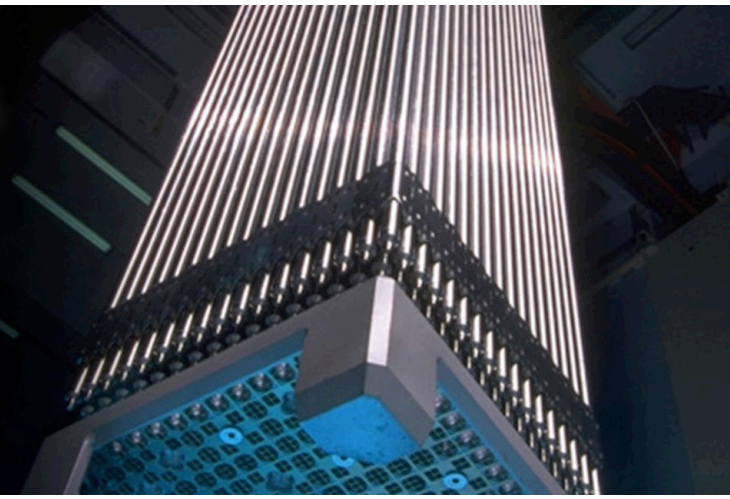
American Nuclear Society

Position Statement #47

Utilization of Surplus Weapons Plutonium As Mixed Oxide Fuel



The American Nuclear Society (ANS) endorses the rapid application of mixed uranium plutonium oxide (MOX) fuel technology to accomplish the timely disposition of surplus weapons-grade plutonium. The end of the Cold War has led to universal recognition that both the United States and Russia possess stockpiles of weapons-grade plutonium that far exceed their defense requirements. In 1994 the National Academy of Sciences (NAS) stated the following: "The existence of this material [surplus weapons-usable plutonium and highly enriched uranium] constitutes a clear and present danger to national and international security.[1] Russia and the United States have held extensive discussions on plutonium disposition, culminating in a September 2000 agreement[2] to dispose of 34 metric tons of surplus weapons grade plutonium in each country. The U.S. Department of Energy has completed two major Environmental Impact Statements on surplus plutonium disposition.[3,4] Implementation of the associated Records of Decision[5,6] has resulted in an ongoing program to dispose of surplus U.S. weapons-grade plutonium by fabricating the material into MOX fuel and using the fuel in commercial nuclear reactors. As with the blend-down of highly enriched uranium, this disposition path utilizes the inherent value of the material to our advantage. Russia is developing a program to dispose of surplus Russian weapons-grade plutonium as fuel for future advanced reactors. In addition, MOX technology can be applied in support of recent statements by world leaders indicating a desire to expand the scope materials that may be released from weapons stockpiles.

The use of MOX fuel in nuclear reactors consumes much of the weapons-grade plutonium and alters the isotopic makeup of the remainder so that it is less attractive for use in nuclear weapons. In addition, spent MOX fuel assemblies are large, highly radioactive, and maintained under material and security controls as for all spent fuel and therefore are fully compliant with the "Spent Fuel Standard" for plutonium disposition, while proliferation issues remain to be resolved with alternative technologies.[7]

MOX fuel has been proven on an industrial scale. MOX fuel demonstration programs began in the 1960s in the United States and Europe. In the early 1980s, use of significant quantities of MOX fuel began in European nuclear power reactors. As the MOX fuel fabrication technology developed, it became possible to produce MOX fuel pellets that are very similar to 100% uranium oxide fuel in both physical characteristics and reactor performance. Dozens of nuclear power reactors in Europe are currently using MOX fuel to produce electricity. The safety and performance record of MOX fuel is comparable to that of low enriched uranium fuel.[8,9]

While the U.S. program to dispose of surplus weapons-grade plutonium using MOX fuel is underway, successful completion of the overall program is not assured. Challenges include achieving commensurate progress in Russia, financing the U.S. and Russian programs, and maintaining public support. To help surmount these challenges, the ANS makes the following recommendation:

- The United States and the international community should take the necessary steps to support the completion of the U.S. and Russian disposition programs.
- Governmental and nongovernmental organizations should sponsor information exchanges among the United States, Russia, and other nations with MOX fuel expertise.
- Industry and professional organizations should work to inform the public and media about the nonproliferation benefits of the MOX fuel program and the safe and successful track record of manufacturing and using MOX fuel.

References

1. "Management and Disposition of Plutonium," p. 1, National Academy of Sciences, Committee on Arms Control and International Security, 1994.
2. "Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated As No Longer Required for Defense Purposes and Related Cooperation," September 2000.
3. "Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement," DOE/EIS-0229, U.S. Department of Energy, December 1996.
4. "Surplus Plutonium Disposition Final Environmental Impact Statement, DOE/EIS-0283, U.S. Department of Energy, November 1999.
5. "Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement," U.S. Department of Energy, January 14, 1997.
6. "Record of Decision for the Surplus Plutonium Disposition Final Environmental Impact Statement," U.S. Department of Energy, January 4, 2000.
7. "Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives," "Section 7: Conclusions Relating to Specific Alternatives," U.S. Department of Energy, January 1997.
8. P. Blainpain and F. Frery, "Plutonium Recycling in French Power Plants: MOX Fuel Irradiation Experience and Behaviour," Institution of Nuclear Engineers, Windermere, Cumbria, United Kingdom, June 1996.
9. "Belgian Nuclear Society Conference Report on Plutonium 2000," presented at International Conference on the Future of Plutonium, Brussels, Belgium, October 9–11, 2000.

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