MHS 3-2

POLICY ISSUE
(Information)

March 11, 1988 SECY-88-76

For: The Commissioners

From: Victor Stello, Jr.
Executive Director
for Operations

Subject: ACCOUNTABILITY OF RADIOACTIVE MATERIAL USED BY MATERIAL LICENSEES

Purpose: To respond to the Commission's request for information on the accountability of radioactive material used by NRC and Agreement State licensees.

Summary: This paper describes the NRC's current program for traceability and accountability of radioactive materials to assure public health and safety, and explores initiatives for improvement. It does not cover safeguards requirements for special nuclear material related to national security considerations.

Background: In a memorandum dated January 4, 1988, the Chairman requested that the EDO provide to the Commission an information paper on traceability and accountability of radioactive material used by NRC and Agreement State licensees. Concerns about this matter relate to incidents of loss of control of radioactive material, resulting in radiation safety hazards and/or expensive decontamination efforts. These incidents raised questions about the ability of licensees to manage radioactive material properly, and whether or not the NRC and Agreement State regulatory program for accountability and control needs improving.

Discussion:

1. The Scope of the Problem

There is a wide range of licensees and uses of radioactive material under NRC and Agreement State jurisdiction. A licensee can be a one-person operation or a major corporation.

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The licensed radioactive material can be sealed sources or unsealed material, can range in quantity from microcuries to megacuries, can range in half-life from hours to thousands of years, and covers a complete spectrum of radiotoxicity depending on the nuclide involved.

Similarly, incidents involving loss of control of radioactive material cover a wide spectrum. For example, a lost source can remain intact in an unknown location, or can be melted down or otherwise recycled in the form of contamination. In the 1987 incident in Brazil, a lost cesium-137 teletherapy source caused fatalities and extensive contamination. Incidents also occur involving unsealed material. In late 1986, a storage building at Wright-Patterson Air Force Base was contaminated by americium-241 waste which was illegally transferred to the base by J. C. Haynes, requiring an expensive decontamination operation. There have been a number of other incidents over the years involving lost or abandoned radioactive material which was never recovered. There have also been a few incidents involving unexplained radioactive contamination which is presumed to have originated from lost or stolen sources. Enclosure 1 provides a summary of certain notable incidents.

In any system of controls intended to prevent adverse consequences, the type and degree of controls imposed should be based on achieving high assurance that severe consequences are prevented, and providing reasonable assurance that less severe consequences are minimized. For example, it is appropriate to have the highest degree of control over the large quantities (hundreds to millions of curies) of long-lived, gamma-emitting radionuclides in devices such as irradiators, teletherapy devices, and radiography equipment. Progressively less rigorous regulatory efforts at control may be appropriate for devices such as well-logging sources (up to 15 curies), moisture density gauges (10-50 millicuries), and tritium exit signs (up to 10 curies, non-penetrating radiation).

2. The Current NRC Regulatory Program

NRC regulates about 8,000 specific licensees directly. There are also about 15,000 additional specific licensees regulated by the 29 Agreement States. The regulatory requirements of the Agreement States for control of radioactive material are compatible with those of NRC. There are also about 35,000 general licensees who possess devices containing radioactive

material. It is estimated that in 1985 there were 2 million shipments of radioactive material. In addition, there are numerous transactions such as sales of assets, relocations, and waste disposal which present opportunities for unauthorized transfers and loss of control of radioactive material.

Taking into account the size and variation of the regulated industry, the NRC regulatory program places primary responsibility for proper control of radioactive material on the licensees. Regulatory requirements and resources are applied in accordance with the potential health risk. Following is a summary of current regulations, license requirements, and inspection programs applicable to control of radioactive material.

a. Regulations and license requirements

A detailed list of regulations related to control of radioactive material is provided in Enclosure 2. In addition, there are a few standard license requirements which are imposed on most material licensees. Agreement State requirements are equivalent to those of the NRC. The requirements are summarized as follows:

- Licensees must conduct periodic surveys, including physical inventories and leak tests of sealed sources.
- Licensees must immediately report to NRC significant incidents of theft or loss of radioactive material.
- Licensees cannot transfer radioactive material until they verify that it is going to an authorized recipient.
- Licensees must maintain records of receipt, transfer, and disposal of radioactive material.
- Licensees cannot relocate or sell licensed operations without written approval from NRC.
- Licensees must notify NRC of bankruptcy or a decision to terminate operations.
- Licensees must post areas where radioactive material is used, and label devices containing radioactive material.

- o Licensees must control access to radioactive material in unrestricted areas.
- o Licensees must establish procedures for receiving and opening packages.
- o Licensees must keep records of surveys.

In all, there are about 30 specific requirements in the regulations, plus a few standard license conditions, related to accountability and control of radioactive material (excluding safeguards requirements).

b. Inspection Program

About 35 NRC staff-years are budgeted annually for direct materials inspections (excluding safeguards). About 50 staff-years are provided by the Agreement States for inspection of their licensees. The frequency of inspections varies according to the potential hazard. Major fuel cycle facilities are inspected several times per year. Radiographers and major manufacturers are inspected annually. Certain low-hazard licensees are inspected once and might not be inspected again for many years. General licensees are rarely inspected.

The inspection procedures include a review of records to assure proper inventory and accounting of radioactive material. Some independent surveys are also conducted. Physical verification of all radioactive material by the inspector is not normally performed and in most cases would be impractical. The inspections are an audit of the licensees, who are primarily responsible for compliance.

c. Safeguards Program

NRC imposes strict material control, accountability, physical security, and reporting requirements for special nuclear material (SNM) and certain types of source material. Licensee programs are closely monitored by NRC in cooperation with the Department of Energy (DOE). NRC receives about 20,000 SNM transfer reports per year. The annual cost of tracking these transfers is over $1 million for NRC and over $3 million for DOE. This program is

not discussed further in this paper, because it is oriented toward national security rather than radiation safety. However, it does indicate through simple extrapolation that a similar system to control approximately 2 million transfers of radioactive material annually would probably not be feasible because of cost, nor practicable because of the large amount of data which would need to be managed on a daily basis. As discussed below, the staff believes that there are alternative methods available to improve accountability while conserving resources.

3. Effectiveness of the Current Program and Initiatives for Improvement

The current regulatory program is adequate in the sense that incidents involving loss of control of radioactive material are relatively few, considering the large number of licensees and transactions involved. However, the staff believes that many of the incidents that do occur are preventable. The following is a discussion of problem areas identified by the staff, and current and possible future initiatives for improvement.

a. Licensee awareness and responsibility

Although the NRC has many explicit regulations designed to prevent loss of control of radioactive material, licensee negligence is frequently a factor in such incidents. Material is stolen, misplaced, or otherwise lost because the licensee simply does not conscientiously monitor its licensed program. The management might not exercise proper control to begin with, or a well-managed program may deteriorate over time due to staff turnover or economic conditions.

In order to heighten licensees' awareness of their responsibilities, the staff has pursued the following initiatives:

- Applicants for new material licenses are more frequently interviewed or visited by the staff to assess their capabilities and obtain subjective impressions about the applicants' ability and willingness to implement the programs described in their applications.

- All new licensees are scheduled for inspection within six months of issuance of the license.

- New licensees receive a letter with their license which explains requirements to comply with NRC regulations and to notify NRC of any changes in the licensed program, and explains NRC's inspection program and penalties for non-compliance.

- NMSS is establishing a newsletter for all material licensees which will focus on information related NRC requirements, incidents, and compliance. Agreement States will receive copies.

- NRC has issued a color warning poster which describes how to identify possibly radioactive devices, and how to notify authorities in case of emergency. This poster is available for use by licensees as well as scrap metal dealers, waste disposal companies, and other persons who may come across radioactive devices.

- NMSS periodically issues information notices to appropriate licensees and the Agreement States, which discuss the "lessons learned" and corrective actions for significant incidents or cases of non-compliance. (See Enclosure 3 for two recent examples of Information Notices.)

- The staff recently amended the regulations to require significant materials incidents to be reported directly to the NRC Operations Center rather than the Regions. All licensees were notified of this change.

- When cases of non-compliance involving loss of control of radioactive material are identified, the staff takes vigorous enforcement action. Loss of hazardous radioactive material, unauthorized transfers, and failure to report significant incidents of loss of material are Severity Level III violations, for which civil penalties may be imposed. For example, in 1986 a $15,000 civil penalty was assessed for unauthorized abandonment of a gauge at C.E. Glass Company in Missouri.

It is noted that it is difficult to measure in advance the abilities or willingness of a licensee to implement an adequate radiation safety program. While adequate and comprehensive safety programs can be described in a

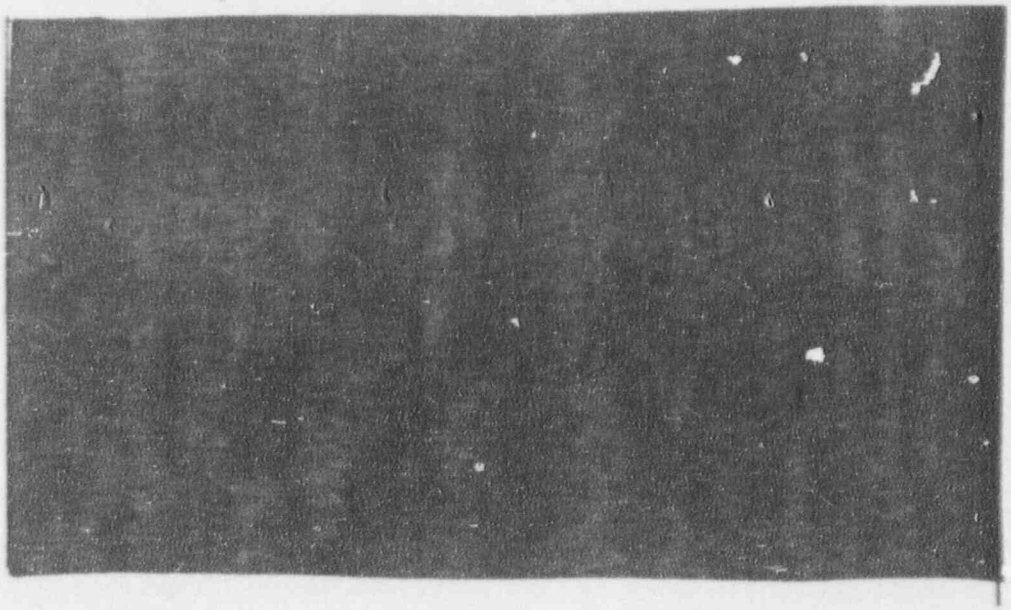
license application, it is inadequate implementation that leads to difficulties. Most of the initiatives noted above address effective implementation and consequences for failure to do so.

b. Inspections

Onsite inspections are an important factor in verifying compliance. They also increase licensees' awareness of their responsibilities, which is a major factor in assuring compliance. However, even if resources for inspections were increased, we could never inspect more than a small fraction of the total transactions involving opportunities for loss of radioactive material.

The staff is planning to evaluate the feasibility of a supplement to the inspection program, where certain categories of licensees could be periodically contacted by a mail survey. Licensees would be required to answer questions about the status of their program, location of radioactive material, and any transfers or disposals. The staff would follow up any discrepancies by telephone contacts or onsite inspections. The mail survey would be a resource-efficient method of monitoring licensees who are not inspected frequently. It would identify many cases where licensees move, sell facilities, lose track of radioactive material, or go out of business without notifying NRC.

c. Monitoring of transactions and verification



Ex 5

- o The staff is considering rulemaking to require all commercial waste disposal site operators to report periodically to NRC detailed information, in an electronic format, on radioactive waste shipments received by the waste disposal sites.

d. General licensees

In SECY-87-167, the staff discussed the need to place additional restrictions on general licensees and generally licensed devices to improve accountability and control. Actions under consideration by the staff include: (1) tracking general licensees and devices under a computer system, (2) requiring periodic inventory reports from general licensees, (3) requiring additional restrictions on the type of devices which can be generally licensed, and (4) additional labeling and service requirements for the devices.

e. Financial assurance

The staff is pursuing rulemaking to require licensees to provide financial assurance both for decommissioning and for clean-up following radiological incidents. The final rule on decommissioning was provided to the Commission in SECY-87-309. A rule on clean-up following incidents is in the early stages of development. Rules on financial assurance will heighten licensees' awareness of their responsibilities, discourage unauthorized transfers, and provide funds for decommissioning and clean-up in cases where licensees fail to meet their responsibilities.

f. Long-term storage of radioactive material

Many licensees store unwanted or surplus long-lived radioactive material because of the lack of available disposal facilities, because they are uncertain of future needs, because they are trying to save disposal costs, or because there is no suitable way at present to dispose of the materials.[1] Such long-term storage increases the risk of loss of

[1]The NRC staff and Agreement States recently surveyed licensees, in order to identify licensed cesium-137 teletherapy sources similar to the source involved in the Brazilian incident. The results indicate that there are about 20 cesium teletherapy sources under license. Most are still in active use. Large cesium sources are difficult to dispose of, because of restrictions placed on disposal of sources with high specific activity.

material due to inadequate long-term monitoring. The staff plans to take actions which would encourage licensees to dispose of, rather than store, surplus material, and provide tighter surveillance requirements for material that must be held in storage. This effort will have to take into account the availability of disposal facilities, particularly for transuranic or "greater than Class C" waste. The staff is coordinating with the Department of Energy on this issue.

4. Conclusions

Although there are already many regulatory requirements in place related to accountability for radioactive material, the regulatory program can still be improved. Due to the broad scope of the materials program, no single action can resolve the problem of inadequate control of radioactive material. Furthermore, regulatory resources should be committed in proportion to the potential hazard.

The possible initiatives for improvement fall into three categories: (1) ongoing initiatives within budgeted resources, (2) new initiatives which can be implemented without a major commitment of resources, and (3) major new initiative which will require a major commitment of resources.

Ongoing initiatives being pursued by the staff with budgeted resources are as follows:

- Improved communications between NRC and licensees.
- Vigorous enforcement actions in cases of non-compliance.
- Establishment of financial assurance requirements for decommissioning and clean-up after accidents.
- Coordinating with IAEA in evaluating the possibility of establishing a system for notifying regulatory authorities of shipments of radioactive material into their countries.

The staff plans to pursue the following new initiatives, and anticipates that their implementation will not require major commitments of resources:

[redacted]

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- Rulemaking to require commercial waste disposal site operators to report to NRC detailed information in a computer format on waste shipments received.

The following major initiatives will require major commitments of currently unbudgeted resources:

- Review and revision of regulatory requirements for general licensees.

- Development of a mail survey program as a supplement to onsite inspections of certain categories of licensees.

As discussed in SECY-87-167, the staff is developing a basis for improved accountability for certain generally licensed devices through rulemaking. A mail survey program could be established for general licensees, and possibly expanded later to other categories of licensees. In addition, the rules governing generally licensed devices have been in existence for some time, and should be re-examined in terms of current regulatory framework and practices. This is reinforced by the problems recently experienced by the 3M static elimination devices. The staff is undertaking a scoping study to determine what further initiatives might be warranted in this area.

The staff will coordinate with the Agreement States as appropriate to assure compatible improvements for their licensees.

GAO is conducting an audit of the NMSS Materials Program and staff anticipates receiving a draft report by the end of March. A second, more specific audit will be initiated on the Broad Licensee Program. We will revisit the issue of traceability and accountability of radioactive material once we receive the two GAO audit reports. We are not recommending Commission action at this time.

Victor Stello, Jr.
Executive Director for Operations

Enclosures: 1. Summary of Notable Incidents
2. List of Regulations
3. Information Notices dtd 2/2/88 and 10/29/87

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SUMMARY OF NOTABLE INCIDENTS
INVOLVING LOSS OF CONTROL OF RADIOACTIVE MATERIAL

1. Cobalt-60 Contamination - New York - 1983

Unexplained cobalt-60 contamination (about 25 curies total) was discovered in 100 tons of scrap metal at a steel plant. There were no significant doses to workers or offsite releases. Decontamination costs exceeded $2 million. The probable cause was a lost radiography or teletherapy source.

2. Teletherapy Device - Mexico/U.S. - 1984

An unused teletherapy device (400 curies of cobalt-60) was mixed with scrap metal in Mexico. An estimated 10 Mexicans probably received radiation overexposures. Contaminated products were imported into the U.S., and had to be recalled. The cost of decontamination and recovery efforts probably exceeded $1 million.

3. Cesium-137 Contamination - California - 1985

Unexplained cesium-137 contamination (about 1.5 curies total) was discovered in a steel plant. There were no significant doses to workers or offsite releases. Decontamination costs were about $1 million. The probable cause was a lost gauge.

4. Lost Radiography Source - Morocco - 1984

A Moroccan citizen apparently picked up a lost radiography source (30 curies of iridium-192) and brought it home. Eight family members died before the cause was discovered.

5. Americium-241 Contamination - Ohio - 1987

Americium waste was illegally transferred by John C. Haynes to Wright-Patterson Air Force Base. The waste was later inadvertently disturbed by radiation workers, contaminating the storage building. There was one possible worker overexposure, but no significant releases to the environment. An expensive clean-up was required at government expense.

6. Abandoned Gauge - Missouri - 1986

In 1981, C-E Glass, Inc. sold a facility containing a licensed gauge (1.2 curies of cobalt-60) to an unlicensed company without notifying NRC. The facility was later sold to a salvage company. The salvage company removed the gauge and left it outdoors with the shutter open, until NRC inspectors found it in 1986. Several workers had worked in the vicinity of the gauge. NRC assessed a $15,000 civil penalty.

7. Stolen Teletherapy Device - Brazil - 1987

Someone removed a teletherapy device from a closed clinic in Brazil. They broke open the device, causing overexposures and extensive contamination. Several persons died from radiation injuries.

LIST OF NRC REGULATIONS RELATED TO CONTROL OF RADIOACTIVE MATERIAL
(EXCLUDING SAFEGUARDS REQUIREMENTS)

10 CFR Section	Requirement
19.11	Posting of notices to workers.
20.201	Surveys. (Used as basis to require inventories and leak testing. The requirement for leak testing and periodic inventory requirements are standard license conditions.)
20.203	Caution signs, labels, signals, and controls.
20.205	Procedures for picking up, receiving, and opening packages.
20.207	Storage and control of licensed materials in unrestricted areas.
20.311	Transfer for disposal and manifests.
20.401	Records of surveys, radiation monitoring, and disposal.
20.402	Reports of theft or loss of licensed material.
20.403	Report of incidents involving radioactive material.
30.34b	A license cannot be transferred without written NRC approval.
30.34h	Bankruptcy reporting requirement.
30.36	Termination of licenses and decommissioning.
30.41	Transfer of byproduct material. This section requires confirmation that a requestor has a license authorizing the possession of radioactive material before shipment.
30.51	Records of receipt, transfer, and disposal.
31.5	Requires notification of device damage, transfers, disposal, theft or loss.
31.7	Requires notification of theft/loss.
31.11	Requires registration on NRC-483 and report of theft/loss.
32.11	Requires transfer of material reports.
32.14	Requires transfer of material reports.

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10 CFR Section	Requirement
32.16	Requires transfer of material reports.
32.18	Requires transfer of material reports.
32.22	Requires transfer of material reports.
32.26	Requires transfer of material reports.
32.51	Requires transfer of material reports.
32.53	Requires transfer of material reports.
34.26	Quarterly inventory requirements.
34.27	Utilization logs.
35.59	Inventory and leak testing of medical sources.
40.25	Registration of general licensee who receives or uses depleted uranium.
40.35	Requires transfer of material reports.
40.51	Transfer of source or byproduct material.
40.61	Records of receipt, transfer, and disposal.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

February 2, 1988

NRC INFORMATION NOTICE NO. 88-02: LOST OR STOLEN GAUGES

Addressees:

All NRC licensees authorized to possess gauges under a specific or general license.

Purpose:

This notice is intended to inform licensees of the requirement to notify NRC immediately if gauges are lost or stolen. It is expected that licensees will review the information for applicability to their specific or generally licensed activities, distribute the notice to responsible radiation safety staff, and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, this information notice does not constitute new NRC requirements, and no written response is required.

Description of Circumstances:

In several recent events, fixed gauges containing radioactive material were removed from production lines, set aside, and lost or stolen. It is believed that these gauges were inadvertently transferred to unrestricted areas, such as a scrap yard or landfill. Reasonable attempts were made to find the gauges, but without success. In several cases, the loss of the gauge was not reported to the NRC until long after the gauge was first noticed to be missing. The failure to control the gauges, and the failure to report the loss of the gauges to the NRC, has been the subject of escalated civil penalty enforcement actions.

Discussion:

The NRC considers theft or the loss of a gauge to be a situation which could constitute a substantial hazard and therefore be reportable under 10 CFR Part 20.402(a)(1). Lost gauges have, in the past, resulted in exposures to members of the public and contamination of unrestricted areas. Licensees are advised that any loss or theft of a gauge should be immediately reported to the NRC as required by 10 CFR Part 20.402.

Licensees should also note that both general and specific licenses for fixed gauges normally prohibit removal of gauges from their installed location except by a licensed manufacturer or service company, unless the user licensee is authorized to do so by his license. Further, most specific and general gauge licensees are required, as a condition of that license or instructions from the manufacturer, to periodically inventory and/or leak test the gauges in their possession.

No written response is required by this notice. If you have any questions regarding this information notice, please contact the appropriate NRC regional office or this office.

Glen L. Sjoblom for
Richard E. Cunningham, Director
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material
Safety and Safeguards

Technical Contact: Jack R. Metzger, NMSS
(301) 492-3424

Attachment: List of Recently Issued NRC Information Notices

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

October 29, 1987

NRC INFORMATION NOTICE NO. 87-55: PORTABLE MOISTURE/DENSITY GAUGES: RECENT INCIDENTS OF PORTABLE GAUGES BEING STOLEN OR LOST

[Refer also to NRC Information Notice No. 86-67, August 15, 1986, Same subject]

Addressees:

All NRC licensees authorized to possess portable gauges.

Purpose:

This notice is intended to inform licensees of the recent increase in incidents of portable gauges being lost or stolen during use, transportation, and storage. It is expected that recipients will review the information for applicability to their licensed activities and consider actions, if appropriate, to preclude similar problems from occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Several incidents have occurred recently where portable moisture and density gauges have been lost or stolen from licensees, either from job sites or from vehicles during transportation. Gauges lost or stolen were not secured or were stolen while left unattended by the users.

In one recent event, a gauge was stolen after the user failed to lock the case and failed to chain the case to the truck, which itself was left unattended. This event resulted in four violations of NRC requirements. In another case, a gauge was stolen after being left outdoors, unattended, over a weekend, at a construction site.

Discussion:

A primary contributing factor in these incidents was the failure of the gauge users to secure and maintain control over the gauges.

Title 10 CFR 20.207 requires that licensed material (e.g., portable gauges) must be under the constant surveillance and immediate control of the licensee, or must be secured in storage. At construction sites, the licensee must constantly control access to the gauge during use at the site, and keep it in locked storage when not in use.

NRC licensees transporting portable gauges are subject to the regulations in 10 CFR Part 71. Section 71.5(a) incorporates certain regulations (49 CFR 170-189) of the Department of Transportation (DOT), to which these licensees are also subject. Licensees who transport gauges to and from temporary job sites in private vehicles are shippers acting as private carriers, and as such, must comply with the DOT regulations governing both shippers and carriers. Title 49 CFR 177.842(d) requires that packages containing radioactive material (i.e., the gauge in its case) must be blocked and braced to prevent movement of the package during transportation (see Information Notice 87-31, attached). For pickup trucks, this requirement is usually met when the gauge is secured within its case, and the case is secured and locked to the bed of the truck.

The NRC has also noted several incidents where gauges were damaged in transportation accidents or by being run over by construction vehicles. The most prevalent cause of such incidents is the failure by the licensee to secure and lock the cargo door, combined with a failure to properly secure the device/case to the bed of the vehicle. Licensees are reminded that they should use care to avoid these types of incidents. If a gauge is damaged, the area around the gauge should be restricted, and the licensee's radiation safety officer and NRC should be promptly notified.

No specific action or written response is required by this notice. If you have any questions regarding this information notice, please contact the appropriate NRC regional office or this office.

Richard E. Cunningham, Director
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material Safety
and Safeguards

Technical Contact: Don Mackenzie, NMSS
(301) 427-4052

Attachments:
1. Information Notice No. 86-67
2. List of Recently Issued NRC Information Notices