

October 23, 1979

SECY-79-38A

SG  
Nulsen

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## COMMISSIONER ACTION

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For: The Commissioners

From: William J. Dircks, Director  
Office of Nuclear Material Safety and Safeguards

Thru: Lee V. Gossick, Executive Director for Operations *KG*

Subject: PHYSICAL PROTECTION OF CATEGORY II AND III MATERIAL  
IN TRANSIT

Purpose: To submit for the Commission's consideration an analysis of need for further protection of Category II and III material in transit along with a staff recommendation.

Category: This paper covers a minor policy issue requiring Commission action.

Issue: Whether physical protection for Category II and III materials in transit should be upgraded to be equivalent to the levels of protection provided by DOE for material of the same categories?

Decision Criteria:

1. Is any additional protection necessary for Category II and III material in transit?
2. Which measures to increase protection levels are most cost effective?

Alternatives:

1. Maintain current levels of physical protection for Category II and III materials.
2. Amend current regulations to allow NRC to control scheduling of certain Category II shipments where aggregate quantities of concurrent shipments may amount to a formula quantity.
3. Increase physical protection levels for Category II material, along the lines of but not duplicative of DOE requirements, in addition to Alternative 2.
4. Increase physical protection levels for Category II material to duplicate DOE requirements, in addition to Alternative 2.

Contact:  
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4181

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Discussion:

On June 24, 1979, the Commission approved, for publication in the Federal Register, amendments to 10 CFR Parts 70, 73, and 150 (SECY-79-38) for the physical protection of Category II and III special nuclear material as defined in IAEA bulletin INFCIRC/225/Rev.1, June 1977. In addition to approving these amendments, the Commission requested the staff to examine, for possible strengthening, several areas of the Category II and III amendments. One area identified was the protection of Category II and III material in transit. The staff was directed to provide an analysis of any need for such protection, a corresponding staff recommendation, and as an alternative, a draft proposed NRC rule comparable to the DOE order (Order 5632.1) for protection of Category II material in transit.

In developing the analysis for more stringent in-transit physical protection requirements, the staff formally contacted the Office of Safeguards and Security, Department of Energy (DOE), for information concerning the technical rationale and impact analysis used in developing their requirements. Because of a heavy workload, DOE was not able to formally respond to NRC's inquiry in the time allotted, but they did respond informally via telephone. Enclosure "B" is a copy of the letter sent to DOE. Based on this response, it appears that the DOE made no formal technical assessment of the need for or extent of physical protection to be required of Category II and III material in transit, but developed their requirements based on what they judged their contractors could reasonably meet. Similarly, the proposed DOE requirements were not subjected to a formal value/impact assessment. It is still too early to determine what impact DOE's order has had on contractor shipping costs. The impact may be slight since DOE said that the contractors in many instances combine their Category II material shipments with Category I shipments which are shipped in specially designed safe-secure transport (SST) vehicles accompanied by two or more escorts. This option is generally not available to NRC licensees.

Threat Analysis Summary

Regarding sabotage, SECY-77-79 (Feb. 11, 1977) stated that the risk of dispersion of small or moderate quantities of nuclear materials does not appear to pose a risk to the public sufficient to justify specific protection measures for these materials. This view was supported further by the staff in NUREG-0170, "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes." Based upon information obtained informally from DOE, there was no systematic assessment done of the sabotage threat to DOE owned Category II and III materials, and no specific measures were included in the DOE order to protect against sabotage of such material while in transit.

A study, currently in progress to reassess the potential risk to the public health and safety of sabotage of Category II or III materials, has an estimated completion date of March 1980. The position of the staff, pending completion of this study, is that there is presently no justification for requiring specific measures to protect against sabotage of Category II and III materials in-transit. Enclosure "C" discusses this issue in further detail. The staff does maintain, however, that there is presently a need for physical protection of Category II and III materials against theft.

SECY-78-142 (March 9, 1978) which initially proposed the amendments now referred to as the Category II/III Rule, included a technical assessment of the consequences of misuse of Category II and III materials through theft. The levels of protection provided for Category II material in the Category II/III Rule were based on this technical assessment and staff interpretations of IAEA recommendations to arrive at a rule that would provide protection equivalent to that recommended in the IAEA document INFCIRC/225/Rev.1.

#### Analysis of Need for Additional Protection

Insofar as Category III material is concerned, there is presently equivalency between NRC and DOE physical protection requirements. No additional requirements for Category III materials in-transit are considered necessary.

The additional requirements which would be needed to bring the present NRC physical protection requirements for Category II material in-transit to a level of protection equivalent to DOE Order 5632.1 include requiring locked vehicles or cargo compartments; detailed search of the load vehicle prior to loading and shipment; exclusive-use trucks in the case of road shipments; frequent telephone communications between the transport vehicle and the shipper, receiver or a designated agent of either; a minimum of two escorts for all shipments (one escort can be the driver for road shipments); maintaining the shipment under surveillance by escorts during the trip; and clearances for escorts.

The staff has considered the need for and the desirability of requiring each of these measures. For each of these measures the staff has prepared an analysis which is included in Enclosure "D". As a result of this analysis, it appears that the need for any of the additional measures considered is a highly subjective judgment based upon the perceptions of both (a) how strategically important Category II quantities of highly enriched uranium are, and (b) how much additional protection is provided by a given measure. Given

this, the decision whether or not to include a particular requirement depends largely on a subjective judgment of the value of the measure (i.e., the increase in protection) versus the cost of providing such protection. Regardless of this judgment, it should be noted that none of the additional measures considered to bring NRC requirements into conformity with DOE requirements would achieve prevention of armed theft of in-transit Category II material.

The inclusion of the following measures in amendments to the physical protection requirements in the Category II/III Rule, were examined: locked and sealed vehicles or cargo compartments; exclusive-use trucks; frequent telephone communications; a single escort (in addition to the driver of a truck); and shipment surveillance by the escort. The adoption of these additional measures would bring NRC requirements into closer conformity to the recommendations contained in IAEA publication INFCIRC/225 especially in regard to the recommendations for locked vehicles and searches of the load vehicle which imply the need for exclusive-use trucks. However, it should be noted that with the adoption of Alternative 2 requirements, there is, as discussed below, little or no technical justification for these additional measures since a formula quantity of SSNM, made up of separate shipments, will never be in-transit at the same time.

The staff determined, also, that a second escort for air, rail, and sea shipments, and a detailed search prior to loading and shipment were unnecessary. The bases for these findings are discussed in Enclosure "D".

The fact that many public comments were received following publication of the draft Category II/III Rule [43 FR 22216, May 24, 1978] which questioned the technical justification for physical protection requirements for Category II and III material, was recognized by the staff at the time of publication of the final rule. It was indicated in the staff's response to those comments [44 FR 43280, July 24, 1979] that the threat to the common defense and national security, insofar as Category II material is concerned, arises mainly from the possibility of multiple thefts of close to



formula quantities of SSNM through which a formula quantity could be accumulated to allow construction of a nuclear explosive device. In view of the indirect nature of this threat, with respect to physical protection requirements for individual shipments of Category II material, it was stated that the proposed requirements were of a detection nature, rather than prevention. Also, for this reason, it was determined that the technical justification for requiring security clearances for persons involved in the transportation of less than formula quantities of SSNM, based on the threat to the common defense and national security, was too indirect to justify clearances and that only employer screening would be required.

However, recognizing that the availability, in the aggregate, of greater than formula quantities of SSNM among several Category II shipments in-transit at the same time posed a continued threat, the Commission included in the Physical Protection Upgrade Rule [approved for publication as a final rule on July 24, 1979] a prohibition against concurrent shipments of Category II material by a single licensee if the aggregate quantity included in such shipments amounted to a formula quantity. The staff proposes to extend this requirement to allow the staff to withhold approval for the dispatching of certain Category II shipments so that the staff will be able to assure, if necessary, that a formula quantity of SSNM will not in the aggregate be in-transit simultaneously as a result of Category II shipments made by different licensees. This will provide assurance that in the event a Category II shipment is discovered missing or stolen, NRC will have an opportunity to prevent additional material from falling into the hands of adversaries before the original shipment is recovered or otherwise accounted for.

This authority to delay Category II shipments is proposed as an amendment to 10 CFR Part 73.47(e)(6). It is the basis for Alternative 2 as presented in this paper, and is also included in Alternatives 3 and 4. Both Alternatives 2 and 3 are presented in Enclosure "A".

In Alternative 2, there is a combination of preventive and detection measures which would provide assurance that the NRC could respond to an individual theft of a Category II shipment in sufficient time to prevent an adversary from accumulating a formula quantity of SSNM through multiple thefts.

Alternative 3 includes the amendment found in Alternative 2 as well as additional measures to facilitate earlier detection of missing material and lessen the opportunities for theft by eliminating the temporary storage and transfers associated with normal freight operations and providing for greater control by the licensees. These measures are:

- o locked and sealed vehicles or cargo compartments
- o exclusive-use trucks
- o frequent telephone communication
- o single escort (in addition to the driver)
- o shipment surveillance by the escort

Neither Alternative 2 nor Alternative 3 provides for prevention of individual thefts, especially those which could be perpetrated by a dedicated, armed and well-trained adversary. Thus, the additional measures in Alternative 3 do not provide a significantly higher level of protection than Alternative 2, but they do increase shipment costs. In comparative terms, air shipment costs are doubled while road shipment costs are increased by an order of magnitude.

Alternative 4 is similar to Alternative 3 in most respects except that:

- o it provides for two escorts for air, sea, and rail shipments,
- o includes a requirement for a detailed search of the load vehicle prior to loading and shipment, and
- o requires escorts to have security clearances.

None of these additional measures provides a theft prevention capability, or increases the efficiency of theft detection, while cumulatively they further increase shipment costs substantially.

Cost Analysis  
Summary

The summary of costs of implementing the additional physical protection measures outlined in this paper are as follows (See Enclosure "E" for complete discussion).

<u>Summary of Road Shipping Costs</u>	
(for sample trip - 500 lb load - 800 miles)	
<u>General Truck Freight (Common Carrier)</u>	\$ 85.
<u>Exclusive-Use Road Vehicle -</u>	
- Rented Van and Hired Driver.....	\$ 925
- Specialized Hauler.....	\$1,046.
- Rented 14-Foot Truck and Hired Driver...	\$1,133.
- Common Carrier.....	\$1,791.

Summary of Escort Costs by Mode  
(for sample 800 mile trip)

	<u>Single Escort</u>
<u>General Truck Freight (Common Carrier)</u>	--
<u>Exclusive-Use Road Vehicle -</u>	
- Rented Van and Hired Driver*,+.....	\$385.
- Specialized Hauler .. (Double Operation)**.....	\$531.
- Specialized Hauler (Single Operation)*.....	\$385.
- Rented 14-Foot Truck and Hired Driver*,+.....	\$385.
- Common Carrier (Single Operation)*.....	\$385.
<u>Air Cargo (Exclusive of local ground transportation)***.....</u>	\$221.
<u>Rail Freight.....</u>	\$970.

- \* Escort provided by the licensee; escort is non-driver.
- \*\* There is additional cost due to higher minimum load and a qualified driver-escort is provided enabling continuous (double) operation.
- \*\*\* Assumes four-hour flight and terminal time.
- + Does not include insurance.

COMBINED SHIPPING AND ESCORT COSTS  
(for sample 800 mile trip)

<u>Options</u>	<u>Approximate Cost</u>
o Present costs for road shipment.....	\$ 85.
o Present costs for air shipment.....	\$ 215.
o Costs for exclusive-use road vehicle (specialized hauler) and single escort...	\$1,431.
o Cost for air-cargo with single escort.....	\$ 436.
o Costs for rail shipment with single escort.....	\$2,181.

For comparison purposes, it was determined that the minimum value of material comprising a Category II shipment (approximately one kilogram of high enriched uranium in bulk form) has a value of about \$40,000. The maximum typical value of a Category II shipment, comprised of close to five kilograms of high enriched uranium in the form of precisely machined and fabricated fuel elements or assemblies has a value of about \$280,000. The transportation cost (by exclusive-use truck provided by a specialized hauler) for a typical 800-mile shipment, about \$1,400, would add about 3.5% onto the total cost of the lowest valued quantity of Category II material delivered to the recipient as customer. The same \$1,400 shipment cost would add on only about 0.5% to the total cost of the highest valued quantity of Category II material delivered to the recipient as customer.

Investigation has shown that licensees customarily have not elected to ship Category II materials by rail. In an examination of Category II shipments made in the past eighteen months, it was determined that no rail shipments of Category II material have been made by licensees. The costs of such shipments would be comparable to that for exclusive-use trucks, but the slower transportation would make the costs of escorts for such shipments much greater than for the other modes. The frequent layovers in freight yards would also pose much greater risk of theft of the material.

Resources: It is estimated that no additional NRC personnel will be needed to carry out the proposed action.

Conclusion: The staff concludes that Alternative 2 provides the most cost effective requirements to increase physical protection levels for Category II materials in-transit. Enclosure "A" includes proposed amendments to implement Alternative 2.

Recommendation: That the Commission approve Alternative 2 and instruct the staff to prepare that alternative for publication in the Federal Register for public comment.


Note:

In accordance with 10 CFR 51.5(d)(3) an environmental impact statement, negative declaration, or environmental impact appraisal need not be prepared because these amendments are considered non-substantial and insignificant from the standpoint of environmental impact.



Coordination:

The Office of the Executive Legal Director has no legal objection to the recommendations of this paper. The Offices of Inspection and Enforcement and Standards Development concur in the recommendations of this paper.

 OCT 22 1979  
William J. Dircks, Director  
Office of Nuclear Material Safety  
and Safeguards

Enclosures:

- "A" Proposed Amendments
- "B" Letter to DOE
- "C" Threat Analysis
- "D" Discussion of DOE Requirements
- "E" Costing of Alternatives

Note: Commissioner comments should be given directly to the Office of the Secretary by C.O.B. Monday, November 5, 1979.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT October 30, 1979, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

DISTRIBUTION

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ENCLOSURE A

Proposed Amendments

I. Alternative 2

1. Category II in-transit requirements (Section 73.47(e)) would be amended to include an additional paragraph §73.47(e)(6) to read as follows:

(6) If, after receiving notification of a shipment of special nuclear material pursuant to §73.72 of this Part, it appears to the Commission that two or more shipments of special nuclear material of moderate strategic significance, constituting in the aggregate an amount equal to or greater than a formula quantity of strategic special nuclear material, may be en route at the same time, the Commission may order one or more of the shippers to delay shipment.

II. Alternative 3

1. Category II in-transit requirements (Section 73.47(e)) would be revised to read as follows:

(e) In-Transit Requirements for Special Nuclear Material of Moderate Strategic Significance.

(1) Each licensee who transports, exports, or 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 point, name of carrier, and transport identification.

(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 either by exclusive-use road vehicle or by air, rail, or sea,

~~[(iv)]~~ (iv) transport the material in ~~[a]~~ tamper-indicating sealed containers enclosed in a locked and sealed cargo compartment,

~~[(v)]~~ (v) check the integrity of the containers, locks and seals prior to shipment,

~~[(v)]~~ arrange for the in-transit physical protection of the material in accordance with the requirements of §73.47(e)(3) of this part unless the receiver is a licensee and has agreed in writing to arrange for the in-transit physical protection.

\*Underlined words denote new text - dashed through and bracketed words indicate deletions to present text - relative to the Commission approved Category II/III Rule.

Enclosure "A"

(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,

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

(iii) arrange for the in-transit physical protection of the material in accordance with the requirements of §73.47(e)(3) of this part unless the shipper is a licensee and has agreed in writing to arrange for the in-transit physical protection.

(3) Each licensee, either shipper or receiver, 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] frequent communications [capability], for monitoring of the shipment, for notification of any delays in the scheduled shipment, or to request appropriate law enforcement agency response in the event of an emergency, between the [carrier] transport vehicle and the shipper, receiver or a shipper/receiver designee.

(ii) arrange for at least one escort to check locks and seals when necessary and maintain surveillance of the material during all loading and unloading operations, stops, emergencies, or other situations that might affect security of the material. For road shipments the escort must be in addition to the driver, except for shipments of less than one hour in duration.

~~[(ii)]~~ (iii) 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)]~~ (iv) conduct screening of all licensee employees involved in the transportation of the material in order to obtain information on which to base a decision to permit them control over the material.

~~[(iv)]~~ (v) establish and maintain response procedures for dealing with threats of thefts or thefts of such material.

~~[(v)]~~ (vi) 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

\*Underlined words denote new text - dashed through and bracketed words indicate deletions to present text - relative to the Commission approved Category II/III Rule.

~~[(vi)]~~ (vii) conduct immediately a trace investigation of any shipment that is lost or unaccounted for after the estimated 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 §73.47(c), (e)(1), and (e)(3).

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

(i) comply with the requirements specified in §73.47(c), (e)(2), and (e)(3), and

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

(6) If, after receiving notification of a shipment of special nuclear material pursuant to §73.72 of this Part, it appears to the Commission that two or more shipments of special nuclear material of moderate strategic significance, constituting in the aggregate an amount equal to or greater than a formula quantity of strategic special nuclear material, may be en route at the same time, the Commission may order one or more of the shippers to delay shipment.

\*Underlined words denote new text - dashed through and bracketed words indicate deletions to present text - relative to the Commission approved Category II/III Rule.

(Secs. 53, 161i., Pub. L. 83-703, 68 Stat. 930, 949, as amended Sec. 7, PL 93-377, 88 STAT 475 (42 U.S.C. 2073, 2201).)



ENCLOSURE B

JUL 5 1979

Dr. Joseph Tinney  
Division of Policy & Analysis  
Office of Safeguards & Security  
U.S. Department of Energy  
Washington, D.C. 20545

Dear Dr. Tinney:

The Nuclear Regulatory Commission (NRC) recently approved publication of amendments (enclosed) to Title 10 of the Code of Federal Regulations that will place safeguard requirements on licensees who possess, use, or transport Category II quantities of special nuclear material (SNM). On approving the amendments, the Commission directed the staff to prepare a Commission paper, comparing the need for our licensees to protect in-transit quantities of Category II SNM with the level of protection afforded similar quantities of government-owned SNM by virtue of DOE Order 5362. In order to better meet the Commission's request, we need to understand the rationale and analysis that provided the basis for some of the specific DOE requirements in that Order.

The following have been identified as topics on which we need input from DOE in order to properly prepare a response to the Commission. We would appreciate any information that you can provide on these questions.

SPECIFIC TOPICS

1. Requirement g(1)(a)1:
  - a. Was a value/impact analysis made on the requirement that Category II material be shipped by exclusive-use truck? If so, please forward a copy of the analysis.
  - b. What was the basis for requiring at least two escorts for all Category I material in-transit?
2. Requirement g(1)(a)6:
  - a. What is the danger to the public health and safety resulting from sabotage of Category II quantities of SNM?
3. Requirement g(3)
  - a. Would you please send us a copy of Form DOE-60?

GENERAL TOPICS

1. What was the basis for developing a categorization of SNM different from the Category I, II, and III quantities used by the IAEA?

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Enclosure "B"

OFFICE					
SURNAME					

Dr. Joseph Tinney

- 2 -

2. What was the basis for placing safeguard requirements on low-enriched uranium, high-enriched Pu and uranium-233 for quantities above 1 gram? Specifically, what threat was identified that required protection of such small quantities of SNM?
3. Could we be provided a copy of any cost-impact analysis that your Category II and III requirements will have on your contractors?

We would appreciate receiving answers to the above questions by July 18, 1979, so that they can be factored into the Commission paper due to the Commission by the end of July. All responses can be sent to Mr. James A. Prell, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. If you have any questions about the information requested, please call Mr. Prell (443-5901).

Sincerely,

Karl E. Goller, Director  
Division of Siting, Health & Safeguards Standards  
Office of Standards Development

Enclosures:  
As stated

Task MP 711-1

Distribution  
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SD Rdg  
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SGSB Rdg  
SGSB Subj (2)  
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POOR ORIGINAL

Enclosure "B"

OFFICE	SGSB:SB	SGSB:SD	SHSS:SD	SHSS:SD	
NAME	JAPurple	WBRdg	RAPurple	KRGoller	

ENCLOSURE C

## THREAT ANALYSIS

### Sabotage Threat

NRC staff presently has under study an assessment of the potential risk to the public health and safety of sabotage of Category II or III material in-transit. Until this study is complete (estimated completion date is March 1980) an accurate risk assessment cannot be made. However, the staff can draw some conclusions based on previous studies done in this area.

There appears to be no particular reason to assume that sabotage of in-transit SNM is any more hazardous to the public health and safety than sabotage of in-transit nuclear by-product material or toxic chemicals. This summarizes statements made and supported by the staff in NUREG-0170, "Final Environmental Statement On the Transportation of Radioactive Material by Air and Other Modes." Specifically, as it applies to Category II and III material, NUREG-0170 made the following statements:

- a. Low Enriched Uranium - paragraph 7.2.1, page 7-1 -- "Furthermore, the radioactivity of this material is so low that dispersal by manual means or acts of sabotage would not produce a significant radiological hazard."
- b. Uranium Highly Enriched in U-235 - paragraph 7.2.7, page 7-4 -- "Because of its low radioactivity, sabotage of U-235 would not, in general, constitute a general threat to the public."
- c. Plutonium and Uranium-233 - paragraph 7.2.8, page 7-5 -- "In addition, because of their radioactivity, plutonium and U-233 are potentially hazardous, particularly when in the form of respirable aerosols. Therefore, for significant quantities of these materials, the potential exists for misuse both as illicit explosives and as dispersal weapons."

In this context "significant quantities" was interpreted to mean greater than formula quantities and the stated threat is not one of sabotage but of theft and ultimate use of the material in an illicit weapon. For less than formula quantities NUREG-0170 makes the following statement in paragraph 7.4.2, page 7-8: "While this level is not directly related to risks associated with dispersal weapons, it can be shown that the possible consequences from dispersal of such quantities would be of the same order as malevolent use of chemical explosives and small compared to a nuclear explosion. (It has been estimated in Reference 7-3 that plutonium dispersed in a city having a high population density could result in one fatality for each 15 grams dispersed.)"

Staff, therefore, feels that protection against sabotage of in-transit SNM is not warranted at this time, pending the results of the study to be completed in March 1980.

Enclosure "C"



Theft Threat

There appears to be little technical justification for requiring preventive measures to protect against the theft of individual Category II shipments, since the quantities of strategic special nuclear material involved in such shipments are less than that needed to construct a nuclear explosive device. This was recognized at the time the Category II/III Rule was approved by the Commission [44 FR 43280, July 24, 1979], when it was stated that the threat to Category II material arises mainly from the possibility of multiple thefts of close to formula quantities of SSNM which, in the aggregate, could be accumulated to allow construction of an illicit nuclear weapon. This led to the decision to provide for detection of individual thefts of Category II shipments, but to exclude measures to prevent such thefts.

However, the threat of multiple theft of Category II shipments was the prime consideration in the Commission's decision to include in the recently approved [July 24, 1979] Physical Protection Upgrade Rule a prohibition against multiple shipments of Category II material by the same licensee if the total quantity included in such shipments amounted to a formula quantity. Additional measures to prevent multiple thefts of Category II shipments by different licensees would be similarly justified.

ENCLOSURE D

## Discussion of DOE Requirements

### Exclusive-Use Truck

DOE Requirement: "Use of government-owned or exclusive-use truck by a commercial carrier."

Present NRC Requirement: "Route material in most safe and direct manner". (Exclusive-use truck or container not required.)

Discussion: The intent of the DOE requirement apparently is to assure that SNM containers are not accidentally misrouted, and to minimize travel time and limit access to cargo compartments. Most Category II shipments are small and can be shipped much less expensively in LTL (less than truckload) mode. Exclusive-use tractor trailers cost much more because carriers are allowed to charge for minimum loads in the tens of thousands of pounds, while most Category II shipments do not exceed 500 pounds. The use of privately owned or rented trucks of a much smaller size commensurate with the job, and driven by escorts, would still not offer a very much more cost-effective alternative. Although exclusive-use road vehicles are much more costly than shipping the same material by general freight, they offer some security advantages. They provide the licensee and NRC with greater control over the progress and routing of the shipment, since the carrier is responsible only to the licensee and need not make intermediate stops to load or unload other cargo. Also, lengthy layover times can be avoided at truck depots, where general freight might be stored for a time pending continuation of the shipment on a different truck. These intermediate stops are times when the shipment would be most vulnerable to theft. Also, the duration of the shipment is reduced due to more direct travel between origin and destination. Exclusive-use road vehicles also allow for double (continuous) operation, which would eliminate intermediate layovers entirely. (DOT regulations require drivers to stop for eight hours of rest after every ten hours of driving time, but allow two drivers to alternate driving, permitting continuous operation if a specially designed sleeper berth is available in the cab.)

The increase in cost for road shipments due to the requirement for an exclusive-use vehicle is significant compared to the cost for making the same shipment by general freight. However, when compared to the value of the material shipped, it is a relatively small percentage of the total value of the shipment (see Enclosure "E").

### Escorts

DOE Requirement: "...in custody of at least two escorts..." (Escorts can include the driver.) "Escorts shall maintain shipment under surveillance"

Enclosure "D"

Present NRC Requirement: (No escort required for road, rail, air, or sea shipments. No requirement for surveillance or inspection of shipment during trip.)

Discussion: DOE requires two escorts to perform surveillance and other security related duties while the transport is in motion as well as stopped. (For road shipments, one escort can be the driver.) No in-transit surveillance or inspection capabilities are required by NRC for Category II shipments, nor are they recommended in INFCIRC/225/Rev.1. IAEA recommendations do not include the use of escorts to accompany shipments. The presence of an escort to maintain the shipment under surveillance during times the driver is concerned with other things (vehicle maintenance and refueling, and during rest stops) could enhance the security of the shipment, and provide continuity of security supervision in case changes of drivers or transport vehicles become necessary. However, the necessity for an escort is not apparent since periodic inspection by the driver could provide an adequate detection capability during stops.

A single escort for Category II air shipments would be capable of performing all functions required of the two DOE escorts. DOE intent regarding the second escort for air and rail shipments was stated by DOE to be for purposes of insider protection. DOE escorts are not required to be armed and therefore are not required to repel an armed attack. Thus their numbers would not be significant from the point of view of armed response. There appears to be no justification for the second escort beyond the insider protection issue, which is to be taken up comprehensively in a response to a separate Commission request regarding this issue.

### Security Clearances

DOE Requirement: "...escorts possessing "L" access authorizations or equivalent."

Present NRC Requirement: "Conduct screening of all licensee employees involved in the transportation of the material."

Discussion: It has been stated previously (Enclosure "C") that the threat to Category II shipments arises from the possibility of multiple thefts, and that there was little technical justification for requiring preventive measures for the protection of individual shipments. The staff has recognized this by requiring only detection measures for Category II shipments. Based upon this lack of technical justification, it was the Commission's judgment at the time the Category II/III Rule was approved [44 FR 43280, July 24, 1979] that the threat to the common defense and national security arising from the possibility of theft of an individual shipment of Category II material was too indirect to justify a requirement for clearances of transportation personnel. This requirement was replaced by a less onerous one that the licensee screen his employees involved with transportation of Category II material.

Locks and Seals for Cargo Compartments

DOE Requirement: "Cargo compartments shall be locked and sealed."

Present NRC Requirement: (No requirement for locked cargo compartments.)

Discussion: The intent of the DOE requirement is to discourage casual unauthorized access to cargo compartments, and provide a means of detecting covert unauthorized access or tampering. Locks are generally easily penetrated and do not pose a significant obstacle to the dedicated adversary. However, the cost of locking and sealing cargo compartments in addition to sealing SHM containers (already required by NRC) is slight, and is probably general practice on the part of most carriers.

Communications

DOE Requirement: "...maintain frequent periodic communication with a control station which can request appropriate law enforcement agency response."

Present NRC Requirement: "Arrange for a telephone or radio communications capability, for notification of any delays in the scheduled shipment."

Discussion: The NRC and DOE requirements are not far from equivalence. The DOE requirement implies that it would be acceptable for the escorts to call the control station during stops of the transport utilizing ordinary telephone lines. The same capability is required of NRC licensees, but actual communication is required only if there is an expected delay in the scheduled arrival of the shipment at its destination. There is little additional cost in requiring periodic check-in calls using ordinary telephones.

Detailed Searches Prior to Loading

DOE Requirement: "...detailed search of the transport vehicle prior to loading and shipment..."

Present NRC Requirement: (No search required)

Discussion: The purpose of the DOE requirement has been stated by DOE personnel as helping to assure that the transport vehicle is not sabotaged as part of a plan for a subsequent theft attempt at some time during the shipment. However, the staff perceives such an act of sabotage as an act of force commensurate with other violent acts which might occur during the shipment, such as armed robbery, for which the Category II/III rule is not implemented to provide any preventive measures. Furthermore, the staff's experience is that even a pre-loading search performed by personnel who had been especially trained in such search procedures would not provide reasonable assurance that the vehicle had not been sabotaged. For these reasons, the detailed search requirement prior to loading and shipment is beyond the scope of the present Category II/III Rule, as currently constituted.



ENCLOSURE E

## Costs of Upgrading Category II Material

### Physical Protection to DOE levels

Listed below are the additional physical protection measures which would be required to bring NRC regulations for the physical protection of Category II material into equivalence with DOE Order 5632.1. In each case, a discussion is presented of the costs of their implementation.

#### Exclusive-Use Truck

Road shipments of Category II material are currently shipped primarily by general freight via common carriers. General freight rates for interstate transportation are regulated by the Interstate Commerce Commission, a Federal agency. These rates differ for different shipment distances and different regions of the country. Therefore, it would be difficult to generalize costs of general freight for Category II shipments. However, it would be informative to compare costs of a typical shipment of Category II material. The typical shipment will be assumed to be travelling a distance of 800 miles (roughly the distance from Washington, D.C. to St. Louis, MO).\* The gross shipping weight of actual shipments of Category II material is between 200 and 500 pounds.

General freight costs for such a shipment would be \$16.61 per hundredweight (100 lbs). In addition, there would be a fuel surcharge of 2.7%. The 800 mile shipment from Washington to St. Louis would cost \$85.29.

The costs for the same trip by exclusive-use vehicle would be different depending upon whether a specialized hauler or common carrier were used. The specialized hauler generally charges less than a common carrier. The cost of exclusive-use truck freight by a particular specialized hauler for the 800 mile typical trip would be at the rate of \$3.27 per hundredweight, but the charges would be calculated on the basis of a 32,000 pound minimum load. The total cost would be \$1,046.40. ( $\$3.27 \times 320$  hundredweights). This is about twelve times the general freight cost.

The common carrier costs for an exclusive-use truck over the same route would be at the rate of \$9.17 per hundredweight for an 18,000 pound minimum load, with an additional fuel surcharge of 8.5%. The total cost would be \$1,790.90 ( $\$.17 \times 1.085 \times 180$ ).

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\* Average Category II shipment by truck for calendar year 1978 is about 800 miles.

Shipment by an exclusive-use truck which can accommodate loads in excess of 32,000 lbs. would appear to be quite wasteful for a shipment whose gross weight does not exceed 500 lbs. Therefore, another alternative was investigated to determine if an exclusive-use vehicle of smaller size could provide substantial savings. This alternative consisted of the shipper hiring a rented vehicle of smaller size. Two types of vehicles available from the Ryder Truck Rental and Leasing Company and which were suitable for the task were chosen as examples; a 14-foot truck and an Econoline van. These vehicles were assumed to be rented for a round trip of 1,600 miles (between Washington and St. Louis). In either case, the renter pays for gasoline and provides the driver, which could be an employee of the licensee. At an average speed of 45 miles per hour, the 1,600 mile trip would require about 36 hours of driving time (taking into account normal rest stops, meals, etc.). In addition, a single driver would have to intersperse his driving time with (DOT required) mandatory rest periods of eight hours each after every ten hours of driving time, so that the trip would take at least 60 hours to complete (36 driving hours + 3 eight-hour rest periods). It is reasonable to expect the trip to be completed within three days, assuming no unnecessary delays.

The Econoline vehicle can be expected to average about 10 miles per gallon. Gasoline would cost approximately ten cents per mile (@ \$1.00/gallon). The rental costs are listed as \$25/day and \$.15/mile. The total rental and gasoline costs for the 1,600 mile round trip would be \$475. [ $\$75 + (\$.15 + \$.10) \times 1,600$  miles].

The 14-foot truck was stated to average 6 mpg (or about 17 cents per mile at the same \$1.00 per gallon rate for gasoline) and rents for \$41/day and \$.18/mile. The total rental and gasoline costs for the 1,600 mile round trip are estimated as \$683. [ $\$123 + (\$.18 + \$.17) \times 1,600$  miles].

In addition to vehicle operating costs, the driver's pay must be considered. This is estimated to be about \$150/day, or about \$12.50/hour of duty time. The three-day trip would result in a driver cost of \$450. The cost of insurance was not considered because it is unknown to what extent the employer's existing coverage would be effective, and such insurance would probably have to be negotiated with an insurance company on a case by case basis.

In summary, the cost of hiring the driver and rental vehicle to transport the material would range from \$925 to \$1,133, exclusive of insurance. The conclusion is that this mode would not represent a significant savings, if any, over the use of an exclusive-use truck provided by a specialized or common carrier.

Summary of Shipping Costs by Mode  
(for sample trip - 500 lbs load - 800 miles)

		<u>Comparative Cost</u>
<u>General Truck Freight (Common Carrier)</u>	\$ 85.	1 X
<u>Exclusive-Use Road Vehicle -</u>		
Rented Van and Hired Driver	\$ 925.	11 X
Specialized Hauler	\$1,046.	12 X
Rented 14-Foot Truck and Hired Driver	\$1,133.	13 X
Common Carrier	\$1,791	21 X

Air Cargo

The cost of air cargo (non-exclusive-use aircraft) is somewhat more than for general freight road shipments, but is considerably less than for exclusive-use truck freight. Rates for sample shipments on air cargo aircraft are provided below for an air cargo firm which has handled radioactive material in the past, Flying Tiger Airfreight.

Airfreight Rates

<u>Origin</u>	<u>Destination</u>	<u>Cost for 500 lbs*</u>
Washington, D.C.	Atlanta, GA	\$126.90
Washington, D.C.	St. Louis, MO	\$213.30
Washington, D.C.	Los Angeles, CA	\$324.27

\*Includes 8% Federal Tax which varies by air terminal.

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In the case of exclusive-use road vehicles provided by the licensee - i.e., rented van or 14-foot truck, the escorts must be available for at least half of the 1,600 mile round trip. The driver, however, must complete the trip in order to bring back the vehicle to the point of origin. The escorts may either complete the trip by ground transportation in the rented vehicle, or return by commercial air transportation. The latter alternative is preferable. The cost of providing a single escort is assumed to be \$12.50 per duty hour, the same as the driver. The number of duty hours for an escort accompanying the transport vehicle both ways is the total driving time - 36 hours. In the case of overnight layovers, while the shipment is in the custody of the escort and driver, there may be additional hours of duty required depending on the method of surveillance.

If only the driver returns with the transport vehicle, and any additional escort personnel use commercial air transportation, the number of hours of duty for the escort would be 18 hours to complete the one-way trip distance plus an additional 4 hours for air and local ground transportation - a total of 22 hours on duty. Air and local ground transportation are estimated to cost \$110. Continuous driving of the vehicle without mandatory rest stops was not considered in this case because the rental vehicles would not be properly equipped with sleeper berths to allow for double operation under Federal Motor Carrier Safety Rules.

If an additional qualified driver-escort is provided by the specialized hauler, the cost of the escort would be about \$.50 per mile, or about \$25 per hour. Also, the minimum load upon which the transportation charge is calculated would be increased to 36,000 lbs. This, however, would allow for double operation (continuous operation of the vehicle) so that the total trip time would be about 18 hours, and there would be no necessity for surveillance during mandatory driver rest periods.

If a non-driver was provided as an escort, who could simply be a licensee employee, the hourly rate would more likely be \$12.50 per hour, but total duty time might be increased over the special hauler case depending on how surveillance required during driver rest periods is performed. The escort would also have to be paid during his return trip. In the example of the 800 mile trip we have chosen, the return transportation costs are assumed to be \$110 per person for commercial air transportation. Escort duty hours would be 22 hours (not including surveillance during driver rest periods). The escort costs are summarized in the table below for each case shown in previous table on "Summary of Shipping Costs by Mode".

The cost of airfare for an escort to accompany an air shipment is based upon a factor of 400% of the 100-lb rate for the freight. Thus, the airfare for an escort for the Washington to St. Louis shipment would be \$170.64.

The cost of providing an escort to accompany a rail shipment would be particularly expensive. It is estimated that total cost of the escort would be \$970. This cost includes the escort's wages at the rate of \$150 per day for five days; his fare for the caboose, \$110; and his airfare by commercial passenger airline for the return trip, \$110. It would also be unreasonable to expect a single escort to maintain the shipment under continuous surveillance during the entire 881-mile trip, especially when the freight car was stationary in freight yards during hours of darkness. Freight yards are routinely targets of vandals and thieves.

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Summary of Escort Costs by Mode\*  
(for sample 800 mile trip)

\*(not including costs of surveillance during driver rest periods)

	<u>Single Escort</u>
<u>General Freight</u>	--
<u>Exclusive-Use Vehicle -</u>	
Rented Van and Hired Driver*	\$385.00
Specialized Hauler (Double Operation)**	\$531.00
Specialized Hauler (Single Operation)*	\$385.00
Rented 14-Foot Truck and Hired Driver*	\$385.00
Common Carrier (Single Operation)*	\$385.00
<u>Air Cargo</u>	\$555.64
<u>Rail Shipment</u>	\$979.00

\* Escort provided by the licensee; escort is non-driver.

\*\* Additional cost due to higher minimum load included;  
qualified driver-escort.

Other Costs

The costs of implementation for other measures such as surveillance, communications, and locking cargo compartments, are generally procedural in nature and do not result in significant increments of additional cost beyond those already described.

Value of Category II Shipments

As a basis for comparison of costs of Category II shipments, it was determined that the minimum value of a Category II shipment, presumed to be comprised of high enriched uranium (approximately 93% U-235) in a quantity just in excess of

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one kilogram, would have a value of about \$40,000. This figure was obtained from a licensee responsible for originating a good portion of Category II shipments, and agrees roughly with information obtained independently from DOE sources based upon the value of uranium feedstock and the cost of separative work units required to enrich the uranium to the 93% level.

It was also found, based upon actual shipment values obtained from the same licensee, that the value of the material after it had been fabricated into fuel elements or assemblies was increased by a factor of about 40%. This leads to the conclusion that the maximum typical value of a Category II shipment, presumed to be comprised of close to five kilograms of HEU in the form of finished fuel assemblies or elements is about \$280,000 [ $\$40,000/\text{kg.} \times 5 \text{ kg.} \times 1.4$  factor for value added in manufacture].

The maximum shipping cost for a road shipment of Category II material over the typical 800-mile shipment distance would be about \$1,400. This represents only 3.5% of the total value of the shipment. This shipment cost would be only 0.5% of the value of the highest valued shipment.