



# Disposition of Surplus Weapons Plutonium Using Mixed Oxide Fuel

Position Statement  
November 2002

The American Nuclear Society (ANS) endorses the rapid application of mixed oxide (MOX) fuel technology to accomplish the timely disposition of surplus weapons-grade plutonium in the United States and in the Russian Federation.

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 existence of this material (surplus weapons-usable plutonium and highly enriched uranium) constitutes a clear and present danger to national and international security. (parenthetical phrase added)<sup>1</sup>

The events of September 11, 2001 lend further emphasis to the need to minimize the chance of weapons-grade plutonium falling into the wrong hands.

Russia and the United States have held extensive discussions on plutonium disposition, culminating in a September 2000 agreement<sup>2</sup> to dispose of 34 metric tons of surplus weapons-grade plutonium in each country. In the United States, the Department of Energy has completed two major Environmental Impact Statements on surplus plutonium disposition<sup>3,4</sup>. Implementation of the associated Records of Decision<sup>5,6</sup> has resulted in an ongoing program to dispose of surplus United States weapons-grade plutonium by fabricating the material into MOX fuel and using the fuel in commercial nuclear reactors. In Russia, the Ministry of Atomic Energy (MINATOM) is developing a similar program to dispose of surplus Russian weapons-grade plutonium as MOX fuel in existing reactors. Russia is also considering the use of the surplus plutonium as fuel for future advanced reactors.

Irradiation of MOX fuel destroys much of the weapons-grade plutonium and isotopically degrades 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. Use of MOX fuel in light water reactors has been found to be fully compliant with the "Spent Fuel Standard" for plutonium

<sup>1</sup> National Academy of Sciences, Management and Disposition of Plutonium, Committee on Arms Control and International Security, 1994, p. 1.

<sup>2</sup> *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.

<sup>3</sup> U. S. Department of Energy, *Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement* (DOE/EIS-0229), December 1996.

<sup>4</sup> U. S. Department of Energy, *Surplus Plutonium Disposition Final Environmental Impact Statement* (DOE/EIS-0283), November 1999.

<sup>5</sup> U. S. Department of Energy, *Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Final Programmatic Environmental Impact Statement*, January 14, 1997.

<sup>6</sup> U. S. Department of Energy, *Record of Decision for the Surplus Plutonium Disposition Final Environmental Impact Statement*, January 4, 2000.

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disposition, while proliferation issues remain to be resolved with alternative technologies such as “can-in-canister” immobilization<sup>7</sup>.

There are several potential technologies, including immobilization and advanced reactors, that could be used to dispose of surplus plutonium, but MOX fuel is the only such technology that 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. Commercial MOX fuel fabrication has been ongoing at three facilities in Belgium and France for some time, and a fourth facility in the United Kingdom is currently starting up. Thirty-five nuclear power reactors in Europe are currently using significant quantities of MOX fuel to produce electricity. The safety and performance record of MOX fuel is comparable to that of low-enriched uranium fuel<sup>8,9</sup>.

While the United States 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, obtaining regulatory approvals for MOX fuel fabrication and MOX fuel use, financing the United States and Russian programs, and maintaining public support. To help surmount these challenges, the ANS makes the following recommendations.

- The United States and the international community should take the necessary steps to support the completion of the United States and Russian disposition programs.
- The U.S. Nuclear Regulatory Commission should perform thorough safety, security, and environmental reviews in a timely manner, taking full advantage of the existing international MOX fuel experience base.
- Governmental and non-governmental organizations should sponsor information exchanges among the United States, Russia, and other industrialized nations with MOX fuel expertise.
- Industry and professional organizations should work to educate 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.

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<sup>7</sup> U. S. Department of Energy, *Nonproliferation and Arms Control Assessment of Weapons-Usable Fissile Material Storage and Excess Plutonium Disposition Alternatives*, January 1997, Section 7 – Conclusions Relating to Specific Alternatives.

<sup>8</sup> 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.

<sup>9</sup> Belgian Nuclear Society Conference Report on Plutonium 2000 - International Conference on the Future of Plutonium, Brussels, Belgium, October 9-11, 2000.

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Position Statements are the considered opinions and judgments of the Society in matters related to nuclear science and technology. They are intended to provide an objective basis for weighing the facts in reaching decisions on important national issues.

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