**Beyond Nuclear Fact Sheet:**

**A Mountain of Radioactive Waste 70 Years High: The Lethal Legacy of the Atomic Age, 1942-2012**

## An Ongoing Radioactive Wreck: The Still Unfolding Disasters of U.S. High-Level Radioactive Waste Policy

Electricity is but the fleeting byproduct from atomic reactors. The actual product is forever deadly radioactive waste. Uranium fuel is a radioactive, toxic heavy metal to begin with. But once it passes through an atomic reactor, where it undergoes fission, it comes out a million times more radioactive. Even decades after removal from a reactor core, in the absence of shielding and at close range, irradiated nuclear fuel can deliver a fatal dose of radiation within just minutes. High-level radioactive waste will remain hazardous for more than a million years, so must be isolated from the living environment "forevermore." Despite such risks, highly radioactive wastes have been accumulating for nearly 70 years, and we don't even know what to do with the first cupful generated by Enrico Fermi on Dec. 2, 1942 as part of the Manhattan Project.

## Danger Lurks Below: The Perils of Pools

- Pool storage was supposed to be a short term interim measure, but 75% of the commercial irradiated nuclear fuel generated since 1957 is still stuck at its original reactor site's pool.
- Most pools are now so tightly packed with waste – approaching the density of operating reactor cores -- that extraordinary precautions must be taken to prevent inadvertent nuclear chain reactions.
- Although often regarded as "out of sight and out of mind," pools actually represent potentially catastrophic accidents waiting to happen.
- Certain U.S. pools contain all the waste ever generated at that reactor since it began operations. Many individual U.S. pools contain more waste in than all the waste contained in Fukushima Daiichi Units 1, 2, 3, and 4 combined.
- Pools have no radiological containment. Emergency back-up power to run cooling systems, make-up water, and even water level, temperature, and radiation gauges are not required by the U.S. Nuclear Regulatory Commission (NRC).
- Pool boil or drain downs (due to accident or attack) would create fatal radiation dose rates near the pool, complicating or preventing emergency response. Once wastes reach ignition temperature, fire could spread through the entire pool inventory. Up to 100% the radioactive Cesium-137 would be released directly into the environment.
- NRC has reported that such a pool fire could cause 143,000 cancer deaths downwind, condemnation of 2,700 square miles of agricultural land, and more than $500 billion in economic damages.
- A growing number of pools have sprung leaks, releasing radioactivity into the environment.
- Near drops of heavy loads, failed seals, turbine missiles, and frozen pipes have shown that risks of sudden pool drain downs are all too real.
- These risks undermine NRC's Dec. 2010 "Nuclear Waste Confidence" claim that pool storage is currently safe and secure, and will remain so for decades to come – a false assertion also maintained by the Blue Ribbon Commission on America's Nuclear Future (BRC).

## "Overflow Parking": The Risks of Dry Cask Storage

- Beginning in the mid-1980s, pools began filling up. The oldest waste was transferred to dry casks.
- Currently, 25% of waste fuel is stored in dry casks. NRC predicts that by 2020, almost all reactors will have at least some dry cask storage.
- Dry casks have been plagued by problems. Seal failures show that as casks age, risks of overheating and waste corrosion increases, which could lead to eventual release of radioactive gases and particles into the environment.
- NRC requires mere notification by utilites of their intention to install dry cask storage, and use of certified casks. However, installation errors and cask flaws are widespread.
- Quality assurance violations in design and fabrication of dry casks leave their structural integrity in question, and have led to such accidents as hydrogen explosions/fires.
- NRC does not require dry casks to direct monitor for overheating, radiological release, or loss of anti-corrosion/heat transfer inert gases.
- Dry casks are not designed to withstand attacks. A 1998 test at the U.S. Army's Aberdeen Proving Ground showed that even the best casks could be breached by an anti-tank missile, creating a pathway for large radioactive releases.
- The August 23, 2011 earthquake at North Anna, VA shifted 26 of 28 vertical dry casks, weighing 115 tons each, up to 5.5 inches on their storage pad, while damaging surface concrete on horizontal dry casks.
- Dry casks will likely have to be replaced, at huge expense, once per century or so, as they wear down from the impacts of the elements, as well as the intense heat and radioactivity they contain. This contradicts NRC's Nuclear Waste Confidence Decision, which says on-site dry cask storage is safe and secure for at least 120 years, if not 300 years.

## Transport risks: "Mobile Chernobyls, Dirty Bombs on Rails, Floating Fukushimas"

- U.S. industry brags of a "perfect" shipping record for high-level radioactive waste, but the 3,000 shipments took place

decades ago. A full-blown away-from-reactor scheme could involve as many shipments in a single year as have occurred in the U.S. over the past 70 years, greatly multiplying transport risks.

- 72 incidents occurred involving irradiated nuclear fuel shipments between 1948-1996. 4 involved radioactivity release beyond the vehicle and transport container. Around 50 involved exterior surface contamination of the shipping container.
- In the late 1990s, it was revealed that a quarter to a third of all waste shipments to the French reprocessing facility involved containers externally contaminated at levels 500-3,300 times permissible doses, a hazard to workers as well as members of the public.
- Even "routine, accident-free" shipments are like "mobile x-ray machines that cannot be turned off." NRC allows a chest x-ray per hour worth of gamma radiation to emanate from a shipping cask to a distance of 6 feet away. At the cask surface, dose rates equivalent to 20 chest x-rays per hour are allowed.
- Risks of severe accidents -- high-speed crashes into immovable objects, high-temperature/long duration fires, deep/long lasting underwater submersions -- could turn radioactive waste truck, train, and barge shipments into "Mobile Chernobyls" or "Floating Fukushimas."
- Transport casks are not designed to withstand attacks, risking "dirty bombs" on the roads, rails, and waterways.
- High-level radioactive waste is not located in metro centers. However, thousands of waste shipments would travel directly through major population centers.
- Barge shipments -- on rivers, the Great Lakes, and sea coasts/bays -- threaten vital drinking water supplies and fishing grounds, as well as tourism, recreation, and ecological biodiversity.

## Risky Relapse into Reprocessing

- Although BRC has reported that a full-scale commercial deployment of reprocessing is not likely for decades, it still advocates for full taxpayer funding for reprocessing research, development, and demonstration – costing tens to hundreds of millions of dollars annually.
- An in depth look at the many risks of reprocessing, from nuclear weapons proliferation, to environmental ruination, to a price tag for taxpayers into the tens or even hundreds of billions of dollars, can be found in Beyond Nuclear's pamphlet posted on-line at: http://www.beyondnuclear.org/storage/Reprocessingwebview.pdf.

## "Parking Lot Dumps": The Senseless Risk of "Centralized" or "Consolidated Interim Storage"

- BRC advocates for "consolidated interim storage," which would create a radioactive waste shell game, first on the roads, rails, and waterways, then at one or more "parking lot dumps."
- "Centralized interim storage" would increase transport risks, as wastes would move from reactors to parking lot dumps, then would move again to permanent repositories.
- Parking lot dumps are often targeted at Native American tribes, an environmental injustice.
- "Interim storage" could easily become de facto permanent, surface storage, if national repositories remain elusive.

## A Burial Site Targeted at Every State in the Lower 48?! The Failures of "Permanent Disposal"

- President Obama decision to cancel the Yucca Mountain, Nevada dumpsite is wise. Yucca is sacred and belongs to the Western Shoshone Indian Nation by treaty rights. It is also a very active earthquake and volcanic zone, with fissured and fractured geology that would allow large amounts of radioactive gases to escape into the atmosphere, and radioactive liquids to leak into the drinking water supply.
- No country has yet opened a geologic repository, as scientific flaws continue to vex efforts to safely isolate irradiated nuclear fuel for the hundreds of thousands and even millions of years it remains hazardous
- BRC advocates re-launching a national "site search" for the first U.S. repository. In 2008, George W. Bush's DOE reported that a second national dumpsite would be needed, even though a first had yet to be opened. In fact, the 63,000 metric tons of commercial irradiated nuclear fuel that existed in the U.S. by spring 2010 was enough to fill our first repository, that does not even exist yet.
- In its 2008 report, DOE indicated each state in the "Lower 48" has "suitable" geology for a permanent repository.
- DOE is also currently exploring the concept of permanent "deep borehole disposal" at reactor sites themselves.

## Hardened On-Site Storage (HOSS): An Interim Alternative

- The only solution for irradiated nuclear fuel is to STOP MAKING IT IN THE FIRST PLACE!
- Nearly 200 environmental groups have been advocating HOSS for a decade. HOSS calls for pools to be emptied into dry cask storage that is well designed and manufactured to last for the many decades that irradiated nuclear fuel will inevitably remain stored on-site at reactors. Even BRC and DOE have acknowledged that any away-from-reactor scheme will take many years or even decades to open, with additional years or decades required to transport the wastes there from the over 100 reactor sites across the U.S.
- HOSS would require irradiated nuclear fuel to be much better safeguarded against accidents, secured against attacks, and protected against leakage into the environment, over decades of inevitable on-site storage.

For more information, visit www.beyondnuclear.org, email kevin@beyondnuclear.org, call (301) 270-2209 ext. 1.