

## Strengthening National and International Plutonium Management Approaches

This paper discusses issues relating to separated plutonium (otherwise known as unirradiated plutonium) in civilian nuclear programs, that is, plutonium that has been chemically separated from spent nuclear reactor fuel by reprocessing but has not been reintroduced into a nuclear reactor after separation and subjected to further irradiation.

In those states that proceeded with civilian reprocessing programs, stocks of separated civilian plutonium have continued to grow in the aggregate. Taken together today, they are substantially greater than world-wide military plutonium stocks. Multiple approaches to limiting the separation of civil plutonium have been implemented, and still others have been given serious study, but stocks have increased regardless, while options for working down these stocks appear to be diminishing. Meanwhile, concern has deepened over the possible theft or diversion of this material, which could bring weapon-sufficient quantities of plutonium into the hands of violent extremists.

It is not sufficient simply to place reprocessing facilities and plutonium holdings under IAEA safeguards. Safeguards are not designed to address nuclear-material security issues. Accordingly, there is a need not only to address specific security measures for separated plutonium, but to complement these with institutional and technical measures to mitigate risks from separated plutonium.

These measures include steps to:

Limit existing reprocessing programs and their risk

- Political measures:

- o Encourage Japan to continue its reprocessing moratorium at least until the Rokkasho mixed plutonium and uranium oxide (MOX) fuel-fabrication facility is operational and a significant number of Japanese nuclear power plants licensed to burn MOX come back online; and to more seriously consider dry cask storage as an alternative to reprocessing.

- o Develop strategies to encourage France to shift to greater use of non-plutonium-based low-enriched uranium fuels for its domestic nuclear power plants and to refrain from exporting a reprocessing plant to China.

- Technical measures:

- o Where possible, reactors should be operated to avoid producing plutonium at or near weapon-grade. Where such material is produced, and reprocessing cannot be avoided, such material should not be reprocessed separately but blended in-process to avoid a product at or near weapon-grade.

Limit the risk of existing civil plutonium stocks

- Political measures:

- o Acknowledge permanent disposition of separated civil plutonium as a problem common to all states possessing significant quantities of this material and establish a new multi-state forum or expand the mandate of an existing forum to develop strategies for the permanent disposition of civil plutonium.

- o Re-examine international plutonium storage concepts.

- Technical measures:

- o Minimize the number of sites with separated plutonium holdings and the number of transport movements of separated plutonium and conduct regular reviews of the security of such sites.

- o Accelerate and maximize mixing of separated plutonium with uranium and conversion to more-processed forms—MOX pellets and fuel assemblies—even if the product will go unused for an extended period. Consider extending this mixing to include plutonium insufficiently pure to be burned in reactor fuel and constructing a new fabrication line at La Hague, France, and using the existing facility at Sellafield to produce such impure MOX.

- o For countries with large stores of MOX and MOX unlikely to be burned in the near term because of impurities, consider placing these fuel rods in the same dry casks as highly radioactive spent fuel rods, providing a medium-term storage capability that will be difficult for non-state actors to exploit, pending ultimate disposal.

- o As the United States pursues its “dilute-and-dispose” option for the permanent disposal of excess military plutonium United States should share its dilution and packaging technologies with other states and include them in unclassified aspects of on-going US research and development activities.

Discourage new reprocessing programs

- Sustain current technology controls

- o Continue current restraints on transfers of reprocessing equipment and technology.

- o Continue to pursue additional commitments like those in the US–UAE and US–Taiwan nuclear agreements, where the US partners have agreed to renounce reprocessing into the indefinite future.
- Actively promote dry cask storage technology as an alternative to reprocessing

## State

United States

## Gender

Male

**Primary authors:** Mr CARLSON , John (Nuclear Threat Initiative ); Mr SPECTOR , Leonard (James Martin Center for Nonproliferation Studies ); Mr POMPER, Miles (James Martin Center for Nonproliferation Studies )

**Presenter:** Mr POMPER, Miles (James Martin Center for Nonproliferation Studies )

**Track Classification:** PP: Nuclear security of nuclear fuel cycle facilities: emerging technologies and associated challenges and complex threats