UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OFFICE OF THE
SECRETARY

June 30, 1977

MEMORANDUM FOR: Lee V. Gossick
Executive Director for Operations

FROM: Samuel J. Chilk
Secretary

SUBJECT: SECY-77-79B--NRC AND INTERNATIONAL PHYSICAL PROTECTION STANDARDS, SUPPLEMENT TO SECY-77-79 AND SECY-77-79A

The Commission approves the general approach that is being taken by the staff for considering the extent that NRC actions to upgrade physical protection requirements should meet recommended international standards. The staff should proceed to develop appropriate rules, subject to resolution of the following:

1. The driving force of the proposed action appears to be likely international ramifications. However, the technical merits of any rule change should also be carefully weighed from a domestic vantage. If a technical basis cannot be justified for the physical protection of Categories II and III materials, staff shall analyze alternative arrangements for absorbing costs for such protection (e.g., industry versus government) and make a recommendation to the Commission on the preferred alternative. The staff's proposed course of action would include a major change in NRC's safeguards policy inasmuch as for the first time physical protections measures would be required for low-enriched uranium. Moreover, thresholds for plutonium and uranium-233 would be lowered to as small as 500g or less even though risks of dispersal are not considered. The grading of physical protection measures for nuclear material should be described in perspective to its potential weapons worth--particularly uranium enriched less than 20 percent in the isotope uranium-235 and plutonium and uranium-233 in quantities less than 2kgs.

2. As of April 8, ERDA had drafted two messages (Immediate Action Directives) for distribution to its field offices addressing plutonium and highly enriched uranium in reference to international protection standards. The Commission should be apprised of whether ERDA plans to take a position on low-enriched uranium, and if so, what that position will likely be.

3. There appears to be a transportation cycle gap because proposed physical protection measures address only fixed sites and transfer

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points. The staff should affirm whether NRC requirements already are operationally equivalent to Section 6.1 of INFCIRC/225 General Requirements for Physical Protection of Nuclear Material in Transit, in regard to Categories I-III.

The above analysis should be transmitted to the Commission, along with the proposed rule, within one month.

cc: Chairman Rowden
Commissioner Gilinsky
Commissioner Kennedy
James Kelley
Ken Pedersen

Enclosure 2

ENCLOSURE 3

BACKGROUND

BACKGROUND INFORMATION

March 19, 1976 - SECY 76-158.

April 29, 1976 - SECY 76-158A. The Commission was informed of an impending meeting of the Physical Protection Subgroup of the Nuclear Supplier Group (NSG) of the IAEA to consider physical protection criteria for nuclear material at fixed sites and in-transit.

June 1976. The NSG adopted for application to export shipments, the physical protection criteria recommended by its subgroup and suggested the criteria as minimum requirements for the physical security for internal operations within nuclear facilities of member nations of the NSG.

July 1976. In a letter to the Chairman, Assistant Secretary of State Irving commended the NSG criteria as a basis for the revision of NRC physical protection requirements.

February 11, 1977 - SECY 77-79. This paper analyzed the issue of whether on-going NRC actions to upgrade physical protection requirements should meet recommended international standards and if so, to what extent the recommendations of the IAEA and/or the NSG should be adopted as a basis for regulatory change. The relevant recommendations of SECY 77-79 call for (a) adoption of the NSG categorization of material; and (b) adoption of general performance requirements for Category II and III material that would provide protection equivalent to the measures recommended by the IAEA in its INFCIRC/225.

June 1977. INFCIRC/225 was modified to change the physical protection categories of nuclear materials to be in agreement with those recommended by the NSG.

June 30, 1977. The Commission published SECY 77-79B in which it approved the general approach recommended by the staff in SECY 77-79 and directed the staff to develop a proposed rule, subject to resolution of the following matters:

a. An analysis of the technical justification for the physical protection of Categories II and III materials.

b. Cost estimates for proposed rule implementation and alternative arrangements for absorbing costs for the proposed required protection.

c. ERDA's (DOE) position and plans to protect low-enriched uranium.

d. Affirmation of whether NRC requirements to protect SSNM while in-transit are operationally equivalent to Section 6.1 of INFCIRC/225 in regard to Categories I-III.

July 5, 1977. A proposed rule to upgrade the physical protection of formula quantities of strategic special nuclear material was issued by NRC and published in the Federal Register. Among other things, this proposed rule includes requirements which satisfy INFCIRC/225 recommendations for the protection of Category I material at fixed sites and in-transit.

ENCLOSURE 4

TECHNICAL ASSESSMENT

TECHNICAL ASSESSMENT

Introduction

This enclosure discusses the technical basis for physical protection of Category II and III materials by assessing their utility, relative to Category I materials, as the nuclear components of crude nuclear explosive devices.

In making this assessment, it is useful to separate the materials within Categories II and III into three classes. The first class consists of small quantities (less than the five kilogram formula amount) of strategic special nuclear material (uranium-233, plutonium, and uranium enriched to 20% or more in the U-235 isotope). The second class consists of low enriched uranium (uranium enriched to less than 20% in the U-235 isotope). Finally, the third class consists of irradiated materials (special nuclear material which is not readily separable from other radioactive material and which has a total external dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding). These classes of materials will form the basis of the discussion of the weapons utility of Category II and III materials.

The utility of a specific type and quantity of special nuclear material in fabricating crude nuclear devicesdepends upon a number of factors which cannot be precisely assessed for regulatory purposes. These factors include the physical and chemical form of the special nuclear material, the specific details of the design of the intended nuclear explosive device, and the technical skills and competence of the group attempting to construct the device. Therefore, rather than addressing these considerations in detail for all possible combinations of Category II and III materials, this discussion is oriented toward maintaining the degree of safeguards conservatism expressed in the Operating Assumption Covering the Relative Ease of Fabricating Clandestine Fission Explosives (attached).

SMALL QUANTITIES OF STRATEGIC SPECIAL NUCLEAR MATERIALS

The Category II materials in this class are unirradiated plutonium or uranium - 233 or uranium 235 (contained in uranium enriched to 20 percent or more in the U-235 isotope) or any combination of these materials in a quantity of less than 5000 grams when computed by the formula, grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium), but which is in a quantity of 1000 grams or more when computed by the formula, grams = (grams contained U-235) + 2 (grams U-233 + grams plutonium). The

Category III materials in this class are unirradiated plutonium or uranium - 233 or uranium - 235 (contained in uranium enriched to 20 percent or more in the U-235 isotope) or any combination of these materials in a quantity of less than 1000 grams when computed by the formula, grams = (grams contained U-235) + 2 (grams U-233 + grams plutonium), but more than 15 grams when computed by the formula, grams = grams plutonium + grams U-233 + grams U-235.

Based upon information supplied by DOE and the weapons laboratories, a single theft of the quantities of the type of strategic special nuclear material specified in either Category II or Category III would not provide sufficient special nuclear material to construct a crude nuclear device. Therefore, the safeguards concern with this class of materials is the possibility of undetected multiple thefts.

LOW ENRICHED MATERIALS

The Category II materials which are in this class are 10,000 grams or more of unirradiated uranium-235 (contained in uranium enriched to 10 percent or more but less than 20 percent in the U-235 isotope). The Category III materials which are in this class are less than 10,000 grams but more than 1000 grams of uranium-235 (contained in uranium enriched to 10 percent or more but less than 20 percent in the U-235 isotope) or more than 10,000 grams of uranium-235 (contained in uranium enriched above natural but less than 10 percent in the U-235 isotope).

Based upon information supplied by DOE and the weapons laboratories, none of the low enriched materials in Categories II or III can be directly used in a practical low technology nuclear explosive device. Before those materials could practically be used in such a device, they would either have to be enriched in the isotope uranium-235 or used to fuel a reactor, producing plutonium which could then be reprocessed from the irradiated fuel. Either of these processes is considered to be beyond the capability of a sub-national level group at this time.

When safeguards are considered for these low enriched materials, it is important to realize that both covert enrichment of uranium and covert use of uranium in a reactor can begin with natural uranium. Enrichment of natural uranium to greater than 20 percent in the isotope uranium-235 requires almost twice as much separative work as does the further enrichment of 3 percent enriched uranium to the same isotopic percentage in uranium-235. However, this difference in the required level of effort is slight in comparison to the total effort currently required to design, construct, and operate an enrichment facility. Likewise, the conversion of natural uranium into plutonium requires a specially designed reactor

(for example, a CANDU or graphite moderated reactor). Nevertheless, the design and construction of such reactors are not inherently more difficult than the design and construction of reactors using enriched uranium fuels. Therefore, the technical basis for establishing safeguards for natural uranium is comparable to that for establishing safeguards for low enriched uranium.

The primary safeguards requirements for low enriched uranium would be the timely detection of the diversion of amounts of material which might be used outside the U.S. in a reactor to produce plutonium or in an enrichment facility to produce HEU. Uncertainty about possible advances in enrichment technology (for example laser enrichment) which, might eventually make it possible for a sub-national group to covertly enrich uranium, may suggest that it would be prudent to safeguard this material at an appropriate level. Therefore, although the main justification for protection of these materials is to demonstrate U.S. willingness to cooperate with the IAEA in support of international safeguards objectives, there may be some justification for protection of these materials against possible future domestic threats.

IRRADIATED MATERIALS

Both Category II and Category III contain irradiated materials. In order to use those materials in a crude nuclear explosive device it is necessary to separate the special nuclear material from the fission product "poisons" and radioactive heat sources. Such a separation is a complex chemical process which is further complicated by the radiation protection measures required. Based upon information provided by DOE the combination of technical skills and physical plant required to separate special nuclear material from irradiated materials is beyond the capability of a sub-national group. Therefore, the primary safeguards requirements for irradiated materials would be the timely detection of diversion of amounts which might be processed outside the U.S. to produce Category I quantities of plutonium. Such large quantities of irradiated strategic special nuclear materials are now protected under current NRC regulations. Safeguards measures do not appear warranted for small or moderate quantities of such materials from either domestic or international standpoints.

CONCLUSIONS AND RECOMMENDATIONS

The simplest manner in which Category II or III materials can be utilized in the construction of a crude nuclear explosive, considering only the problems of the design and fabrication of the device, is to accumulate plutonium, uranium-233, or uranium-235 (enriched to greater than 20%) by multiple thefts until a Category I quantity is obtained. Based upon information supplied by DOE and the weapons laboratories, this is the only way in which a sub-national group could utilize Category II or III

materials to construct a practical nuclear device. This sets the baseline technical requirements for the safeguarding of Category II and III materials. Consistency with our conservative operating assumption (attached) requires that safeguards deter and detect thefts of small and moderate quantities of SSNM.

Additionally, safeguards should be based upon the necessity for timely detection of possible diversion of LEU.

OPERATING ASSUMPTION COVERING THE RELATIVE EASE OF FABRICATING CLANDESTINE FISSION EXPLOSIVES

Background: Under the Energy Reorganization Act of 1974, ERDA was given the responsibility for nuclear weapons design and fabrication. Therefore, NRC relies upon ERDA for technical information related to this area. Since detailed technical information specifically applicable to the design and fabrication of a clandestine fission explosive (CFE) might assist an individual or a group with interest inimical to the public health and safety in either constructing a CFE or perpetrating a credible hoax, this information is classified and subject to strict need-to-know considerations. Consequently, it is impractical to disseminate such data to more than a few NRC personnel who have safeguards responsibilities. This factor, coupled with an appreciation for the dire consequences which could arise from the successful detonation of a CFE, creates the need for a conservative operating assumption in this area. The following assumption has been formulated for the use of NRC staff members with safeguards responsibilities.

Operating Assumption: It is assumed that a small non-national group of people could design and build a crude nuclear explosive device which would produce a significant nuclear yield, that is, a yield much greater than the yield of an equal mass of high explosive. To accomplish this, they would need an amount of special nuclear material which is at least equal to the five-kilogram formula quantity, and they would have to possess the appropriate technical capabilities.

Degree of Conservation of the Operating Assumption: The operating assumption considers two different aspects of the fabrication of a CFE - the amount of SNM required and the technical capability of a group of people attempting the task. The conservatism of each aspect of the assumption is addressed below.

Based upon information supplied by ERDA, more than one theft equal to the five-kilogram formula would be required to construct a CFE. Furthermore, for many types of SNM found within the fuel cycle, significantly more SNM than the five-kilogram formula amount would be required to construct a CFE without metallurgical or chemical processing. However, considering the disastrous consequences of a detonation of a CFE, NRC policy should give safeguards no credit for the fact that more than a five-kilogram formula quantity of SNM is required to construct a CFE.

The degree of conservatism concerning the relative ease of designing and fabricating a CFE, including the time required, is a matter of some conjecture because of the inherent uncertainties associated

with the technical competence of a non-national group. The group would have to include persons capable of searching and understanding the technical literature in several fields and of accomplishing the required technician-type tasks. A great deal depends on the competance of the group; if that is deficient, not only is the chance of producing a total failure increased, but the chance that a member of the group might suffer serious or fatal injury would be quite real. In addition, the possibility of rapid assembly after material acquisition depends strongly on the technical competence of the group. Again, however, due to the disastrous consequences of the detonation of a CFE, NRC policy should give safeguards no credit for the difficulty or any extended length of time involved in designing and fabricating a CFE.

ENCLOSURE 5

PROPOSED RULE

ENCLOSURE 5

NUCLEAR REGULATORY COMMISSION

[10 CFR PART 73]

PHYSICAL PROTECTION OF PLANTS AND MATERIALS

[10 CFR PART 150]

EXEMPTIONS AND CONTINUED REGULATORY AUTHORITY IN AGREEMENT STATES UNDER SECTION 274

Safeguard Requirements for Special Nuclear Material of Moderate and Low Strategic Significance

AGENCY: U.S. Nuclear Regulatory Commission

ACTION: Proposed Rule

SUMMARY: The Nuclear Regulatory Commission is considering amendments to its regulations for physical protection of plants and materials, including nonpower reactors.* These amendments would require physical protection measures against theft of special nuclear material of moderate and low strategic significance. The amendments are proposed in the interest of common defense and security. The measures proposed are designed to provide a level of protection equivalent to that recommended in Information Circular/225 (INFCIRC/225) published by the International Atomic Energy Agency (IAEA). The amendment would specify protection requirements for nuclear materials used at fixed

*Consideration is also being given to the development of additional and supplemental safeguard requirements designed specifically for nonpower reactors. These proposed requirements will be published at a later date for public comment.

sites, including nonpower reactors, and for nuclear materials in transit.

Physical protection requirements for independent spent fuel storage installations and nuclear power reactors are presently covered under 10 CFR § 73.40, § 73.50 and § 73.55 and therefore are not included in these amendments.

DATES: Comments must be received on or before _____, 1978. (date 30 days after publication in FR)

ADDRESSES: Comments or suggestions for consideration in connection with the proposed amendments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch. Copies of comments received may be examined at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C.

FOR FURTHER INFORMATION CONTACT: Mr. R. J. Jones, Chief, Material Protection Standards Branch, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D. C. 20555 (301) 443-5973 or Mr. C. K. Nulsen, Requirements Analysis Branch, Division of Safeguards, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 (301) 427-4043.

SUPPLEMENTARY INFORMATION: The Nuclear Regulatory Commission is considering amendments to its regulations in 10 CFR 73, "Physical Protection of Plants and Materials." These amendments would require

physical protection measures against theft of special nuclear material of moderate and low strategic significance.

The proposed amendments are designed to protect against the theft of special nuclear material of a type and quantity that is not directly useable in the manufacture of a nuclear weapon but which nevertheless could be of substantial assistance in such a project. The proposed amendments would provide a level of protection equivalent to that recommended for Categories II and III material in Information Circular 225 bulletin published by the IAEA as shown in Table 1. Physical protection of unirradiated SNM in Categories II and III is justified on the basis of enhancing domestic protection of such materials by providing theft detection and deterrence capabilities and demonstrating U.S. willingness to accept international physical security standards.

The publication of recommended physical security measures for materials of moderate and low strategic importance by the IAEA, in Information Circular/225 (INFCIRC/225), was accompanied by assessments of domestic safeguards needs relative to those materials. It is the staff's judgment that the proposed requirements are technically justified and are necessary, even without taking into account the general desirability of United States acceptance of internationally recommended standards developed and promulgated with full United States participation. In the absence of protection measures, an adversary could obtain a formula quantity or more of plutonium, U-233 or HEU through multiple thefts of quantities of materials of

Table 1
IAEA CATEGORIZATION OF NUCLEAR MATERIAL[e]

Material	Form	Category I	Category II	Category III
1. Plutonium[a,f]	Unirradiated[b]	2 kg or more	Less than 2 kg but more than 500 g	500 g or less[c]
2. Uranium-235[d]	Unirradiated[b]			
	- uranium enriched to 20% ^{235}U or more	5 kg or more	Less than 5 kg but more than 1 kg	1 kg or less[c]
	- uranium enriched to 10% ^{235}U but less than 20%	-	10 kg or more	Less than 10 kg[c]
	- uranium enriched above natural, but less than 10% ^{235}U	-	-	10 kg or more
3. Uranium-233	Unirradiated[b]	2 kg or more	Less than 2 kg but more than 500 g	500 g or less[c]

[a] All plutonium except that with isotopic concentration exceeding 80% in plutonium-238.

[b] Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 100 rads/hour at one meter unshielded.

[c] Less than a radiologically significant quantity should be exempted.

[d] Natural uranium, depleted uranium and thorium and quantities of uranium enriched to less than 10% not falling in Category III should be protected in accordance with prudent management practice.

[e] Irradiated fuel should be protected as Category I, II or III nuclear material depending on the category of the fresh fuel. However, fuel which by virtue of its original fissile material content is included as Category I or II before irradiation should only be reduced one Category level, while the radiation level from the fuel exceeds 100 rads/h at one meter unshielded.

[f] The State's competent authority should determine if there is a credible threat to disperse plutonium malevolently. The State should then apply physical protection requirements for category I, II or III of nuclear material, as it deems appropriate and without regard to the plutonium quantity specified under each category herein, to the plutonium isotopes in those quantities and forms determined by the State to fall within the scope of the credible dispersal threat.

moderate or low strategic significance. In addition, quantities of uranium enriched to less than 20% U-235 could be diverted, without timely detection, to other countries for additional enrichment or for plutonium production.

The proposed amendments differ in substance from the IAEA categorization in that:

1. a lower limit of 15 grams for plutonium, high enriched uranium-235, or uranium-233 is set for special nuclear material of low strategic significance (Category III),
2. a lower limit of 1000 grams for uranium-235 (contained in uranium enriched to 10 percent or more but less than 20 percent in the U-235 isotope) is set for special nuclear material of low strategic significance (Category III),
3. physical protection is also explicitly required for the combination of plutonium, high enriched uranium, or uranium-233 for special nuclear material of moderate strategic significance (Category II) and low strategic significance (Category III), and
4. independent spent fuel storage installations are presently covered under 10 CFR § 73.40 and 73.50 and therefore are not included in these amendments.

Basically the proposed physical protection measures for special nuclear material of moderate strategic significance require:

using and storing the material in a controlled access area,

2. limiting access to the material only to authorized individuals whose trustworthiness has previously been determined,

3. continuously monitoring the area to detect unauthorized activities, and

4. transporting the material under controlled and planned conditions.

The proposed physical protection measures for special nuclear material of low strategic significance basically require:

1. using and storing the material in a controlled access area,

2. continuously monitoring the controlled access area to detect unauthorized activities, and

3. transporting the material under controlled and planned conditions.

The proposed amendments would apply to licensees authorized to possess, use, transfer, import, and export certain quantities of special nuclear material. Licensees possessing special nuclear material of low strategic significance who are licensed under the agreement states requirements of Part 150 of this chapter will be required to meet the requirements of these proposed amendments pursuant to section 274m of the Atomic Energy Act of 1954, as amended.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that

adoption of the following amendments to Title 10, Chapter I, Code of Federal Regulations, Part 73 is contemplated.

1. Paragraph 70.22(g) of 10 CFR Part 70 is revised as follows:

* * * * *

(g) Each application for a license which would authorize the transport, export or delivery to a carrier for transport of special nuclear material in an amount specified in § 73.1(b)(2) of this chapter shall include a ~~description of the~~** plan for the physical protection of special nuclear material in transit in accordance with §§ 73.30 through 73.36, 73.47(a) and(e), 73.47(g) for 10 Kg or more of special nuclear material of low strategic significance, and 73.70(g) of this chapter including a plan for the selection, qualification and training of armed escorts, or the specification and design of a specially designed truck or trailer as appropriate.

2. Paragraph 70.22(h) of 10 CFR Part 70 is revised as follows:

* * * * *

(h) Each application for a license to possess or use at any site or contiguous sites subject to control by the licensee uranium-235 (contained in uranium enriched to 20 percent or more in the uranium-235 isotope), uranium-233, or plutonium alone or in any combination in a quantity of 5,000 grams or more computed by the formula, grams = (grams

** Comparative text to the existing regulations.
Deletions are lined through and additions are underscored.

contained in U-235) + 2.5 (grams U-233 + grams plutonium), other than a license for possession or use of such material in the operation of a nuclear reactor licensed pursuant to Part 50 of this chapter, shall include a physical security plan, consisting of two parts. Part I shall address vital equipment, vital areas, and isolation zones, and shall demonstrate how the applicant plans to meet the requirements of §§ 73.40, 73.50, 73.60, 73.70, and 73.71 [Part 73] of this chapter in the conduct of the activity to be licensed. Part II shall list tests, inspections, and other means to demonstrate compliance with such requirements.

3. A new paragraph 70.22(j) is added to 10 CFR Part 70.22:

* * * * *

(j) Each application for a license to possess or use at any site or contiguous sites subject to control by the licensee special nuclear material of moderate strategic significance or 10 Kg or more of special nuclear material of low strategic significance as defined under §§ 73.2(z) and (aa) of this chapter, other than a license for possession or use of such material in the operation of a nuclear power reactor licensed pursuant to Part 50 of this chapter, shall include a physical security plan which shall demonstrate how the applicant plans to meet the requirements of Paragraphs 73.47(c) and (d) of Part 73 of this chapter.

4. Paragraph 73.1(b) of 10 CFR Part 73 is revised to read as follows:

§ 73.1 Purpose and Scope

* * * * *

(b) Scope

(1) This part prescribes requirements for (i) the physical protection of production and utilization facilities licensed pursuant to Part 50 of this chapter; (ii) the physical protection of plants in which activities licensed pursuant to Part 70 of this chapter are conducted, and (iii) the physical protection of special nuclear material, by any person who pursuant to the regulations in Part 70 of this chapter possesses or uses at any site or contiguous sites subject to the control by the license, formula quantities of strategic special nuclear material* or special nuclear material of moderate strategic significance or special nuclear material of low strategic significance ~~uranium-235(contained-in-uranium-enriched-to-20-percent-or-more-in-the U-235-isotope);-uranium-233;-or-plutonium-alone-or-in-any-combination in-a-quantity-of-5000-grams-or-more-computed-by-the-formula;-grams-= (grams-contained-in-U-235)-+-2.5-(grams-U-233--grams-plutonium).*~~

(2) This part prescribes requirements for the physical protection of special nuclear material in transportation by any person who is licensed pursuant to the regulations in Part 70 of this chapter who imports, exports, transports, delivers to a carrier for transport in a single shipment, or takes delivery of a single shipment free on board where it is delivered to a carrier, formula

quantities of strategic special nuclear material* or special nuclear material of moderate strategic significance or special nuclear material of low strategic significance ~~either uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope); uranium-233, or plutonium; or any combination of these materials, which is 5000 grams or more computed by the formula, grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium);~~

5. Section 73.2 of 10 CFR Part 73 is amended by adding new paragraphs (z) and (aa) to read as follows:

§ 73.2 Definitions

* * * * *

(z) "special nuclear material of moderate strategic significance" means:

(1) less than formula quantities of strategic special nuclear material, but in a quantity of more than 1000 grams of uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope) or more than 500 grams of uranium-233 or plutonium or in a combined quantity of more than 1000 grams when computed by the equation, grams = (grams contained U-235) + 2 (grams U-233 + grams plutonium), or

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* As defined in Section 73.2(t) and (u) of the proposed rule published in 42 FR 34310 dated July 5, 1977.

(2) 10,000 grams or more of uranium-235 (contained in uranium enriched to 10 percent or more but less than 20 percent in the U-235 isotope).

(aa) "special nuclear material of low strategic significance" means:

(1) less than an amount of strategic special nuclear material of moderate strategic significance, as defined in Paragraph 73.2(z)(1) of this Part, but more than 15 grams of uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope) or 15 grams of uranium-233 or 15 grams of plutonium or the combination of 15 grams when computed by the equation, grams = grams contained U-235 + grams plutonium + grams U-233, or

(2) less than 10,000 grams but more than 1000 grams of uranium-235 (contained in uranium enriched to 10 percent or more but less than 20 percent in the U-235 isotope), or

(3) 10,000 grams or more of uranium-235 contained in uranium enriched above natural but less than 10 percent in the U-235 isotope.

6. A new section 73.47 is added to 10 CFR Part 73 to read as follows:

§ 73.47 LICENSEE FIXED SITE AND IN TRANSIT REQUIREMENTS FOR THE PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIAL OF MODERATE AND LOW STRATEGIC SIGNIFICANCE.

(a) General Performance Objectives

(1) Each licensee who possesses, uses or transports strategic nuclear material of low or moderate strategic significance shall

establish and maintain a physical protection system that will achieve the following objectives:

(i) Minimize the possibilities for unauthorized removal of special nuclear material consistent with the potential consequences of such actions; and

(ii) Facilitate the location and recovery of missing special nuclear material.

(2) To achieve these objectives, the physical protection system shall:

(i) Detect and assess unauthorized access and materials introduction into, or unauthorized activities within the vicinity of special nuclear material;

(ii) Detect and assess unauthorized removal of special nuclear material;

(iii) Assure proper placement and transfer of custody of special nuclear material; and

(iv) Respond to indications of unauthorized removal of special nuclear material and communicate to appropriate response forces in order to facilitate its recovery.

(b) A licensee is exempt from the requirements of this section to the extent that he possesses, uses, or transports special nuclear material which is not readily separable from other radioactive material and which has a total external radiation dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding.

(c) Each licensee who possesses, uses, or transports special nuclear material of moderate strategic significance or 10 Kg or more of special nuclear material of low strategic significance shall submit by [date 60 days from publication in effective form in FR] a security plan or an amended security plan describing how the licensee will comply with all the requirements of Sections 73.47(c), (d), (e), and (f), including schedules of implementation.

(d) FIXED SITE REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL OF MODERATE STRATEGIC SIGNIFICANCE - Each licensee who possesses, stores, or uses quantities and types of special nuclear material of moderate strategic significance at fixed sites, except those who are licensed to operate a nuclear power reactor pursuant to Part 50, shall:

(1) store or use such material only within a controlled access area which is illuminated sufficient to allow detection and surveillance of unauthorized penetration or activities,

(2) store such material within a vault, vault-type room, or GSA approved security cabinet,

(3) continuously monitor with an intrusion alarm or other devices or procedures the controlled access area to detect unauthorized penetration or activities,

(4) conduct preemployment screening to determine the trustworthiness of employees having access to the material,

(5) develop and maintain a controlled badging and lock system to identify and limit access to the controlled access area to authorized individuals,

(6) limit access to the controlled area to authorized individuals who require such access in order to perform their duties,

(7) assure that all visitors to the controlled access area are under the constant escort of an individual who has been authorized unescorted access to the area,

(8) establish a security organization consisting of at least one watchman per shift able to assess and respond to any security incidents in the controlled access area,

(9) provide a communication capability between the security organization and appropriate response force,

(10) search on a random basis vehicles and packages entering or leaving the controlled access area, and

(11) establish and maintain contingency plans for dealing with threats of thefts or thefts of such material.

(e) IN TRANSIT REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL OF MODERATE STRATEGIC SIGNIFICANCE -

(1) Each licensee who transports, exports or who delivers to a carrier for transport special nuclear material of moderate strategic significance shall:

(i) provide advance notification to the receiver of any planned shipments specifying the mode of transport, estimated time of arrival, location of the nuclear material transfer, name of carrier and flight number, if applicable,

(ii) receive confirmation from the receiver prior to the commencement of the planned shipment that the receiver will be ready to

accept the shipment at the planned time and location and acknowledges the specified mode of transport,

(iii) transport the material in a locked or sealed container, and

(iv) check the integrity of the containers, locks, and seals prior to shipment.

(2) Each licensee who receives special nuclear material of moderate strategic significance shall:

(i) check the integrity of the containers, locks, and seals upon receipt of the shipment, and

(ii) notify the shipper of receipt of the material as required in Section 70.54 of Part 70 of this chapter.

(3) Each licensee who arranges for the physical protection of special nuclear material of moderate strategic significance while in transit or who takes delivery of such material free on board (f.o.b.) the point at which it is delivered to a carrier for transport shall:

(i) arrange for a telephone or radio communications capability between the carrier of the material and the shipper or receiver,

(ii) minimize the time that the material is in transit by reducing the number and duration of nuclear material transfers and by routing the material in the most safe and direct manner,

(iii) conduct preemployment screening, of all licensee employees involved in the transportation of the material to determine the trustworthiness of the individual entrusted with transportation duties,

(iv) establish and maintain contingency plans for dealing with threats of thefts or thefts of such material,

(v) make arrangements to be notified immediately of the arrival of the shipment at its destination, or of any such shipment that is lost or unaccounted for after the estimated time of arrival at its destination, and

(vi) conduct immediately a trace investigation of any shipment that is lost or unaccounted for after the estimated arrival time and report to the Nuclear Regulatory Commission as specified in § 73.71 and to the shipper or receiver as appropriate. The licensee who made the physical protection arrangements shall also immediately notify the Director of the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office listed in Appendix A of the action being taken to trace the shipment.

(4) Each licensee who exports special nuclear material of moderate strategic significance shall comply with the requirements specified in paragrapns 73.47(c) and (e)(1) and (3) up to the first point where the shipment is offloaded outside the United States,

(5) Each licensee who imports special nuclear material of moderate strategic significance shall,

(i) comply with the requirements specified in paragrapns 73.47(c) and (e)(2) and (3) from the first point where the shipment is picked up inside the United States, and

(ii) notify the exporter who delivered the material to a carrier for transport of the arrival of such material.

(f) FIXED SITE REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL OF LOW STRATEGIC SIGNIFICANCE - Each licensee who possesses, or uses special

nuclear material of low strategic significance at fixed sites except those who are licensed to operate a nuclear power reactor pursuant to Part 50, shall:

(1) store or use such material only within a controlled access area,

(2) continuously monitor with an intrusion alarm or other devices or procedures the controlled access area to detect unauthorized penetrations or activities,

(3) assure that a guard, watchman, or offsite response force will respond to all unauthorized penetrations or activities, and

(4) establish and maintain contingency plans for dealing with threats of thefts or thefts of such material.

(g) IN TRANSIT REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL OF LOW STRATEGIC SIGNIFICANCE -

(1) Each licensee who transports or who delivers to a carrier for transport special nuclear material of low strategic significance shall:

(i) provide advance notification to the receiver of any planned shipments specifying the mode of transport, estimated time of arrival, location of the nuclear material transfer, name of carrier and flight number, if applicable,

(ii) receive confirmation from the receiver prior to commencement of the planned shipment that the receiver will be ready to accept the shipment at the planned time and location and acknowledges the specified mode of transport,

(iii) transport the material in locked or sealed containers, and

(iv) check the integrity of the containers, locks, and seals prior to shipment.

(2) Each licensee who receives quantities and types of special nuclear material of low strategic significance shall:

(i) check the integrity of the containers, locks, and seals upon receipt of the shipment and

(ii) notify the shipper of receipt of the material as required in section 70.54 of Part 70 of this chapter.

(3) Each licensee who arranges for the physical protection of special nuclear material of low strategic significance while in transit or who takes delivery of such material free on board (f.o.b.) the point at which it is delivered to a carrier for transport shall:

(i) establish and maintain contingency plans for dealing with threats of thefts or thefts of such material,

(ii) make arrangements to be notified immediately of the arrival of the shipment at its destination, or of any such shipment that is lost or unaccounted for after the estimated time of arrival at its destination, and

(iii) conduct immediately a trace investigation of any shipment that is lost or unaccounted for after the estimated arrival time and report to the Nuclear Regulatory Commission as specified in § 73.71 and to the shipper or receiver as appropriate. The licensee who made the physical protection arrangements shall also immediately notify the Director of the appropriate Nuclear Regulatory Commission Inspection

and Enforcement Regional Office listed in Appendix A of the action being taken to trace the shipment.

(4) Each licensee who exports special nuclear material of low strategic significance shall comply with the appropriate requirements specified in paragraphs 73.47(c) and (g)(1) and (3) up to the first point where the shipment is offloaded outside the United States.

(5) Each licensee who imports special nuclear material of low strategic significance shall:

(i) comply with the requirements specified in paragraph 73.47(c) and (g)(2) and (3) from the first point where the shipment is picked up inside the United States, and

(ii) notify the person who delivered the material to a carrier for transport of the arrival of such material.

7. Section 73.71(a) of 10 CFR Part 73 is changed as follows:

§ 73.71 Reports of unaccounted for shipments, suspected theft, unlawful diversion, or industrial sabotage.

(a) Each licensee who conducts a trace investigation of a lost or unaccounted for shipment pursuant to § 73.36(f), § 73.47(e)(3)(vi), or § 73.47(g)(3)(iii) shall immediately report to the appropriate NRC Regional Office listed in Appendix A of this part the details and results of his trace investigation and shall file within a period of fifteen (15) days a written report to the appropriate NRC Regional Office setting forth the details and results of the trace investigation. A copy of such written report shall be sent to the Director of

Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

* * * * *

8. Section 73.72 of 10 CFR Part 73 is amended as follows:

§ 73.72 Requirement for advance notice of shipment of special nuclear material.

Each licensee who plans to import, export, transport, deliver to a carrier for transport in a single shipment, or take delivery at the point where it is delivered to a carrier, formula quantities of strategic special nuclear material [~~quantities of special nuclear material as specified in § 73.1(b)(2)~~] shall notify the Director of the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office listed in Appendix A by U.S. Mail, postmarked at least seven days in advance of the shipping date. The following information shall be furnished in the advance notice: shipper, receiver, carrier(s), estimated date and time of departure and arrival, transfer point(s), and mode(s) of shipment. The Director of the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office shall also be notified by telephone seven days in advance of the shipping date that an advance shipping notice has been sent by mail, and of any changes to the shipment itinerary prior to the shipment date. Road shipments or transfers with one way transit times of one hour or less in duration between installations of a licensee are exempt from the requirements of this section.

9. A new Section 150.14 of 10 CFR Part 150 is added to read as follows:

§ 150.14 Commission Regulatory Authority for Physical Protection Persons in Agreement States possessing, using or transporting special nuclear material of low strategic significance, that is, in quantities greater than 15 grams of plutonium or uranium-233 or uranium-235 (enriched to 20% or more in the U-235 isotope) or any combination greater than 15 grams when computed by the equation grams = grams plutonium + grams uranium-233 + grams uranium-235 (enriched to 20% or greater in the U-235 isotope), shall meet the physical protection requirements of § 73.47 of 10 CFR Part 73.

Dated at Washington, D.C. this _____ day of _____, 1978.

For the Nuclear Regulatory Commission.

_____
Samuel J. Chilk
Secretary of the Commission

ENCLOSURE 6

VALUE/IMPACT ASSESSMENT CONTAINING A REPORT JUSTIFICATION ANALYSIS

ENCLOSURE "6"

VALUE/IMPACT ASSESSMENT CONTAINING A REPORT JUSTIFICATION ANALYSIS PHYSICAL PROTECTION OF PLANTS AND MATERIALS

EXEMPTIONS AND CONTINUED REGULATORY AUTHORITY IN AGREEMENT STATES UNDER SECTION 274

Proposed Amendments to §70.22(g), (h) and (j); §73.(b)(1) and (2); §73.2(2) and (aa); §73.4(a)(b),(c), (d), (e) and (f); §73.71(a); §73.72 and §150.4

I. The Proposed Action

A. Description

Proposed amendments to 10 CFR Part 73 would require that various Part 50, Part 70 and state/licensees including most non-power reactors, various fuel cycle facilities and many research and teaching institutions possessing, using, or transporting non self protecting SNM of: less than 5000 gm formula quantities of Pu, U-233 and U-235 enriched to 20% or more; or more than 1 Kg of U-235 as uranium enriched to 10% but less than 20%; or more than 10 Kg of U-235 as low-enriched uranium, implement new provisions for physical security. These provisions are equivalent to those standards set out in the International Atomic Energy Agency (IAEA) circular INFIRC/225.

B. Need for the Proposed Action

The publication of recommended physical security requirements for materials of moderate and low strategic importance by the IAEA, INFCIRC/225, and the participation by the United States in their development, was accompanied by and continues to be accompanied by assessments of domestic safeguards needs related to those materials. It is the staff judgment that the proposed requirements are technically justified as a necessary safeguards upgrading action commensurate with internationally recognized requirements, developed and promulgated with full United States participation.

C. Value/Impact of the Proposed Action

1. NRC Operations

The proposed requirements would deter theft of materials of moderate and low strategic significance and would assure timely detection of thefts or attempted thefts. For each of the proposed requirements, the Office of Nuclear Material Safety and Safeguards, the Office of Nuclear Reactor Regulation, and the Office of Standards Development would prepare acceptance criteria in sufficient detail to enable an evaluator to determine whether a given device or procedure would satisfy the requirements. This work would require no additional staffing for those offices. The effort required to conduct reviews of the security plans submitted by about 54 licensees who possess SNM of moderate strategic significance is estimated to be 44 man months. No additional staffing in the Division of Safeguards would be necessary to complete these reviews or for routine maintenance. The Office of Inspection and Enforcement would make initial adequacy determinations at each of the affected facilities and thereafter would inspect facilities possessing material of moderate strategic significance at appropriate intervals. The Office of Inspection and Enforcement would require additional personnel to carry out this program.

2. Other Government Agencies

Other government agencies shall minimally, if at all, be involved in the development of the needed contingency plan information from a licensee. The FBI, DOE and DOD may be involved in other contingency plans developed by the NRC.

Wholesale disposal of Pu-Be sources, which may be stimulated by the proposed amendments for materials of low strategic significance, could work logistical problems upon the DOE's Mound Laboratories - the responsible return depot for the leased ^{239}Pu.

3. Industry

Benefits to industry would be improved protection of valuable materials and facilities. Much of the industry is already in substantial conformance with the proposed requirements, having responded to interim guidance on such matters in the case of medium power non power reactors, and elsewhere to the general prudent deployment of accepted industrial security practices. Promulgation of the proposed requirements would

codify widely existent practice. Competition amongst the commercially oriented licensees would be enhanced by subjecting everyone to uniform security costs.

The impact upon the licensees will be costs associated with compliance with the proposed regulations. Costs and benefits, of particular safeguards items are detailed in Annex 1 to this Enclosure 6. The affected industry and the development of industry wide cost impacts are described in further detail in Annex 2 to this Enclosure 6.

Protection requirements for material of moderate strategic significance would apply at about 54 facilities. The maximum capital cost per affected facility would be $11,000, and would apply only if the facility had to install a complete new security system including an intrusion alarm system, locks, lights, badge systems and an around-the-clock security force. Annual costs subsequent to the first year would be about $45,000, almost entirely for guard force salaries and overhead expenses. Since all affected facilities already have watchman coverage and are attended by responsible operating staff during working hours, it is estimated that none will actually require additional security forces. Deployment of upgraded physical security systems are expected to be such that the 54 impacted facilities will incur fixed site incremental capital costs of about $330,000 and incremental annual operating costs of about $33,000. Incremental costs for transportation are estimated to total about $145,000 capital and $14,000 annual operating. Details are given in Tables III through VI of Annex 2 to this Enclosure 6.

Protection requirements for material of low strategic significance would apply at almost 500 licensees--the overwhelming majority of which are universities each possessing from 16 to 80 grams of plutonium as 1 to 5 curie Pu-Be neutron sources. The maximum capital cost per secured location is estimated to be about $3,300, which includes $660 for an alarm system. Annual costs are estimated as about $600. It is estimated that the affected industry will incur incremental fixed site capital costs of about $900,000 and incremental annual costs of $250,000 and incremental capital and annual costs for transportation of about $120,000 and $12,000, respectively. Details are given in Tables VII through X of Annex 2 to this Enclosure 6.

Many of the affected universities received their small inventories of plutonium as gifts of 1 to 5 curie Pu-Be neutron sources from industrial users when the latter switched to AmO_2-Be and $^{238}PuO_2$-Be neutron sources. Those Pu-Be sources can be replaced with AmO_2-Be or $^{238}PuO_2$-Be sources at prices comparable to those estimated for effecting the

proposed physical security requirements for materials of low strategic significance, i.e., $1,400 to $1,900 for 1 to 5 Ci $^{238}PuO_2$-Be or $1,600 to $2,900 for 1 to 5 Ci AmO_2-Be sources. Some users may elect that alternative. Others may simply dispose of their sources and amend or terminate their licenses.

4. Public

No impact on the public can be foreseen. The public will benefit in that a more rigorous approach to physical security has taken place leading to a higher level of assurance that extensive thefts or attempted thefts of nuclear materials of strategic significance are unlikely and are likely to be detected in a timely manner. Further, the proposed amendments support international safeguards and non-proliferation objectives.

II. Technical Approach

A. Technical Alternatives

1. Other technical means of accomplishing the required physical security upgrading.

2. Replacement of strategically significant materials, i.e., Pu in Pu-Be sources with AmO_2 or $^{238}PuO_2$.

3. Exemption of small quantities of Pu or U-233 in sealed sources from requirement for alarmed use and storage areas.

B. Value/Impact of Technical Alternatives

1. A great many technical alternatives are possible for upgrading physical security to achieve protection equivalent to the IAEA standards in INFCIRC/225 and to those of the proposed requirements. However, those that are decidedly different than those of INFCIRC/225, although they would accomplish the necessary upgrading for domestic safeguards, would not further international safeguards to the extent that being in literal conformance with INFCIRC/225 would through tangible demonstration of U.S. willingness to endorse the IAEA standards. All such technical alternatives are thereby rejected for further consideration.

2. A technical alternative which may apply to some extent as an unavoidable economic consequence of the proposed regulations is the replacement of the entire SNM inventories of some 400

licensees possessing material of low strategic significance, consisting almost exclusively of 1 to 5 curie Pu-Be neutron sources, with sources containing no materials of strategic significance. Pu-Be neutron sources have already been largely replaced in the commercial sector by AmO_2-Be or $^{238}PuO_2$-Be sources. Replacement with such sources would, in some cases, be less expensive than acquisition of the physical security requisite to continued possession of Pu-Be neutron sources. Commercially supplied "Standard IAEA Capsule" neutron sources of 1 to 5 curies cost from $1,400 to $1,900 for ^{238}Pu-Be and from $1,600 to $2,900 for AmO_2-Be. This alternative may be elected by many affected licensees. Others may simply elect disposal of the sources and license terminations. Either alternative will involve processing of license amendments by NRC and/or various state licensing authorities and repossession of the leased ^{239}Pu by the DOE at its Mound Laboratories.

3. The IAEA recognized in INFCIRC/225 the possibility that "research type facilities outside the nuclear fuel cycle and corresponding shipments may not be able to meet the recommendations. In such cases the states' physical protection system may make specific exceptions on a case-by-case basis." The overwhelming majority of licensees affected by the proposed regulations are "research type facilities outside the nuclear fuel cycle" and are, in fact, mostly universities. The larger university facilities possess research reactors and related facilities and the smaller ones possess one or more Pu-Be neutron sources. The economic impacts of the proposed regulations could be substantially reduced by exempting some or all research type facilities. However, non power reactor facilities are, for the most part, already protected to levels commensurate with the proposed regulations and such protection is largely regarded as only prudent and necessary for industrial security and for protection from sabotage and theft of valuable equipment, etc., other than SNM.

Small inventories of SNM consisting only of one or a few sealed Pu-Be sources and, perhaps, an even smaller quantity of Pu or U-235 in sealed fission foils or neutron detectors characterize almost 300 licensees. Those are typically universities which may be ill equipped to bear the expense of acquiring alarmed intrusion detection systems but who generally already control access to those materials with locked storerooms and or locked neutron irradiators. An

exception to the requirement for alarmed storage and/or use areas for those materials would relieve individual licensees of at least $700 new capital expenditure and $375 per year operating costs each and the affected education industry by about $210,000 capital costs and about $113,000 annual costs. Thefts or other losses of such materials are already required to be reported and any attempt to gather greater than formula quantities by a series of thefts should be detected before it could be successful. Such an exception is judged to not drastically compromise either the furtherance of our international safeguards objectives or effective domestic safeguards.

III. Procedural Approach

A. Procedural Alternatives

Upgraded physical security for use and transportation of materials of moderate or low strategic significance could be effected several ways. Some of those are:

1. Issue guides with detailed criteria and implement on a case-by-case basis. This has been the practice with many medium power non power reactors except that the guides were not formally promulgated.

2. Issue guides with detailed criteria and revise regulations to incorporate physical security performance criteria.

3. Issue guides with detailed criteria and revise regulations to include physical security criteria equivalent to those of INFCIRC/225.

4. Revise regulations to include all necessary information and detailed criteria to meet physical security requirements.

B. Value/Impact of Procedural Alternatives

All of the procedural alternatives could effect the required upgrading. However, only alternative (3) provides a high visibility endorsement of IAEA and would be the most effective in furthering international safeguards. Alternative (1) suffers from having less than the appearance of law and would require extensive negotiations with affected licensees. Alternative (2) would require concomitant development of both performance criteria and regulatory guides and would delay both domestic upgrading and

furthering our international objectives. Alternative (4) would put an unseemly amount of detail into the regulations.

C. Decision on Procedural Approach

Alternative (3) is judged to be the most desirable of the alternative procedural approaches and should be pursued.

IV. Report Justification Analysis

The proposed amendments are in the interest of national security to assure protection of public health and safety and are for the purpose of protection against theft of special nuclear material of moderate and low strategic significance.

A. Security Plans

1. 10 CFR Part 70, §70.22(g) will require each application for a license which would authorize the transport, export or delivery to a carrier for transport of moderate strategic significant SNM 10 Kg or more of material of low strategic significance (low enriched uranium) to provide a plan for physical protection of in transit material including as appropriate, the selection, qualification and training of armed escorts, or the specification and design of specially designed truck or trailer.

2. 10 CFR Part 70 §70.22(j) will require each application for a licensee to possess or use at any site or contiguous sites subject to control by licensee quantities and types of moderate strategic significant SNM or 10 Kg or more of low strategic significance (low enriched uranium) other than a license for possession or use of such material in the operation of a nuclear power reactor, to include a physical security plan which will demonstrate how the applicant plans to meet general performance objectives to minimize the possibilities for unauthorized removal of SNM consistent with potential consequences of such action; and facilitate the location and recovery of missing SNM.

3. 10 CFR Part 73, §73.47(a) will require a licensee who possesses, uses, or transports moderate strategic significance SNM or 10 Kg or more of material of low strategic significance (low enriched uranium) to submit 60 days (two months) after publication in effective form a security plan or an amended security plan, including schedules for implementation. The security plan or the amended security plan is to describe how the licensee will comply with:

a. Fixed Site Requirements of:

(1) using SNM only within a controlled access area which is illuminated sufficient to allow detection and surveillance of unauthorized penetration or activities,

(2) storing SNM within a controlled access area in a vault, vault-type room, or GSA approved security cabinet,

(3) continuously monitor with an intrusion alarm or other devices or procedures the controlled access area to detect unauthorized penetration or activities,

(4) conducting preemployment screening to determine the trustworthiness of employees having access to the material,

(5) developing and maintaining a badging system to identify and limit access to the controlled access area to authorized individuals,

(6) limiting access to the controlled area to authorized individuals who require such access to perform their duties,

(7) assuring that all visitors to the controlled access area are under the constant escort of an individual who has been authorized access to the area,

(8) establishing an onsite security organization of at least one (1) guard or watchman per shift to assess and respond to any security incidents in the controlled access area,

(9) providing a communication capability between the onsite security organization and an offsite response force,

(10) searching on a random basis, vehicles and packages entering the controlled access area for items which could be used for theft purposes, and

(11) establishing and maintaining contingency plans for dealing with threats of thefts or theft related to the use or storage of such material.

a. Notifications and Trace Investigations

(1) A licensee who transports, exports or delivers to a carrier for transport moderate strategic significance SNM shall:

(a) provide advance notification to the receiver of any planned shipments specifying the mode of transport, estimated time of arrival, location of the nuclear material transfer, name of carrier and, if applicable, flight number, and

(c) receive confirmation from the receiver prior to the commencement of the planned shipment that the receiver will be ready to accept the shipment at the planned time and location and acknowledges the specified mode of transport.

(2) Receiving licensee of moderate strategic significance SNM shall notify the shipper of receipt of the material.

(3) A licensee who arranges for the physical protection of moderate strategic significance SNM while in transit or who takes delivery of material f.o.b. point of delivery to a carrier for transport shall conduct immediately a trace investigation of any shipment lost or unaccounted for after the estimated arrival time and report to the Nuclear Regulatory Commission (NRC) and to the shipper or receiver as appropriate.

(4) A licensee who exports moderate strategic significance SNM shall:

(a) comply with 2.a. and c. above, up to the first point where the shipment is taken off the vehicle outside the United States,

(b) make arrangements with the consignee to be notified immediately of the arrival of the

shipment at its destination, or of any such shipment that is lost or unaccounted for after the estimated time of arrival at its destination, and

(c) conduct immediately a trace investigation of any shipment that is lost or unaccounted for after the estimated arrival time and report to the NRC.

(5) Each licensee who imports moderate strategic significance SNM shall:

(a) comply with 2.b. and c. above, from the first point where the shipment is picked up from the vehicle inside the United States, and

(b) notify the exporter who delivered the material to a carrier for transport of the arrival of the material. In the event a shipment fails to arrive at its destination at the estimated time, the consignee, shall report to the NRC and the shipper of the licensee who made the physical protection arrangements and immediately notify the Director of the appropriate NRC Inspection and Enforcement Regional Office of the action being taken to trace the shipment.

b. Trace Investigation Reports

10 CFR 73.71, §73.71(a) will require a written report fifteen (15) days after the trace investigation to the appropriate NRC Regional Office setting forth the details and results of the investigation. A copy of the report is to be sent to the Director, Office of Inspection and Enforcement.

V. Statutory Considerations

A. NRC Authority

Section 204(b)(1) of the Energy Reorganization Act of 1974, allots to the NRC the Atomic Energy Act authority for the "provision and maintenance of safeguards against threats, thefts, and sabotage of ... licensed facilities, and materials." The Atomic Energy Act of 1954 as amended provides ample authority for

the Commission to require licensees to whatever measures for physical security for materials of moderate and low strategic significance deemed necessary to protect the public health and safety and the common defense and security.

B. Need for NEPA Assessment

The proposed amendments have an insignificant environmental impact and pursuant to 10 CFR 51(a)(3) require neither an environmental impact statement nor a negative declaration.

VI. Relationship to Other Existing or Proposed Regulations or Policies

There are no apparent potential conflicts or overlaps with other agencies. Coordination with other Federal agencies will be done by the NRC.

VII. Summary and Conclusions

The proposed regulations will both further our international safeguards objectives and effect necessary upgrading of domestic safeguards without working undue hardships on either the licensees or the NRC staff. However, some small nonfuel-cycle research facilities may elect to discontinue or markedly amend their operations rather than incur the costs for upgrading.

ANNEX 1

COST BENEFIT ANALYSIS OF

PROPOSED § 73.47 OF 10 CFR PART 73

To estimate the cost to the licensee using or storing special nuclear material of moderate or low strategic significance, several conservative assumptions were made. It was assumed that:

1. the licensee would be using the material in a room 50 ft W x 100 ft L x 20 ft H. This room would have 3 doors entering it. Two of these doors would be fire/exit type doors while the third door would be used for normal personnel entrance.

2. the licensee would want to have a minimum of a 30 foot-candle light level at the work area. This was based on Regulatory Guide 5.14, "Visual Surveillance of Individuals in Material Access Areas." However, the proposed amendments require no minimum light level in this area and therefore would not have to be met.

3. the licensee would not already have onsite a night watchman or guard which could respond to security incidents.

4. It would take the licensee between 2 weeks and one month (depending on the level of security required) to prepare the security plan and one week to prepare the contingency plan. In both cases, this time could probably be substantially reduced.

Tables 1, 3, 5, and 7 show the capital cost for implementing the proposed amendment. Tables 2, 4, 6, and 8 give the estimated recurring annual costs once the security system has been implemented. Tables 9, 10, 11, and 12 give the benefits for each of the specific requirements of the proposed amendment.

Table 1

Capital Costs for Security at Facilities
Having Special Nuclear Material of Moderate Strategic Significance

Requirement	Cost to Facility per § 73.47
1. Door Locks	$ 940
2. Improved Lighting	$ 3237
a. 30 ft. Candle Level	
3. GSA Security Cabinet	$ 410
4. Interior Intrusion Alarm	
a. Monitored Onsite	$ 1195
5. Preemployment Screening	
a. NAC	$ 90
6. Badging System	$ 100
7. Card Key System	$ 675
8. Security Plan Preparation	$ 3350
9. Contingency Plan Preparation	$ 770

Explanation of Table 1

Item

1. Locks - It was assumed that the controlled access area will have 3 doors at its perimeter. Two doors would be emergency type doors requiring emergency breaker strikes costing approximately $250 each. The third door would be the main entrance and would be equipped with a combination or electric type lock. The cost for a 3-position combination type lock is $170. Installation time for the 3 locks would be approximately 8 hours costing about $270.00. Total cost therefore will be approximately 2 x $250 + $170 + $270 = $940.

2. Improved Lighting - Although there are no minimum lighting level requirements in § 73.47, for costing purpose we assumed an illumination level of 30 foot-candles throughout the area based on Regulatory Guide 5.14, "Visual Surveillance of Individuals In Material Access Areas." The size of the controlled access area was assumed to be 80' x 100' x 20'. The walls and ceiling were assumed to be painted in a light color with the floor a dark color. Pepco estimated a minimum of 90 40-watt fluorescent lamps would be needed to obtain a 30 foot-candle level.

Fluorescent lamps cost approximately $1.50 each. A 2' x 4' fixture which contains 4 lamps was assumed to be used. These fixtures cost approximately $75 each. Installation costs, including the wiring for 22 fixtures needed to obtain a 30 foot-candle light level, would be about $1452. (NOTE: Fluorescent lamps were chosen since it was assumed most facilities were already equipped with them. However, High Pressure Sodium Vapor lamps might prove more cost effective in the long run.)
Total Cost = (90)($1.50) + (22)($75) + $1452 = $3237.00

3. GSA Security Cabinet - It was assumed that some facilities would have only small quantities of moderate or low strategic material which could then be stored in GSA security cabinets. The cheapest class and the one used by NRC for protecting classified documents is a GSA class #6 security cabinet. The price of a 2-drawer legal size version is about $410 and a 4-drawer legal size version is about $650. (Note: GSA approved security cabinets are cheaper than non-approved cabinets because of the large number purchased by the government thus reducing their unit cost.)

4. Interior Intrusion Alarm - It was assumed that 3 balanced magnetic switches and a volumetric ultrasonic detector with 4 slave units would be needed to provide protection to the 50' x 100' x 20' controlled access area. The onsite security organization was assumed to have a guard station where the alarm system

would be monitored. It was also assumed a simple D.C. line supervisory system would be needed to monitor the area. Costs of purchasing, and installing the equipment for one year are as follows:

1.	Ultrasonic dectector	$140
2.	4 slave units	$120
3.	3 Balanced Magnetic Switches	$125
4.	D.C. line supervisory	$450
5.	Installation	$360
	Total	$1195

5. Preemployment Screening - Two types of screening services were invastigated. The first is a National Agency Check (NAC) which costs $16/person. Assuming 6 people will require such a check, this would cost the licensee $90. The second type of check would be a credit-employment check. The commercial credit investigative service we checked with charges $75 per year plus $2.25/person for a credit check, plus $7.35/person for an employment check going back 2 years. Assuming 6 people require such a check, the licensee would pay $75 + (6)(2.25 + 7.35) \approx $135 a year. Since the NAC check was less expensive, it was chosen.

6. Badging System - Since the number of people requiring a badge is small, it was assumed the licensee would have his badge designed

and made by a commercial firm. The design and printing of 200 badges costs approximately $70.00. The cost of taking a photograph of each person and placing it in the badge costs approximately $5 each. Therefore, the first year the licensee should expect to pay approximately $70 + (6)($5) = $100.

7. Card Key System - A simple magnetic card key system, in which the authorized individual places a magnetic key card in a slot at the door to unlock the door, is assumed as probably the most efficient way of limiting access to authorized employees. Cost of such a system is:

1.	Card Reader	$214
2.	Electric Strike	$200
3.	Transformer	$ 50
4.	Installation Cost ($33/hour)	$200
5.	(6) Plastic Laminate Cards @ $1.25 each	$ 7.50
		$671.50 ≅ $675

8. Security Plan Preparation - It is assumed approximately (1) man-month will be required to prepare the security plan. Based on one man-year costing $40,000, one man-month will cost 40,000 ÷ 12 ≅ $3350.

9. Contingency Plan Preparation - It is assumed approximately 1 man-week will be required to prepare the contingency plan. Based on a man-year costing $40,000, one man-week will cost: $40,000 ÷ 52 ≅ $770.

Table 2

Annual Recurring Costs for Physical Security
at Facilities Having Special Nuclear Material of
Moderate Strategic Significance

Requirement	Annual Cost to Facility
1. Locks	$ 94
2. Lighting	$ 178.50
3. Security Cabinets	$ 41
4. Interior Intrusion Alarms	$ 260
5. Badging System	$ 10
6. Card Key System	$ 67.50
7. Preemployment Screening	
a. NAC	$ 30
8. Security Organization	
a. Watchman	$43,800
9. Security Plan Revisions	$ 335
10. Contingency Plan Revisions	$ 77

Explanation of Table 2

1. Based on a draft copy of a MITRE report, MTR-3841, prepared for the NRC entitled "An Evaluation of Cost Estimates of Physical Security Systems for Recycled Nuclear Fuel," an annual maintenance and service cost of 10% of initial hardware cost was used to determine the annual recurring costs for the following items:

A.	Locks	10% x $940 = $94
B.	Lighting	10% x $1785 = $178.50
C.	Security Cabinets	10% x $410 = $41
D.	Card Key System	10% x $675 = $67.50

2. A commercial central alarm service would cost approximately $260 for annual maintenance and service.

3. For the Badging System and the Preemployment Screening it was assumed that the facility would have an average of 33% turn-over rate per year in personnel or 2 new individuals per year. Therefore, recurring costs are based on this figure.

A.	Badging System	(2) x $5/individual = $10
B.	Preemployment Screening	
	a. NAC	2 x $15/person = $30

3. To provide a 24-hour commercial armed guard service at the facility costs approximately $5.50/hour which includes the uniform and service revolver. To provide a 24-hour watchman, or unarmed guard, service at a facility costs approximately $5.00/hour. Therefore, a year's guard service will cost approximately 24 x 365 x $5.50 = $43,180 or a year's watchman service will cost approximately 24 x 365 x 5 = $43,800. Since only a watchman is required, the lower figure was chosen.

4. It was assumed that 10% of the initial preparation cost of the Security and Contingency Plan would be spent each year in revision preparation.

A.	Security Plan Revision	10% x $3350 = $335
B.	Contingency Plan Revision	10% x $770 = $77

Table 3

Capital Costs for Implementing § 73.47
Security Requirements for Transportation of
Special Nuclear Material of Moderate Strategic Significance

Requirement	Cost
1. Locks for Containers	$2000
2. Telephone	-
3. Security Plan Preparation	$1540
4. Contingency Plan Preparation	$ 770
5. Preemployment Screening	$ 90
Total	$4400

Explanation of Table 3

1. It was assumed that 20 locks costing approximately $100 each would be required. The number of locks required is a conservative estimate since most licensees affected by the proposed amendment have very few shipments annually. 20 x $100 = $2000

2. A telephone could be used to provide frequent communication with the licensee. This represents no significant additional cost.

3. It is estimated that about 2 man-weeks will be required to prepare the security plan. Based on one man-year costing $40,000, 2 man-weeks will cost [$40000 ÷ 52] x 2 = $1540.

Table 3 (Continued)

4. It was assumed approximately 1 man-week will be required to prepare the contingency plan. Based on one man-year costing $40,000, one man-week will cost $40,000 ÷ 52 = $770.

5. Since an NAC check is less expensive than a commercial credit-employment check, it was chosen. Again as in fixed sites, 6 men are assumed to require such a check, each costing $15. Therefore total cost = 6 x 15 = $90.

Table 4

Annual Recurring Security Costs for
Transportation of Special Nuclear Material
of Moderate Strategic Significance

Requirement	Annual Cost*
1. Locks For Containers	$200
2. Preemployment Screening	$ 30
3. Security Plan Revision	$154
4. Contingency Plan Revision	$ 77
Total	$461

*Explanation for determining these costs are the same as found for Explanation of Table 2.

Table 5

Capital Costs for Security at Facilities Having Special Nuclear Material of Low Strategic Significance

Requirement	Cost to Facility per § 73.47
1. Door Locks	$940
2. Interior Intrusion Alarm	
a. Monitored Offsite	$660
3. Card Key System	$675
4. Security Plan Preparation	$3350
5. Contingency Plan Preparation	$770
Total	$6395

Explanation of Table 6

1. Door Locks - The same assumptions as to room size and number of doors used for estimating costs of physical security for special nuclear material of moderate strategic significance was used here. See Explanation of Table 1.

2. Interior Intrusion Alarm - It was assumed in this case that a commercial offsite central alarm service would be used. Costs for alarming a 50' x 100' x 20' room are as follows:

		Equip. Cost	Install. Cost
1.	(1) Master Ultrasonic Detector	140	80
2.	(4) Slave Ultrasonic Detectors	115	80
3.	(3) Balanced Magnetic Switches	125	120
		380	280
	Total Initial Capital Equipment Cost	$380 + $280 = $660	

3. Card Key System - It was assumed that the same type of access control system as used in Table 1 would be used for SNM of low strategic significance. See Explanation of Table 1.

4. A security plan is required for facilities having more than 10 kg of special nuclear material of low strategic significance. It is estimated that 1 man-month will be required to prepare the security plan. Assuming 1 man-year costs $40,000, one man-month will cost $40,000 ÷ 12 ≅ $3350.

5. Contingency Plan Preparation - It was assumed 1 man-week would be required to prepare the contingency plans. Assuming 1 man-year costs $40,000, 1 man-week will cost $40,000 ÷ 52 ≅ $770.

Table 6

Annual Recurring Costs for Physical Security at Facilities Having Special Nuclear Material of Low Strategic Significance

Requirements	Annual Cost to Facility
1. Door Locks	$ 94
2. Interior Intrusion Alarm	$375
3. Offsite Guard Response	$240
4. Card Key System	$ 68
5. Security Plan Revision	$335
6. Contingency Plan Revision	$ 77
Total	$1189

Explanation of Table 6

1. Per Mitre report number MTR-3541 entitled "An Evaluation of Cost Estimates of Physical Security Systems for Recycled Nuclear Fuel" door locks, security cabinets, and card key systems are estimated to have a 10 percent of initial cost as recurring maintenance and service cost.

2. A commercial central alarm service would cost approximately $375 for annual maintenance and service plus leasing costs of the telephone line.

3. A commercial offsite guard response, if tied into a commercial central alarm service, costs about $240/year.

4. It was assumed that 10% of the initial preparation cost of the Security Plan would be spent each year in revision preparation.

5. Approximately 1/2 man-day annually would be required to revise the contingency plan or 10% of $770 = $77.

Table 7

Capital Costs for Implementing § 73.47 Security Requirements for Transportation of Special Nuclear Material of Low Strategic Significance

	Requirement	Cost
1.	Locks For Containers	$2000
2.	Security Plan Preparation	$1640
3.	Contingency Plan Preparation	$ 770
	Total	$4310

1. Locks - It was assumed 20 locks at $100 each would be required. The number of locks required is a conservative estimate since most licensees affected by the proposed amendment have very few shipments annually. 20 x $100 = $2000

2. Security Plan Preparation - It was estimated 2 man-weeks would be required. It was assumed 1 man-year costs $40,000. Therefore, 2 man-weeks = [$40,000 ÷ 52] x 2 ≅ $1540.

3. Contingency Plan Preparation - It was assumed 1 man-week would be required. It was also assumed 1 man-year costs $40,000. Therefore 1 man-week = $40,000 ÷ 52 ≅ $770.

Table 8

Annual Recurring Security Costs for
Transportation of Special Nuclear Material
of Low Strategic Significance

Requirement	Annual Cost
1. Locks	$200
2. Security Plan Revision	$134
3. Contingency Plan Revision	$ 77
Total	$431

Explanation for costs of Table 8 are the same as found for explanation of Table 2.

Table 9

Benefits of Increased Security for Facilities
Having Special Nuclear Material of Moderate
Strategic Significance

Requirement and Cost	Benefit
1. Door Locks ($940)	Allows for positive control of personnel access into the controlled area, while still permitting emergency exit from the area. Also allows for high lock security during inactive time periods in area.
2. Improved Lighting ($3237)	Allows for visual detection of security incidents affecting the safekeeping of this material.
3. GSA Security Cabinet ($410)	Allows for the safe storage of small quantities of SNM during periods of time when such material is not being used.
4. Interior Intrusion Alarm System ($1195)	Allows for immediate detection of an intruder entering or moving within the controlled area during unoccupied periods of time so that assistance can be summoned in time for adequate response.
5. Preemployment Screening ($90)	Gives the employer assurance of the character of the people who will be working with the material.
6. Badging System ($100)	Allows fellow employees to quickly ascertain who has been authorized access to the controlled area, thus allowing for more positive access control.

Table 9

Benefits of Increased Security for Facilities Having Special Nuclear Material of Moderate Strategic Significance

(Continued)

Requirement and Cost	Benefit
7. Onsite Guard Service ($43,800)	Allows for a 24-hour immediate watchman response to security incidents. Also watchman will periodically check packages, escort visitors, patrol the area, monitor alarm system, and communicate security incidents to the appropriate response force.
8. Card Key System ($675)	Magnetic card keys would be issued to authorized employees. Each time they desired access to the controlled area they would have to insert the card key, thus giving positive control over personnel entering area.
9. Security Plan Preparation ($3360)	This allows NRC licensors to determine the adequacy of the physical security measures implemented.
10. Contingency Plan Preparation ($770)	Allows the licensee to know in advance what his response should be to any security incident.

Table 10

Benefits of Increased Security for Transportation of Special Nuclear Material of Moderate Strategic Significance

Requirement and Cost	Benefit
1. Locks For Containers ($2000)	Allows for some deterrence against unauthorized penetration and tampering while the material is in transit.
2. Contingency Plan Preparation ($770)	Allows the licensee to know in advance what his response should be to any security incident.
3. Preemployment Screening ($90)	Gives the employer assurance of the character of the people who will be working with the material.
4. Security Plan Preparation (1540)	This allows NRC licensors to determine the adequacy of the physical security measures implemented.

Table II

Benefits of Increased Security at Facilities Having Special Nuclear Material of Low Strategic Significance

Requirements and Costs	Benefit
1. Door Locks ($940)	Allows for positive control of personnel access into the area while still permitting emergency exit from the area. Also allows for high lock penetration security during inactive time periods in the area.
2. Interior Intrusion Alarm System ($660)	Allows for immediate detection of an intruder entering or moving within the controlled area during inactive time period so that assistance can be summoned in time for adequate response.
3. Offsite Guard Response ($240)	Allows for 24-hour guard monitoring and response to alarms.
4. Card-Key System ($675)	Magretic card keys would be issued to authorized employees. Each time they desired access to the controlled area they would have to insert the card key, thus giving positive control over personnel entering the area.
5. Security Plan Preparation ($3350)	This allows NRC licensors to determine the adequacy of the physical security measures implemented.
6. Contingency Plan Preparation ($770)	Allows the licensee to know in advance what his response should be to any security incident.

Table 12

Benefits of Increased Security for Transportation of Special Nuclear Material of Low Strategic Significance

Requirements and Cost	Benefit
1. Locks for Containers ($2000)	Allows for some deterrence against unauthorized penetration and tampering while the material is in transit.
2. Security Plan Prepration ($1640)	This allows the NRC licensors to determine the adequacy of the physical security measures implemented.
3. Contingency Plan Preparation ($770)	Allows the licensee to know in advance what his response should be to any security incident.

ANNEX 2

The Affected Industry and Industrywide Costs

The affected industry handling materials of moderate strategic significance (Category II) consists of about 54 licensees, all except 12 of which are primarily non power reactor operators. Those 54 facilities are described further in Table I. The industry handling materials of low strategic significance (Cagegory III) is much more extensive. It consists of a few fabricators of low enriched uranium fuels, a few lower powered non power reactor facilities, a few research facilities using a few hundreds of grams of plutonium or U-235 in various enrichments and over 400 licensees using plutonium in quantities ranging from about 100 grams down to 16 grams as encapsulated Pu-Be neutron sources. Further description is given in Table II. A survey of non power reactor licensees revealed that, of 60 respondees, only 13 did not already have intrusion alarms. In view of internal interim guidance for security plans for medium power non power reactors which has been used by ORR since 1974 and which calls for intrusion alarms for such facilities it is felt that almost all non-power reactor facilities already have intrusion alarms and most of the other provisions for physical security which would be required by the proposed regulations. All licensees possessing material of moderate strategic significance already have onsite physical security forces.

Assessments of various elements of costs to the affected industry handling material of moderate strategic significance are detailed in Tables III through VI. Overall costs impacts of the proposed regulations are estimated at about $475,000 capital and about $45,000 annual costs.

Costs elements for facilities possessing materials of low strategic significance are assessed in Tables VII through X. Overall industry wide costs impacts of the proposed regulations for physical security of materials of low strategic significance are estimated at about $1,050,000 capital costs and about $270,000 annually.

Table I
Category II Facilities

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
ZYI	State University of New York at Buffalo	36.0K R 32.1K	SNM-273, SNM-723, R-77,1051	1.01 kg Pu 0.012 Kg U-235 as 20+%, 27.9 kg U-235 as <10%
YBC	National Bureau of Standards	17.0K	SNM-362, SMB-405, 08-00566-05	0.955 kg Pu, 0.608 Kg U-235 as 20+%, 1.033 U-235 as 10% < 20%, 0.005 kg U-233 TEK = 1.569 Kg
YCI	Babcock & Wilcox	2526.0K R 1466.0K	R-47, SNM-778, CX-10	
YBG	Naval Surface Weapons Center	1.2K	SNM-1147, SNM-1251, SNM-1489	
IBW	University of Puerto Rico			0.69 Kg Pu, 0.009 Kg U-235 as 20+%, 0.70 Kg TEK
ZKB	Iowa State University of Science & Technology	7.2 Kg, 7.0 Kg	SNM-74, R-59, SUB-591	0.096 Kg Pu, 4.63 Kg U-235 as 20+%, 4.41 Kg TEK
ZXW	U of Washington College of Engineering	8.1 Kg, 8.1 Kg	SNM-108, R-73, WN-C001-SUB	0.104 Kg Pu, 4.3 Kg U-235 as 20+%, 4.10 Kg TEK

Table 1 (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
ZLV	Lowell Technological Institute	4.6K	SNM-714, SNM 1220	0.19 Kg Pu, 4.2 Kg U-235 as 20+%, 4.1 Kg TEK
ZMP CCP	Massachusetts Institute of Technology	159.4K 17.5K	SNM-81, SNM-83, SNM-171, R-37, SNM-986, SUB-687	0.732 Kg Pu, 4.10 Kg U-235 as 20+%, 296.3 Kg U-235 as <10%, 8.63 Kg TEK
XBX	Intelcom Industries, Inc.	0.7K	2468-80	0.043 Kg Pu, 3.94 Kg U-235 as 20+%, 0.058 Kg U-235 as <10%, 3.72 Kg TEK
ZZC	Worcester Polytechnic Institute	4.1K R 4.1K	R-61	0.016 Kg Pu, 3.78 Kg U-235 as 20+%, 3.55 Kg TEK
ZOV	Ohio State University	8.5K R 8.1K	SNM-516, SNM-732, SNM-917, R-75, SUB-846, 34-00293	0.241 Kg Pu, 3.58 Kg U-235 as 20+%, 3.57 Kg TEK
ZMH	Manhattan College, Mech. Eng. Dept.	3.5K R 3.3K	SNM-827, R-94, 76-3	0.238 Kg Pu, 3.105 Kg U-235 as 20+%, 314 Kg TEK
ZKK	University of Kansas	4.2K R 4.1K	R-79, SNM-365	0.032 Kg Pu, 2.77 Kg U-235 as 20+%, 2.6 Kg TEK

Table 1 (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
CBS	Purdue University			0.296 Kg Pu, 2.45 Kg U-235 as 20+%, 225 Kg U-235 as <10%, 10.04 Kg TEK
YFI	David Witherspoon, Inc.	2.0K	SNM-952, SUB-587	1.760 Kg U-235 as 20+%, 1.64 Kg TEK Contaminated ferrous scrap, exempt from 73.40
ZIB	Columbia University	1.7K	SNM-870, R-128	0.22 Kg Pu, 149 Kg U-235 as 20+%, 0.073 Kg U-233, 1.55 Kg TEK
ZJG	Eastman Kodak	1.6K	SNM-1513, 799-0253	1.58 kg U-235 as 20+%, 1.48 Kg TEK; A neutron multiplier
ZKD	Teledyne Isotopes, Inc.	1.0k	SNM-107	0.001 kg Pu, 1.501 Kg U-235 as 20+%, -1.006 U-235 as 10 to < 20%, -0.055 Kg U-235 as <10%, 0.001 Kg U-233, 1.50 Kg TEK

Table 1 (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
XIW	Regents of U of California - Santa Barbara	1.3K	SNM-1417 Retired, 1336-42, R- ,50-433	0.012 Kg Pu, 1.21 Kg U-235 as 20+%, 1.09 Kg TEK
XAL	USNRC-Region III			0.964 Kg U-235 as 20+%, 0.087 Kg U-235 as <10%, 0.91 Kg TEK
VAZ	Nuclear Fuel Services - West Valley			
ZJR	University of Illinois, Dept. of Physics	8.1K R 5.6K	SNM-235, SNM-866, SUB-520, SUB-571, R-115, R-117	0.154 Kg Pu, 6.197 Kg U-235 as 10 to <20%, 1.37 Kg TEK
ZRV tDW	Pennsylvania State University	17.2K R 12.6K	SNM-95, SNM-123, SNM-231, R-2, SU -428	0.334 Kg Pu, 4.44 Kg U-235 as 20+%, 4.52 U-235 as 10 to <20%, 134 Kg U-235 as <10%, 0.004 Kg U-233 15.13 kg TEK

Table 1 (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
ZCI	University of California, Berkeley	7.8K R 7.4K	SNM-973, R-101, 1333-59, SNM-1471	0.256 Kg Pu, 0.003 Kg U-235 as 20+%, 4.29 Kg U-235 as 10 to <20%, 1.07 Kg TEK
YAI	U.S. Geological Survey	4.2k R 4.0K	SNM-111, R-113	0.175 Kg Pu, 0.001 Kg U-235 as 20+%, 3.86 Kg U-235 as 10 to <20%, 0.897 Kg TEK
YMI	University of California, Irvine	3.1K	SNM-1143, R-116, 1338-59	3.95 Kg U-235 as 10 to <20%, 0.76 Kg TEK
ZUU	University of Utah	4.3K R 0.7K	SNM-663, SNM-1263, R-25	0.103 Kg Pu, 3.79 Kg U-235 as 10 to <20%, 0.85 Kg TEK
ZMY	Michigan State University	3.3K R 3.0K	SNM-390, SNM-468, SNM-658, SNM-1014, R-114, SUB-403	0.279 Kg Pu, 3.38 Kg U-235 as 10 to <20%, 0.89 Kg TEK
ZKI	Kansas State	3.5K R 3.4K	R-88, 38-C 011-01	0.08 Kg Pu, 0.001 Kg U-235 as 20+%, 3.245 Kg U-235 as 10 to <20%, 0.673 Kg TEK
YAI	Armed Forces Radiobiology Res. Inst.	5.2K R 5.0K	SNM-706, SMB-670-670, R-84	0.186 Kg Pu, 3.50 Kg U-235 as 10 to <20%, 0.88 Kg TEK

Table I (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
ZUS	University of Texas, Nuclear Reactor Laboratory	5.8K R 5.8K	R-92	3.29 Kg U-235 as 10 to <20%, 0.64 Kg TEK
ZAQ	University of Arizona	3.7K	SNM-432, R-52, 10-24	0.696 Kg Pu, 3.04 Kg U-235 as 10 to <20%, 0.64 Kg TEK
ZMR	University of Maryland	2504.9K R 4.6K	SNM-64, R-70, SUB-630 MD-33-004-02, MD-33-004-04,	0.143 Kg Pu, 0.002 Kg U-235 as 20+%, 3.25 Kg U-235 as 10 to <20%, 0.79 Kg TEK
ZAD	Aerotest Operations	5.0K R 5.0K	R-98, CPRR-27, 2010-07	0.016 Kg Pu, 2.77 Kg U-235 as 10 to <20%, 0.55 Kg TEK
YIX	Dow Chemical Company	2.3K R 2.3K	R-108, STB-527, STB-433, 21-00265-07	2.80 Kg U-235 as 10 to <20%, 0.555 Kg TEK
ZSW	Reed College	2.6K	ORE-0010-3, R-112	0.080 Kg Pu, 2.27 Kg 10 to <20%, 0.53 Kg TEK
ZJK	Idaho State University	2.3K R 0.7K	SNM-1373, R-110	0.0200 Kg Pu, 2.187 Kg U-235 as 10 to <20%, 0.45 Kg TEK 5-1 ci Pu-Be sources 1510 g U-235 fuel plates 1 g U-235 fission counter

Table I (Continued)

Reporting Identification Symbol	Licensee Name	Possession Limit/ Possession Related to Operation of a Reactor	Licenses in Effect	Material in Possession as of June 1977 (TEK = Total Equivalent Kilograms - c.f. 10 CFR 70.4(t))
YBZ	Veteran's Administration Hospital	2.3K R 2.3K	R-57	2.02 Kg U-235 as 10 to <20%, 0.40 Kg TEK
ZAZ	Atomics International Nuclear Development Field Laboratory	5613.3K R 193.3K	SNM-21, R-40, CX-17, CALIF-0015-59, R-118	0.018 Kg Pu, 2.258 Kg U-235 as 20+%, 0.654 Kg TEK Currently based upon less than 5000 grams formula quantity at Pu site. U Plant still Category I.
ZBK	Battelle Columbus Laboratory	195.6K R 39.3	SNM-7, R-4, 34-6854-05	3.709 Kg Pu, 5953 Kg U-235 as 20+%, 3.79 Kg TEK Currently on under 5000 gram formula quantity basis.

Table II (cont'd)

Category III Facilities

RIS	Low Enriched Uranium
	Most are fuel fabricators.
YLM	Westinghouse Electric Co. - COlumbia
YLJ	General Electric Co. - Wilmington
YUD	Exxon Nuclear
YNJ	Babcock & Wilcox - Lynchburg
ZQN	Babcock & Wilcox - Apollo
ZWQ	Combustion Engineering - Windsor
ZEF	Combustion Engineering - Hematite
VAQ	Chem - Nuclear Systems, Inc. - Waste Disposal
YCE	Babcock & Wilcox - Research & Development
ZQM	NFS - Erwin
VAT	NECO - Waste Disposal
VAY	NECO - Waste Disposal
VAV	NECO - Waste Disposal
VCM	Southern Space - Waste Disposal

Table II

Category III Facilities

RIS — Plutonium

200-600 gm, much as encapsulated Pu-Be neutron sources and fission foils and chambers.

ZFS — EG & G

ZYK — Western Michigan University

ZYN — Westinghouse Electric Co., Elect. Tube Division

ZSF — University of Pittsburgh

ZGF — University of Florida

ZTP — California State at San Diego

ZPY — North Carolina State - Probably irradiated only

ZBY — Boeing

YCO — Wright - Patterson AFB

80-200 gm, most as encapsulated Pu-Be neutron sources and fission foils and chambers.

40 facilities - mostly universities

15-80 gm, essentially all as encapsulated Pu-Be

416 facilities - almost all universities

Uranium Enriched 20% or More

About 40 licensees not already counted elsewhere for other possessions. About 9 are research reactors.

Uranium Enriched 10 to 20%

13 facilities - all except one are research reactors. The other is NBS which has already been counted under plutonium.

Table III

Material of Moderate Strategic Significance Fixed Site Capital Costs

Requirement	Estimated Capital Cost to Facility	Estimated Number of Facilities Requiring	Estimated Industry Capital Costs
Door Locks	$ 940	30	$ 28200
Improved Lighting	3237	8	25896
GSA Security Cabinet	410	20	8200
Interior Intrusion Alarm Monitored on Site	1195	20	31100
Pre-Employment Screening	90	30	2700
Badging System	100	30	3000
Card Key System	675	20	13500
Security Plan Preparation	3350	53	177550
Contingency Plan Preparation	770	53	40810
	$10767		$330,956

Table IV

Material of Moderate Strategic Significance Fixed Site Annual Costs

Requirement	Estimated Annual Costs to Facility	Estimated Incremental Number of Facilities Incurring	Estimated Industry Incremental Annual Costs
Door Locks	$ 94	30	$ 2820
Improved Lighting	178.50	8	1428
GSA Security Cabinet	41	20	820
Interior Intrusion Alarms Monitored on Site	260	20	3110
Pre-Employment Screening	30	30	900
Badging System	10	30	300
On Site Security Force	43800	None	0
Card Key System	67.50	20	1350
Security Plan Upkeep	335	53	17755
Contingency Plan Upkeep	77	53	4081
	$44893		$31136

Table V

Material of Moderate Strategic Significance Capital Costs for Transportation

Requirement	Estimated Capital Costs per Shipper	Estimated Number of Shippers Incurring Incremental Costs	Estimated Incremental Industry Capital Costs
locks for Sealed Containers	$ 2000	10	$ 20000
Telephone	----	--	-----
Security Plan Preparation	1540	53	81620
Contingency Plan Preparation	770	53	40810
Pre-Employment Screening	90	30	2700
	$ 4400		$ 145130

Table VI

Materials of Moderate Strategic Significance Incremental Annual Costs for Transportation

Requirement	Estimated Annual Costs per Shipper	Estimated Number of Shippers Incurring Incremental Costs	Estimated Incremental Industry Annual Costs
Locks for Sealed Containers	$ 200	10	$ 2000
Security Plan Upkeep	154	53	7950
Contingency Plan Upkeep	30	53	1590
Pre-Employment Screening	77	30	2310
	$ 461		$ 13850

Table VII

Materials of Low Strategic Significance Fixed Site Initial Costs

Requirement	Estimated Capital Cost to Facility	Estimated Number of Facilities Requiring	Estimated Industry Capital Costs
Door Locks	$ 940	200	$ 188000
Interior Intrusion Alarm Monitored:			
a. On Site	1195	30	46650
b. Off Site	660	300	198000
Card Key System	675	100	67500
Security Plan Preparation (Large IEU Facilities)	3350	10	33500
Contingency Plan Preparation	770	500	385000
	$ 3580 or 3045 ($6950 for large IEU facilities)		$ 918550

Table VIII

Materials of low Strategic Significance Fixed Site Annual Costs

Requirement	Estimated Annual Costs to Facility	Estimated Incremental Number of Facilities Requiring	Estimated Industry Incremental Annual Costs
Door Locks	$ 94	200	$ 18800
Interior Intrusion Alarm Monitored:			
a. On Site	260	30	4665
b. Off Site	375	300	112500
Off Site Guard Response	240	300	72000
Card Key System	68	100	6800
Security Plan Upkeep (large LEU Facilities)	335	10	3350
Contingency Plan Preparation	77	500	38500
	$ 499 or 615 ($834 for large LEU facilities)		$ 259750

Table IX

Materials of Low Strategic Significance Capital Costs for Transportation

Requirement	Estimated Capital Costs Per Shipper	Estimated Number of Shippers Incurring Incremental Costs	Estimated Incremental Industry Capital Costs
Locks for Sealed Containers - 20	$ 2000	10	$ 20000
Locks for Sealed Containers - 1	100	100	10000
Security Plan Preparation (Large TEU Shippers)	1540	10	15400
Contingency Plan Preparation	770	100	77000
	$ 2770 or 870 ($2310 for large TEU shippers)		$122,400

Table X

Materials of low Strategic Significance Annual Costs for Transportation

Requirement	Estimated Annual Costs per Shipper	Estimated Number of Shippers Incurring Incremental Costs	Estimated Incremental Industry Annual Costs
locks for Sealed Containers - 20	$ 200	10	$ 2000
lock for Sealed Containers - 1	10	100	1000
Security Plan Upkeep	154	10	1540
Contingency Plan Upkeep	77	100	7700
	$ 277 or 87 ($231 for large LEU shippers)		$ 12240