Factsheet #4: Radioactive Waste

Just the Facts: The Five Fatal Flaws of Nuclear Power

Nuclear power is not a clean energy source: it produces both low and high-level radioactive waste that remains dangerous for several hundred thousand years. Generated throughout all parts of the fuel cycle, this waste poses a serious danger to human health. Currently, over 2,000 metric tons of high-level radioactive waste and 12 million cubic feet of low level radioactive waste are produced annually by the 103 operating reactors in the United States. **No country in the world has found a solution for this waste.** Building new nuclear plants would mean the production of much more of this dangerous waste with no where for it to go.

Uranium Mining and Processing

Uranium must be mined and enriched to form fuel for nuclear reactors. Each of these procedures results in radioactive contamination of the environment and risks to public health. Most uranium mining in the U.S. takes place in Utah, Colorado, New Mexico, Arizona, and Wyoming – areas of the country that are suffering from its effects. Uranium is mined by physically removing uranium ore, or by extracting the uranium in a newer process known as in situ leaching. Conventional mining has caused dust and radon inhalation for workers – resulting in high rates of lung cancer and other respiratory diseases – and both types of mining have caused serious contamination of groundwater. When conventionally mined, uranium metal must be separated from the rock in a process called milling, which forms large radon-contaminated piles of material known as tailings. These tailings are often abandoned aboveground. Twelve million tons of tailings, for instance, are piled at present along the Colorado River near Moab, Utah, threatening communities downstream. In the case of in situ leaching, a solution is pumped into the ground to dissolve the uranium. When the mixture is returned to the surface, the uranium is then separated and evaporated in slurry pools.

Sweetwater Pit, September 25, 1980, Courtesy of Kennecott Uranium Company

Following this separation, uranium is sent to a facility for enrichment – a process that concentrates the amount of fissile uranium. Enrichment produces toxic hydrogen fluoride gas and large amounts of depleted uranium. Depleted uranium poses a threat to public health and should be disposed of in a geologic repository.

Waste from Reactors

Over 54,000 metric tons of irradiated fuel has already accumulated at the sites of commercial nuclear reactors in the United States. There are several proposals to manage such highly radioactive waste, but none of them would satisfactorily deal with the material.

Yucca Mountain

The Yucca Mountain project has found itself beset with controversy and may very well never open. Numerous unresolved problems remain with the geologic and hydrologic suitability of the proposed site, and serious questions have been raised about its ability to contain highly radioactive waste for the time required. In December 2004, the Department of Energy (DOE) missed its stated license application deadline for the project. DOE currently has no estimate of when it will submit its application. In July 2004, the D.C. Circuit Court of Appeals found that the time limit set by the Environmental Protection Agency (EPA) during which radiation in the groundwater at the site boundary must meet federal drinking water standards was inadequate and illegal. The 1992 Energy Policy Act requires the EPA to set public health and safety standards for Yucca Mountain "based upon and consistent with" the recommendations of the National Academy of Sciences (NAS). In August 2005, the EPA released a revised standard for the site. The proposed standard, however, is still inadequate for protecting public health, and would be the least protective radiation standard in the world.

Scientific fraud is also a longstanding problem in the research on the site. Most recent problems include:

- In March 2005, DOE and the U.S. Geological Survey revealed emails showing that USGS scientists

falsified data related to quality assurance and modeling of water infiltration at the site. Quality assurance (QA) is extremely important to good science, because QA procedures are established to ensure that the data are generated, documented, and reported correctly. The data in question deals with how rapidly water can travel through the mountain, corrode waste containers, and release the material into the environment. There have been other issues in the past with the movement of water through Yucca Mountain.

- In December 2005, DOE instructed Bechtel SAIC LLC, its main contractor, to cease engineering work and safety assessment on key areas of the site due to poor QA and design control practices.
- In January 2006, the NRC found that researchers incorrectly measured the amount of corrosion on the metals, and overestimated the ability of the metals to isolate nuclear waste in engineered packages.

Private Fuel Storage

Private Fuel Storage (PFS) is a consortium of eight commercial nuclear utilities that has been granted a license by NRC to open an aboveground "interim" storage site for 40,000 metric tons of irradiated fuel on Goshute land in Utah. The license still requires the approval of the Bureau of Land Management and the Bureau of Indian Affairs, and three of the companies involved in the project have recently withdrawn or withheld funding from the consortium.

Even if opened, PFS will not solve the waste problem, even temporarily. Waste will always be on-site at operating reactors in order to cool. By transporting waste and storing it above ground in yet another part of the country, PFS will just make the existing problem worse. The "temporary" nature PFS is also questionable, because the project is completely dependent on the opening of Yucca Mountain. PFS raises serious environmental justice issues, because the lease on which PFS is based is mired in controversy and corruption.

Reprocessing, Fast Reactors, and Transmutation

Fast reactors, in combination with reprocessing and transmutation, have recently been proposed by the Bush administration as a way to deal with the waste. Despite this push, these technologies are not a solution to this country's nuclear waste problem. Reprocessing is the chemical process of extracting uranium, and plutonium from irradiated fuel after it is removed from a reactor. Reprocessing process is extremely expensive, poses a security threat, leads to environmental contamination, and does not eliminate the need for a repository.

Fast neutron reactors – high temperature reactors that use separated plutonium and have an inert gas or liquid metal as a coolant – have been put forward as a way to reduce the radioactivity of spent fuel by converting long-lived radionuclides in the waste into shorter-lived radionuclides, a process known as transmutation.

Attlee Benally in protective clothing at Hanford - Christopher Anderson/Spokesman Review

But fast neutron reactors have a terrible track record in safety and are incredibly expensive. These reactor designs also have many remaining technological problems, including the difficulties of using plutonium fuels in operating reactors, low rates of transmutation, unproven fuel fabrication systems, and dangers to workers making the fuel. Even if these problems were addressed, fast-neutron reactors would not eliminate the need for a repository.

Transportation

The continued production of radioactive waste will also require its regular transportation through communities across the country. Transportation routes to Yucca Mountain, for instance, by rail, road and barge, would pass through as many as 45 states and the District of Columbia, putting the dangerous waste within half a mile of 50 million people. The transportation of high-level radioactive waste on this scale, and over such long distances, is unprecedented.

In February 2006, the National Academies of Science (NAS) released a report on the transport of irradiated fuel and high-level radioactive waste in the United States, which identifies several vital issues that must be studied before any large-scale shipments of irradiated nuclear fuel commence. These issues include full-scale crash testing of transport packages under severe accident conditions, a study of security issues, and a study of very-long-duration fires before any waste is shipped. In addition to these technical concerns about transportation, the report questioned DOE's preparedness for such large-scale shipments, and concluded "the challenges of sustained implementation should not be underestimated." It is clear from the report's recommendations that DOE is not meeting the basic requirements for safe transport.

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