

A Practical Overview of Radioactive Wastes and the Global Nuclear Energy Partnership (GNEP)

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1. Introduction

The creation of huge quantities of long-lived radioactive waste turns out to be the most formidable problem facing the nuclear power plants today. Retrospectively, the difficulty of radioactive waste disposal was not considered to be a big problem during the time when nuclear power plants were first introduced. It was assumed that such wastes could be recycled or buried. Unfortunately, however, finding safe ways of storing radioactive wastes so that they do not leak radioactivity into the environment has proved to be a much more difficult task than anticipated at that time. Radiation resulting from radioactivity occurs when unstable nuclei of atoms decay and emit radiation. A Figure concerning Paths of Radiation to the Body are shown at the poster display[1].

The Global Nuclear Energy Partnership (GNEP) began as U.S. proposal, announced by U.S. Secretary of Energy, Samuel Bodman on February 6, 2006, to form an international partnership to promote the use of nuclear power and close the nuclear fuel cycle in a way that reduces radioactive wastes and the risk of nuclear proliferation[2]. This proposal would divide the world into "fuel supplier nations," which supply enriched uranium fuel and take back spent fuel, and "user nations," which operate nuclear power plants[3]. Today GNEP consists of 21 partner countries, three permanent international nongovernment observers and 17 participating observer countries[4]. GNEP operates by consensus among its partners based on an agreed GNEP Statement of Principles[5].

2. Basic Types of Radioactive Waste

High-level Radioactive Waste

High-level radioactive waste consists mostly of spent nuclear fuel from nuclear power plants. It contains approximately 95% of all the radioactivity in low- and high-level waste combined. All countries with high-level radioactive waste and spent nuclear fuel plan to eventually dispose of these materials deep underground, in a geological disposal facility called a repository.

Uranium Mill Tailings

Uranium mill tailings are primarily the sandy process waste material from a conventional mill. This ore residue contains the radioactive decay products mainly from the U-238 chain and heavy metals. These mill tailings are generally left outdoors in huge piles releasing radioactive materials into the surrounding air and water.

Low-level Radioactive Waste

Low-level radioactive wastes are usually defined in terms of what they are not. They are

not spent fuel, milling tailings, reprocessed materials, or transuranic materials. It includes the remainder of radioactive wastes and materials generated in nuclear power plants. Approximately 90% of the radioactive waste produced in the world is low-level.

3. PUREX Process

This process for the reprocessing of spent nuclear fuel to separate uranium and plutonium from the fission products and from one another. Following the dissolution of the irradiated fuel in aqueous nitric acid, uranium and plutonium are transferred to an organic phase by intensive mixing with an organic solvent extraction—30% tributyl phosphate (TBP) in kerosene is used as organic solvent—while the fission products remain in the aqueous nitric phase. Further process steps enable the subsequent separation of uranium and plutonium from one another. Two Figures regarding PUREX are displayed

4. GNEP International Partnership

The United States has established a number of cooperative arrangements to pursue technical cooperation on this proposal. On February 16, 2006 the United States, France and Japan signed an "arrangement" to research and develop sodium-cooled fast reactors in Support of the GNEP. The United States has established "action plans" for collaboration with Russia, Japan and China. As of September 2, 2008, GNEP partners are: Australia, Bulgaria, Canada, China, France, Ghana, Hungary, Italy, Japan, Jordan, Kazakhstan, **Republic of Korea**, Lithuania, Poland, Romania, the Russian Federation, Senegal, Slovenia, Ukraine, United Kingdom and the United States. The three permanent international nongovernment observers are: the International Atomic Energy Agency, the Generation IV International Forum and Euratom.

5. Conclusion

GNEP has proven controversial in the United States and internationally. In this regard, four Tables and four Figures were extracted from Radioactive Wastes and the Global Nuclear Energy Partnership issued by Institute for Policy Studies (www.ips-dc.org) in collaboration with Friends of the Earth USA and the Government Accountability Project.

REFERENCES

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- [4] Global Nuclear Energy Partnership (<http://www.gneppartnership.org/>)
- [5] GNEP Statement of Principles (http://www.gneppartnership.org/docs/GNEP_SOP.pdf)