
**Regulatory Analysis for Final Rule:
Amendments to Material Control and Accounting
Regulations (10 CFR Part 74)**

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

**Division of Rulemaking & Division of Fuel Cycle Safety,
Safeguards, and Environmental Review**

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Executive Summary

The U.S. Nuclear Regulatory Commission (NRC) is amending Title 10 of the *Code of Federal Regulations* (10 CFR) Part 74 material control and accounting (MC&A) regulations applicable to special nuclear material (SNM) and some source material. The changes in this rulemaking would revise and consolidate MC&A requirements in 10 CFR Part 74 in order to update, clarify, and strengthen the existing requirements. Specifically, this rulemaking would consolidate the MC&A requirements currently in 10 CFR Part 72 for independent spent fuel storage installations and monitored retrievable storage installations [both hereafter referred to as storage installations] in 10 CFR Part 74. The requirements for general performance objectives (GPOs) would be consolidated and revised to apply to all licensees authorized to possess more than 350 grams of SNM. The requirement to establish an item control system would be expanded to include reactor facilities licensed under 10 CFR Part 50 or 52 and storage installations licensed under 10 CFR Part 72. The requirements for tamper-safing procedures would be made applicable to licensees subject to Subpart C of 10 CFR Part 74. Category I, II, and III licensees subject to Subparts E, D, and C of 10 CFR Part 74, respectively, would be required to designate one or more material balance areas (MBAs), or a combination of one or more MBAs and one or more item control areas (ICAs), at their facilities, and designate material custodians who would be responsible for monitoring these areas. Some current exemptions in the MC&A regulations would be modified to strengthen the requirements. Plain language revisions would also be made to 10 CFR Part 74. References to due dates and reporting frequencies would be made more uniform by expressing such times in terms of calendar days. Section 74.4, "Definitions," would be amended by adding, removing, and modifying certain terms. Associated guidance documents would be created or revised to reflect these changes and address public comments.

This regulatory analysis examines the benefits and costs of the changes to the requirements described above.

This rule would affect the following existing licensees:

- 61 power reactor sites licensed under 10 CFR Part 50 or 52.
- 6 decommissioning reactor sites licensed under 10 CFR Part 50.
- 31 non-power reactor sites licensed under 10 CFR Part 50.
- 15 storage installations licensed under 10 CFR Part 72.
- 8 greater than critical mass facilities licensed under 10 CFR Part 70.¹
- 2 Category I facilities licensed under 10 CFR Part 70.
- 3 Category III fuel fabrication facilities licensed under 10 CFR Part 70.
- 1 Category III enrichment facility licensed under 10 CFR Part 70.

¹ The term "non-fuel cycle facility licensees" used in this document refers to those licensees authorized to possess SNM under 10 CFR Part 70, but who are not subject to Subpart H of 10 CFR Part 70 or the requirements in Subparts C, D, or E of 10 CFR Part 74, as well as those licensees authorized to possess SNM under other Parts of 10 CFR, such as nuclear reactors or storage installations. While all existing licensees subject to Subparts C, D, or E are involved in fuel cycle activities, other types of future facilities (e.g., those that use SNM for production of isotopes for medical use) may be subject to these subparts.

- 2 Category II facilities expected to be licensed under 10 CFR Part 70 or 50 or 52 (e.g., those that use SNM for production of isotopes for medical use). There are no existing Category II facilities. For the purpose of this analysis, the NRC estimates that two future facilities will be affected.
- 0 irradiated fuel reprocessing plants. Because there are no existing irradiated fuel reprocessing plants and no new irradiated fuel reprocessing plants are currently under construction, the analysis assumes that no irradiated fuel reprocessing plants would be affected during the analysis period.

Benefits and Costs

This regulatory analysis measures the incremental costs of the rule relative to a baseline that reflects anticipated behavior in the event the NRC undertakes no additional regulatory action (alternative 1, the “no-action” alternative). The analysis quantifies the costs associated with two affected attributes: industry implementation and industry operation. The implementation cost captures the industry startup cost. The industry operation cost captures the ongoing cost broken down annually. Because of the inherent difficulties in determining the monetary value of some of the benefits associated with the affected attributes, the analysis includes a qualitative assessment of these attributes. The treatment of qualitative factors is consistent with Commission direction in staff requirements memorandum (SRM) SRM-SECY-14-0087, “Staff Requirements – SECY-14-0087 – Qualitative Consideration of Factors in the Development of Regulatory Analyses and Backfit Analyses,” dated March 4, 2015, and the guidance provided in NUREG/BR-0058, Revision 4, “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,” dated September 2004, and NUREG/BR-0184, “Regulatory Analysis Technical Evaluation Handbook,” dated January 1997.

The analysis makes the following key findings:

Cost to Industry. The costs from the rule are in the form of implementation (one-time) and operational (recurring) costs. The rule would result in an average one-time cost per licensee of approximately \$28,000, followed by an average annual cost per licensee of approximately \$2,700. The rule would result in a total one-time cost to the entire industry (see breakdown of the 129 affected licensees above) of approximately \$3.6 million followed by total annual costs to the entire industry of approximately \$348,000. The analysis estimates the total present value of these costs over the 25-year analysis period to be between \$9.6 million and \$7.6 million (at a 3-percent and 7-percent discount rate, respectively).

Cost to NRC. Under the regulatory action, the NRC developed proposed and final rule packages. In addition, the NRC updated and developed guidance documents. The costs incurred to develop these documents and all rulemaking activities are considered sunk costs and are not included in this regulatory analysis. This regulatory analysis does not include an estimate of the cost to update the inspection program as the inspection program is reviewed and updated at 3-5-year intervals and the changes would be incorporated without requiring a separate program update to procedures. The NRC inspection activities at a facility would include the changes without an increase in the cost to NRC of conducting inspections. Inspectors would evaluate licensee implementation of the changes within the scope of the routine inspection program elements.

Benefits. The rule would enhance security and safeguards, knowledge, and regulatory efficiency. First, the rule would reduce the risk of misuse of SNM through requirements for an item control system and the modification of some existing item exemptions. The new item control requirements would increase the accuracy of inventory information that supports the resolution of discrepancies, protect against unauthorized or unrecorded removal of items or removal of SNM from an item, and enhance the capability to rapidly locate selected items. By revising existing item control exemptions, the rule would help ensure that SNM within a facility is not stolen or otherwise diverted from the facility and would promote the NRC's strategic goal of ensuring the secure use of radioactive materials.

Second, the rule would consolidate and clarify GPOs for all affected licensees. To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee ensure the MC&A program's effectiveness, which in turn would result in improvements in the licensee's ability to maintain current knowledge of its SNM. These revised MC&A regulations help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM.

Third, the rule would increase regulatory efficiency and effectiveness by clarifying which requirements apply to different types of facilities as well as clarifying acceptable methods for achieving GPOs and promoting efficient licensee implementation and NRC inspection.

Decision Rationale. The NRC considered two alternatives, one in which the NRC takes no rulemaking action (Alternative 1) and one in which the NRC conducts a rulemaking (Alternative 2). The NRC selected Alternative 2. Alternative 2 results in a net overall cost; however, the rule does have many benefits, as previously discussed. These benefits cannot be quantified because the NRC is unable to accurately determine: (1) the frequency of attempted theft or diversion; (2) the frequency with which theft or diversion attempts may be successful; and (3) the consequences of successful theft or diversion. Notwithstanding these limits on quantification, the NRC projects there would be a reduction in overall risk of misuse of SNM with this rule. Although the NRC could not quantify the benefits of this rule, it did examine the rule's benefits qualitatively.

The new item control requirements would increase the accuracy of inventory information that supports the resolution of discrepancies, protects against unauthorized or unrecorded removal of items or removal of SNM from an item, and enhances the capability to rapidly locate selected items. By revising existing item control exemptions, the rule would help ensure that SNM within a facility is not stolen or otherwise diverted from the facility and would promote the NRC's strategic goal of ensuring the secure use of radioactive materials.

To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee gather additional valuable information that it could then use to ensure the MC&A program's effectiveness. These revised MC&A regulations help ensure that the information about SNM is

accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM.

In addition, the rule would increase regulatory efficiency and effectiveness by clarifying what requirements apply to different types of facilities as well as clarifying acceptable methods for achieving GPOs and promoting efficient licensee implementation and NRC inspection.

The decision rationale is based on how the benefits and costs have been analyzed. The NRC has determined that the rule is cost-justified because the benefits associated with reducing the risk of misuse of SNM, improving knowledge, and increasing regulatory efficiency and effectiveness outweigh the estimated costs associated with the rule.

Table ES-0-1 Combined Implementation and Annual Cost Summary by Entity over the 25-year analysis period

Entity	One-time Implementation Costs*	Recurring and Annual Operating Costs*	Total combined Implementation and Annual Cost undiscounted*	Present Value combined Implementation and Annual Cost at 3% discount rate*	Present Value combined Implementation and Annual Cost at 7% discount rate*
Industry	(\$3,559,000)	(\$348,000)	(\$12,257,000)	(\$9,617,000)	(\$7,613,000)
NRC	\$0	\$0	\$0	\$0	\$0
Total	(\$3,559,000)	(\$348,000)	(\$12,257,000)	(\$9,617,000)	(\$7,613,000)

*figures rounded to nearest thousand

Glossary of Terms and Acronyms

10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
ADAMS	NRC's Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
FTE	Full-Time Equivalent
GAO	Government Accountability Office
GPO	General Performance Objective
GTCM	Greater Than Critical Mass
ICA	Item Control Area
MBA	Material Balance Area
MC&A	Material Control and Accounting
MOX	Mixed Oxide
NRC	U.S. Nuclear Regulatory Commission
NUREG	Nuclear Regulatory Publication
OIG	Office of the Inspector General
OMB	Office of Management and Budget
ORNL	Oak Ridge National Laboratory
RG	Regulatory Guide
ROP	Reactor Oversight Process
SNM	Special Nuclear Material

1. Introduction

This document presents a regulatory analysis of the NRC's rule to revise and consolidate the MC&A requirements in 10 CFR Part 74 in order to update, clarify, and strengthen the existing requirements to reduce the risk of misuse of SNM. Specifically, this rulemaking would consolidate the MC&A requirements currently in 10 CFR Part 72 for storage installations in 10 CFR Part 74. The requirements for GPOs would be consolidated and revised to apply to all licensees authorized to possess more than 350 grams of SNM. The requirement to establish an item control system would be expanded to include reactor facilities licensed under 10 CFR Part 50 or 52 and to storage installations licensed under 10 CFR Part 72. The requirements for tamper-safing procedures would be made applicable to licensees subject to Subpart C of 10 CFR Part 74. Category I, II, and III licensees would be required to designate one or more MBAs, or a combination of one or more MBAs and one or more ICAs at their facilities, and designate material custodians who would be responsible for monitoring these areas. Some current exemptions in the MC&A regulations would be removed or modified to strengthen the requirements. Plain language revisions would also be made to 10 CFR Part 74. References to due dates and reporting frequencies would be made more uniform by expressing such times in terms of calendar days rather than "days." Section 74.4 would be amended by adding, removing, and modifying certain terms.

This analysis presents background material, rulemaking objectives, alternatives, and input assumptions and describes the consequences of the rule language and alternative approaches necessary to accomplish the regulatory objectives.

1.1 Background

On February 25, 1985, a rulemaking created 10 CFR Part 74 and moved the MC&A requirements applicable to Category III licensees out of 10 CFR Part 70, with the intention of 10 CFR Part 74 eventually containing all of the domestic MC&A regulatory requirements (50 FR 7575). These changes were made for a number of reasons: (1) to avoid confusion with the safety requirements in 10 CFR Part 70; (2) to allow the requirements to be presented in a more orderly manner; and (3) to be consistent with the use of 10 CFR Part 73 for physical protection requirements so that specific safeguards program requirements would be found in 10 CFR Parts 73 and 74 and the general licensing requirements retained in 10 CFR Part 70. Subsequent rulemakings moved the MC&A requirements applicable to Category I and II licensees from 10 CFR Part 70 to 10 CFR Part 74 (52 FR 10033; March 30, 1987, and 67 FR 78130; December 23, 2002, respectively).

Following the events of September 11, 2001, the Commission directed the NRC staff to undertake a comprehensive review of the NRC's safeguards and security programs. NRC's safeguards and security programs for SNM currently include physical protection requirements, information security requirements, and MC&A requirements. Physical protection and MC&A programs complement each other in the safeguarding of nuclear materials from unauthorized use or diversion by providing for a variety of measures to promptly detect and deter sabotage, theft, or diversion attempts. The physical protection requirements are focused primarily against

external threats, while the MC&A requirements are focused primarily against internal threats. The nature of events of September 11, 2001, which demonstrated external threats to facilities, led the staff to prioritize its efforts to initially address physical protection requirements. However, several independent reviews of NRC's oversight of SNM were conducted in the 2001-2005 timeframe. A number of the review recommendations highlighted several areas where enhancements and efficiencies could be made, particularly in the areas of regulations, guidance, and inspection programs. Additionally, NRC took several actions in response to the lessons learned from the MC&A inspections at commercial nuclear power reactors conducted after an event in 2000 where a power reactor licensee failed to adequately control and account for the SNM contained in two spent fuel rods. The NRC actions included revisions to inspection procedures and schedules for nuclear reactors to include MC&A in the baseline inspection program. Revisions were also made to guidance for MC&A at power reactors.

In 2001-2002, the NRC's Office of the Inspector General (OIG) conducted an audit to determine whether NRC adequately ensures its licensees control and account for SNM. (OIG-03-A-15, *Audit of NRC's Regulatory Oversight of Special Nuclear Material*, May 23, 2003; ADAMS Accession No. ML031550068). OIG found that "NRC's current [c. 2003] levels of oversight of licensees' MC&A activities do not provide adequate assurance that all licensees properly control and account for SNM." In response to this audit, the NRC engaged the Oak Ridge National Laboratory (ORNL) to perform a review of the NRC's MC&A program, including regulations, practices, and inspections. ORNL's review, conducted in 2003 and 2004, included recommendations in four principal topic areas: regulations, licensing, inspection program, and safeguards management program.

In 2005, the U.S. Government Accountability Office (GAO) reviewed the effectiveness of NRC's regulations and oversight of nuclear power plants' performance in controlling and accounting for their spent fuel (GAO-05-339, *Nuclear Regulatory Commission: NRC Needs to Do More to Ensure that Power Plants are Effectively Controlling Spent Nuclear Fuel*, April 12, 2005, ADAMS Accession No. ML051120124). GAO made several recommendations for the NRC in this area.

In 2005, the NRC staff used the review recommendations and the lessons learned to inform its recommendation to the Commission that the MC&A regulations be revised to clarify and strengthen the requirements and associated guidance documents be developed and updated. The Commission subsequently directed NRC staff to develop a rulemaking plan to incorporate regulatory improvements in the MC&A program. In 2007, the NRC staff documented the technical basis (ADAMS Accession No. ML072130075) for developing the rulemaking plan to revise the MC&A regulations. The NRC staff developed the rulemaking plan (SECY-08-0059, *Rulemaking Plan: Part 74 - Material Control and Accounting of Special Nuclear Material*, ADAMS Accession No. ML080580307) and the Commission directed the staff (SRM-SECY-08-0059, *Staff Requirements – SECY-08-0059 – Rulemaking Plan: Part 74 - Material Control and Accounting of Special Nuclear Material*, ADAMS Accession No. ML090360473) to proceed with rulemaking. On November 8, 2013, the NRC published in the *Federal Register* for public comment a proposed rule to amend its MC&A regulations, which included a request for comment on the regulatory analysis (78 FR 67225). The NRC received a number of comments related to the regulatory analysis, including that the draft regulatory analysis did not consider all of the changes in the proposed rule. In response to the comments, the NRC staff has revised

the regulatory analysis to provide more detail and additional support for each of the changes in the final rule and to ensure that the cost estimates are realistic. For additional information about these comments and the NRC's responses, see "U.S. Nuclear Regulatory Commission Staff Responses to Public Comments on Proposed Rule: 'Amendments to Material Control and Accounting Regulations' and Associated Draft Guidance, 78 FR 67224 and 78 FR 67225 (November 8, 2013)" (ADAMS Accession No. ML18061A050).

1.2 Statement of the Problem and Objective of the Rulemaking

The NRC's MC&A regulations ensure that the information collected by the licensee about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to: (1) maintain current knowledge of its SNM and (2) manage its program for securing and protecting SNM. The MC&A program, together with physical protection of facilities and information security requirements, make up the primary elements of the NRC's SNM safeguards program. The MC&A component of the larger safeguards program helps ensure that SNM within a licensed facility is not stolen or otherwise diverted from the facility.

Over the years, the NRC has revised its regulations to consolidate MC&A requirements in one place, 10 CFR Part 74, to provide a single framework for controlling and accounting for all SNM under NRC oversight. All that remains to be moved are the requirements in 10 CFR Part 72 that apply to storage installations. In addition, many of the current MC&A requirements were developed over 20 years ago and are outdated. This includes, for example, outdated definitions and terminology, as well as inconsistencies and opportunities for consolidation. Further, although most of the existing 10 CFR Part 74 Subpart B general provisions apply to all licensees that are authorized to possess and use SNM, some licensees have expressed confusion as to which requirements apply to a particular facility and, accordingly, clarification is needed. Further, there are a few areas that need to be strengthened in order to help ensure that SNM is not stolen or otherwise diverted. For example, some current exemptions need to be modified to ensure licensees achieve a complete and comprehensive inventory of the SNM in their possession and ensure timely detection of and protection against unauthorized and unrecorded removal of SNM. The requirement for a nuclear reactor or a storage installation licensee to implement and maintain an item control system is needed to provide assurance that these licensees are adequately protecting against unauthorized and unrecorded removal of SNM. Finally, provisions for tamper-safing procedures strengthen the existing item control and inventory requirements at Category III licensees to deter and detect unauthorized and unrecorded removals of SNM.

As explained in the proposed rule (78 FR 67225), the objective of this rulemaking is to revise and consolidate MC&A requirements in 10 CFR Part 74 in order to update, clarify, and strengthen the existing requirements. Revisions to achieve this objective are identified in the Alternative 2 discussion in Section 2.2 of this regulatory analysis.

2. Identification and Preliminary Analysis of Alternative Approaches

The following sections describe the two regulatory alternatives that the NRC is considering in order to meet the rulemaking objective identified in the previous section. Section 3 of this regulatory analysis presents a detailed analysis of the benefits and costs of the two regulatory alternatives.

2.1 Alternative 1: No Action

Under Alternative 1, the no-action alternative, the NRC would not amend the current 10 CFR Part 74 regulations. Current NRC regulations do not include GPOs for those licensees authorized to possess more than 350 grams of SNM, but not authorized to possess Category I, II, or III amounts of licensed material. Licensees under Subpart B are required to establish and follow written MC&A procedures, but reactor licensees and storage installation licensees are not presently required to implement an item control system. Licensees under Subparts C and D (Category III and II facilities, respectively) are now allowed to potentially exempt kilogram amounts of SNM from the item control system. There is now no requirement for tamper-safing procedures in Subpart C and licensees under Subpart E (Category I facilities) are not required to control access to unused tamper seals or account for seals. Licensees under Subparts C, D, and E are not required to designate MBAs, ICAs, or custodians for these areas. Any future irradiated fuel reprocessing plant would currently be exempt from the Subpart E requirements.

Under Alternative 1, licensees would continue to comply with existing regulations. Alternative 1 would avoid costs that the rule would impose; however, the existing requirements would not be updated, clarified, or consolidated and the strengthening of the security requirements for SNM would not occur. This alternative is equivalent to the status quo and serves as a baseline against which the other alternative can be measured.

2.2 Alternative 2: Revise and Consolidate to Update, Clarify, and Strengthen Requirements for MC&A of SNM in 10 CFR Part 74

Under Alternative 2, to revise and consolidate MC&A requirements in 10 CFR Part 74 in order to update, clarify, and strengthen the requirements, the NRC would make the changes listed below. The changes would result in costs and benefits, as evaluated in Section 3 of this regulatory analysis. Changes that would not result in costs to the licensees are also identified below.

- Relocate to 10 CFR Part 74 the reporting requirements related to the Nuclear Materials Management and Safeguards System for storage installations that currently exist in 10 CFR Part 72. In this regard, revisions would be made to remove requirements from 10 CFR 72.72, 72.74, 72.76, and 72.78. This consolidation of the provisions would result in no new requirements and therefore, licensees would not incur new costs for these changes.

- Revise 10 CFR Part 74 to make it clear which requirements apply to which types of facilities. Although most of the Subpart B general provisions apply to all licensees that are authorized to possess and use SNM, some licensees have expressed confusion as to which requirements apply to a particular facility. To address this matter, the NRC would modify the 10 CFR Part 74 definitions for *formula quantity*, *special nuclear material of moderate strategic significance*, and *special nuclear material of low strategic significance* by conforming them to the existing definitions in 10 CFR Parts 70 and 73. These classes of SNM correspond to Category I, II, and III quantities of SNM, respectively. Licensees authorized to possess Category I material are subject to the requirements in 10 CFR Part 74, Subpart E, while licensees authorized to possess Category II or III material are subject to the requirements in Subpart D or C, respectively. To further clarify these definitions, the NRC staff would add Appendix A to 10 CFR Part 74, which is a table listing the Category I, II, and III quantities of strategic SNM, as well as the formulas used to calculate these quantities. These clarifications of the provisions would result in no new requirements, and therefore licensees will not incur new costs for these changes.
- Include GPOs that would apply to licensees authorized to possess more than 350 grams of SNM. The existing GPO requirements are set forth in 10 CFR 74.31(a) and 74.33(a) for Category III licensees, 10 CFR 74.41(a) for Category II licensees, and 10 CFR 74.51(a) for Category I licensees. Building on these existing GPOs, a new 10 CFR 74.3 would consolidate the GPOs and apply them to all licensees authorized to possess more than 350 grams of SNM, including nuclear reactors licensed under 10 CFR 50 or 52 and storage installations licensed under 10 CFR Part 72.
- Add item control system requirements in 10 CFR 74.19(d) that would apply to nuclear reactors licensed under 10 CFR Part 50 or 52 and storage installations licensed under 10 CFR Part 72.
- Modify item control provisions in 10 CFR 74.31(c)(6), 10 CFR 74.33(c)(6), and 10 CFR 74.43(b)(5) and (6). A change in 10 CFR 74.31(c)(6) would revise and clarify the item control system capability for Category III licensees. The system must ensure that items (as defined in 10 CFR 74.4) are stored and handled or subsequently measured in a manner such that unauthorized removals of individual items, or 500 grams or more of uranium-235 from one or more items, will be detected. Furthermore, changes in 10 CFR 74.33(c)(6) for Category III uranium enrichment licensees and in 10 CFR 74.43(b)(5) for Category II licensees would revise and clarify the existing threshold levels with respect to the item control system capabilities. This provides a uniform threshold level for all Category III licensees while preserving the graded approach between Category II and III licensees. In addition, the changes to the item control exemptions in 10 CFR 74.31(c)(6), 74.33(c)(6), and 74.43(b)(6) would require each affected facility to include some currently exempted items in its item control system.
- Remove the existing exemption in 10 CFR 74.51(a) for an irradiated fuel reprocessing plant, consistent with SECY-09-0082, "Update on Reprocessing Regulatory Framework – Summary of Gap Analysis," dated May 28, 2009 (ADAMS Accession No. ML091520280),

thereby requiring any future irradiated fuel reprocessing plant licensees to establish and maintain an MC&A program.

- Include definitions for some new terms and clarify the definitions of some existing terms. In this regard, the NRC staff would add defined terms for *accounting, material custodian, item control area, item control system, material balance area, material control and accounting, and storage installation*. These additions and clarifications of existing terms would result in no new requirements and, therefore, licensees would not incur new costs for these changes.
- Strengthen requirements related to tamper-safing. Having tamper-safing procedures is already required for Category II and I licensees in 10 CFR 74.43(c)(3) and 74.59(f)(2), respectively. Similar requirements for tamper-safing procedures would be added in 10 CFR 74.31(c)(9) for Category III licensees and 10 CFR 74.33(c)(9) for uranium enrichment facility licensees. The changes would add new provisions for Category III licensees to maintain and follow procedures for the use and control of tamper-safing devices if tamper-safing is used. The changes would also revise the existing tamper-safing requirements for Category II and I licensees by clarifying the measures for controlling access to and distribution of unused seals and records.
- Add a requirement for Category I, II, and III licensees to designate one or more MBAs, or a combination of one or more MBAs and one or more ICAs, at their facilities, and designate material custodians who would be responsible for these areas.
- Include other miscellaneous clarifying changes, including plain language revisions. These changes and revisions would, for example, replace the existing references to the Fundamental Nuclear Material Control plan with references to an MC&A plan. These clarifications would result in no new requirements and, therefore, licensees would not incur new costs for these changes.

The guidance documents listed below have been updated. A previously drafted guidance document for Category II facilities (NUREG-2159) has been updated, and is included with the guidance documents listed. In addition, Regulatory Guide (RG) 5.29 is being revised, re-titled, and re-issued as “Special Nuclear Material Control and Accounting System for Non-Fuel Cycle Facilities.” Previously, RG 5.29 applied exclusively to nuclear power plants. This revision is made to apply to all non-fuel cycle facilities, not just nuclear power plants.

The guidance titles and ADAMS Accession Numbers are below:

- NUREG/BR-0096, Revision 2, “Instructions and Guidance for Completing Physical Inventory Summary Reports,” ML18017A176.
- NUREG-1065, Revision 3, “Acceptable Standard Format and Content for the Material Control and Accounting (MC&A) Plan Required for Special Nuclear Material of Low Strategic Significance,” ML18017A148.

- NUREG-1280, Revision 2, “Acceptable Standard Format and Content for the Material Control and Accounting (MC&A) Plan Required for Strategic Special Nuclear Material,” ML18017A192.
- NUREG-2158 (formerly NUREG/CR-5734), “Acceptable Standard Format and Content for the Material Control and Accounting (MC&A) Plan Required for Low Enriched Uranium Enrichment Facilities,” ML18017A168
- NUREG-2159, “Acceptable Standard Format and Content for the Material Control and Accounting (MC&A) Plan Required for Special Nuclear Material of Moderate Strategic Significance,” ML18017A206.
- RG 5.29, Revision 3 (issued in draft as DG-5057), “Special Nuclear Material Control and Accounting System for Non-Fuel Cycle Facilities,” ML18019B209.

The NRC has estimated the benefits and costs of Alternative 2, as described in Sections 3 and 4 of this regulatory analysis, and has pursued this alternative for the reasons discussed in Section 5.

3. Estimation and Evaluation of Benefits and Costs

This section describes the analysis that the NRC conducted to identify and evaluate the benefits and costs of the rulemaking and its no-action alternative. Section 3.1.1 of this regulatory analysis describes how the benefits and costs were analyzed. Section 3.2 identifies the attributes that are affected by the rulemaking. Section 3.3 identifies the entities expected to be affected by the rulemaking and the applicability period. Section 3.4 presents the labor rates used in the analysis. Section 3.5 presents the detailed results of the NRC staff's evaluation of the rulemaking's estimated costs. Section 3.6 provides a summary.

3.1 Methodology

3.1.1 Analytical Methodology

This section describes the methodology used to analyze the costs/benefits associated with the rule. The methodology for a regulatory analysis is specified by various guidance documents. The two documents that govern the NRC's regulatory analysis process are NUREG/BR-0058, Revision 4, and NUREG/BR-0184. In addition, the methodology is consistent with guidance from Office of Management and Budget (OMB) Circular No. A-4.

Based on OMB guidance, present value calculations are presented using both 3-percent and 7-percent real discount rates. The real discounted rates, or present value calculation, determine how much society would need to invest today to ensure that the designated dollar amount is available in a given year in the future. By using present value calculations, benefits and costs are valued equally regardless of time. The 3-percent rate approximates the real rate of return on long-term government debt which serves as a proxy for the real rate of return on savings. This rate is appropriate when the primary effect of the regulation is on private consumption. Alternatively, the 7-percent rate approximates the marginal pretax real rate of return on an average investment in the private sector and is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. Current trends in the marketplace reflect returns on investments well below the 3-percent and 7-percent discount rates, upon which OMB Circular No. A-4 is based. The NRC staff is providing a zero discount rate (e.g., undiscounted values) as a further sensitivity analysis.

In this regulatory analysis, the NRC staff identifies all attributes related to the regulatory action and analyzes them either quantitatively or qualitatively. For the quantified regulatory analysis, the NRC staff developed expected values for each benefit and cost. First, for each alternative, the NRC staff determined the benefits and costs and then discounted the consequences in future years to the current year of the regulatory action. Finally, the NRC staff summed the benefits and costs for each alternative and compared them.

This regulatory analysis measures the incremental costs of the rule relative to a “baseline” that reflects anticipated behavior in the event the NRC does not undertake any regulatory action (Alternative 1, the “no action” alternative). As part of the regulatory baseline used in this analysis, the NRC staff assumes full licensee compliance with existing NRC regulations. This alternative is equivalent to the status quo and serves as a baseline to measure against the other alternative. Section 3.6 of this regulatory analysis presents the estimated incremental benefits and costs of the rule relative to this baseline.

After performing the quantitative regulatory analysis, the NRC staff addressed attributes that could only be evaluated qualitatively. The rule includes changes that would affect attributes in a positive but not easily quantifiable manner. For example, the changes would decrease the risk of a security-related event, such as theft or diversion of radioactive material and subsequent use for unauthorized purposes. Quantification of the risk is subject to uncertainty due to the estimation of factors such as: (1) the frequency of attempted theft or diversion, (2) the frequency with which theft or diversion attempts may be successful; and (3) the consequences of successful theft or diversion. Increasing the security of SNM decreases this risk and increases the common defense and security of the nation. Other qualitative values that are positively affected include regulatory efficiency and improvements in knowledge.

The benefits include any desirable changes in the affected attributes. The costs include any undesirable changes in affected attributes.

The NRC staff used data from subject matter experts, stakeholder comments, knowledge gained from past rulemakings, and information gained during public meetings and from correspondence, to collect data for this analysis. The NRC staff used reasonable labor hour estimates generally selected from the higher end of ranges to avoid underestimating the quantity in question.

3.1.2 Sign Conventions

The sign conventions used in this analysis posit that all favorable consequences for the alternative are positive and all adverse consequences for the alternative are negative. For example, additional costs above the regulatory baseline are shown as negative values, and cost savings and averted costs are shown as positive values. Negative values are shown using parentheses (e.g., negative \$500 is displayed as (\$500)).

3.2 Identification of Affected Attributes

This section identifies the factors within the public and private sectors that the final rule is expected to affect, using the list of potential attributes in Chapter 5 of NUREG/BR-0184 and in Chapter 4 of NUREG/BR-0058. This evaluation considered each attribute listed in Chapter 5 of NUREG/BR-0184. The basis for selecting those attributes is presented below.

Affected attributes include the following:

- Industry Implementation - This attribute accounts for the projected net economic effect on the affected licensees of installing or implementing mandated changes. These costs include those associated with procedural and administrative activities, equipment, labor, and materials. Under the action, the industry would incur a one-time cost to implement the rule as outlined in the new and amended requirements discussed in Section 2.2 of this regulatory analysis.
- NRC Implementation - This attribute measures the projected net economic effect on the NRC of implementing the regulatory action on all affected licensees. Under the regulatory action, the NRC developed proposed and final rule packages. In addition, the NRC updated and developed guidance documents. The costs incurred to develop these documents and all rulemaking activities are considered sunk costs and are not included in this regulatory analysis.
- Industry Operations - This attribute measures the projected net economic effect of routine and recurring activities required by the regulatory action on all affected licensees. Under the regulatory action, the industry would incur ongoing costs to meet the new and amended requirements discussed in Section 2.2 of this regulatory analysis.
- NRC Operations - This attribute measures the projected net economic effect on the NRC after the regulatory action is implemented. The changes would include inspection and enforcement of requirements for certain licensees to assure the common defense and security from lost, missing, stolen, misused or diverted SNM. Inspectors would assess licensee implementation of the requirements noted above and operational activities noted above to maintain the MC&A program at licensee facilities. The NRC does not estimate any additional operating cost due to the regulatory action because its routine inspection program is reviewed and updated at 3-5 year intervals and these changes would be incorporated into the routine updates without increasing cost to the NRC.
- Security and Safeguards Considerations - The changes are intended to establish requirements that would continue to provide assurance that activities involving SNM are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.
- Improvements in Knowledge - This attribute accounts for the potential value of new information. The revised MC&A regulations would help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM. For example, the new item control system requirements in 10 CFR 74.19(d) would help the licensee gather additional valuable information that it could then use to help ensure the MC&A program's effectiveness.
- Regulatory Efficiency - The changes would result in enhanced regulatory efficiency through regulatory improvements. The rule would establish specific requirements that enhance regulatory clarity and consistency and promote the efficient implementation and inspection of licensee MC&A programs.

Attributes that the rulemaking alternatives would *not* affect include the following: occupational health (routine), occupational health (accidents), public health (routine), public health (accidents), environmental considerations, general public, offsite property, onsite property, antitrust considerations, and other Government entities.

3.3 Affected Entities and Applicability Period

This section outlines the possible effects of Alternative 2 (implementing the rule) on affected entities. The provided information was taken from NUREG-1350, Vol. 28, NRC Information Digest, 2017-2018 Edition. Appendix A provides additional detail on all Part 70 licensees affected.

The analysis assumes the following licensees would be affected by this rule:

- Power reactor facilities licensed under 10 CFR Part 50 or 52. (The NRC staff estimates that 59 currently operating and 2 future sites would be affected.)
- Decommissioning reactor facilities licensed under 10 CFR Part 50. (The NRC staff estimates that 6 sites (2 power reactor- spent fuel stored in pool and not moved to dry-storage, Vermont Yankee and Fort Calhoun and 4 non-power reactor facilities, General Atomics TRIGA Mark F, San Diego, CA 1, General Atomics TRIGA Mark I, San Diego, CA, General Electric Company GETR (Tank), Sunol, CA, University of Buffalo Pulstar, Buffalo, NY) would be affected.)
- Non-power reactor facilities licensed under 10 CFR Part 50. (The NRC staff estimates that 31 facilities would be affected.)
- Storage installations licensed under 10 CFR Part 72. There are 74 licensed storage installations of which 59 are located at an operating reactor facility. The analysis assumes that the 59 storage installations located at an operating reactor facility would not be affected separately by the regulatory action. (The NRC staff estimates that 15 storage installations would be affected.)
- Greater than critical mass facilities licensed under 10 CFR Part 70. (The NRC staff estimates eight facilities will be affected.)*
- Category I facilities licensed under 10 CFR Part 70. For the purposes of this analysis, the Shaw AREVA MOX Services, LLC facility is not included because there is not currently a projected date when the facility will be licensed to possess material and, therefore, be subject to the provisions of the rule. (The NRC staff estimates two facilities would be affected.)*
- Category III fuel fabrication facilities licensed under 10 CFR Part 70. (The NRC staff estimates three facilities would be affected.)*
- Category III enrichment facility licensed under 10 CFR Part 70. (The NRC staff estimates one facility would be affected.)*
- Category II facilities expected to be licensed under 10 CFR Part 70. (The NRC staff estimates that two future facilities would be affected.)*

*See Appendix A for detailed list of all Part 70 licensees affected.

- There are no existing irradiated fuel reprocessing plants. Because no new irradiated fuel reprocessing plants are currently under construction, the analysis assumes that no irradiated fuel reprocessing plants would be affected during the analysis period.

Applicability Period

OMB Circular No. A-4 states, “the time frame for your analysis should cover a period long enough to encompass all the important benefits and costs likely to result from the rule.” The applicability period for the affected entities is estimated to average 25 years. This estimate is based on the sum of the average remaining license term across these types of facilities. On average, the licenses for the affected licensees expire in 2044. Given that the rule is expected to become effective in 2019, the average remaining life for currently licensed affected entities is estimated to be 25 years from rule issuance, so that any recurring costs would be discounted over that time.

The analysis assumes that the final rule would be effective in 2019. The analysis assumes that the one-time implementation cost would be incurred in calendar year 2019. All costs are expressed in 2018 dollars. For this regulatory analysis, the costs, including the implementation cost, are discounted to 2018 dollars when applicable.

3.4 Labor Rates

Licensee labor rates were obtained from National Wage Data available on the Bureau of Labor Statistics Web site (www.bls.gov). Depending on the industry and the occupation (e.g., manufacturing, health and safety), an appropriate mean hourly labor rate is selected. Because exact hourly rates would be difficult to obtain and may not be sufficiently recent, nationwide mean hourly rates are used. The hourly cost was determined by multiplying the hourly labor rate by 1.5 to account for the cost of benefits (e.g., insurance premiums, pension, and legally required benefits).

This analysis uses the following hourly rates:

- Nuclear Power Reactor Operators-Scientific Research and Development (\$40.69*1.5=\$61.04).
- Licensing Assistants (\$25.19*1.5=\$37.79)
- Nuclear Engineer (\$49.14*1.5=\$73.71)

3.5 Detailed Results

This section presents the costs and benefits of the two alternatives.

3.5.1 Alternative 1: No Action

This regulatory analysis measures the incremental effects of the rule relative to a baseline, which reflects anticipated behavior in the event that the regulation is not imposed. The baseline used in this analysis assumes full licensee compliance with existing NRC requirements, including current regulations and relevant orders.²

By definition, the “no action” alternative, the baseline for the principal analysis, does not result in any change in benefits or costs.

3.5.2 Alternative 2: Revise and Consolidate Requirements for MC&A of SNM in 10 CFR Part 74

3.5.2.1 Industry Implementation

Cost: GPOs (10 CFR 74.3) and MC&A Procedures (10 CFR 74.19(b))

All licensees listed in Section 3.3 of this regulatory analysis would review their existing MC&A programs and associated procedures, as required in 10 CFR 74.19(b), and revise as necessary in order to show that the GPOs in 10 CFR 74.3 are achieved. The level of effort to revise as necessary in order to show that the GPOs are achieved will vary by licensee type.

The NRC staff estimates that the power reactor sites would need 250 labor hours. These licensees would need to review their existing procedures and revise if necessary in order to show that the GPOs would be achieved. This estimate assumes 210 labor hours for the nuclear engineer and 40 labor hours for the licensing assistant.

The NRC staff estimates that the decommissioning reactor sites, non-power reactor sites, and storage facilities, listed in Appendix A would each need 125 labor hours. In addition, six of the eight licensees authorized to possess greater than a critical mass of SNM (GTCM; as defined in 10 CFR Part 70) operate non-power reactors licensed under 10 CFR Part 50 and would also each need 125 labor hours. These licensees operations are less complex and the necessary effort to review their existing procedures and revise if necessary in order to show that the GPOs would be achieved is less than power reactor sites. This estimate assumes 105 labor hours for the nuclear engineer and 20 labor hours for the licensing assistant.

The NRC staff estimates that the Category I facilities, Category II facilities, Category III fuel fabrication facilities and Category III enrichment facility would need 125 labor hours. This estimate assumes 105 labor hours for the nuclear engineer and 20 labor hours for the licensing assistant.

The NRC staff estimates that two of the eight GTCM licensees listed in Appendix A (Passport Systems, Inc and Sensor Concepts & Applications) would need 500 labor hours. These two licensees would need a greater effort as they will need to develop new procedures that address the GPOs. This estimate assumes 420 labor hours for the nuclear engineer and 80 labor hours for the licensing assistant to review and, if necessary, revise these procedures.

² NUREG/BR-0058, “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,” which is the NRC’s staff guidance for regulatory analyses, states that, “in evaluating a new requirement...the staff should assume that all existing NRC requirements have been implemented.”

Table 3-1 GPOs and MC&A Procedures

Cost/Benefit Activity		
GPOs and MC&A procedures 74.19(d)	Labor hours	Mean/Best cost estimate*
Hours to develop procedures (nuclear engineer)	210	(\$15,479)
Hours to develop procedures (licensing assistant)	40	(\$1,512)
Total per licensee		(\$16,991)
Power reactor sites	61	(\$1,036,433)
Total for power reactor sites		(\$1,036,433)
Non-power reactor sites		
Hours to develop procedures (nuclear engineer)	105	(\$7,740)
Hours to develop procedures (licensing assistant)	20	(\$756)
Total per licensee		(\$8,495)
Decommissioning reactor sites	6	(\$50,972)
Non-power reactor sites	31	(\$263,356)
Storage Installations	15	(\$127,430)
Category I facilities	2	(\$16,991)
Category II facilities	2	(\$16,991)
Fuel Fabrication facilities	3	(\$382,291)
Enrichment facility	1	(\$8,495)
Greater than critical mass facilities	6	(\$50,972)
Total	66	(\$917,498)
Greater than critical mass facilities		
Hours to develop procedures (nuclear engineer)	420	(\$30,958)
Hours to develop procedures (licensing assistant)	80	(\$3,023)
Greater than critical mass facilities	2	(\$33,981)
Total		(\$1,987,912)

*numbers are rounded

Cost: New Item Control System (10 CFR 74.19(d))

As part of their existing MC&A programs and in support of the GPOs, the item control system requirement in 10 CFR 74.19(d) is extended to the nuclear reactors licensed under 10 CFR Part 50 or 52 and storage installations licensed under 10 CFR Part 72. These licensees would be required to establish, document, implement, and maintain an item control system.

The NRC staff estimated 200 labor hours would be needed for each of the affected licensees to review their existing programs and revise, as necessary, to include the item control system. This estimate assumes 80 labor hours each for the nuclear reactor operator and nuclear engineer, and 40 labor hours for the licensing assistant. This would result in a one-time cost to each affected licensee of approximately \$12,000.

Table 3-2 New Item Control System – 10 CFR 74.19(d)

Cost/Benefit Activity	Labor hours	Mean/Best cost estimate*
New Item Control System		
Hours to review & revise MC&A program (nuclear power reactor operator)	80	(\$4,883)
Hours to review & revise MC&A program (nuclear engineer)	80	(\$5,897)
Hours to review & revise MC&A program (licensing assistant)	40	(\$1,512)
Total per licensee		(\$12,292)
Affected Facilities	# of Facilities	Totals
Storage installations	15	(\$184,368)
Non-power reactor sites	31	(\$381,027)
Power reactor sites	61	(\$749,763)
Decommissioning reactor sites	6	(\$73,747)
Total		(\$1,388,906)

*numbers are rounded

Cost: Revised Item Control Capability & Exemptions (10 CFR 74.31(c)(6), 10 CFR 74.33(c)(6), and 10 CFR 74.43(b)(5) and (b)(6))

The changes in 10 CFR 74.31(c)(6), 10 CFR 74.33(c)(6), and 10 CFR 74.43(b)(5) and (b)(6) include revising and clarifying the item control system capabilities and reducing the item control exemption thresholds. The changes would require each affected facility to review and update, as necessary, existing item control systems and procedures. It is estimated by the NRC that the changes would affect three Category III fuel fabrication facilities, one enrichment facility, and two Category II facilities. The implementation cost associated with updating existing item control procedures for the modified item controls is estimated to be 380 labor hours. This estimate assumes 300 labor hours for the nuclear engineer and 80 labor hours for the licensing assistant. This would result in a one-time cost to each affected licensee of approximately \$25,000. The NRC estimates the effort necessary to update existing procedures for the enrichment facility to have less of an effect and estimate the labor hours to be 150 for the nuclear engineer and 80 for the licensing assistant. This would result in a one-time cost to the affected licensee of approximately \$14,000.

Table 3-3 Revised Item Control Capability & Exemptions – 10 CFR 74.31(c)(6), 10 CFR 74.33(c)(6), and 10 CFR 74.43(b)(5) and (b)(6)

Cost/Benefit Activity	Labor hours	Mean/Best cost estimate*
Revised Item Control Capability & Exemptions		
Hours to review & revise procedures (nuclear engineer)	300	(\$22,113)
Hours to review & revise procedures (licensing assistant)	80	(\$3,023)
Total per license		(\$25,136)
Affected Facilities	# of Facilities	Totals
Fuel fabrication facilities	3	(\$75,409)
Enrichment facilities**	1	(\$14,080)
Category II facilities	2	(\$50,272)
Total		(\$139,761)

*numbers are rounded

**For the enrichment facility, the labor estimate for the nuclear engineer is half that of the fuel fabrication facilities

Cost: Tamper-safing (10 CFR 74.31(c)(9), 74.33(c)(9), 74.43(c)(3), and 74.59(f)(2)(i))

The changes would require each affected facility to review and update as necessary their existing tamper-safing procedures. It is estimated by the NRC that the changes would affect three Category III fuel fabrication facilities, one enrichment facility, two Category II facilities, and two Category I facilities. The implementation cost associated with reviewing and updating existing tamper-safing procedures is estimated to be 40 labor hours. This estimate assumes 32 labor hours for the nuclear engineer and 8 labor hours for the licensing assistant. This would result in a one-time cost to each affected licensee of approximately \$3,000.

Table 3-4 Tamper-safing – 10 CFR 74.31(c)(9), 74.33(c)(9), 74.43(c)(3), and 74.59(f)(2)(i)

Cost/Benefit Activity	Labor hours	Mean/Best cost estimate*
Tamper safing		
Hours to review & revise procedures (nuclear engineer)	32	(\$2,359)
Hours to review & revise procedures (licensing assistant)	8	(\$302)
Total per licensee		(\$2,661)
Affected Facilities	# of Facilities	Totals
Category I facilities	2	(\$5,322)
Category II facilities	2	(\$5,322)
Fuel fabrication facilities	3	(\$7,983)
Enrichment facilities	1	(\$2,661)
Total		(\$21,288)

*numbers are rounded

Cost: Add designation of MBAs, ICAs, and material custodians (10 CFR 74.31(c)(10), 74.33(c)(10), 74.43(c)(9), and 74.59(h)(5).

The changes would add new provisions to require all Category I, II, and III licensees subject to Subpart E, D, and C of 10 CFR Part 74, respectively, to designate one or more MBAs, or a combination of one or more MBAs and one or more ICAs, and assign custodial responsibility for the control of the material in such areas. The NRC estimates that the changes would affect the three Category III fuel fabrication facilities, one enrichment facility, two Category II facilities, and two Category I facilities. All of the existing licensees have established MBAs, ICAs, and designated custodians in accordance with their NRC-approved MC&A plans. The rule change provides flexibility for a licensee to designate one or more MBAs, or a combination of one or more MBAs and one or more ICAs, and to assign custodial responsibility for these areas as needed. The implementation cost associated with designating MBAs or ICAs and assigning custodial responsibility is estimated to be 40 labor hours per licensee. This estimate assumes 32 labor hours for the nuclear engineer and 8 labor hours for the licensing assistant. This would result in a one-time cost to each affected licensee of approximately \$3,000.

Table 3-5 Add designation of MBAs, ICAs, and custodians – 10 CFR 74.31(c)(10), 74.33(c)(10), 74.43(c)(9), and 74.59(h)(5).

Cost/Benefit Activity	Labor hours	Mean/Best cost estimate*
Add designation of MBAs, ICAs, and custodians		
Hours to review & revise procedures (nuclear engineer)	32	(\$2,359)
Hours to review & revise procedures (licensing assistant)	8	(\$302)
Total per facility		(\$2,661)
Affected Facilities	# of Facilities	Totals
Category I facilities	2	(\$5,322)
Category II facilities	2	(\$5,322)
Fuel fabrication facilities	3	(\$7,983)
Enrichment facilities	1	(\$2,661)
Total		(\$21,288)

*numbers are rounded

Table 3-6 Total Industry Implementation Cost

Total Industry Implementation Cost	Total Cost*
GPOs and MC&A procedures	(\$1,987,912)
New item control system	(\$1,388,906)
Revised item control capability & exemptions	(\$139,761)
Tamper-safing	(\$21,288)
Add designation of MBAs, ICAs, and custodians	(\$21,288)
Total	(\$3,599,155)

*numbers are rounded

3.5.2.2 NRC Implementation

Under the regulatory action, the NRC developed proposed and final rule packages. In addition, the NRC updated and developed guidance documents. The costs incurred to develop these documents and all rulemaking activities are considered sunk costs and are not included in this regulatory analysis. This regulatory analysis does not include an estimate of the cost of updating the inspection program, as the inspection program is reviewed and updated at 3 to 5-year intervals and the changes would be incorporated without requiring a separate program update to procedures. Additionally, this regulatory analysis does not include an estimate of the cost of reviewing MC&A plan revisions, because any anticipated changes related to the implementation of the final rule would not require a formal NRC staff review. Applicable 10 CFR Part 70 licensees are authorized under 10 CFR 70.32(c)(1)(iii) to make changes that do not decrease the effectiveness of the MC&A program without prior NRC approval.

3.5.2.3 Industry Operation

Cost: Item Control System – Recordkeeping.

Changes to 10 CFR 74.19(d) would require all affected licensees to establish, document, and maintain an item control system as defined in 10 CFR 74.4. A total of 114 licensees (61 power reactor sites, 6 decommissioning reactor sites, 31 non-power reactor sites, and 16 storage facilities) would be affected by the recordkeeping requirements for the item control system, and the annual time to perform these actions would be 10 hours per licensee. The annual cost would be approximately \$400 per licensee.

Table 3-7 Item Control System – Recordkeeping

Recordkeeping	Labor hours	Mean/Best cost estimate*
Hours for recordkeeping (licensing assistant)	10	(\$378)
Affected Facilities	# of Facilities	Totals
Storage installations	15	(\$5,669)
Non-power reactor sites	31	(\$11,715)
Power reactor sites	61	(\$23,052)
Decommissioning reactor sites	6	(\$2,267)
Total		(\$42,703)

*numbers are rounded

Cost: Item Control System – Periodic SNM Audits.

To confirm the new item control system requirements in 10 CFR 74.19(d), it is assumed that the affected licensees would conduct periodic SNM audits or a similar activity. The NRC estimates that it would take 50 labor hours (\$3,686) for the power reactor sites and decommissioning reactor sites to conduct the audits. The NRC estimates it would take 5 hours (\$305) for the storage installations and non-power reactor sites to conduct the audits. The NRC estimates that one audit or similar activity per year on average would be conducted over the analysis period.

Table 3-8 Item Control System – Periodic SNM Audits

Item Control System- Periodic SNM Audits	Labor hours	Mean/Best cost estimate*
Hours to conduct audit (nuclear power reactor operator)	5	(\$305)
Hours to conduct audit (nuclear engineer)	50	(\$3,686)
Affected Facilities	# of Facilities	Totals
Storage installations	15	(\$4,578)
Non-power reactor sites	31	(\$9,461)
Power reactor sites	61	(\$224,816)
Decommissioning reactor sites	6	(\$22,113)
Total		(\$260,968)

*numbers are rounded

Cost: Revised Item Control Capability & Exemptions for Category II & III.

The changes to 10 CFR 74.31(c)(6), 74.33(c)(6), and 74.43(b)(5) and (6) would require each affected licensee to confirm the quantities and locations of SNM and include currently exempted items in their item control system. The NRC estimates that the changes would affect the three Category III fuel fabrication facility licensees, one enrichment facility licensee, and two Category II facility licensees. The annual time would be 100 labor hours for a nuclear engineer. The annual cost would be approximately \$7,400 per licensee.

Table 3-9 Revised Item Control Capability & Exemptions

Revised Item Control Capability & Exemptions	Labor hours	Mean/Best estimate*
Hours to complete controls (nuclear engineer)	100	(\$7,371)
Affected Facilities	# of Facilities	Totals
Category II facilities	2	(\$14,742)
Fuel fabrication facilities	3	(\$22,113)
Enrichment facilities	1	(\$7,371)
Total		(\$44,226)

*numbers are rounded

Table 3-10 Total Industry Annual Operational Cost

Total Licensee Annual Operational Cost		Total Cost
Recordkeeping		(\$42,703)
Item Control System – Periodic SNM Audits		(\$260,968)
Revised Item Control Capability & Exemptions		(\$44,226)
Total		(\$347,896)

3.5.2.4 NRC Operations

The changes would include inspection and enforcement of requirements for certain licensees to help ensure material is not lost, missing, stolen, or diverted. Inspectors would assess licensee implementation of the requirements and operational activities noted above to maintain the MC&A program at licensee facilities. Because inspectors would evaluate licensee implementation of the changes within the scope of the routine inspection program elements, the NRC inspection activities at a facility would include the changes without an increase in the cost to NRC of conducting inspections.

3.5.2.5 Security and Safeguards Considerations

The NRC determined that the rule changes would be in accord with the common defense and security by enhancing protection of SNM. One of the qualitative benefits of the rule relates to the reduced risk of misuse of SNM that would be achieved as a result of implementing requirements for item controls. The NRC is unable to quantify this reduction in risk due to the uncertainty associated with estimating factors such as: (1) the frequency of attempted theft or diversion, (2) the frequency with which theft or diversion attempts may be successful, and (3) the consequences of successful theft or diversion. However, the protective measures, controls, and capabilities that would be established through the rule reduce the risk of a theft or diversion of SNM. The benefits of the new requirements for item controls are discussed below in qualitative terms.

The NRC's existing MC&A regulations specify requirements for collecting and reporting information about SNM that is held by a licensee. MC&A, together with physical protection of facilities and information security requirements, make up the primary elements of the NRC's SNM safeguards program. The revised MC&A regulations would help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM.

The new item control system requirement in 10 CFR 74.19(d) would enhance security and safeguards by requiring the licensees to increase and maintain: (1) the accuracy of inventory

information that supports the resolution of discrepancies, (2) the protection against unauthorized removal or unrecorded removal of items or removal of SNM from an item, and (3) the capability of rapidly locating selected items.

With regard to modifying existing item control requirements, the MC&A component of the larger safeguards program helps ensure that SNM within a facility is not stolen or otherwise diverted from the facility and promotes the NRC's strategic goal of ensuring the secure use of radioactive materials. Clarifying the detection capability of the item control system and revising some of the currently allowed exemptions for item control for Category III licensees would require these licensees to collect and maintain additional MC&A information on these types of items and verify the information periodically. The provisions related to tamper-safing procedures would strengthen the existing item control and inventory requirements that help deter and detect unauthorized and unrecorded removals of SNM by requiring Category III licensees to maintain and follow procedures where tamper-safing is used.

3.5.2.6 Improvements in Knowledge

The NRC's regulations specify requirements for collecting and reporting information about SNM that is held by a licensee. To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee gather additional valuable information that it could then use to ensure the MC&A program's effectiveness. These revised MC&A regulations help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM.

3.5.2.7 Regulatory Efficiency

The revisions would make it clear which requirements apply to which type of facility. Although the Subpart B general provisions apply to almost all facilities that are authorized to possess and use SNM, licensees have expressed confusion as to which requirements apply to a particular facility. To reduce confusion and, therefore, reduce unnecessary effort and cost associated with this matter, the NRC staff would modify the 10 CFR Part 74 definitions for *formula quantity*, *SNM of moderate strategic significance*, and *SNM of low strategic significance* by conforming them to the existing definitions in 10 CFR Parts 70 and 73. Licensees authorized to possess Category I material are subject to the requirements in 10 CFR Part 74, Subpart E, while licensees authorized to possess Category II or III material are subject to the requirements in Subpart D or C, respectively. To further clarify these divisions, the NRC staff would add Appendix A to 10 CFR Part 74, which is a table listing the Category I, II, and III quantities of SNM and the formulas used to calculate these quantities.

In addition, the amendments would increase efficiency by clarifying acceptable methods for achieving GPOs and would promote efficient licensee implementation and NRC inspection of MC&A programs.

3.6 Totals

Quantitative Results: Total Present Value for the Cost

Table 3-11 summarizes the combined implementation and annual costs by entity, over the 25-year analysis period for Alternative 2.

Table 3-11 Quantitative Results Total Present Value for the Cost*

Entity	One-time Implementation Costs	Recurring and Annual Operating Costs	Total Combined Implementation and Annual Cost Undiscounted	Present Value Combined Implementation and Annual Cost at 3% Discount Rate	Present Value Combined Implementation and Annual Cost at 7% Discount Rate
Industry	(\$3,559,000)	(\$348,000)	(\$12,257,000)	(\$9,617,000)	(\$7,613,000)
NRC	\$0	\$0	\$0	\$0	\$0
Total	(\$3,559,000)	(\$348,000)	(\$12,257,000)	(\$9,617,000)	(\$7,613,000)

*figures rounded to nearest thousand

3.6.1 Benefits and Costs

This section presents the benefits and costs estimated for the amended MC&A regulations (Alternative 2). To the extent that the affected attributes could be analyzed quantitatively, the net effect of each alternative has been calculated and is presented in Table 3-12. However, benefits could be evaluated only on a qualitative basis.

The costs from the rule are in the form of implementation and operational costs. The rule would result in an average one-time cost per licensee of approximately \$28,000 followed by an average annual cost per licensee of approximately \$2,700. The rule would result in a total one-time cost to the entire industry (see breakdown of the 129 affected licensees above) of approximately \$3.6 million followed by total annual costs to the entire industry of approximately \$348,000. The analysis estimates the total present value of these costs over the 25-year analysis period to be between approximately \$9.6 million and \$7.6 million (at a 3-percent and 7-percent discount rate, respectively).

With respect to benefits, the rule would reduce the risk of misuse of SNM through requirements for an item control system and the modification of some existing item exemptions. The new item control requirements would increase the accuracy of inventory information that supports the resolution of discrepancies, protects against unauthorized or unrecorded removal of items or removal of SNM from an item, and enhances the capability to rapidly locate selected items. By revising existing item control exemptions, the rule would help ensure that SNM within a facility is not stolen or otherwise diverted from the facility and would promote the NRC's strategic goal of ensuring the secure use of radioactive materials. To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee gather additional valuable information that it could then use to ensure the MC&A program's effectiveness. These revised MC&A regulations would help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM. In addition, the rule would increase regulatory efficiency and effectiveness by clarifying what requirements apply to different types of facilities as well as clarifying acceptable methods for achieving GPOs and promoting efficient licensee implementation and NRC

inspection. Table 3-12 summarizes the results of the cost benefit analysis, relative to the no-action alternative (Alternative 1).

Table 3-12 Summary of Overall Benefits and Costs (Quantitative and Qualitative)

<p>Alternative 1: No Action Industry Total Cost: \$0 NRC Total Cost: \$0</p> <p><u>Qualitative consideration of factors</u> None</p>	<p>Alternative 2: Industry Implementation Costs: \$3.6 million Industry Annual Cost: \$348,000 Industry combined Implementation/ Operation Costs over 25 year analysis period: \$12.3 million undiscounted \$9.6 million using a 3% discount rate \$7.6million using a 7% discount rate</p> <p>NRC Cost: \$0</p> <p><u>Qualitative consideration of factors</u></p> <p><u>Safeguards and Security Considerations</u> The rule would reduce the risk of misuse of SNM through requirements for an item control system and the modification of some existing item exemptions. The new item control requirements would increase the accuracy of inventory information that supports the resolution of discrepancies, protects against unauthorized or unrecorded removal of items or removal of SNM from an item, and enhance the capability to rapidly locate selected items. By revising existing item control exemptions, the rule would help ensure that SNM within a facility is not stolen or otherwise diverted from the facility and would promote the NRC’s strategic goal of ensuring the secure use of radioactive materials</p> <p><u>Improvements in Knowledge</u> To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee gather additional valuable information that it could then use to ensure the MC&A program’s effectiveness. These revised MC&A regulations help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM.</p> <p><u>Regulatory Efficiency</u> The rule would increase regulatory efficiency and effectiveness by clarifying which requirements apply to different types of facilities as well as clarifying acceptable methods for achieving GPOs, and promoting efficient licensee implementation and NRC inspection of MC&A programs.</p>
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4. Uncertainty Analysis

As this regulatory analysis is based in part on estimates of values, it is useful to conduct a sensitivity analysis of the variables, as a part of the uncertainty analysis, to illustrate where there is the greatest amount of uncertainty. A Monte Carlo sensitivity analysis was completed with the assistance of @RISK®, a software program specially designed for completing a sensitivity analysis. The Monte Carlo approach provides an answer to the question: “What distribution of net costs results from multiple draws of the probability distribution assigned to key variables?”

4.1 Uncertainty Analysis Assumptions

A Monte Carlo analysis allows a range of possible inputs to be assigned to a distribution that is sampled in the simulation. Monte Carlo simulations involve introducing uncertainty into the analysis by replacing the point estimates of the variables used to estimate base case costs with probability distributions. The simulation repeatedly generates inputs to its mathematical algorithm that are selected randomly from a distribution of the possible inputs. After 10,000 simulations, the analysis provides a distribution of the results for variations in the values modeled.

A Monte Carlo analysis requires the identification of the variables that are uncertain; in this analysis, the uncertain variables are those that make up the licensees implementation costs for updating their GPOs and MC&A procedures. The specific variables in this analysis include the labor hours needed to update the GPOs and MC&A procedures.

A simplistic approach for taking the variables into account is the Triangular (also known as Three-Point Estimate) technique. This technique uses three estimates to define an approximation of the proposed rule's cost. This technique works as follows: low, high, and best estimates for each variable are developed. The values for the estimates are based on NRC staff expertise and stakeholder feedback.

For this analysis, the uncertainties in licensee implementation costs are expressed in terms of upper- and lower-bounds for the effort (labor hours). No attempt was made to apply an uncertainty analysis to the quantitative benefits of the rule because the benefits could not be quantified. The uncertainties in frequency and scope of the consequences of concern that would be averted by implementation of the rule cannot be accurately estimated.

The upper- and lower-bound estimates, as well as the NRC staff's best estimate, are presented in Table 4-1. The NRC staff used the labor rate assumptions from Section 3.4 of this regulatory analysis to calculate the labor hour costs for these estimates. Using these estimated costs, the NRC staff generated a number of uncertainty distributions using a Monte Carlo simulation with the @Risk[®] software. This simulation provides a statistical summation that can be used to characterize the overall uncertainty of the analysis.

Table 4-1 summarizes the variable assumptions in the analysis.

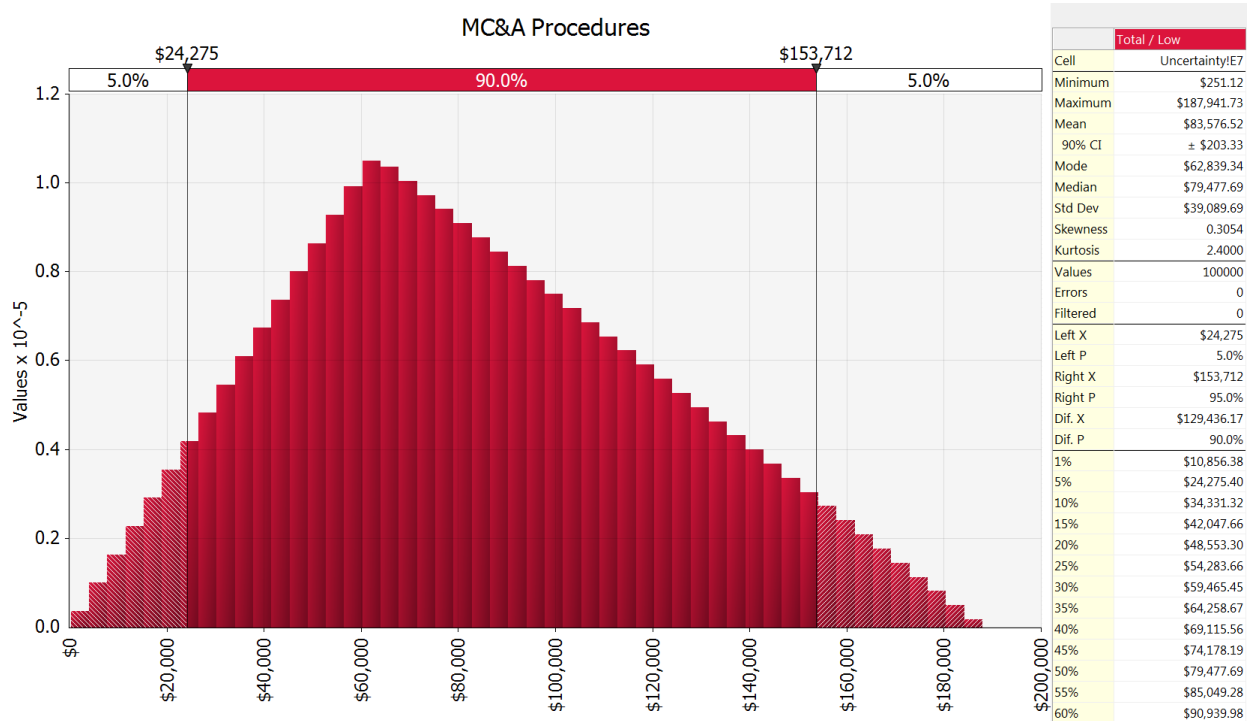
Table 4-1 Uncertainty Analysis Variables

Cost/Benefit Activity	Estimated Labor hours		
GPOs and MC&A procedures 74.19(b)	Low	Best	High
Hours to develop procedures (power reactor operator)	105	210	420
Hours to develop procedures (nuclear engineer)	105	210	420
Hours to develop procedures (licensing assistant)	20	40	80

4.2 Uncertainty Analysis Results

Ten thousand simulations were run. Figure 4-1 displays the histograms of the realized costs.

Figure 4-1 MC&A Procedures



4.3 Summary of the Uncertainty Analysis

The analysis confirms that there is a cost to the industry for this rule. The NRC staff assessed which variables have the largest effect on total industry implementation costs for the rule. As shown in Figure 4-1, the simulation results indicate large variations in the uncertainty associated with the potential implementation costs. Since the actual implementation cost associated with these costs is unknown, the costs for the update to the procedures are a best estimate with a large range of uncertainties. This is reflected in the simulations above.

5. Decision Rationale

The changes in this rulemaking are intended to revise and consolidate MC&A requirements in 10 CFR Part 74 in order to update, clarify, and strengthen the existing requirements. The decision rationale is based on how the benefits and costs have been analyzed. Relative to the no-action alternative, Alternative 2 would result in a one-time implementation cost to each licensee of approximately \$28,000 and an annual cost to each of the licensees of approximately \$2,700.

Offsetting the net cost, the NRC has determined that Alternative 2 would result in qualitative benefits, as discussed previously in Section 3.5 of this regulatory analysis. Although the NRC could not quantify the benefits of this rule, it did examine its benefits qualitatively. These include both the direct benefits that would accrue and the indirect benefits from risks that could be avoided. The decision rationale is based on how the benefits and costs have been analyzed.

The NRC has determined the qualitative benefits of the rule outweigh its costs. Implementing the rule's requirements for item controls would reduce the risk of misuse of SNM. The new item control requirements would increase the accuracy of inventory information that supports the resolution of discrepancies, protects against unauthorized or unrecorded removal of items or removal of SNM from an item, and enhances the capability to rapidly locate selected items. By revising existing item control exemptions, the rule would help ensure that SNM within a facility is not stolen or otherwise diverted from the facility and would promote the NRC's strategic goal of ensuring the secure use of radioactive materials. To confirm the quantities and locations of SNM effectively in accordance with the GPOs, it is assumed that the affected licensees for the new item control system requirements would conduct periodic SNM audits. These audits and reports would help the licensee ensure the MC&A program's effectiveness, which in turn would result in improvements in the licensee's ability to maintain current knowledge of its SNM. These revised MC&A regulations would help ensure that the information about SNM is accurate, authentic, and sufficiently detailed to enable a licensee to maintain current knowledge of its SNM and manage its program for securing and protecting SNM. In addition, the rule would increase regulatory efficiency and effectiveness by clarifying what requirements apply to different types of facilities as well as clarifying acceptable methods for achieving GPOs, promoting efficient licensee implementation and NRC inspection. The NRC has determined that the rule is cost-justified because the benefits associated with reducing the risk of misuse of SNM, improving knowledge, and increasing regulatory efficiency and effectiveness outweigh the estimated costs associated with the rule.

6. Implementation

The NRC staff proposes to make the final rule effective 12 months after its publication in the *Federal Register*. For this analysis, the final rule effective date is 2019.

7. Backfitting

Maintaining control and accounting of nuclear material through an effective MC&A program ensures adequate protection in the secure use and management of nuclear materials. Furthermore, if there is a question of loss or theft from a facility that possesses special nuclear material, that problem can only be resolved if there are records of the nuclear material quantities and locations. By ensuring the accounting and control of these materials, an effective MC&A program protects public health and safety and promotes the common defense and security.

As discussed in Section III of the backfit evaluation (ADAMS Accession No. ML18032A499), the final rule contains provisions that constitute backfitting of entities that are the subject of backfitting and issue finality provisions in 10 CFR Part 50, Part 52, Part 70, and Part 72. These new or revised provisions are necessary extensions and clarifications of existing requirements for the control and accounting of nuclear material at licensed facilities. These provisions clarify and enhance the existing MC&A regulations to promote an effective MC&A program which ensures nuclear materials are properly accounted for and secure. As discussed in Section III of the backfit evaluation, the NRC staff finds that these provisions of the final rule are necessary to maintain adequate protection of the public health and safety and are in accord with the common defense and security. Therefore, the NRC staff finds that the final rule constitutes an acceptable instance of backfitting and violation of issue finality and recommends that the Commission issue the final rule.

8. References

- NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook, Final Report," U.S. Nuclear Regulatory Commission, Washington, DC, January 1997.
- NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Revision 4, U.S. Nuclear Regulatory Commission, Washington, DC, September 2004.
- SECY-08-0059, "Rulemaking Plan: Part 74 - Material Control and Accounting of Special Nuclear Material," April 25, 2008.
- NUREG/CR-4627, "Generic Cost Estimates, Abstracts from Generic Studies for Use in Preparing Regulatory Impact Analyses."
- OMB Circular No. A-4, "Regulatory Analysis," U.S. Office of Management and Budget, Washington, DC, September 17, 2003.
- Department of Labor (U.S.), Bureau of Labor Statistics. Occupational Employment Statistics, Occupational Employment and Wages.
- NUREG-1350, Vol. 29, "NRC Information Digest," 2017-2018 Edition.

9. Appendix A Part 70 Licensees Affected

Name of Licensee	Status	Type	Notes
Babcock & Wilcox Nuclear Operations Group	Active	Cat I	
Nuclear Fuel Services	Active	Cat I	
Shaw AREVA MOX Services, LLC	Under construction (operating license under review)	Cat I	Not included in affected
Northwest Medical Isotopes, LLC	Construction permit issued, construction not started	Cat II	Counted as future affected licensee
SHINE	Construction permit issued, construction not started	Cat II	Counted as future affected licensee
American Centrifuge Plant	License issued, construction halted	Cat III enrichment	Not counted as affected licensee
American Centrifuge Plant, Lead Cascade	License issued, construction halted-decommissioning	Cat III enrichment	Not counted as affected licensee
Louisiana Energy Services, Urenco USA	Active	Cat III enrichment	
Eagle Rock Enrichment Facility	License issued, construction not started	Cat III enrichment	Not counted as affected licensee
Framatome	Active	Cat III FF	
GE-Hitachi Global Laser Enrichment	License issued, construction not started	CAT III enrichment	Not counted as affected licensee
Global Nuclear Fuel – Americas, LLC	Active	Cat III FF	
Westinghouse Electric Company, LLC	Active	Cat III FF	
Department of Commerce, NIST	Active	GTCM	
General Electric (Vallecitos)	Active	GTCM	
Idaho State University	Active	GTCM	
MIT	Active	GTCM	
Penn State	Active	GTCM	
Purdue University	Active	GTCM	

Passport Systems IC	Active	GTCM	
Sensor Concepts & applications	Active	GTCM	