

Safeguards and Security Issues

Part of NRC's mission, beyond ensuring adequate protection of public health and safety, and protecting the environment, is to promote the common defense and security. To meet its mission, the NRC implements licensing and oversight programs for material control and accounting (MC&A) and physical protection. As part of its efforts to develop a regulatory framework for reprocessing facilities, the NRC is evaluating its licensing and oversight programs for MC&A and physical protection to ensure that reprocessing operations provide adequate protection and ensure the secure use of nuclear materials.

REGULATORY GAPS DISCUSSED IN THIS SECTION:

- ✓ Gap 4 - Exclusion of Irradiated Fuel Reprocessing Facilities in 10 CFR 74.51
- ✓ Gap 8 - Risk-Informing 10 CFR Part 73 and 10 CFR Part 74
- ✓ Gap 17 - Diversion Path Analysis Requirements
- ✓ Gap 18 - Approaches toward Material Accounting Management
- ✓ Gap 20 - Advanced Fuel Cycles and Transuranic Special Nuclear Material (SNM) Classification

NRC'S SPECIAL NUCLEAR MATERIAL CLASSIFICATION FRAMEWORK

NRC divides special nuclear material (SNM) into three main categories, according to the risk and potential for its direct use in a fissile explosive or for its indirect use in the production of nuclear material for use in a fissile explosive:

- **Strategic SNM (SSNM)** – identified as Category I quantity
- **SNM of moderate strategic significance** – identified as Category II quantity
- **SNM of low strategic significance** – identified as Category III quantity

NRC regulations in 10 CFR 73.2 and 10 CFR 70.4 define the types and quantities of SNM that correspond to each category. The NRC's MC&A and physical protection programs use this classification framework to establish security and safeguards requirements that are commensurate to the risks presented by the theft, loss, or diversion of these materials.

NRC'S RESPONSIBILITIES FOR MC&A AND PHYSICAL PROTECTION

Material control means the use of control and monitoring measures to prevent or detect loss of SNM. Material accounting is defined as the

use of statistical and accounting measures to maintain knowledge of SNM quantities present in each area of a facility. It includes the use of physical inventories and material balances to verify the presence of material or to detect the loss of material through theft or diversion. NRC's MC&A requirements are graded based on the significance of the material or facilities being protected. The NRC establishes regulations for MC&A in 10 CFR Part 74, and assesses compliance with these requirements through a comprehensive licensing, inspection, and oversight program.

Physical protection consists of a variety of measures for the protection of nuclear material or facilities against sabotage, theft, and diversion. NRC's approach to physical protection is graded based on the significance of the material or facilities being protected. NRC establishes physical protection requirements in 10 CFR Part 73 and assesses compliance with the requirements through a comprehensive licensing, inspection, and oversight program.

RISK INFORMING NRC'S SECURITY AND MC&A REQUIREMENTS

The current quantity-based categorization scheme in the existing regulations may not adequately address the different attributes and risk levels of materials that could be handled in a reprocessing facility. Accordingly, current requirements may result in excessive safeguards and security measures for relatively unattractive materials. A new material categorization scheme for 10 CFR Part 73 and 10 CFR Part 74 that incorporates attractiveness levels, based on material composition for currently designated SNM, could provide a more risk-informed approach for protection of material involved in reprocessing processes. The NRC may consider alternative risk-informed regulatory approaches that consider other factors, beyond type and quantity, which contribute to the overall attractiveness of commercial fuel derived from reprocessing.

EXCLUSION OF REPROCESSING FACILITIES FROM CATEGORY I MC&A REQUIREMENTS

The regulation in 10 CFR 74.51 currently excludes reprocessing facilities from Category I material control and accounting (MC&A) requirements. Category I reprocessing facilities would not have the same MC&A requirements as other Category I facilities if the exclusion is not removed, yet comparable requirements may be needed to protect against theft and diversion of separated special nuclear material and other materials.

IMPROVEMENTS TO MATERIAL ACCOUNTING MANAGEMENT

Modern reprocessing facilities are likely to have large throughputs and inventories. Currently, 10 CFR 74.59(f) gives predefined quantity limits and timeliness requirements for Category I facilities, which must perform physical inventories every 6 months. Predefined limits on inventory difference determinations and the frequency of inventory periods could pose a challenge for reprocessing facilities. Improved technology, such as near real-time accounting, has been used at certain overseas reprocessing plants. This and other technologies can provide a more frequent inventory analysis without a facility shut-down, and will facilitate meeting the current timeliness and quantity goals. Without the assistance of modern technology, meeting the established timeliness and goal quantities could be a challenge for new reprocessing facilities.

DIVERSION PATH ANALYSIS

Currently, there are no existing regulations for a diversion path analysis requirement in 10 CFR Part 74. Establishing diversion path analysis requirements could make 10 CFR Part 74 more risk-informed and would provide an effective detection and response program to mitigate potential safeguards vulnerabilities and system weaknesses.

ADVANCED FUEL CYCLES AND EXPANDED SNM CLASSIFICATION

Existing regulations do not address the security risks of certain fissile elements, such as americium (Am) and neptunium (Np), which can be separated in more advanced fuel cycle separations, because these elements are currently not regulated or treated as fissile material or SNM. Some advanced fuel cycle separation methods have the ability to separate actinides, such as Am and others, resulting in separated and pure fissile products. Currently, these advanced fuel cycle separation methods are not industrially mature and are still being researched. The NRC will continue to monitor industry interest in these alternative separation processes, and consider if additional changes to its requirements are needed.