaminated with iodine-131 increases the risk of contracting thyroid cancer, especially for female infants. A low dose would produce a low risk; the risk increases proportionally to the dose.

"We don't have data on iodine-131 levels in milk samples taken from the same areas where polluted rain fell," said Dr. Arjun Makhijani, IEER's president. "Such information is important for making reliable estimates of radiation dose and risk. We must ensure that fallout is not rising to levels that could repeat even a small part of the tragedy associated with atmospheric nuclear weapons testing in Nevada during the 1950s and 1960s."

IEER recommended that government actions should include:

- Designating water, food, and air radiation measurements as an emergency function to be kept operational in the event of a federal government shutdown due to lack of a budget resolution.
- Making coordinated measurements of Fukushima fallout in air, rainwater, milk, and drinking water, and making these data immediately available on a public web site. Air measurements should include results from charcoal filters or canisters to ensure that the gaseous forms of iodine-131 are captured.
- Coordinating measurements of rainwater with weather patterns and estimated arrival of fallout from Japan over the United States, and making these data available in as close to real time as possible, on a public web site.
- Advising those who might be using rainwater for drinking purposes by publication of rainout maps with iodine-131 data.
- Developing contingency plans for advising farmers in case high milk contamination levels are anticipated. Such plans may include of sheltering animals and feeding them stored, uncontaminated grain and hay so that clean milk can be produced in the event of greater fallout than has been reported so far.
- Publication of the protocol used for sampling air, water, and milk.
- Use of consistent risk statements based on the 2006 risk study by the National Academies (http://www.nap.edu/openbook.php?isbn=030909156X)

"It is lamentable that the U.S. government is not speaking with a coherent, science-based voice on the risks of radiation," said Dr. Makhijani. "There is no safe level of radiation exposure in the sense of zero risk. Period. This has been repeatedly concluded by official studies, most recently a 2006 study done by the National Academies. Yet there is no shortage of unfortunate official statements on radiation that may seek to placate the public about 'safe' levels of radiation, but actually undermine confidence."

As an example, IEER cited a statement by the Nuclear Regulatory Commission that "In general, a yearly dose of 620 millirem from all radiation sources has not been shown to cause humans any harm." (http://www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html). This annual dose includes medical uses of radiation, including CAT scans, and other voluntary exposures, from which people get some benefits. It also includes indoor radon, which the EPA estimates "is the number one cause of lung cancer among non-smokers.... Overall, radon is the second leading cause of lung cancer [after smoking]. Radon is responsible for about 21,000 lung cancer deaths every year. About 2,900 of these deaths occur among people who have never smoked." (http://www.epa.gov/radon/healthrisks.html).

"While the NRC is saying the 620 millirem a year on average has not been shown to cause harm, the EPA is saying that only about one-third of this total average annual dose attributable to indoor radon, is responsible for thousands of cancer deaths every year," said Dr. Makhijani. "The NRC statement is an appalling misrepresentation of the science that underlies its own regulations as well as published statements on radon risks by the EPA. Using the 2006 National Academies risk estimates for cancer, 620 millirem per year to each of the 311 million people in the United States would eventually be associated with about 200,000 cancers each year; about half of them would be fatal."

Dr. Makhijani continued, "The largest risks by far are in Japan; the risks from Fukushima in the United States, based on the limited data so far, appear to be very low at the individual level. But they are being experienced by large populations, as they were during Chernobyl fallout. More intensive measurements, a frank portrayal of both individual and population risks, for children and adults using National Academies risk numbers, and prompt publication are essential. If the government does not provide accurate, science-based, trustworthy information, how can people make well-informed decisions for themselves and their families at a confusing time?"

Related materials:

National Cancer Institute. *SEER Cancer Statistics Review 1975-2007*, Table 1.4 Age-Adjusted SEER Incidence and U.S. Death Rates and 5-Year Relative Survival (Percent) By Primary Cancer Site, Sex and Time Period.

U.S. Environmental Protection Agency. *RadNet Laboratory Data: Japanese Nuclear Emergency: Radiation Monitoring*, 2011

Bill Would Expand Relief for Americans Sickened by Radiation Exposure

Washington, D.C. –Idaho Senators Mike Crapo and Jim Risch have joined* Senator Tom Udall (D-NM) and a bipartisan group of senators to introduce the Radiation Exposure Compensation Act (RECA) Amendments of 2011. The Act would provide expanded restitution for Americans sickened from working in uranium mines or living downwind of atomic weapons tests.

Other co-sponsors of the bill include Senators Jeff Bingaman (D-NM), Mark Udall (D-CO) and Michael Bennet (D-CO). Companion legislation was concurrently introduced in the House by Rep. Ben Ray Luján (D-NM-3).

Among other things, the RECA Amendments of 2011 would build upon previous RECA legislation by further widening qualifications for compensation for radiation exposure; qualifying post 1971 uranium workers for compensation; equalizing compensation for all claimants to $150,000; expanding the downwind exposure area to include seven states; and funding an epidemiological study of the health impacts on families of uranium workers and residents of uranium development communities.

“I recognize the burden placed upon cancer patients and their families to pay for the expensive regimen of treatments this disease requires. Passage of this legislation is the first step in helping Idahoans get the care they need,” said Crapo.

“For decades now, Idahoans have been pleading their case to the federal government for help in dealing with the health effects they suffered as a result of nuclear testing. This bill answers those pleas by providing the same assistance those in neighboring states already receive,” said Risch.

“As the U.S. government built up its Cold War nuclear arsenal during the mid-20^th century, many Americans paid the price with their health – and all the while, the government was slow to implement federal protections,” Tom Udall said. “With this legislation, we honor a generation of hardworking Americans who sacrificed their lives and health by working or living near the uranium mines. We are taking the next step to close this sad chapter in our history by expanding RECA to include all who are justified in receiving radiation exposure compensation.”

“This legislation represents a continued commitment to compensating Americans whose health was negatively affected by the Cold War. I am particularly glad that the bill includes – for the first time – the downwinders from the Trinity site who have never been compensated,” said Bingaman, who worked on the original RECA law, as well as the 2000 law that made several improvements to the program.

"The patriots who worked on nuclear sites and in uranium mines during the Cold War were crucial to maintaining our national security," Mark Udall said. "It's our responsibility now to make sure we help properly take care of those who are dealing with illnesses they contracted because of radiation exposure. This bill will expand RECA so that a wider pool of workers affected and communities downwind will be able to access the compensation they deserve."

"During the Cold War, thousands of Coloradans served our country by working to build the nation's nuclear arsenal and now we know that through no fault of their own, they were not properly protected from harmful radiation exposure," *Bennet *said. “I will continue to work with this bipartisan group of likeminded Senators who are fighting to properly compensate those workers, their families and others who have suffered over many years. Addressing this wrong is the only right and just thing to do."

“Communities throughout New Mexico are still reeling from the legacy of uranium mining, as it continues to impact families to this day. It is critical that we continue to fight for those who have been affected so they can be compensated for the suffering they have endured. This legislation recognizes the sacrifices of the workers and miners whose efforts contributed to our victory during the Cold War, and the downwinders who have been forgotten for too long. These patriotic Americans have waited long enough for the compensation they deserve,”
said Luján.

Specifically, the *Radiation Exposure Compensation Act Amendments of 2011 would:

*Extend compensation to employees of mines and mills employed after Dec. 31, 1971. These are individuals who began working in uranium mines and mills after the U.S. stopped purchasing uranium, but failed to implement and enforce adequate uranium mining safety standards. Many of these workers have the same illnesses as pre-1971 workers who currently qualify for RECA compensation.

*Add core drillers to the list of compensable employees, which currently only includes miners, millers and ore transporters.

*Add renal cancer, or any other chronic renal disease, to the list of compensable diseases for employees of mines and mills. Currently, millers and transporters are covered for kidney disease, but miners are not.

*Allow claimants to combine work histories to meet the requirement of the legislation. For example, individuals who worked half a year in a mill and half a year in a mine would be eligible for compensation. Currently, the Department of Justice makes some exceptions for this, but the policy is not codified in law.

*Make all claimants available for an equal amount of compensation, specifically $150,000, regardless of whether they are millers, miners, ore transporters, onsite employees, or downwinders.

*Make all claimants eligible for medical benefits. Currently, only miners, millers and ore transporters can claim medical benefits through the medical expense compensation program.

*Recognize radiation exposure from the Trinity Test Site in New Mexico, as well as tests in the Pacific Ocean.

*Expand the downwind areas to include all of Arizona, Nevada, New Mexico, Colorado, Idaho, Montana, and Utah for the Nevada Test Site; New Mexico for the Trinity Test Site; and Guam for the Pacific tests.

*Allow the use of affidavits to substantiate employment history, presence in affected area, and work at a test site. Current legislation only allows miners to use affidavits.

*Return all attorney fees to a cap of 10 percent of the amount of the RECA claim, as was mandated in the original 1990 RECA legislation.

*Authorize $3 million for five years for epidemiological research on the impacts of uranium development on communities and families of uranium workers. The funds would be allocated to the National Institute of Environmental Health Sciences to award grants to universities and non-profits to carry out the research.

*Allow in the miners, millers, core drillers, and ore transporters to file a Special Exposure Cohort petition within the Energy Employees Occupational Illness Compensation Program Act (EEOICPA). Other DOE workers are currently allowed to file such petitions for compensation when claims are denied and there is not enough information for NIOSH to do dose reconstruction to determine the impacts of exposure.

EDI thanks Preston Truman (Downwinders.org) for posting this news release.

The Atomic Breeding Grounds

By KARL GROSSMAN

As efforts are made in Washington to trim the federal government, one group is pointing to an area of the government that, it says, “must be cut back”—the string of national nuclear laboratories. These facilities, it charges, are “spending billions upon billions in taxpayer money annually while developing deadly nuclear technology.”

The organization is the Global Network Against Weapons & Nuclear Power in Space based in Maine and for 25 years active in challenging nuclear technology.

In a statement it issued last week in connection with the Fukushima nuclear disaster, the Global Network declared that the U.S. national nuclear laboratories have been “breeding grounds for developing lethal atomic energy.” The laboratories are Los Alamos and Sandia in New Mexico, Oak Ridge in Tennessee, Lawrence Livermore and Lawrence Berkeley in California, Brookhaven in New York, Argonne in Illinois, Pacific Northwest in Washington, Savannah River in South Carolina and Idaho National Laboratory.

The U.S. national nuclear laboratory system grew out of the Manhattan Project, the World War II crash program to build atomic bombs. Los Alamos, Oak Ridge and Argonne were original Manhattan Project laboratories. Later other laboratories were set up, all owned by the U.S. Atomic Energy Commission, with the mission of developing nuclear technology.

The laboratories have worked on a wide range of projects—from more powerful nuclear weapons, notably the hydrogen

bomb, to nuclear-powered airplanes and rockets, food irradiation, the use of nuclear devices as a substitute for TNT to excavate the earth, and development of commercial nuclear power.

They've served as a taxpayer-supported research-and-development base for the nuclear industry. Further, their directors and many of their personnel have been deeply engaged in the promotion of nuclear technology.

With their products and focus nuclear, the laboratories have minimized the dangers of radioactivity. This has resulted in many of the laboratories being designated by the U.S. Environmental Protection Agency as high-pollution due to radioactive contamination at them.

Ownership of the national nuclear laboratory system was transferred to a new Department of Energy after the Atomic Energy Commission was disbanded by Congress in 1974 because its dual roles of promoting and regulating nuclear technology were deemed a conflict of interest.

The current secretary of Department of Energy is Steven Chu, formerly director of one of the laboratories, Lawrence Berkeley, and a major booster of nuclear power. Indeed, before becoming secretary he joined with the other national nuclear laboratory directors in signing a statement titled: "The Essential Role of Nuclear Energy." He and the others directors declared: "We believe that nuclear energy must play a significant role in our nation's—and the world's electricity portfolio for the next 100+ years."

Chu has been a major influence on Barack Obama as Obama as president has come to embrace nuclear power, and even after the nuclear disaster in Japan insisting on the construction of more U.S. nuclear power plants. As a candidate, Obama had been critical of nuclear power.

The Global Network in its statement called for "the closure of all national nuclear laboratories" as enablers of nuclear technology, and it also called for ending the use of nuclear power on earth and in space devices.

"The issue of switching to safe, clean energy is not technological—it's political," said the Global Network. "The problem involves vested interests: the government agencies which push nuclear power, notably in the United States the national nuclear laboratories and the entity that owns them, the Department of Energy headed currently by a former national nuclear laboratory director, and the nuclear industry as it seeks to profit from selling nuclear technology despite the cost in people's lives."

The Global Network was established after the disclosure that the next mission of the ill-fated Challenger space shuttle in 1986 was to loft a plutonium-fueled space probe. The national laboratories at Oak Ridge and Los Alamos developed the plutonium device then manufactured by General Electric (also the manufacturer of the Fukushima nuclear plants).

The Global Network noted that through the years it "has emphasized that there are safe alternatives to energize space devices. In recent times, NASA, at long last, has begun substituting solar energy for nuclear power in space. Indeed, in coming months NASA's solar-powered Juno spacecraft will be launched on a five-year mission to Jupiter. It was not long ago that NASA emphatically insisted that solar power could not substitute for nuclear beyond the orbit of Mars. Suddenly, it now can be done."

"Likewise," said the statement, as "numerous studies have documented, safe, clean, renewable energy technologies now here can provide all the power we need on earth. Nuclear power and its deadly dangers are unnecessary" It cited a *Scientific American* 2009 cover story, "A Plan for A Sustainable future," which concluded: "Wind, water and solar technologies can provide 100 percent of the world's energy needs."

The Global Network charged that "a disgrace in demanding nuclear power on earth and space has been President Barack Obama. As president, he has reversed the critical position he espoused as a candidate and now, even in the wake of the Fukushima disaster in Japan, is seeking to 'revive' the nuclear industry with the building of new nuclear plants using billions of taxpayer dollars. Meanwhile, his administration has been pushing to also 'revive' the use of nuclear power in space by restarting U.S. production of Plutonium-238 for use on space devices."

As to ending nuclear power on earth, the statement said "although the nuclear establishment claims this is impractical, it is not. In the U.S. where nuclear power provides 20% of the electricity, there's a 20% reserve capacity in the electrical system. All 104 U.S. nuclear plants could—and must—be immediately shut down. The reserve capacity can deal with their absence." Meanwhile, it said "a concentrated effort could—and must—be made to swiftly bring the safe, clean energy technologies on line."

As to eliminating nuclear power on space devices, it said that "accidents such as the 1964 SNAP-9A disaster in which a plutonium-powered satellite fell from orbit, disintegrating and spreading the plutonium widely—a plutonium release long seen as causing an increase in lung cancer on earth—have demonstrated the folly of using nuclear power overhead."

The Fukushima nuclear disaster "tragically demonstrates, again, the dangers of nuclear power, an energy source that must be abandoned--as a clear and present threat to life. Instead there must be full implementation of safe, clean energy technologies --- which are here today."

"Sadly," said the Global Network, "Japan is now the victim of three gargantuan nuclear disasters: Hiroshima, Nagasaki,

and Fukushima," said the Global Network. "Unless the nuclear juggernaut is stopped, we all live in Hiroshima, Nagasaki and Fukushima."

There has been virtually no Congressional oversight of the national nuclear laboratories. Members of the House of Representatives with a laboratory in their district consider their role as being an advocate for it and seek to get as much federal money for the laboratory as possible. U.S. senators have also been great advocates of the laboratories in their states. In recent years, this Congressional support has included sending hundreds of millions of dollars of federal "stimulus" funds from the American Recovery and Reinvestment Act to the national nuclear laboratories.

When, on rare occasions, a member of Congress challenges a national nuclear laboratory, it can be perilous. For instance, after Representative Michael Forbes took on Brookhaven National Laboratory over the radioactive tritium its two nuclear reactors were leaking into Long Island's groundwater, the wife of a former laboratory scientist challenged him in a primary and by 35 votes deprived him of the Democratic Party nomination. In that 2000 contest, laboratory scientists manned telephone banks in support of their candidate. She lost, but Forbes was out of Congress.

Similarly, scrutiny by media of a national nuclear laboratory has met with intense attacks. After the *Santa Fe New Mexican* for example, ran an investigative series on Los Alamos National Laboratory and the radioactive contamination it caused and the increased risk of cancer to area residents as a result, the laboratory complained and the paper's editor was fired and the two reporters who wrote the 1991 series—"Fouling the Nest"—were transferred to other beats. Also, following discussions between the newspaper's publisher and Los Alamos Director Siegfried Hecker, the *New Mexican* provided a 27-page supplement prepared by the laboratory that began: "Los Alamos National Laboratory pursues its environmental, safety, health and security responsibilities with the same spirit it applies to its scientific work."

The laboratories routinely try to cloak their activities with the assertion they are environmentally concerned—indeed sometimes they claim environmental leadership. This week, Brookhaven National Laboratory, a Superfund site, its reactors forced to close because of the radioactivity they were discharging into Long Island's aquifer, the sole source of potable water for the island, is holding an "Environmental Education Summit." It has invited "teachers and environmental educators from various Long Island and New York State agencies" to "discuss issues, trends, and ideas about environmental education."

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