Fact Sheet 5: Safe Energy

The unsolved problem: nuclear waste

Contact: wecf@wecf.eu
info@umweltinstitut.org
www.wecf.eu
www.umweltinstitut.org

The Unsolved Problem: Nuclear Waste

The radioactive waste from nuclear power plants is a serious danger to humans and the environment. Due to the long half-life of some of the substances the waste remains a danger for extended periods of time – in some cases for millions of years. Very small quantities are enough to cause a catastrophe, if they enter into drinking water supplies. By stopping the use of nuclear energy, the continuous production of radioactive waste from civilian use will come to an end.

Toxic Almost Forever

Uranium is the fuel used in nuclear reactors. The fission of uranium-235 produces different radioactive products; the non fissionable uranium-238 breeds so called transuranes including the highly toxic plutonium. Therefore spent fuel rods are highly radioactive. On average, an atomic power plant produces 30 tonnes of high level waste per year. Over a 40 year life span this results in roughly 1200 tonnes of highly radioactive waste. Germany, alone, has generated 13,000 tonnes of spent or partially spent fuel since the beginning of nuclear power there. So called "low level nuclear wastes" such as protective clothing and cleaning materials are added to the waste pile along with high-level radioactive materials such as used pipes or valves. All in all, a power plant produces nearly 100 tonnes total of nuclear waste every year that requires safe storage. (1) Nuclear waste is not just produced from active power plants. The largest volume of radioactive waste comes from decommissioned nuclear power plants.

Reprocessing: A Dead End

The idea of a "closed nuclear fuel cycle" remains a fiction. The proposal was for commercial nuclear reactors to produce fissionable plutonium from reprocessing of high level waste that would be used in fast breeders reactors: plutonium reactors where non fissionable uranium-238 would, in turn, supply more and more plutonium – that was the dream, at least. However, it was not to be. Between very high costs, poor technological development, questionable safety, and dangerous vulnerability of diversion to military use, breeder reactor technology never gained momentum or public support. And, without the breeder reactor, the main incentive to separate plutonium from high level nuclear waste from power plants for civilian use is gone.

Despite this fact, France, Great Britain, Russia and Japan still have reprocessing programmes in order to use the separated plutonium in MOX fuel elements and then to feed them back into civilian reactors. (2) The reprocessing of used fuel elements produces plutonium (1 %), highly radioactive waste that requires storage (4 %), and depleted uranium (95 %). The reuse of the separated uranium in new fuel rods remains an exception. The fact is, the separated uranium fraction is actually more nuclear waste. Reprocessing also requires a lot of transportation and puts additional radiation into the environment. Reprocessing is not waste disposal. It is merely a possibility to gain more time until a solution is found.

Final Storage: Still Elusive

The unsolved problem of nuclear waste disposal is still with us today, even a greater challenge than 50 years ago when the first reactor went online. There is not a single functioning final storage site for high level radioactive waste any where in the world. The general perception holds that nuclear waste storage in deep geological formations is the least dangerous method – even though this final storage is not without risk. Whether granite, salt, clay or other geological formations are capable of housing highly radioactive and heat generating material over long periods of time safely is not decided.
Bit by bit, it is becoming clear that the selection of a final storage location is not merely a technical and scientific problem. None of the attempts to find a designated site, starting in the 1970's, has led to a final, approved storage site.

In Germany, for example, there was no transparency in the siting process and social opposition to the plan was ignored for a long time. The attempt

to learn from previous mistakes, led to a multi-tier selection process with continuous public participation. But it is uncertain whether the waste storage concept, completed in 2002, will ever become reality. (3)
The final storage plans for Finland and the USA are quite advanced yet. The proposed siting of a gigantic nuclear waste storage site in Yucca Mountain, Nevada, on the lands of the Western Shoshone Indian Tribe, is very controversial and is at the center of an ongoing dispute between the State of Nevada and the federal government in Washington, D.C.
The completed storage site in Olkiluoto, Finland, on the other hand, has experienced relatively little opposition.
Additionally, the waste sites in Finland as well as one in Sweden, are located near the coast. This clearly is not a good solution, because the ground on which the plants are sited is not stable enough which can lead to erosion and entry of salt water in the waste storage area.

The Idea of Transmutation

The process of transmutation is seen as one possible future for nuclear waste disposal. Here, long-lived radio nuclides are separated from the waste and transformed into shorter lived, and therefore less dangerous, substances. This technology, however, will not be available within the immediate future years on any large scale. The process requires new and environmentally harmful reprocessing plants that would have to be built along with an arsenal of fast breeders or special reactors, which do not yet exist. All of this would increase already existing risks making it a less than desirable solution. A final storage site is nevertheless desperately needed. (4)

The unresolved problem of nuclear waste should prevent any further consideration of expanding the development of nuclear energy. More nuclear power means more wastes that would be on the planet, threatening the integrity of our fragile ecosystems and human health for thousands of years without adequate storage. We are leaving future generations with a massive burden to cope with – this action does not acknowledge our own responsibility in having created a problem that for which we have no good solution.

Karin Wurzbacher,
Umweltinstitut München e.V.,
Germany

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