United States General Accounting Office

GAO

Report to the Ranking Minority Member, Subcommittee on Financial Management, the Budget, and International Security, Committee on Governmental Affairs, U.S. Senate

August 2003

NUCLEAR SECURITY

Federal and State Action Needed to Improve Security of Sealed Radioactive Sources

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Highlights

Highlights of GAO-03-804, a report to Ranking Minority Member, Subcommittee on Financial Management, the Budget, and International Security, Committee on Governmental Affairs, U.S. Senate

Why GAO Did This Study

Sealed radioactive sources, radioactive material encapsulated in stainless steel or other metal, are used worldwide in medicine, industry, and research. These sealed sources could be a threat to national security because terrorists could use them to make “dirty bombs.” GAO was asked to determine (1) the number of sealed sources in the United States, (2) the number of sealed sources lost, stolen, or abandoned, (3) the effectiveness of federal and state controls over sealed sources, and (4) the Nuclear Regulatory Commission (NRC) and state efforts since September 11, 2001, to strengthen security of sealed sources.

What GAO Recommends

GAO recommends that NRC (1) collaborate with states to determine availability of highest risk sealed sources, (2) determine if owners of certain devices should apply for licenses, (3) modify NRC’s licensing process so sealed sources cannot be purchased until NRC verifies their intended use, (4) ensure that NRC’s evaluation of federal and state programs assess security of sealed sources, and (5) determine how states can participate in implementing additional security measures. NRC stated that some of our recommendations would require statutory changes. We clarified our report language to address this concern. Agreement states and an organization of radiation experts agreed with our recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-03-804.

To view the full report, including the scope and methodology, click on the link above. For more information, contact Gene Aloise at (202) 512-6870 or aloisee@gao.gov.

August 2003

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Federal and State Action Needed to Improve Security of Sealed Radioactive Sources

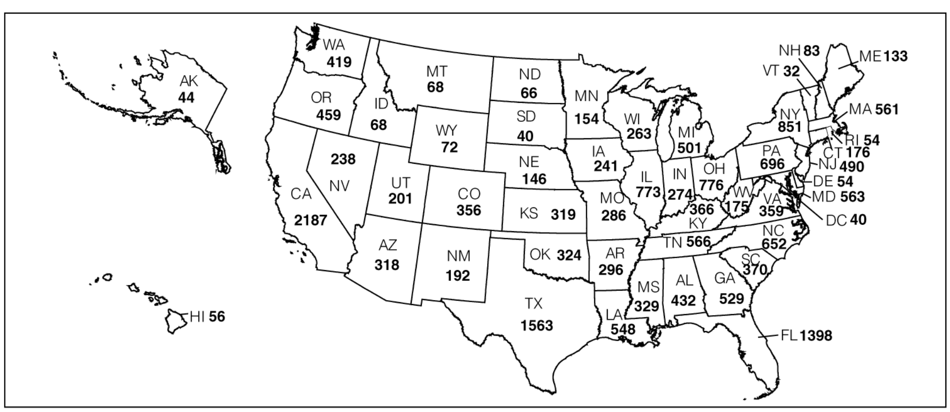
What GAO Found

The number of sealed sources in the United States is unknown because NRC and states track numbers of licensees instead of individual sealed sources. Users of certain devices containing sealed sources are not required to apply to NRC for a license. Accounting for these devices has been difficult. In addition, since 1998, more than 1,300 incidents have taken place in the United States where sealed sources have been lost, stolen, or abandoned. The majority of these lost devices were recovered.

Security for sealed sources varied among the facilities GAO visited in 10 states. Also, a potential security weakness exists in NRC’s licensing process to obtain sealed sources. Approved applicants may buy sealed sources as soon as a new license is issued by mail. Because the process assumes that the applicant is acting in good faith and it can take NRC as long as 12 months before conducting an inspection, it is possible that sealed sources can be obtained for malicious intent. In addition, NRC currently evaluates the effectiveness of state regulatory programs, but these evaluations do not assess the security of sealed sources.

Since the terrorist attacks of September 11, 2001, NRC and states have notified licensees of the need for heightened awareness to security, but have not required any specific actions to improve security. NRC has been developing additional security measures since the attacks, and issued the first security order to large facilities that irradiate such items as medical supplies and food on June 5, 2003. Additional orders to licensees that possess high risk sealed sources are expected to follow. NRC and states disagree over the appropriate role of states in efforts to improve security. NRC intends to develop and implement all additional security measures on licensees with sealed sources, including those licensed by states. However, over 80 percent of states responding to our survey feel they should be given responsibility to inspect and enforce security measures.

Number of Medical, Industrial, and Research Users of Sealed Sources (About 20,000 Total Nationwide) as of December 31, 2002



Sources: NRC license tracking system and GAO survey of agreement states.

Contents

Letter

Appendixes

Tables

Figures

Abbreviations

CFR	Code of Federal Regulations
CRCPD	Conference of Radiation Control Program Directors
DOE	Department of Energy
DOT	Department of Transportation
GAO	General Accounting Office
NRC	Nuclear Regulatory Commission
OAS	Organization of Agreement States

United States General Accounting Office
Washington, D.C. 20548

August 6, 2003

The Honorable Daniel K. Akaka
Ranking Minority Member
Subcommittee on Financial Management,
the Budget, and International Security
Committee on Governmental Affairs
United States Senate

Dear Senator Akaka:

Since the September 11, 2001, terrorist attacks there has been concern that certain radioactive material, such as cobalt-60, strontium-90, iodine-131, cesium-137, iridium-192, and americium-241, could be used in the construction of a radiological dispersion device—commonly referred to as a "dirty bomb." Such radioactive materials are used in devices that treat cancer, sterilize food and medical instruments, and detect flaws in pipelines and other types of metal welds. Much of the radioactive material used in these devices is encapsulated, or sealed, in metal such as stainless steel, titanium, or platinum to prevent its dispersal.[1] A dirty bomb could be produced by using explosives in combination with radioactive material upon detonation. Most experts agree that the dispersed radioactive material would have few short-term health effects on exposed individuals and that the explosives, not the radioactive material, would likely cause the greatest amount of immediate injuries, fatalities, and property damage. However, a dirty bomb—depending on the type, form, amount, and concentration of radioactive material used—could cause radiation exposure in individuals in close proximity to the material for an extended time and potentially increase the long-term risks of cancer for those contaminated. In addition, the evacuation and cleanup of contaminated areas after such an explosion could lead to panic and serious economic costs on the affected population.

Under the Atomic Energy Act of 1954, the Nuclear Regulatory Commission (NRC) regulates domestic medical, industrial, and research uses of sealed sources through a combination of regulatory requirements, licensing,

[1]Some loose material, such as iodine-131, used in thyroid cancer treatments, and technetium-99m, commonly used in medical imaging procedures is not in sealed source form. However, for simplicity this report uses the term "sealed source" to refer to all radioactive materials used for medical, industrial, and research purposes.

inspection, and enforcement. Section 274 of the act authorizes NRC to give primary regulatory authority to states (called "agreement" states) under certain conditions.[2] To date, NRC has relinquished its licensing, inspection, and enforcement authority to 32 agreement states that administer the use of sealed sources within their jurisdictions;[3] while continuing to regulate the use of sealed sources in the remaining states. NRC periodically evaluates each agreement state's regulatory program for compatibility with NRC regulations and its effectiveness in protecting public health and safety. Two types of licenses are associated with the use of radioactive materials—general licenses and specific licenses. A generally licensed device usually contains a sealed source within a shielded device, such as gas chromatograph units, fixed gauges, luminous exit signs, or reference and check sources. Such devices are designed with inherent radiation safety features so that persons with little or no radiation training or experience can use it, and as such do not require NRC or agreement state approval to purchase and are widely commercially available. Specific licenses cover uses, such as cameras used for industrial radiography, medical devices used to treat cancer, and facilities that irradiate food or medical products for sterilization. These uses generally require larger amounts of radioactive material than can be obtained with a general license. Organizations or individuals wanting to obtain a specific license must submit an application and gain the approval of either NRC or an agreement state. In addition to NRC and agreement states, other federal agencies, such as the Department of Transportation, the Food and Drug Administration, and the Environmental Protection Agency, regulate the safe transportation, medical use, and cleanup of radioactive material. The Department of

[2]The purpose of section 274 of the Atomic Energy Act of 1954, as amended (42 U.S.C. § 2021) is to recognize the interest of the states in the peaceful uses of atomic energy and to establish programs for cooperation between the states and NRC to control the radiation hazards associated with the use of radioactive materials. While it details procedures for NRC to relinquish its regulatory authority to the states for medical, industrial, and research uses of radioactive materials, NRC retains sole regulatory authority over, among other things, nuclear power plants and the export and import of radioactive materials. In addition, NRC retains regulatory authority over federal facilities (such as Department of Defense bases or Veterans Administration hospitals)—see 10 C.F.R. § 30.6(b)(2).

[3]At the time of our report, Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Utah, and Washington were agreement states. NRC expects Wisconsin will become an agreement state in the summer of 2003.

Energy (DOE) regulates the use of radioactive material at its facilities and at the national laboratories.

This report—the third that we have prepared at your request to examine efforts to control sealed radioactive sources—examines efforts in the United States to regulate the use of sealed sources domestically and to prevent the use of this material by terrorists.[4] Specifically, you asked us to determine (1) the known number of sealed sources in the United States; (2) how many of these sealed sources have been lost, stolen, or abandoned; (3) the effectiveness of federal and state controls over sealed sources; and (4) NRC's and agreement states' efforts considered or implemented following September 11, 2001, to strengthen security of sealed sources. To address these objectives, we distributed a survey to radiation control agencies in the 32 agreement states, the 18 non-agreement states, the District of Columbia, and Puerto Rico to determine numbers and types of radioactive materials licenses in their jurisdictions and to solicit their views on the regulation of sealed sources. At the time of this report, all of the agreement states except Arizona, 11 non-agreement states, and Puerto Rico had responded to our survey. We did not receive responses from the following non-agreement states—Alaska, Connecticut, Minnesota, Missouri, Pennsylvania, South Dakota, Vermont, Wyoming, and the District of Columbia.[5] We also surveyed and interviewed officials in the four NRC regional offices; interviewed officials at NRC headquarters in Rockville, Maryland; and analyzed NRC license and incident databases. In addition, we observed NRC evaluations of the effectiveness of state regulatory programs in Rhode Island and Florida and a similar evaluation of NRC's Region III radioactive materials regulatory program in Lisle, Illinois. We visited 10 states to meet with officials of state radiation control agencies

[4]Our report, U.S. General Accounting Office, *Nuclear Nonproliferation: DOE Action Needed to Ensure Continued Recovery of Unwanted Sealed Radioactive Sources*, GAO-03-483 (Washington, D.C.: Apr. 15, 2003) examined DOE's efforts to recover and dispose of unwanted "greater-than-Class-C" sources—sources that typically contain greater concentrations of isotopes such as plutonium-238, plutonium-239, and americium-241, that cannot be disposed of at existing low-level radioactive waste facilities. Our report, U.S. General Accounting Office, *Nuclear Nonproliferation: U.S. and International Assistance Efforts to Control Sealed Radioactive Sources Need Strengthening*, GAO-03-638 (Washington, D.C.: May 16, 2003) examined international efforts conducted by the United States, the Russian Federation, the International Atomic Energy Agency, and others to control sealed sources.

[5]Although we did not receive surveys from these states, we obtained data on incidents involving sealed sources and numbers and types of licensees from NRC.

and selected licensees representing a variety of types and uses of sealed sources. Appendix I presents our scope and methodology in more detail.

Results in Brief

The precise number of sealed sources in use today in the United States is unknown. NRC estimates that there are approximately 2 million sealed sources in the United States. This estimate is based on the number of specific and general licensees from NRC's databases and agreement states combined with data from an NRC survey conducted in the early 1990s. NRC and agreement states do not track the actual numbers of sealed sources, but only track the number of specific licensees and have limited data on general licensees. NRC, in cooperation with DOE, has begun examining options for developing a national sealed source tracking system, but this effort is limited in scope; importantly, it has had only limited involvement of the agreement states. Our analysis of NRC's specific license database and responses to our survey of agreement states indicate that about 20,000 entities (companies, hospitals, organizations, and in some cases, individuals) have obtained specific licenses to possess and use radioactive material, including sealed sources. Agreement states regulate 80 percent of these entities, while NRC regulates the remaining 20 percent.

NRC has had difficulty accounting for generally licensed devices. Owners of these devices are not required to apply to NRC or agreement states for licenses. Mishandling and improper disposal of generally licensed devices has, in some cases, lead to expensive investigation and clean up. NRC began tracking generally licensed devices in April 2001, but has experienced problems locating device owners. To assist in this effort, NRC has contracted with a private investigation firm to help locate owners. In order to improve accountability over generally licensed devices, we are recommending that NRC determine the need to require owners of these devices to apply for specific licenses and whether the additional costs presented by applying for and approving specific licenses are commensurate with the risks these devices present.

Since 1998, there have been more than 1,300 reported incidents of lost, stolen, or abandoned devices containing sealed sources, an average of about 250 per year. The majority of these devices were subsequently recovered. Both NRC and DOE recognize the importance of determining how many sealed sources are present in the United States, and which sealed sources pose the greatest risk if they were to be used in a dirty bomb. NRC and DOE are working together to categorize sealed sources by their level of risk. However, NRC's and DOE's efforts are limited in scope because they do not include an analysis of sealed sources in the agreement states, which regulate 80 percent of the nation's radioactive materials licensees. This is because there is no single source of data on agreement state licensees; instead each state has its own database of the licensees it regulates. These databases are not linked to one another and NRC does not have access to them. Therefore, we are recommending that NRC as part of its continuing efforts to categorize the sealed sources that pose the greatest risk, consult with the agreement states to determine the types, amount, and availability of the highest risk sealed sources.

Weaknesses exist in federal and state controls over the security of sealed sources. Our visits to radiation control programs and licensees in 10 states found that security for devices containing sealed sources varied among facilities we visited. For example, a medical device manufacturer that we visited had extensive security measures, including electronic access control to areas containing sealed sources, perimeter fencing, and background checks on employees. On the other hand, a medical use licensee that we visited kept its sealed sources in an unlocked, unguarded space with the door propped open. In addition, we found a potential security weakness in NRC's licensing process to obtain sealed sources. The process assumes an applicant is acting in good faith and allows applicants to acquire sealed sources as soon as a new license is issued by mail. It can then take NRC as long as 12 months to conduct its first inspection, leaving the possibility that materials will be obtained and used maliciously in the meantime. Certain agreement states have implemented measures to address this weakness, such as delivering licenses in person or conducting inspections before the delivery of sealed sources. In addition, NRC currently evaluates the effectiveness of state regulatory programs, but these evaluations do not assess the security of sealed sources. To address security weaknesses, we are recommending that NRC modify its licensing process to ensure that radioactive sources cannot be purchased before NRC verifies that the material will be used as intended. We are also recommending that NRC modify its evaluations of agreement state and NRC programs to include criteria and performance measures of program effectiveness in ensuring the security of sealed sources.

Since the terrorist attacks of September 11, 2001, NRC, along with the agreement states, has notified licensees of the need for heightened awareness to security and the need to take certain actions, but has not issued, until recently, legally binding orders to improve the security of sealed sources. NRC has been developing specific additional security measures since the attacks, and issued orders on June 5, 2003, to strengthen security at large irradiator facilities. Although irradiator facilities contain large amounts of radioactive material, they are specially designed to include thick concrete and steel walls, security interlocks, and other protective equipment to protect against radiation exposure and secure the sealed sources. In light of such built-in security, agreement state officials and others have questioned NRC's decision to select irradiators as the first recipient of additional security measures. Of agreement states responding to our survey, 93 percent identified sealed sources used in industrial radiography as of greater concern. Reasons for this may include that these devices are widely available and portable.

NRC and some agreement states disagree on the appropriate role of the states in the regulation of sealed source security. The Atomic Energy Act of 1954 gives NRC the authority to issue rules, regulations, or orders to promote the common defense and security and to protect the health and minimize danger to life or property. Based on this authority, NRC intends to order licensees with sealed sources, including those licensed by agreement states, to implement additional security measures. NRC has already done so for large irradiator facilities. However, 82 percent of agreement states responding to our survey indicate that they want to have responsibility for inspection and enforcement of security measures for sealed sources. In addition, 74 percent of agreement states responding to our survey indicated that their state program could effectively respond to a radiological incident with its current resources. NRC officials argue that the agreement states lack the staff and funding to carry out the additional responsibility of securing sealed sources. However, according to NRC officials we contacted, NRC clearly faces similar staffing and funding problems. NRC has initiated a materials security working group, which includes the states, as a mechanism for discussing and identifying potential resolutions to these issues. We are recommending that NRC determine how agreement and non-agreement states can participate in the development and implementation of additional security measures over sealed sources.

We presented a draft of this report to NRC, the Conference of Radiation Control Program Directors (CRCPD), and the Organization of Agreement States (OAS) for comment. NRC stated that the draft report did not fully present either the current status of NRC's efforts to improve the security of high-risk radioactive sources or the large effort that NRC has devoted to this issue over the past 18 months. NRC believed that several of our recommendations would require statutory changes at both federal and state levels. We clarified our recommendations regarding the participation of the states in the development and implementation of additional security measures. CRCPD and OAS officials generally agreed with our conclusions and recommendations.

Background

Radioactive material in sealed sources is used in equipment designed to diagnose and treat illnesses (particularly cancer), irradiate food and medical products for sterilization purposes, detect flaws and other failures in pipeline and other types of metal welds, and determine the moisture content of soil and other materials.[6] Until the 1950s, only naturally occurring radioactive materials, such as radium-226, were available to be used in sealed sources. Since then, sealed sources containing radioactive material produced artificially in nuclear reactors and particle accelerators have become widely available, including cobalt-60, strontium-90, technetium-99m, cesium-137, and iridium-192. Under the Atomic Energy Act of 1954, the states retain sole regulatory authority over most naturally occurring radioactive material as well as radioactive material produced in particle accelerators. Federal jurisdiction extends only to those materials used as a source of material for nuclear fuel or created as a result of irradiation in nuclear reactors.

Radioactive material can be found in various forms. For example, cobalt-60 is a metal, while the cesium-137 in some sealed sources is in a powder form closely resembling talc. Radioactive materials never stop emitting radiation, but their intensity decays over time at various rates. The term “half-life” is used to indicate the period during which the radioactivity decreases by half as a result of decay. Radioactive materials are measured by their level of activity. The greater the activity level—measured in units called curies[7]—the more radiation emitted, which increases the potential risk to the public if the radioactive materials are lost or stolen.

[6]See appendix II for a discussion of medical and industrial devices that use radioactive sources.

[7]The curie is the unit of measurement most commonly used in the United States. The corresponding international standard unit, the Bequerel (Bq) is the activity equal to one radioactive disintegration per second. One bequerel=2.7 x 10^{-11} curies.

Two types of licenses are associated with the use of radioactive materials—general licenses and specific licenses. A generally licensed device usually consists of a sealed source within a shielded device, such as gas chromatograph units, fixed gauges, luminous exit signs, or reference and check sources. These devices are designed with inherent radiation safety features so that persons with little or no radiation training or experience can use it. General licensees are automatically licensed without having to apply to NRC or an agreement state for a license and are subject to a variety of requirements under NRC's or agreement states' regulations.[8] Furthermore, manufacturers are required to report quarterly to NRC the names of customers who purchase generally licensed devices. Examples of requirements general licensees are subject to under NRC's regulations include:

- general licensees shall not abandon the devices;
- complying with instructions and precautions listed on device labels;
- performing tests to ensure radioactivity is not leaking from the device at least every 6 months, and, if leakage is detected, suspend operation of the device and have it repaired or disposed of by the manufacturer or another entity authorized to perform such work; and
- reporting to NRC or an agreement state the transfer of a device to another licensee or the disposal of the device.

A company seeking radioactive material for uses that do not qualify for a general license must apply to NRC or, if it conducts business in an agreement state, to the appropriate state for a specific license. Its application must demonstrate how the use of the materials will meet the safety requirements in NRC's or agreement states' regulations.[9] Applicants must provide information on the type, form, and intended quantity of material, the facilities in which the material will be used, the qualifications of users of the materials, and radiation protection programs the applicant has in place to protect their workers and the public from receiving excessive doses of radiation.

[8]NRC's regulations are at 10 C.F.R. § 31.5.

[9]NRC's regulations are at 10 C.F.R. Parts 19-21, 30-39, 40, 61, 70, and 71.

NRC and the Agreement States Lack Complete Information on Numbers of Sealed Sources

The number of sealed sources in use today in the United States is unknown primarily because no state or federal agency tracks individual sealed sources. Instead, NRC and the agreement states track numbers of specific licensees. NRC and DOE have begun to examine options for developing a national tracking system, but to date, this effort has had limited involvement by the agreement states. NRC had difficulty locating owners of certain generally licensed devices it began tracking in April 2001 and has hired a private investigation firm to help locate them. Twenty-five of the 31 agreement states that responded to our survey indicated that they track some or all general licensees or generally licensed devices, and 17 were able to provide data on the number of generally licensed devices in their jurisdictions, totaling approximately 17,000 devices.

NRC and Agreement States Track Licensees Rather Than Individual Sealed Sources

NRC estimates that there are approximately 2 million licensed sealed sources in the United States. However, there is no single source of information in the United States to verify authorized users, locations, quantities, and movements of sealed sources. Separate systems are in place at NRC and in each agreement state to track the identities of specific licensees and the maximum quantity of radioactive material that they are authorized to possess. These systems do not, however, record the number of sealed sources actually possessed by specific licensees nor do the systems track movements (such as purchase, transfer, or disposal) of sealed sources by specific licensees. Licensees are required to maintain records for the acquisition and disposition of each sealed source it receives and inspections by NRC and/or an agreement state includes confirming inventory records.

The Secretary of Energy and the Chairman of NRC established a working group in June 2002 to address, among other things, the options for establishing a national source tracking system and the potential for the use of technological methods for tagging and monitoring sealed sources in use, storage, and transit. This working group reported in May 2003 that a national source tracking system should provide a “cradle to grave” account of the origins of each high-risk source, and record how, by whom, and where a source has been transported, used, and eventually disposed of or exported. According to the report, such a system would help NRC and DOE to:

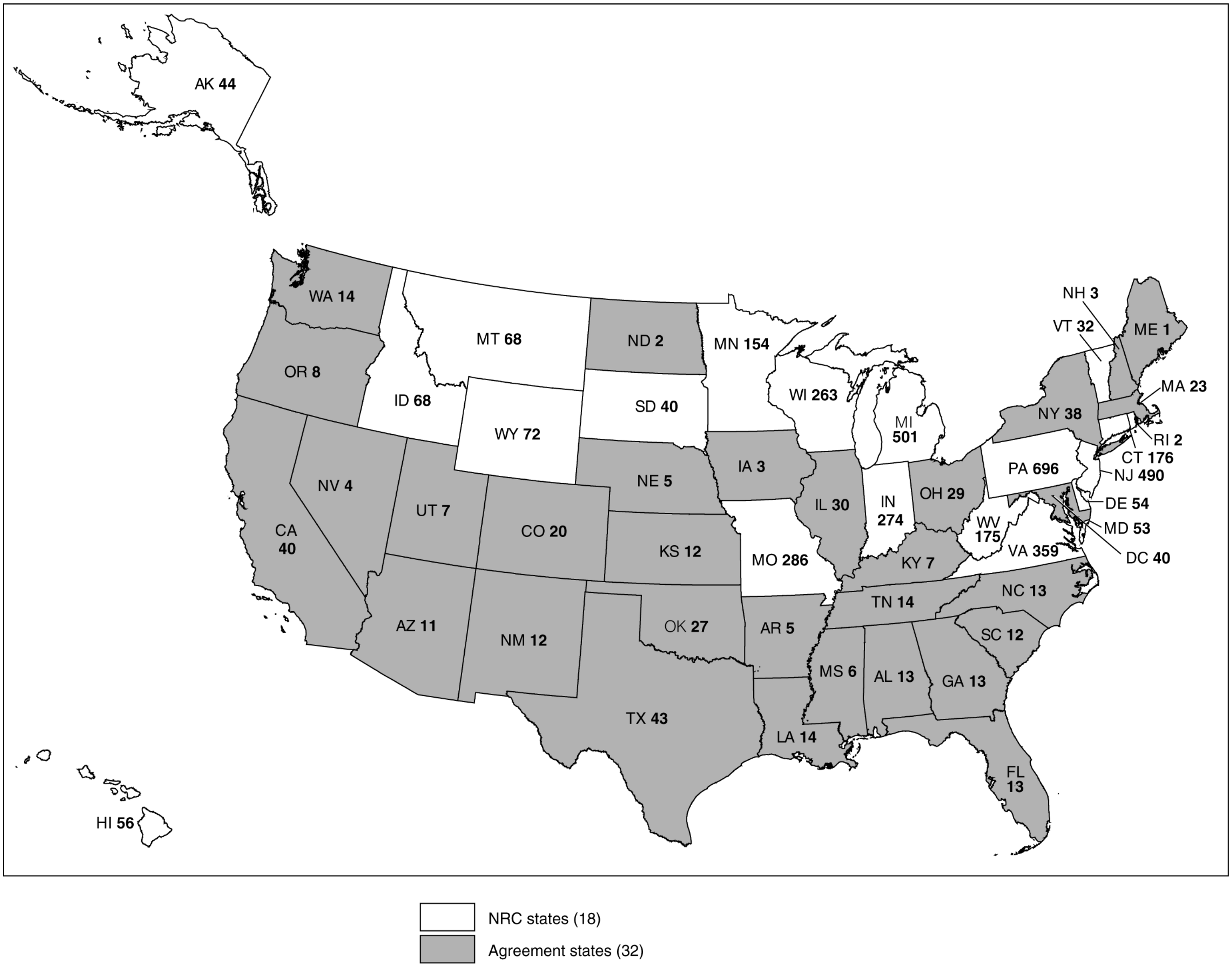
- monitor the location and use of sealed sources,

- detect and act on discrepancies,
- conduct inspections and investigations,
- communicate sealed source information to other government agencies,
- respond in the event of an emergency,
- verify legitimate ownership and use of sealed sources, and
- further analyze hazards attributable to the possession and use of sealed sources.

The working group did not determine how data on sealed source licensees in the agreement states would be integrated into a national level system.

While there are no complete data on the number of sealed sources in the United States, data are available on the number of specific licensees authorized to use sealed sources. Analysis of NRC's specific license database and responses to our survey of the agreement states indicates that there are about 20,000 specific licensees in the United States (see figs. 1 and 2). The majority (nearly 80 percent) are regulated by the 32 agreement states, the remaining 20 percent of specific licensees are regulated by NRC.

Figure 1: NRC Regulated Specific Licenses in NRC Regulated States and on Federal Facilities in Agreement States as of December 31, 2002



Sources: NRC license tracking system and GAO survey of agreement states.

Notes: NRC regulates specific licensees on federal facilities in agreement states.

NRC also regulates 5 specific licensees in Guam, 120 specific licensees in Puerto Rico, and 7 specific licensees in the U.S. Virgin Islands.

Figure 2: Agreement State Regulated Specific Licenses as of December 31, 2002

Sources: NRC license tracking system and GAO survey of agreement states.

Our analysis of NRC's license tracking system and responses to our survey of agreement states indicates that sealed sources for medical uses comprise the largest portion of specific licenses issued (see table 1).

Table 1: Number of Specific Licenses Issued By Use in the United States as of December 31, 2002

State	Medical	Measuring systems	Industrial radiography	Well logging	Irradiators-large	Irradiators-small	Other	Total
Alabama	153	185	26	3	0	2	63	**432**
Alaska	10	21	7	0	0	1	5	**44**
Arizona	NA	NA	NA	NA	NA	NA	NA	**318**
Arkansas	118	128	10	6	1	4	29	**296**
California	655	799	40	18	9	26	640	**2,187**
Colorado	85	166	12	10	0	4	79	**356**
Connecticut	69	38	3	0	0	3	63	**176**
Delaware	19	16	1	1	0	2	15	**54**
District of Columbia	18	6	0	0	1	3	12	**40**
Florida	866	367	20	8	2	24	111	**1,398**
Georgia	267	175	13	1	2	5	66	**529**
Guam	2	3	0	0	0	0	0	**5**
Hawaii	21	25	3	1	0	1	5	**56**
Idaho	20	36	0	0	0	0	12	**68**
Illinois	273	338	18	7	4	8	125	**773**
Indiana	144	86	4	0	0	1	39	**274**
Iowa	67	136	6	0	0	5	27	**241**
Kansas	130	142	12	20	0	2	13	**319**
Kentucky	158	180	6	8	0	3	11	**366**
Louisiana	NA	NA	NA	NA	NA	NA	NA	**548**
Maine	47	57	4	0	0	3	22	**133**
Maryland	226	140	2	0	7	19	169	**563**
Massachusetts	120	180	7	0	2	13	239	**561**
Michigan	250	168	7	4	1	7	64	**501**
Minnesota	56	49	5	0	1	5	38	**154**
Mississippi	118	157	21	5	1	6	21	**329**
Missouri	136	84	7	0	0	3	56	**286**
Montana	16	38	1	0	0	2	11	**68**
Nebraska	50	66	4	0	3	4	19	**146**
Nevada	86	130	5	1	0	3	13	**238**
New Hampshire	27	39	2	0	1	1	13	**83**
New Jersey	239	98	5	0	7	13	128	**490**
New Mexico	44	99	9	11	2	5	22	**192**
New York	512	268	25	2	2	4	38	**851**

(Continued From Previous Page)

State	Medical	Measuring systems	Industrial radiography	Well logging	Irradiators-large	Irradiators-small	Other	Total
North Carolina	266	235	17	1	4	5	124	**652**
North Dakota	13	37	4	4	0	3	5	**66**
Ohio	341	274	22	4	2	5	128	**776**
Oklahoma	111	107	27	20	0	8	51	**324**
Oregon	88	262	8	0	0	4	97	**459**
Pennsylvania	296	215	11	4	1	24	145	**696**
Puerto Rico	65	35	3	0	2	3	12	**120**
Rhode Island	22	16	6	0	0	1	9	**54**
South Carolina	149	145	22	0	3	1	50	**370**
South Dakota	17	16	0	0	0	0	7	**40**
Tennessee	261	167	26	1	2	10	99	**566**
Texas	672	468	102	54	7	19	241	**1,563**
Utah	38	108	10	7	1	2	35	**201**
Vermont	13	10	0	0	0	2	7	**32**
U.S. Virgin Islands	2	4	0	0	0	0	1	**7**
Virginia	126	155	12	2	1	6	57	**359**
Washington	110	199	10	0	0	2	98	**419**
West Virginia	66	89	2	3	0	0	15	**175**
Wisconsin	106	88	9	0	1	7	52	**263**
Wyoming	17	40	2	3	0	0	10	**72**
Total	**7,781**	**7,090**	**578**	**209**	**70**	**284**	**3,411**	**20,289**

Sources: NRC license tracking system and GAO survey of agreement states.

Notes: NA=not available.

Does not include licenses issued for naturally occurring or accelerator-produced radioactive materials in NRC regulated states. Twenty-nine of the 31 agreement states responding to our survey do not distinguish between materials regulated under the Atomic Energy Act of 1954 and naturally occurring or accelerator-produced radioactive materials in their licensing actions.

Data for Arizona and Louisiana includes only the total number of licensees.

Fixed and portable gauges used in industry to measure density, moisture content, thickness, and so forth, are the next most prevalent use of sealed sources, with nearly 7,100 specific licenses issued nationwide. Over 570 specific licenses have been issued for industrial radiographers. In addition, there are 70 large irradiators (containing high levels, between 10,000 and 15 million curies, of cobalt-60) across the United States used for the sterilization of food and medical products, and 284 smaller irradiators (containing less than 10,000 curies of, in most cases, cesium-137 and cobalt-60) used in hospitals and other facilities for sterilization of smaller products, such as units of blood. The remaining specific licenses in the United States are issued for a variety of purposes, including, among other things, manufacturing and distribution of smoke detectors (containing small amounts of americium-241), academic research, and disposal of radioactive waste.

NRC Has Had Difficulty Finding Owners of Generally Licensed Devices

While data exist on the numbers and locations of specific licenses in the United States, complete data are not available on the numbers of general licenses. In most cases general licensees are not required to apply to NRC or an agreement state for a license to possess and use a device. Therefore, in the past, data on general licensees have come from manufacturers of generally licensed devices that are required to report quarterly to NRC or the agreement states the names of customers purchasing generally licensed devices. According to NRC, approximately 40,000 general licensees possess an estimated 600,000 generally licensed devices in the United States. Although general licensees are required to follow NRC's regulations, they traditionally have little contact with NRC. Mishandling and improper disposition of generally licensed devices has, on occasion, resulted in limited radiation exposure to the public and, in some cases, entailed expensive investigation, cleanup, and disposal activities. For example, two incidents occurred in New Jersey in 1997 involving luminous exit signs containing tritium. In May 1997, a 14-year old removed three tritium exit signs from a demolition site near his home and opened one sign exposing himself to radioactive material and contaminating his home. In October 1997, a patient at a state-run psychiatric hospital broke a tritium exit sign. While no injuries resulted, the state spent more than $200,000 cleaning up the hospital and disposing of the more than sixty barrels of radioactive waste—primarily contaminated carpeting, furniture, bedding, and other debris—from the incident.

NRC amended its regulations effective February of 2001, to, among other things, better enable NRC to verify and track the location, use, and disposition of generally licensed devices. NRC focused its efforts to improve accountability over generally licensed devices on a small subset of devices that were determined to be of higher risk. The amended regulations include a requirement for general licensees to register with NRC devices that contain certain levels of radioactive material.[10] General licensees would be charged $450 to cover the costs of the registration program.

Beginning in April 2001, NRC mailed registration forms to about 2,800 of its general licensees.[11] As of May 2003, approximately 61 percent of them had responded. Twenty-eight percent of the registration forms were returned as undeliverable and the remaining 11 percent were not returned by the general licensee, a response rate significantly lower than NRC expected. According to NRC, a significant amount of the submitted information is incomplete or inaccurate, requiring additional follow up that was not anticipated. To help increase the response rate, phone calls are being made in advance to locate general licensees before registration forms are sent to ensure the responsible individuals at the correct addresses receive them. In addition, NRC has contracted with a private investigation firm to help find general licensees whose addresses in the database are incorrect.

Twenty-five of the 31 agreement states that responded to our survey said that they require registration of some or all generally licensed devices. Seventeen of these states were able to provide us with data on the number of generally licensed devices they regulate. These 17 states estimate that approximately 17,000 generally licensed devices are used in their jurisdictions.

[10] 10 C.F.R. § 31.5(c)(13). Registration is required for levels equal to or greater than 10 millicuries of cesium-137, 0.1 millicuries of strontium-90, 1 millicurie of cobalt-60, or 1 millicurie of any transuranic element (elements with atomic numbers higher than uranium).

[11] This registration effort did not include the agreement states because the agreement states are not required to adopt compatible regulations requiring registration of generally licensed devices until February 2004. Once all agreement states have adopted rules compatible to NRC's regulations, NRC says that it is considering coordinating with them to implement a national level database that will incorporate data from agreement states and NRC regulated states.

Over 1,300 Devices Containing Sealed Sources Have Been Reported Lost, Stolen, or Abandoned Since 1998

Since 1998, there have been more than 1,300 incidents where devices containing sealed sources have been reported lost, stolen, or abandoned in the United States, an average of about 250 per year. The majority of these lost devices were subsequently recovered. Both NRC and DOE recognize the importance of not only determining how many sealed sources are present in the United States, but also which sealed sources pose the greatest risk if used in a dirty bomb. NRC and DOE are working together to categorize sealed sources by their level of risk. However, NRC's and DOE's efforts have not, to date, addressed sealed sources in the agreement states.

Majority of Lost and Stolen Sealed Sources Subsequently Recovered and Represented Little Risk to the Public

Analysis of NRC's Nuclear Materials Events Database indicates that, between 1998 and 2002, there were over 1,300 incidents of lost, stolen, and abandoned sealed sources. These losses averaged about 250 per year. Many of these incidents involved stolen portable gauges that are used to measure the moisture content and density of soils, concrete, or asphalt on construction sites. By themselves, these gauges contain low amounts of radioactive material and pose relatively little risk to the public. Portable gauges are most often stolen from construction sites or from vehicles such as pickup trucks. According to NRC and agreement state officials, individuals stealing gauges are usually unaware that they contain radioactive material, and they often abandon or return them once discovering their contents. Nevertheless, responding to these incidents takes time and resources. Well logging sources also account for a relatively large number of lost and abandoned sources. One major oil services company accounts for over 30 of the 132 total well logging sources abandoned since 1998. These sources contain several curies of americium-241 and cesium-137. These losses usually consisted of a sealed source becoming lodged down a well and subsequently abandoned. The well is filled with concrete and a marker is attached warning of the presence of radioactive materials. In addition, sealed sources are occasionally abandoned when companies owning them go bankrupt.

According to NRC, most sealed sources that are lost, stolen, or abandoned are subsequently recovered. In the past 5 years, few incidents have occurred involving what NRC considers high-risk sealed sources. For example, in March 1999, an industrial radiography camera containing over 88 curies of iridium-192 (a quantity NRC considers to be of concern) was stolen from a trailer at the radiographer's home in Florida. The Florida radiation control program, local law enforcement, and the Federal Bureau of Investigation conducted an investigation, but never recovered the sealed source. According to NRC, the iridium-192 in the sealed source has now decayed to the point where it is no longer a high risk to the public.

Another example of lost or stolen sealed sources took place in a North Carolina hospital in March 1998. During a quarterly inventory of a hospital's sealed sources, it was discovered that 19 sealed sources were missing, containing an aggregate of over 600 millicuries of cesium-137—a highly dispersible radioactive material. These sources included 18 cesium-137 sealed sources—which had been locked in a safe at the time of the disappearance—and a new cesium-137 sealed source still stored in its shipping container. The North Carolina radiation control program, NRC, DOE, and the Federal Bureau of Investigation conducted an extensive joint investigation. The investigation included air and ground searches using radiation detection equipment. However, the sealed sources were not recovered and a conclusion about the cause of the incident was not reached.

NRC's and DOE's Efforts to Categorize Sealed Sources of Greatest Concern Does Not Include Sealed Sources in Agreement States

The working group established by the Secretary of Energy and the Chairman of NRC in June 2002 was also tasked with determining which radioactive materials pose the greatest risk if used in a dirty bomb. Their analysis was to provide a relative ranking of the degree of risk posed by specific materials as a basis on which initial judgments can be made regarding specific protective measures to be developed for these materials.

Using experts from DOE's Sandia National Laboratory, the task force developed a methodology to systematically evaluate radioactive materials for a dirty bomb. Researchers at Sandia considered the potential dispersability of radioactive materials, the number of locations possessing the material, the quantity of material possessed at each facility, and the protective measures already applied to the material. The combination of these factors yielded a "hazard index," which serves as an expression of relative concern. Specific radioactive materials were rated high, medium, low, or very low, depending upon the degree of health risk posed for their use in a dirty bomb.[12] The analysis focused on the potential health effects of

[12]See U.S. Department of Energy and U.S. Nuclear Regulatory Commission, *Radiological Dispersion Devices: An Initial Study to Identify Radioactive Materials of Greatest Concern and Approaches to Their Tracking, Tagging, and Disposition*, (Washington, D.C., May 2003). The specific radioactive materials identified as highest priority for increased protection in the near term have not been listed in the report. This information is "For Official Use Only."

the use of radioactive materials in a dirty bomb and did not explicitly address the psychological and economic consequences. According to an NRC official, no specific data exists regarding how the public would react to a dirty bomb, which complicates efforts to analyze its psychological consequences.

The working group's analysis included materials under an NRC license and DOE's control in the United States, excluding nuclear weapons materials, radioactive materials in nuclear power plants, spent fuel, and other radioactive waste. DOE's and NRC's report, however, did not consider sealed sources held by the approximately 15,000 specific licensees in the agreement states. Although the agreement states and NRC have similar types of licensees, agreement states often have greater numbers of licensees with certain types of sealed sources than NRC-regulated states. For example, our survey of agreement states indicates that Texas has more well logging specific licensees than any other state.[13] In addition, states exclusively regulate the use of naturally occurring and accelerator produced radioactive materials. Agreement state officials told us that any consideration of the risks presented by sealed sources needs to include all materials regulated by NRC and the agreement states because the psychological and economic consequences of a dirty bomb are likely to be similar whether the radioactive material is naturally or artificially produced. NRC plans to work with the states to implement follow-up actions based on the recommendations in the DOE/NRC report. Vulnerability studies have been initiated to identify security vulnerabilities and appropriate security enhancements. Scenarios involving the aggregation of sources in a single location will be considered. In addition, methods for improved tracking of the locations of sources will be developed.

[13]Well logging is a process that uses sealed sources and/or unsealed radioactive materials to determine whether a well, drilled deep into the ground, contains minerals, such as coal, oil, and natural gas.

Weaknesses Exist in Federal and State Controls Over the Security of Sealed Sources

Weaknesses exist in federal and state controls over the security of sealed sources.[14] Security for devices containing sealed sources varied among facilities we visited in 10 states. In addition, NRC's licensing process to obtain sealed sources presents a potential security weakness, namely that approved applicants may purchase sealed sources as soon as a new license is issued by mail. Because the process assumes that the applicant is acting in good faith, it is possible that sealed sources can be obtained for malicious intent. It can take as long as 12 months before NRC conducts its first inspection of the sealed source holder, potentially allowing sealed sources to be obtained and used maliciously without NRC's knowledge.

Security at Facilities Using Sealed Sources Varies

During visits to licensees, regulated by both NRC and agreement states, we found a varied level of security provided to sealed sources. A medical device manufacturer we visited in an agreement state had extensive security measures in place to protect sealed sources. For example, a heavy iron fence surrounds the building and guards are on duty to monitor the facility 24 hours per day, 7 days per week. For shielding and security, the concrete walls and ceiling containing the radioactive materials are more than 6 feet thick. All areas housing materials have electronic locks requiring a 4-digit code and card access. Visitors must be pre-arranged and escorted at all times. Background and drug checks are conducted on all personnel before hiring. Once hired, they are provided with varying degrees of building access, depending upon their duties. Eighteen staff members are fully trained in emergency response for hazardous materials and every employee is required to complete a 3-hour training course on radioactive materials and refresher training sessions are held frequently. Following the events of September 11, 2001, the company examined risks for the facility and established an in-house task force to develop scenarios of potential terrorist attacks. To test the company's security and employees' preparedness, the company's chief executive officer had a helicopter land, unannounced, on the roof of one of the company's buildings. Following this drill, emergency plans were developed that were integrated with the national Homeland Security Advisory System. For example, whenever the national threat level is raised to orange, the facility's front gates are closed

[14] As used in this report, *security* refers to measures to prevent unauthorized access to, loss, and/or theft of sealed sources. *Safety* refers to measures intended to minimize the likelihood of an accident with sealed sources and, should such an accident occur, to mitigate its consequences.

and locked at all times. If the threat level were ever increased to red, no visitors would be allowed. Furthermore, the company has entered an agreement with the local police to hire armed off-duty police to provide additional security for the facility should the national threat level be raised to red.

Extensive security measures were also present at a facility we visited in an agreement state that manufactures portable moisture density gauges.[15] Sealed sources, shipped to the manufacturer for installation in moisture density gauges, are immediately placed in a shielded basement storage room that is kept locked at all times. Only three staff members have keys to access the room. Entrances to the manufacturing facility are kept locked at all times, with an alarm system activated after closing time. Visitors must be escorted during visits. Finally, the company has initiated a computerized "cradle to grave" tracking system where all sealed sources installed in moisture density gauges are tracked from manufacture, use, and eventual disposal.

In the course of visits to a medical licensee, we observed poor security practices with sealed sources. For example, during a visit to a hospital in an agreement state, we were told that sealed sources, including strontium-90, cesium-137, and iridium-192, were securely stored in a room equipped with an electronic lock with limited access. Later, during a tour of the hospital, we found the room unlocked, unattended, and the door propped open. The hospital official explained that this practice was very unusual; he locked the room door after inspection and continued the tour. Shortly thereafter, we passed the room for a second time. Again, the room was unlocked, unattended, and the door propped open. The storage room was in close proximity to the hospital's laundry and maintenance facility, which is accessible to any hospital employee. In addition, an entry to the hospital from the outside was also nearby, and this entrance was not guarded nor equipped with radiation detection equipment to notify security if any sealed sources were being removed or stolen.

We also saw potential vulnerabilities at industrial radiography licensees we visited in agreement states. Industrial radiographers use high radioactivity iridium-192 sources to produce an image on photographic film to inspect

[15]Moisture density gauges are commonly used to measure density of asphalt and concrete surfaces and soil moisture content during road construction. See appendix II for a complete descriptions of radioactive devices.

metal parts and welds for defects. These devices are very portable because they are often used at remote locations. The devices are also subject to limited security at the locations we visited—primarily a series of padlocks on storage cases for the device. Personnel are not required to have background checks and training was historically only on-the-job. Most agreement states now require classroom training and testing to enhance radiographers' knowledge and skills. One industrial radiographer we visited added extra security measures consisting of a motion detector alarm system—monitored by the local police—and an extra lock to the gate of the storage room at its facility. However, this additional security would not prevent the theft of the sealed source when the device is being used in the field or at a customer's facility. This industrial radiographer had taken additional steps to train his workers to be aware of security threats and required—even before it was required by NRC and agreement state regulations—for two people to be present whenever the sealed source was being used.

Current Licensing Process Leaves Sealed Sources Vulnerable

To qualify for a specific license to use sealed sources, an applicant must demonstrate that their use of sealed sources will meet safety requirements set forth in NRC regulations or in comparable agreement state regulations (if the license applicant is located in an agreement state). NRC requires license applications to include information on, among other things, types of sealed sources that will be used, details of the applicant's radiation protection program for workers dealing with sealed sources, and qualifications of users of sealed sources. NRC reviews this information for adherence to procedures and criteria documented in NRC licensing guidance.[16] If the application meets approval criteria, a license is issued.

NRC licensing procedures do not require inspection of licensee facilities before the issuance of a license. Instead, NRC performs initial inspections no later than 12 months after issuance of a license.[17] However, as pointed out by an agreement state official, a licensee can purchase sealed sources as soon as a license has been acquired by mail. As a result, licensees may purchase sealed sources legally without first verifying that they will use the

[16] NRC publishes guidance for specific license applicants that outlines procedures for licensing the use of sealed sources. See U.S. Nuclear Regulatory Commission, *NUREG-1556—Consolidated Guidance about Materials Licenses*, (Rockville, Maryland: Nov. 2001).

[17] Chapter 2800 of NRC's Inspection Manual contains guidance for inspections of specific licensees with sealed sources.

material as intended. Several agreement states have developed methods to verify the legitimacy of potential licensees. For example, one program we visited conducts prelicensing inspections. Another state program hand-delivers licenses at the end of the application process. An agreement state official explained that pre-licensing inspections and hand delivery enabled regulators to establish authenticity of the prospective licensee and whether information provided in the application is indeed valid.

NRC and Agreement States Generally Ensure Safe Use and Handling of Sealed Sources

NRC conducts periodic evaluations of NRC regional materials programs and agreement state radiation control programs to ensure that public health and safety is adequately protected. Accidents and injuries resulting from the use of sealed sources are relatively few. For example, analysis of NRC's Nuclear Materials Events Database and responses to our survey of the agreement states indicates that in fiscal year 2002, only 25 of the approximately 20,000 licensees in the United States reported radiation exposures in excess of regulatory limits. In addition, according to NRC, there were only 32 reported accidents in fiscal year 2002 involving medical use of sealed sources out of tens of thousands of medical procedures conducted.

To evaluate the performance of its and agreement states' programs, NRC developed the Integrated Materials Performance Evaluation Program, which uses several performance indicators in assessment of program effectiveness, including timeliness and quality of licensee inspection, program staffing and training, licensing activity, and response to incidents and allegations. Officials from NRC and agreement states participate in these periodic evaluations. During these evaluations, NRC and agreement state officials review program documentation and interview officials with the state or regional program to assess the program's performance. When the results of each performance indicator have been determined, a final report is issued.[18] Agreement state or NRC regional programs can be evaluated as:

- adequate to protect the public health and safety,
- adequate but needs improvement, and

[18]The final determination of program adequacy is made by a management review board at NRC, which consists of NRC executives and a nonvoting representative of the agreement states.

- inadequate to protect public health and safety.

Figure 3 outlines the results of the most recent reviews of agreement state and four NRC regional programs.

Figure 3: Results of Integrated Materials Performance Evaluation Program Reviews

State program or NRC Region	Date	Status of inspections programs	Technical quality of inspections	Technical staffing and training	Technical quality of licensing actions	Response to incidents and allegations	Final determination of program adequacy
Alabama	04/02	○	○	○	○	○	Adequate
Arizona	03/02	○	○	○	○	○	Adequate
Arkansas	03/98	○	○	○	○	○	Adequate
California	10/99	○	○	○	○	○	Adequate
Colorado	02/01	○	○	○	○	○	Adequate
Florida	02/03	○	○	○	○	○	Adequate
Georgia	04/00	○	○	○	○	○	Adequate
Illinois	03/01	○	○	○	○	○	Adequate
Iowa	08/99	○	○	○	○	○	Adequate
Kansas	04/02	○	○	◒	○	○	Adequate
Kentucky	07/00	◒	○	○	○	○	Adequate
Louisiana	03/00	○	○	○	○	○	Adequate
Maine	11/02	○	○	○	○	○	Adequate
Maryland	03/99	○	○	○	◒	○	Adequate
Massachusetts	06/02	○	○	○	○	◒	Adequate
Mississippi	05/01	○	○	○	○	○	Adequate
Nebraska	09/02	○	○	○	○	○	Adequate
Nevada	09/01	●	○	◒	○	◒	Adequate but needs improvement. Heightened oversight
New Hampshire	06/01	●	○	◒	○	○	Adequate but needs improvement. Heightened oversight
New Mexico	06/01	○	○	○	○	○	Adequate
New York	07/02	◒	○	○	○	◒	Adequate
North Carolina	09/00	○	○	○	○	○	Adequate
North Dakota	04/99	○	○	○	○	○	Adequate
Ohio	05/01	○	○	○	○	○	Adequate
Oklahoma	07/02	○	○	○	○	○	Adequate
Oregon	08/02	○	○	○	○	○	Adequate
Rhode Island	11/02	●	○	○	○	○	Adequate but needs improvement. Heightened oversight
South Carolina	07/99	○	○	○	○	○	Adequate
Tennessee	08/00	●	●	○	○	◒	Adequate but needs improvement. Heightened oversight
Texas	08/01	○	○	○	○	○	Adequate
Utah	11/98	○	○	○	○	○	Adequate
Washington	09/99	○	○	○	○	○	Adequate
NRC region I	03/01	○	○	○	○	○	Adequate
NRC region II	03/02	○	○	○	○	○	Adequate
NRC region III	03/99	○	○	○	○	○	Adequate
NRC region IV	04/99	○	○	○	○	○	Adequate

○ Satisfactory
◒ Satisfactory with recommendations for improvement
● Unsatisfactory

Source: NRC.

NRC's most recent reviews of the 32 agreement states and NRC regional programs, dating back to 1998, found that all programs are adequately protecting public health and safety. Of the last 35 program reviews, 31 programs were found adequate to protect public health and safety—the highest evaluation. Four programs were found "adequate but needs improvement" and were placed on "heightened oversight."[19] A program placed on heightened oversight must follow a plan to improve performance or it will be placed on probation for failing to correct programmatic deficiencies. Furthermore, NRC reserves the right to suspend a state's agreement if the state does not comply with one or more of the requirements of the Atomic Energy Act of 1954.

The Integrated Materials Performance Evaluation Program is intended to ensure that the NRC and the agreement states adequately protect the health and safety of the public in accordance with NRC standards. For example, in February 2003, the Rhode Island program was found "adequate but needs improvement." As a result of its evaluation, the Rhode Island program was placed on heightened oversight and was instructed to follow a detailed plan to improve performance, which includes NRC monitoring of progress through bimonthly teleconferences. In addition, the Rhode Island program must periodically submit a progress report to NRC. The review team found that a deficiency in staffing and training had led to Rhode Island's performance problems. Therefore, as part of the plan to improve performance, Rhode Island was instructed to address staffing and training concerns. In November 2003, a follow-up review will be conducted to establish whether the program has improved enough to remove it from heightened oversight status.

The review program also encourages states and NRC regions to learn good practices from one another. For example, an NRC official recommended that Florida be cited for a good practice for its in-house training efforts for the program's staff, including the creation of a new "training coordinator" position. As a result of participation by an Ohio official during Florida's last evaluation, Ohio's program decided to hire a training coordinator. Furthermore, because review results are available to the public and a good practices report is periodically distributed to all agreement states and NRC regions, all programs have access to the good practices of other programs.

[19] States under "heightened oversight" as of May 31, 2003, are Rhode Island, Nevada, and New Hampshire. Tennessee was removed from "heightened oversight" based on an October 2001 follow-up review.

The report not only shares the good practices, but also the reasons for poor performance. Agreement state and NRC regional programs can take action to improve performance by examining the strengths and weaknesses of other programs.

NRC Efforts to Improve Security over Sealed Sources Have Been Limited and Disagreement Exists over the Appropriate Role of the States

Efforts undertaken by NRC and agreement states to strengthen the security of sealed sources for medical, industrial, and research use have only, to date, required large irradiator facilities to take specific actions. Additional orders to licensees that possess high-risk sealed sources are expected to follow. NRC and agreement states disagree over the appropriate role of the states in efforts to improve security. NRC intends to develop and implement all additional security measures on licensees with sealed sources, including those licensed by agreement states. However, 82 percent of agreement states responding to our survey feel they should be responsible for inspecting and enforcing security measures for sealed sources in their states under their authority to ensure public health and safety.

NRC's Security Efforts Have Not Focused on Sealed Sources

Since the events of September 11, 2001, NRC efforts have focused on issuing advisories and orders for nuclear reactor and nuclear fuel licensees and implementing changes within NRC to streamline its security responsibilities. Specifically, NRC has issued over 30 advisories and 20 security orders requiring action to nuclear power plants, decommissioning power reactors, fuel cycle facilities, and spent fuel facilities.[20] Between November and December 2001, NRC's Office of Investigations visited 80 nuclear facilities, law enforcement agencies, and first responders nationwide to interview officials and review records to identify potential terrorist risks. NRC forwarded potential leads to the Federal Bureau of Investigation. In addition, NRC has revised the "design basis threat" for nuclear power plants—the largest reasonable threat against which a regulated private guard force should be expected to defend under existing law—and issued a corresponding order in April 2003 requiring power

[20] *Advisories* are non-public, rapid communications from NRC to its licensees that provide information obtained from the intelligence community or law enforcement agencies on changes to the threat environment, and guidance for licensees to take specific actions promptly to strengthen their capability against the threat. *Security orders* contain requirements for licensees to implement interim compensatory security measures beyond that currently required by NRC regulations and as conditions of licenses.

plants to implement additional actions to protect against sabotage by terrorists and other adversaries. NRC also made a series of internal administrative changes, such as consolidating the agency's security responsibilities in establishing an Office of Nuclear Security and Incident Response,[21] which includes a Threat Assessment Team responsible for working directly with the Central Intelligence Agency and the Federal Bureau of Investigation on security issues. The Office of Nuclear Security and Incident Response also works with the Department of Homeland Security and other agencies concerned with terrorism to assess and respond to potential threats. In an effort to more effectively communicate and respond to threats, NRC developed a Threat Advisory and Protective Measures System[22] based on the national Homeland Security Advisory System, and increased staffing at its 24-hour Emergency Operations Center. NRC also conducted a review of information available to the general public on the NRC Web site for potential security risks.

Efforts to strengthen the security of sealed sources for medical, industrial, and research use—by both NRC and agreement states—have been limited. Since September 11, 2001, NRC has issued a total of six advisories urging licensees to ensure security of sources and advising them to be more aware of the possibility of theft and sabotage.[23] Licensees were also advised to double-check shipping documents and inform local police authorities of their possession of sealed sources. On June 5, 2003, NRC issued its first security order for large irradiator facilities—70 facilities nationwide that expose products, such as medical supplies, to radiation for sterilization—that requires licensees to take action to strengthen security. The decision to select irradiators first has been questioned by agreement state officials and licensees, as they feel other uses of sealed sources pose a higher risk. For example, 93 percent of agreement states responding to our survey identified industrial radiographers as of greater concern. Reasons for this may include that the sealed sources in these devices are portable, have high

[21]The Office of Nuclear Security and Incident Response was established in April 2002 and consists of two divisions – the Division of Nuclear Security and the Division of Incident Response Operations. It is responsible for the agency's security, safeguards, and incident response efforts and to serve as a point of contact and counterpart to the Department of Homeland Security and other federal agencies. In this role, the Office of Nuclear Security and Incident Response participates in a number of interagency working groups and committees that address issues relating to terrorism, information sharing, and planning.

[22]NRC established this system in response to Homeland Security Presidential Directive 3.

[23]There were a total of seven advisories, one of which was a correction to a prior advisory.

radioactivity, and are widely available (over 570 licensees in the United States). Although irradiator facilities contain larger amounts of radioactive material than industrial radiographers, they are specially designed to include thick concrete and steel walls, security interlocks, and other protective equipment to protect against radiation exposure. In addition, the irradiator facilities we visited had taken the initiative to implement supplementary security measures, such as installing motion detectors, more extensive security alarms and monitoring, and employee identification badges. Other uses identified by agreement states officials in our survey as requiring stricter regulation include portable gauges and well-logging devices—over 4,600 and over 200 licensees nationwide, respectively.

Transportation was also identified as needing additional security. Although most agreement states surveyed indicated that the Department of Transportation's (DOT) regulations are adequate to ensure safe transportation of sealed sources, 81 percent of them identified weaknesses in current regulations and 77 percent indicated that communications and coordination needs to be improved between their state program and DOT. Some DOT officials we spoke with disagreed that sealed sources were particularly vulnerable during transportation. However, one DOT official noted that large quantities of iridium-192 are regularly shipped to the United States from Europe and South America using regular commercial freight services. Such sources are shipped in stainless steel transport kegs that require no special tools or equipment to open. Once loaded with up to 10,000 curies of iridium-192, the transport keg weighs only 150 to 200 pounds. While this official believed that, overall, security is sufficient during transport, he told us that at certain phases such shipments could be vulnerable to terrorist diversion.

NRC and the agreement states have formed a materials security working group to develop and issue new security orders by the end of the year for approximately 2,100 licensees—located throughout the United States—that have been determined to be of the greatest risk based upon NRC's and DOE's work to categorize sealed sources. When these orders are issued, affected licensees will have a certain specified time period to comply with the order and implement required security measures. At the end of this period, licensees will be subject to inspections to ensure compliance and face enforcement actions if actions have not been taken.

Agreement states' efforts to strengthen the security of sealed sources have focused primarily on facilitating NRC actions, such as forwarding NRC advisories, increasing attention on security when conducting inspections and license reviews, and coordinating with local law enforcement and first responders to develop emergency response procedures. Eighty-six percent of agreement state officials responding to our survey indicated that they are adequately addressing post-September 11, 2001, heightened security concerns involving malicious use of radioactive material.

NRC and the Agreement States Disagree over Development and Enforcement of Additional Security Requirements

The Atomic Energy Act of 1954 authorizes NRC to issue rules, regulations, or orders to promote the common defense and security, while granting agreement states the authority to ensure public health and safety.[24] Following the events of September 11, 2001, NRC determined that security-related efforts for all medical, industrial, and research licensees—including those licensed by agreement states—should be the responsibility of NRC under its common defense and security authority. However, 82 percent of agreement states responding to our survey noted that they want to have responsibility for inspection and enforcement of security measures for sealed sources under their authority to ensure public health and safety. Agreement states already enforce NRC's existing security regulations under this authority. In addition, 74 percent of agreement states responding to our survey indicated they could effectively respond to a radiological incident with their current resources.

Individual commissioners at NRC have expressed concern with budget shortfalls many states are currently experiencing. These commissioners said that states experiencing budgetary difficulties may not be able to assume additional responsibilities and that it may impact their program's performance. When asked whether their state had sufficient resources to support new efforts, 60 percent of agreement states responding to our survey indicated they would need additional resources.[25] However, officials from organizations representing agreement states and non-agreement states have met with NRC and advised NRC that, although many states are

[24]NRC's regulations require licensees to secure licensed materials that are stored in controlled or unrestricted areas from unauthorized removal or access and to control and maintain constant surveillance of licensed material that is not in storage and is in a controlled or unrestricted area. 10 C.F.R. §§ 20.1801, 20.1802.

[25]Approximately 20 percent of agreement state officials responding to our survey indicated that they are having difficulty retaining sufficient and/or qualified personnel to effectively regulate sealed sources. Nevertheless, NRC has determined that all agreement state programs are adequately protecting public health and safety.

facing budget cuts, funding of the radioactive materials programs in these states have largely been stable and the programs have been able and will likely be able to adequately fulfill their responsibilities.

According to our discussions with NRC officials, NRC is also facing budget and staffing constraints, largely as a result of its dependence upon fees from the licensees it regulates—only 20 percent of the total sealed sources licensees nationwide—for funding of its sealed source licensing and inspection activities. As more states become agreement states, NRC has fewer licensees to support its licensing and inspection programs.[26] To address the potential effect this reduction in funding may have on its licensing and inspection programs, NRC and the agreement states have entered into a partnership—called the National Materials Program—to better share the responsibility for protecting public health and safety. Since the agreement states regulate about 80 percent of the nation's sealed source licensees, the National Materials Program allows them to participate more actively in the development of regulations and guidance, particularly in areas where they possess expertise. For example, Texas, an agreement state, regulates more well logging specific licensees than exist in all NRC-regulated states. Thus, according to NRC officials, Texas could take the lead in developing any new public health and safety regulations for well loggers. Both NRC and the agreement states are currently conducting pilot projects to determine how the National Materials Program can and will work. In addition, states remain solely responsible for regulating certain radioactive materials, such as naturally occurring radioactive material like radium and material produced in particle accelerators, increasing the importance of federal and state cooperation in developing and implementing additional safety and/or security measures. NRC and the agreement states are continuing to work cooperatively to develop information on how responsibilities can be shared under the National Materials Program.

NRC officials said that NRC lacks sufficient staff to conduct inspections of all licensees expected to receive security orders—large irradiator facilities and approximately 2,100 licensees that NRC has identified as presenting the greatest risk. To mitigate this staffing shortage, NRC intends to enter

[26]NRC is required by the Energy and Water Development Appropriations Act, 2001 (P.L. 106-377) to recover 94 percent of its budget through fee recovery. As the number of NRC licensees decreases with an increasing number of agreement states, fees paid by NRC's licensees have increased in order to support NRC's regulatory program.

into contracts with agreement states or independent contractors to assist in carrying out these inspections. According to agreement state officials we spoke with, however, agreement states may be reluctant to participate in these efforts if they have had no role in developing the additional security requirements or are not provided additional funding. NRC would remain responsible for taking appropriate enforcement action for any security violation found during these inspections. According to NRC, although final details regarding funding have yet to be determined, NRC anticipates increasing its licensees' fees and using funds NRC has received from emergency supplemental appropriations to cover costs associated with additional security.

Conclusions

The terrorist attacks of September 11, 2001, have changed the focus of radioactive sealed sources regulation. Where NRC and the agreement states previously concentrated on ensuring the safe and effective use of sealed sources, they must now increasingly consider how to prevent terrorists from obtaining and using the material. Efforts to improve controls over sealed sources face significant challenges, especially how to balance the need to secure these materials while not discouraging their beneficial use in academic, medical, and industrial applications. The first step to improve security is to conduct a threat assessment that would identify sealed sources most likely to be used in a terrorist attack and the consequences of such an attack. Defining the types of sealed sources that are of the greatest concern will allow federal and state efforts to be appropriately prioritized. NRC's and DOE's current efforts to categorize sealed sources by the greatest amount of risk and their efforts to establish a national-level tracking system for the highest risk sealed sources are commendable. However, these efforts could be strengthened by involving the agreement states, which regulate 80 percent of the nation's radioactive materials licensees, in determining risk. In addition, these efforts could be further strengthened by determining the economic consequences of a dirty bomb and how to effectively mitigate any resulting psychological consequences. In addition, NRC's current regulations leave sealed sources at risk of malicious use. Modifying its regulations to eliminate general licensing of devices containing sealed sources could improve accountability, potentially reducing the number of sources that are lost, stolen, or abandoned. Furthermore, modifying NRC's licensing and/or inspection process to verify—before a licensee purchases radioactive material—that it will be used as intended may increase the security of sealed sources.

The President's National Strategy for Homeland Security recognizes the critical importance of integrating federal, state, local, and private sector efforts to prepare and respond to terrorist attacks, including those using sealed sources. The initial responsibility, however, falls upon state and local governments and their organizations—such as police, fire departments, emergency medical personnel, and public health agencies—which will almost invariably be the first responders to any terrorist event involving sealed sources. Because of state and local governments' role in responding to incidents—in addition to the fact that the federal government lacks authority over naturally occurring and accelerator produced radioactive material—it is critical to involve state and local governments in the development and implementation of additional security over sealed sources. State radiological protection agencies can provide valuable expertise on the licensees that they have been regulating, in many cases, for decades. Developing criteria and performance measures to gauge NRC's and agreement states' effectiveness at implementing additional security as part of NRC's performance evaluation process would help ensure the consistent application of additional security measures across the United States. NRC and the agreement states have a proven record of cooperation in regulating the safe use of radioactive materials, including sealed sources. As increasing demands are placed on budgets at all levels of government, effectively leveraging the knowledge and resources of federal, state, and local agencies will be crucial to ensuring that sealed sources continue to be used safely and remain secure against terrorist use.

Recommendations for Executive Action

To determine the sealed sources of greatest concern, we recommend that the Chairman of NRC collaborate with the agreement states to identify the types, amount, and availability of the highest risk sealed sources and the associated health and economic consequences of their malicious use. In addition, we recommend that NRC and the agreement states determine how to effectively mitigate the psychological effects of their use in a terrorist attack.

In addition, accountability over generally licensed devices needs to be improved and gaps in the current licensing process need to be addressed. Because new efforts will involve additional licensing and inspection of potentially thousands of licensees and devices, we recommend that the Chairman of NRC:

- determine, in consultation with the agreement states, the costs and benefits of requiring owners of devices that are now generally licensed to apply for specific licenses and whether the costs are commensurate with the risks these devices present and

- modify NRC's process of issuing specific licenses to ensure that sealed sources cannot be purchased before NRC's verification—through inspection or other means—that the materials will be used as intended.

Finally, to ensure that the federal and state governments' efforts to provide additional security to sealed sources are adequately integrated and evaluated for their effectiveness, we recommend that the Chairman of NRC:

- determine how officials in agreement and non-agreement states can participate in the development and implementation of additional security measures and

- include criteria and performance measures of the NRC's and the agreement states' implementation of additional security measures in NRC's periodic evaluations of its and agreement states' effectiveness.

Agency Comments and Our Evaluation

We provided NRC, CRCPD, and OAS with draft copies of this report for their review and comment. NRC's written comments are presented as appendix VI. NRC, CRCPD, and OAS also provided technical comments, which we incorporated into the report as appropriate.

NRC stated that the draft report does not fully present either the current status of NRC's efforts to improve the security of high-risk radioactive sources or the large effort that it has devoted to this issue since September 11, 2001. According to NRC, the draft report does not fully reflect its existing statutory framework and does not recognize that several of our recommendations would require statutory changes at both federal and state levels. Furthermore, NRC commented that our draft report should have focused on high-risk radioactive sources that are of greatest concern for malevolent use by a terrorist rather than radioactive sources of all types.

Regarding NRC's comments that our draft report does not fully discuss its activities to increase the security of the highest-risk sealed sources, we note that our draft report detailed all advisories issued by NRC to sealed source licensees urging them to ensure security of sealed sources following September 11, 2001, as well as NRC's efforts with DOE to define the radioactive isotopes of concern. We have added information on the organization and goals of NRC's new materials security working group. Furthermore, our report discusses that NRC's security order to large irradiators was issued on June 5, 2003. This order was issued four days after our meeting with NRC officials to discuss our preliminary findings, conclusions, and recommendations. At the meeting, NRC officials told us that it could take until the end of 2003 for the order to be issued. It is important to note that this is the first and only security order related to sealed sources issued since the September 11, 2001, attacks and that it applies only to 70 large irradiator facilities in the United States. As discussed in our draft report, 93 percent of agreement states responding to our survey identified industrial radiographers, of which there are over 500 nationwide, as of greater concern than large irradiator facilities.

Regarding NRC's comment that our draft report does not recognize that several of our recommendations would require statutory changes at both federal and state levels, we have clarified our report to recommend that NRC determine how officials in agreement and non-agreement states can participate in the development and implementation of additional security measures. We agree with NRC that its statutory framework reserves to NRC the authority to promote the common defense and security and our report discusses the distinction between federal and state authority. However, we continue to believe, as do state officials we spoke with, that involving the agreement and non-agreement states in the development and implementation of additional security measures would be beneficial. As our draft report stated, state and local governments will almost invariably be the first responders to any terrorist event involving sealed sources. States can also provide valuable expertise on licensees that they have been regulating for decades and which NRC has had no prior contact with. In its comments, NRC states that the possibility of state budget shortfalls played absolutely no role in its decision to develop and implement additional security measures under its common defense and security authority. However, numerous NRC officials told us during our review that budget difficulties could impact the performance of state radiation protection programs and NRC's former Chairman discussed the issue at a January 2003 meeting. NRC acknowledges in its comments that cooperation with agreement states is vital to the success of its efforts. We are encouraged that NRC stated in its comments that it will examine changes to its statutory framework in its new materials security working group and intends to work with the states to the maximum extent possible under existing statutes.

Regarding NRC's comment that the draft report should have focused only on high-risk sources rather than radioactive sources of all types, we note that the objectives of our review included determining the known number of all sealed sources in the United States and the number of sources lost, stolen, or abandoned. Our draft report noted that defining the types of sealed sources that are of the greatest concern would allow federal and state efforts to be appropriately prioritized. As we did when responding to a similar comment NRC made in our May 2003 report, we agree that the highest-risk sources present the greatest concern as desirable material for a dirty bomb. [27] However, other sealed radioactive sources could also be used as a terrorist weapon. No one can say with certainty what the psychological, social, or economic costs of a dirty bomb—regardless of the radioactive material used to construct it—would be. We are concerned that NRC's and DOE's identification of the highest-risk sealed sources focuses solely on the health risks of their use and does not address the psychological, social, or economic costs of a dirty bomb. It is also important to note that NRC is still working with the International Atomic Energy Agency to reconcile differences between their definitions of high-risk sealed sources. Furthermore, many of the radioactive isotopes identified by NRC and DOE as high-risk are used only at DOE facilities or by very few NRC licensees in the United States. NRC and DOE did not consider radioactive materials licensees in the agreement states, which constitute 80 percent of the nation's licensees. Without addressing the total consequences of a dirty bomb and considering the availability of sealed sources nationwide, we believe NRC's and DOE's determination of risk is incomplete.

In general, both CRCPD and OAS agreed with the recommendations in the report. However, both organizations noted that our use of the term "sealed source" to refer to all radioactive materials used in medical, industrial, and research purposes may exclude many radioactive isotopes that could be used in a dirty bomb that are loose and not in sealed form, especially those used in medical and research facilities. We used the term "sealed source" for simplicity to distinguish medical, industrial, and research radioactive isotopes from material used in nuclear weapons and as fuel in nuclear reactors. We did not intend to exclude unsealed radioactive material from

[27]See U.S. General Accounting Office, *Nuclear Nonproliferation: U.S. and International Assistance Efforts to Control Sealed Radioactive Sources Need Strengthening*, GAO-03-638 (Washington, D.C.: May 16, 2003).

our discussion of radioactive materials of concern and have clarified our use of the term.

CRCPD stated that the report does not address four critical areas of potential risk. First, CRCPD believes that a major area of risk is at bankrupt facilities where sealed sources can be left unattended and/or unsecured for long periods of time, leaving the sources easy targets for theft. We acknowledge this risk and have revised our discussion of lost, stolen, and abandoned sources appropriately. Second, CRCPD noted that radioactive materials licensed for “storage only” tend to be neglected by the licensee and the regulatory agency. While we agree that this is a potential weakness in sealed source security, individual state practices on “storage only” licenses differ. We did not specifically examine these practices during our review. Third, CRCPD stated that the report does not adequately address the radioactive material under the control of DOE and naturally occurring and accelerator produced radioactive material. While DOE does control a large amount of radioactive material, discussion of the security provided to it was outside of the scope of our review. We believe our report adequately discusses the challenges of regulating naturally occurring and accelerator produced materials. Finally, CRCPD states that the report does not consider transportation hubs through which very large quantities of radioactive material pass each day. While we do not specifically discuss transportation hubs, our draft report noted that weaknesses have been identified in the transportation of sealed sources and, at certain phases of transport, these shipments could be vulnerable to terrorist diversion.

OAS agreed with our recommendation that NRC should include criteria and performance measures of the agreement states’ implementation of additional security measures in NRC’s periodic evaluations of agreement states’ effectiveness. OAS stated that such evaluation is not possible given the current intention of NRC to issue and implement security orders under its common defense and security authority. However, we believe that the recommendation in our draft report that NRC determine how states can participate in the development and implementation of additional security measures addresses this concern.

OAS also noted that our draft report stated that licensees are tracked instead of individual sealed sources and that the draft report lends support to the formation of a national tracking system for sealed sources. OAS commented that our discussion does not accurately describe the current system. Licensees are required to maintain records for the acquisition and disposition of each source it receives and maintain an accurate inventory of sources in their possession. While we agree with this comment and have revised our discussion of license tracking, our draft report was accurate in that there is no single source of information in the United States to verify authorized users, locations, quantities, and movements of sealed sources. OAS goes on to state that there are serious concerns with the practicality and accuracy of a national tracking system and that the development of such a system should be further evaluated with input from the states and private industry. We agree with OAS's comments, but believe that our recommendation to collaborate with the agreement states in order to determine the types, amount, and availability of the highest risk sealed sources and the health, psychological, and economic consequences of their use in a terrorist attack addresses OAS's concerns.

Finally, OAS commented that the states have long requested that the federal government seriously consider placing the use and regulation of all radioactive materials in a single federal agency. According to OAS, the current approach results in a disjointed regulatory structure and different standards for the same public health issue. While we agree that consistency and avoiding duplication is important, addressing the overall regulation of radioactive material in the United States was outside the scope of our review on security of sealed sources.

We conducted our work from August 2002 through June 2003 in accordance with generally accepted government auditing standards. Appendix I presents our scope and methodology in detail.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. We will then send copies to the Chairman and Commissioners of NRC; the Secretary of Homeland Security; the Secretary of Energy; the Administrator, National Nuclear Security Administration; the Director, Office of Management and Budget; the Chairman of the Organization of Agreement States; the Chairman and Executive Director of the Conference of Radiation Control Program Directors; the directors of the radiation control programs in the 32 agreement states; interested congressional committees; and other interested parties. We will also make copies available to others who request them. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report, I can be reached at (202) 512-3841. Key contributors to this report are listed in appendix VII.

Sincerely yours,

Robert A. Robinson
Managing Director, Natural
Resources and Environment

Objectives, Scope, and Methodology

At the request of the Ranking Minority Member, Subcommittee on Financial Management, the Budget, and International Security, Committee on Governmental Affairs, U.S. Senate, we examined the following questions:

1. What is the known number of sealed sources in the United States?

2. How many of these sealed sources have been lost, stolen, or abandoned?

3. How effective are federal and state controls over sealed sources?

4. What efforts have been initiated or considered since September 11, 2001, to better safeguard radiological sources?

To answer these questions, we distributed surveys to 32 agreement states, 18 non-agreement states, Puerto Rico, the District of Columbia, and to NRC's 4 regional offices. We focused the survey on information about each state's radiation control program, specific and general licensing activities, enforcement actions, effectiveness of controls over sealed sources, program evaluation processes, transportation of sealed sources, and the impact of September 11, 2001, on regulatory programs. We acquired a list of the appropriate agreement and non-agreement state officials from NRC's Office of State and Tribal Programs Web site and from the Conference of Radiation Control Program Directors. Because this was not a sample survey, but rather a census of all states, there are no sampling errors. However, the practical difficulties of conducting any survey may introduce errors, commonly referred to as nonsampling errors. For example, measurement errors are introduced if difficulties exist in how a particular question is interpreted or in the sources of information available to respondents in answering a question. In addition, coding errors may occur if mistakes are entered into a database. We took extensive steps in the development of the questionnaires, the collection of data, and the editing and analysis of data to minimize total survey error. To reduce measurement error, we conducted two rounds of pretesting to make sure questions and response categories were interpreted in a consistent manner with both agreement and non-agreement states. We also provided draft copies of the questionnaires to NRC, the Organization of Agreement States (OAS), and the Conference of Radiation Control Program Directors (CRCPD) for their review and comment. Based on both pretesting and comments received from NRC, OAS, and CRCPD, we made relevant changes to the questions based upon these pretests. Copies of the agreement and non-agreement state questionnaires, along with the results to each question, are in appendixes IV and V, respectively.

In addition, we edited all completed surveys for consistency and, if necessary, contacted respondents to clarify responses. All questionnaire responses were double key-entered into our database (that is, the entries were 100 percent verified), and a random sample of the questionnaires was further verified for completeness and accuracy. In addition, all computer syntax was peer reviewed and verified by separate programmers to ensure that the syntax was written and executed correctly.

We made extensive efforts to encourage respondents to complete and return the questionnaires, including sending up to four reminder electronic mail messages to non-respondents, calling state radiation control program directors directly, and collaborating with OAS to promote completion of this survey. Our efforts yielded responses from 31 of 32 (96.8 percent response rate) agreement states and 11 of 18 (61.1 percent response rate) non-agreement states. We also received responses from Puerto Rico and the four NRC regional offices. In total, we achieved an overall response rate of 80.4 percent, receiving 45 of the 56 surveys disseminated. We did not receive a response from one agreement state: Arizona. The non-agreement states of Alaska, Connecticut, Minnesota, Missouri, Pennsylvania, South Dakota, and Wyoming did not respond to our survey, nor did we receive a response from the District of Columbia. Although we did not receive surveys from these states, we obtained data on incidents involving sealed sources and numbers and types of licensees from NRC. Three states (New York, South Carolina, and Texas) have multiple agencies with jurisdiction over sealed sources. We sent and received surveys from the appropriate agencies in each of these states.

To determine the number and types of sealed source licenses in the United States and the number of sealed sources lost, stolen, or abandoned, we relied upon information provided by state radiation control programs in their responses to our survey. In addition, we obtained data from NRC's license tracking system database on licensees NRC regulates—both in the non-agreement states and on federal facilities in the agreement states. To determine the number of sealed sources lost, stolen, or abandoned over the past 5 years, we obtained data on incidents from NRC's Nuclear Materials Events Database. We chose to examine the past 5 years because information was readily available through this database. Because each state uses different systems to track its licensing activities, we did not attempt to independently assess the reliability of data provided by the states in their responses to our survey. However, we did ask states in what ways and how frequently information in their databases is validated. To assess the reliability of NRC's databases, we interviewed officials at NRC in charge of maintaining its license tracking system database and the Nuclear Materials Events Database to determine if data in these systems are reasonably complete and accurate. As a result of these interviews, we did not find any reasons to question the reliability of these data. In addition, we also performed limited testing on NRC's license tracking system database to find missing data or data outside expected ranges. We did not find significant errors or incompleteness as a result of these tests and concluded that the use of the data would not lead to incorrect or unintentional findings. These are the only data on NRC licensing activities in the United States and program managers at NRC regularly use the data.

In addition to data on state programs obtained through our survey, we obtained information through interviews with officials from state radiation control programs. We visited the following states during our review: Florida, Georgia, Illinois, Maryland, New Jersey, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Utah. We also interviewed officials from the Massachusetts, Nevada, New York, and Ohio state radiation control programs.

We selected states to visit based upon the numbers of licensees regulated by the state and the different uses of sealed sources. We selected states with a low number of licensees (Rhode Island, South Carolina, and Utah), a medium number of licensees (Georgia, Maryland, New Jersey, North Carolina, and Pennsylvania), and a high number of licensees (Florida and Illinois). In addition, we considered the types of licensees in each state. For example, we visited South Carolina and Utah because they have two of the nation's three low-level radioactive waste disposal facilities—the Chem-Nuclear Systems, L.L.C. facility in Barnwell, South Carolina and the Envirocare of Utah, Inc., facility in Clive, Utah. When visiting states, we met with officials from selected licensees that represented the major uses of sealed sources. We also visited manufacturers because they may possess larger quantities of radioactive material for installation in devices for sale. In summary, we visited three sites being decommissioned and decontaminated, two low-level radioactive waste disposal facilities, two moisture/density gauge manufacturers, two industrial radiographers, two medical licensees (hospitals), two large irradiator facilities, a well-logging licensee, a nuclear pharmacy, a research and development licensee, and an academic licensee to obtain their views on the effectiveness of NRC and state regulations, including the challenges associated with sealed source security. Additionally, we examined physical security measures during tours of these facilities.

We also visited Rhode Island, Florida, and the NRC Region III office in Lisle, Illinois, because they were undergoing NRC program performance evaluation reviews under the Integrated Materials Performance Evaluation Program. Visiting a program while it was being evaluated gave us the opportunity to witness review procedures for evaluating performance, consistency of application of NRC's review criteria, transparency of the review process, and the level of cooperation and involvement between NRC officials and representatives from agreement states. To follow up our review of the program evaluation process, we attended a 2-day NRC training class on the Integrated Materials Performance Evaluation Program and observed two program evaluation Management Review Board meetings at NRC headquarters in Rockville, Maryland.

We attended two conferences related to sealed source regulation—the May 2002 CRCPD annual meeting held in Madison, Wisconsin, and the annual OAS Conference held in October 2002, in Denver, Colorado. We also obtained a position paper from the Health Physics Society on the regulation of sealed sources. Furthermore, we met with the chairman of the Southeast Compact for low-level radioactive waste and the Advisory Committee on the Medical Uses of Isotopes to elicit views on the regulation and security of sealed sources.

At the federal level, we interviewed numerous NRC officials representing several different offices and programs. During these interviews, NRC provided us with information and documents about the regulation of sealed sources and the challenges it faces in the post September 11, 2001, security environment. We met with NRC's Office of Enforcement, Office of Investigation, Office of Nuclear Materials Safety and Safeguards, Office of Nuclear Security and Incident Response, and Office of State and Tribal Programs. Additionally, we attended an August 2002 meeting between representatives of OAS and CRCPD and the Commissioners of NRC. Finally, to gain the perspective of federal regulators at the regional level, we visited three of the four NRC regional offices, including NRC Region I located in King of Prussia, Pennsylvania; Region II located in Atlanta, Georgia; and Region III located in Lisle, Illinois.

In addition to officials at NRC, we interviewed several other federal government agency officials. To learn about sealed source transportation regulations and issues, we interviewed officials from the Department of

Transportation, including the Office of Hazardous Materials Safety. To establish the role of the Environmental Protection Agency in regulating sealed sources, we met with officials from the Office of Radiation and Indoor Air. We also met with officials from the Federal Emergency Management Agency (FEMA) and observed a FEMA evaluated exercise in March 2003 in Springfield and Morris, Illinois, that simulated a radiological release at a nuclear power plant. We also interviewed Department of Justice and Department of Energy officials.

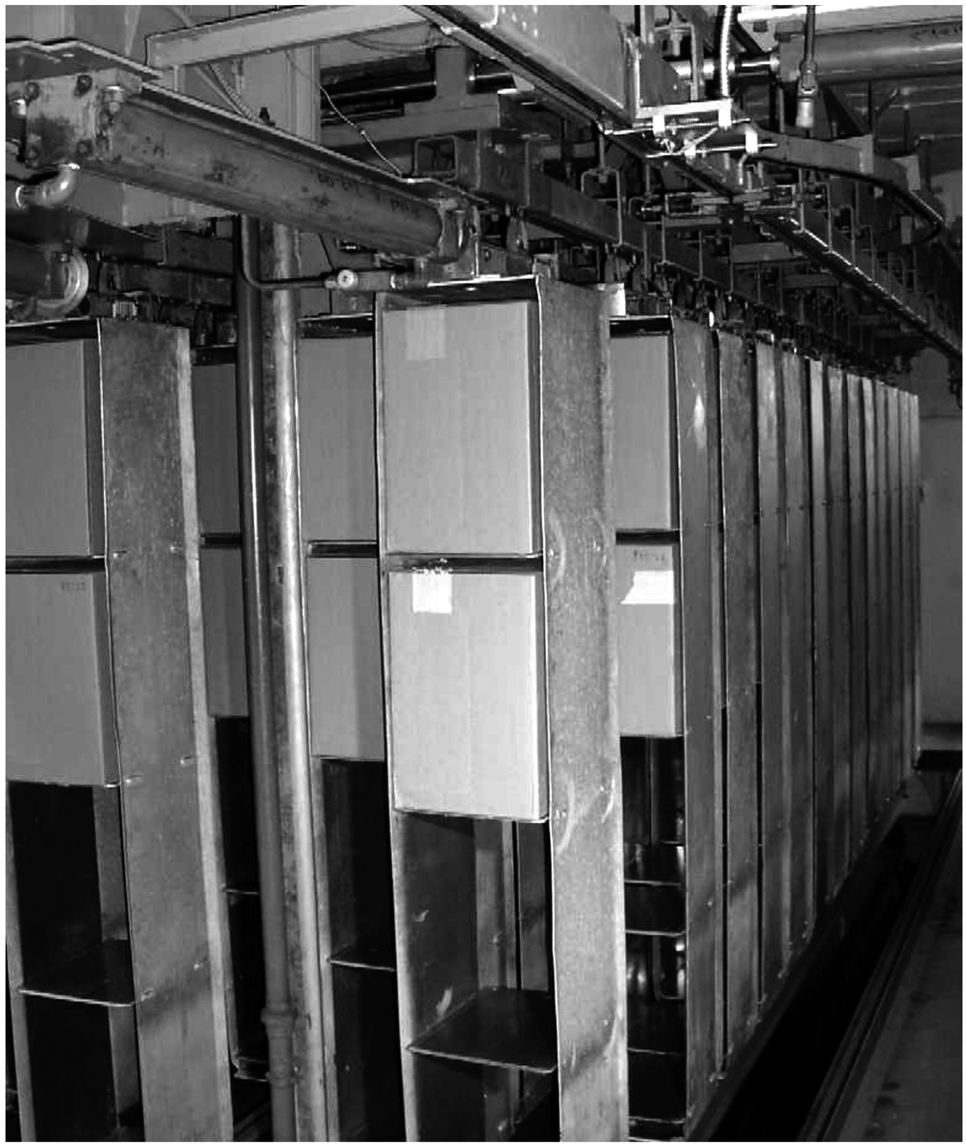
We performed our review from August 2002 through June 2003 in accordance with generally accepted government auditing standards.

Medical and Industrial Devices That Use Sealed Sources

Irradiators

Irradiators are devices or facilities that expose products to radiation for sterilization, such as spices, milk containers, and hospital supplies. Irradiator facilities are relatively few in number and contain very high activity sources, which vary in physical size. Non-self shielded irradiators do not provide shielding from the radiation beam; therefore, the facilities that contain the irradiation must be specially designed, often including thickly shielded walls, interlocks, and other protective equipment. Self-shielded irradiators do not emit external radiation beams and are usually small cabinet type devices. These irradiators are commonly used in research applications or for blood irradiation. According to our survey and NRC specific license data, there are a total of approximately 350 irradiator specific licensees in the United States, about 70 of which are large irradiators.

Figure 4: Product Conveyor System in a Panoramic Irradiator



Source: Ethicon, Inc. Used with permission.

Note: Cobalt-60 sealed sources are placed in racks and stored while not in use in a deep water-filled pool beneath the product conveyor system.

Teletherapy

Teletherapy is commonly referred to as external beam radiation. Fixed multibeam teletheraphy units focus gamma radiation from an array of over

200 cobalt-60 sources on cancer lesions. The facilities within which the units are located are specifically designed to include thickly shielded walls and have other protective equipment, due to the high activity sources. According to our survey and NRC specific license data, there are approximately 60 teletherapy licensees and about 60 gamma knife licensees in the United States.

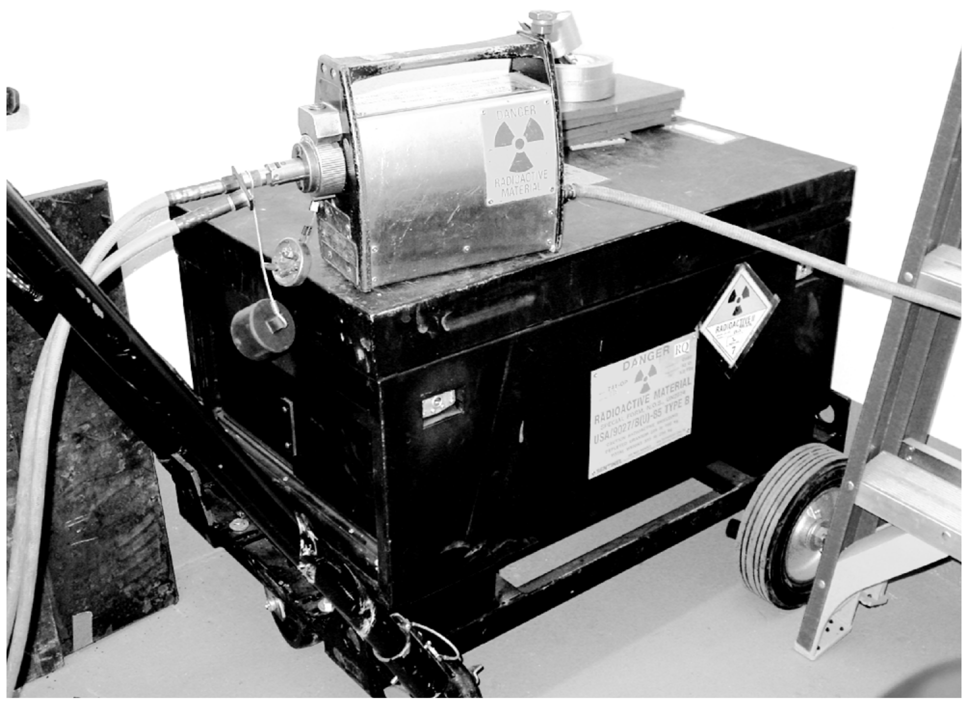
Figure 5: Stereotactic Radiosurgery Device (Gamma Knife)

Source: GAO.

Industrial Radiography

Industrial radiography is the use of radiation to produce an image of internal features on photographic film to inspect metal parts and welds for defects. Industrial radiography sources and devices are generally small in terms of physical size, although the devices are usually heavy due to the internal shielding. The sources are attached to specially designed cables for their operation. The use of radiography sources and devices is very common—a total of over 570 licensees nationwide—and their portability may make them susceptible to theft or loss. Further, the small size of the source allows for unauthorized removal by an individual, and such a source may be placed into a pocket of a garment. Industrial radiography cameras typically contain a high radioactivity iridium-192 source that is capable of inflicting extensive radiation burns if handled improperly.

Figure 6: Industrial Radiography Camera and Storage Case



Source: GAO.

Brachytheraphy

Brachytherapy is an advanced cancer treatment in which radioactive seeds or sources are placed in or near the tumor itself, giving a high radiation dose to the tumor while reducing the radiation exposure in the surrounding healthy tissues. Brachytheraphy applications are of three slightly different varieties, generally referred to as low dose rate, medium dose rate, and high dose rate. These applications use sealed sources that are small physically (less than 1 centimeter in diameter and only a few centimeters long), and, thus, are susceptible to being lost or misplaced. High and medium dose rate sources, and some low dose rate sources, may be in the form of a long wire attached to a device (a remote after loading device). The after loading device may be heavy, due to the shielding for the sources when not in use, and the device may be on wheels for transport within a facility. The remote after loading device may also contain electrical and electronic components for its operation. Brachytherapy sources and devices are located in hospitals, clinics, and similar medical institutions, and such facilities may have a large number of sources.

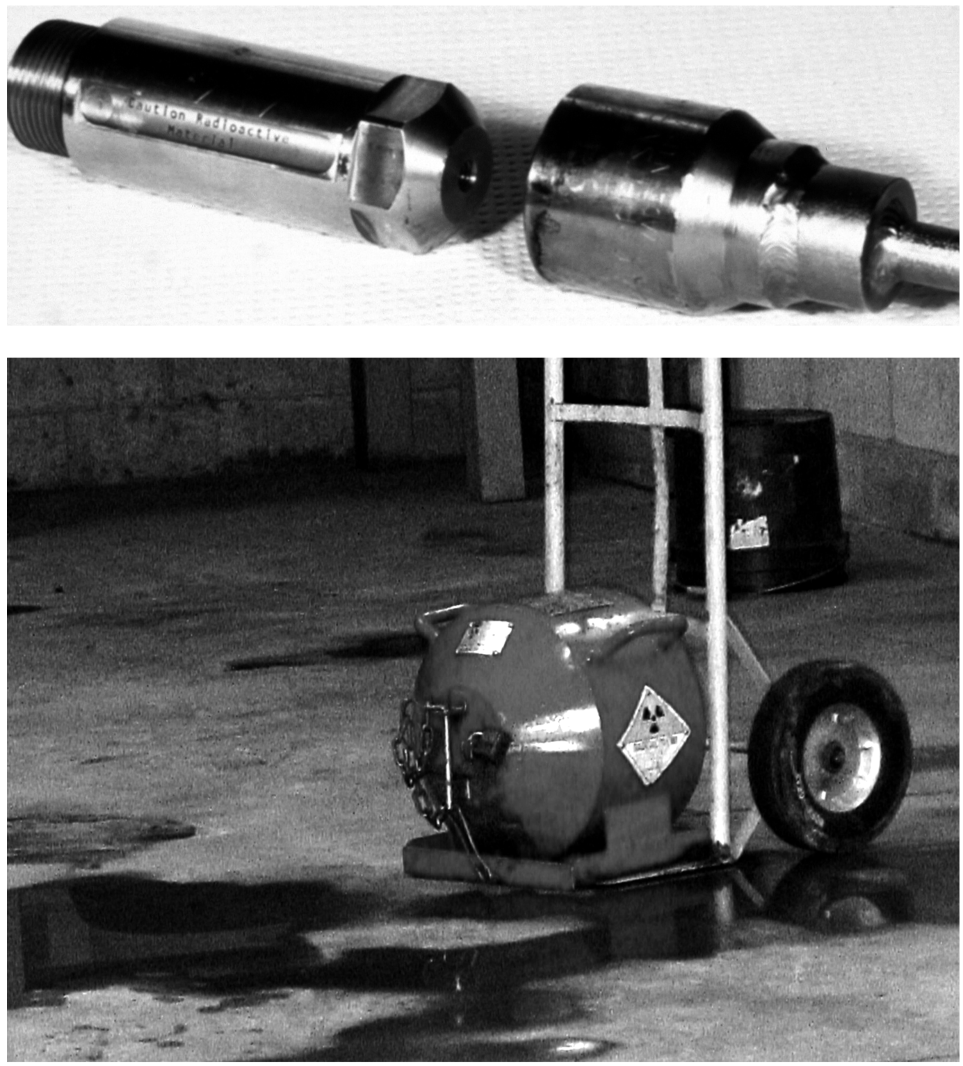
Figure 7: High Dose Rate Remote After Loader Used for Brachytherapy

Source: GAO.

Well Logging Device

Well logging is a process that uses sealed sources and/or unsealed radioactive materials to determine whether a well, drilled deep into the ground, contains minerals, such as coal, oil, and natural gas. The sources are usually contained in long (1 to 2 meters, typically) and thin (less than 10 centimeters in diameter) devices that also contain detectors and various electronic components. The actual size of the sources inside the devices is generally small, but the device is heavy, due to the ruggedness needed for the environments in which they are to be used. Our analysis of NRC's license tracking system and responses to our survey of agreement states indicates that there are about 210 well logging licensees in the United States.

Figure 8: Storage Container for Well Logging Sealed Source

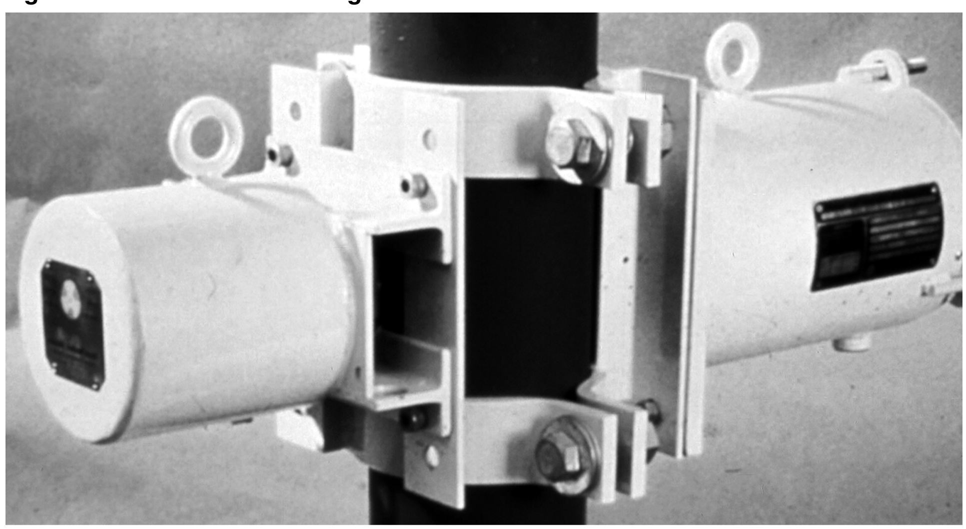


Sources: NRC (top), GAO (bottom).

Fixed Industrial Gauge

Non-portable gauging devices are designed for measurement or control of material density, flow, level, thickness, weight, and so forth. The gauges—possessed by over 1,600 specific licensees and an unknown number of general licensees—contain sealed sources that radiate through the substance being measured to a readout or controlling device. Depending upon the specific application, industrial gauges may contain relatively small quantities of radioactive material, or may contain sources with activities approaching 30 curies. The devices generally are not large, but may be located some distance from the radiation detector, which may have electrical or electronic components located within the detector. A facility may have a large number of these gauges and the locations of such devices or sources within a facility may not be recognized, since the devices may be connected to process control equipment. This lack of recognition may result in a loss of control if the facility decides to modernize or terminate operations.

Figure 9: Fixed Industrial Gauge



Source: NRC.

Portable Gauge

Portable gauging devices, such as moisture density gauges, are used at field locations and contain the sources, detectors, and electronic equipment necessary for the measurement. These gauges—over 4,600 licensees in the United States—contain a gamma emitting sealed source, usually cesium-137, and a sealed neutron source, usually americium-241 and beryllium. The source is physically small in size, typically a few centimeters long by a few centimeters in diameter, and may be located either completely within the device or at the end of a rod/handle assembly. The portability of the device makes it susceptible to loss of control or theft.

Figure 10: Portable Moisture/Density Gauge

Source: GAO.

Table 2: Type and Size of Sealed Sources Used in Medical and Industrial Practices

Practice or Application	Use	Radioisotope	Range of radioactivity level (curies)
Irradiator (sterilization/food preservation)	Industrial	Cobalt-60	5,000-15,000,000
		Cesium-137	5,000-5,000,000
Irradiator (self-shielded)	Research	Cesium-137	2,500-42,000
		Cobalt-60	1,500-50,000
Irradiator (blood)	Medical	Cesium-137	1,000-12,000
		Cobalt-60	1,500-3,000
Teletherapy	Medical	Cobalt-60	1,000-15,000
		Cesium-137	500-1,500
Teletherapy (fixed, multibeam/gamma knife)	Medical	Cobalt-60	4,000-10,000
Industrial radiography	Industrial	Cobalt-60	11-200
		Iridium-192	5-200
		Selenium-75	80
		Ytterbium-169	2.5-10
		Thulium-170	20-200
Brachytherapy (high/medium dose rate)	Medical	Cobalt-60	5-20
		Cesium-137	3-8
		Iridium-192	3-12
Brachytherapy (low dose rate)	Medical	Cesium-137	.01-.7
		Radium-226	.005-.05
		Strontium-90	.02-.04
		Palladium-103	.03
		Iodine-125	.04
		Iridium-192	.02-.75
		Gold-198	.08
		Californium-252	.083
		Ruthenium/Rhodium-106	.00022-.0006
Well logging gauge	Industrial	Americium-241/Beryllium	.5-23
		Cesium-137	1-2
		Californium-252	.027-.11
Fixed industrial gauge (e.g. level/thickness gauge)	Industrial	Americium-241	.012-.12
		Cesium-137	.05-.065
Portable gauge (e.g. moisture/density gauge)	Industrial	Americium-241/Beryllium	.01-.1

(Continued From Previous Page)

Practice or Application	Use	Radioisotope	Range of radioactivity level (curies)
		Cesium-137	.008-.011
		Radium-226	.002-.004
		Californium-252	.00003-.00007

Source: International Atomic Energy Agency, "Categorization of Radioactive Sources, Revision of IAEA-TECDOC-1191" Vienna, Austria, 2003.

Legislation Introduced in the 108th Congress Addressing Security of Sealed Sources

Legislation	Major Efforts	Study Requested
S.6 Comprehensive Homeland Security Act of 2003 Sec. 3006 and Sec. 170.	Amends the Atomic Energy Act of 1954 to include the following major efforts: (1) based on a new classification system, develop a national system for recovery of sealed sources that are stolen or lost; (2) develop a national tracking system that takes into account the new classification system; and (3) establish procedures to improve the security of sealed sources in use, transport, and storage.	Establishes a task force to develop a classification system for sensitive sealed sources that is based on the potential for use by terrorists and the extent of the threat to public health and safety.
S.350 A bill to amend the Atomic Energy Act of 1954 to strengthen the security of sensitive radioactive material.	Directs a task force to (1) determine which sealed sources should be classified as sensitive sealed sources, (2) develop a national system to recover sensitive sealed sources that are lost or stolen, (3) develop a national tracking system for sealed sources, and (4) establish procedures to improve the security of sensitive sealed sources.	Establishes a multiagency task force to evaluate the security of sealed sources and recommends administrative and legislative actions to provide the maximum degree of security against radiological threats.
H.R.891 A bill to establish a task force to evaluate and make recommendations with respect to the security of sealed sources of radioactive materials, and for other purposes.	Directs a task force to (1) establish or modify a classification system for sealed sources based on sealed source attractiveness to terrorists, (2) establish or modify a national tracking system, (3) establish a system to impose refundable fees for proper disposal, and (4) improve the security of sealed sources.	Establishes a multiagency task force to, in consultation with state agencies, make recommendations for appropriate regulatory and legislative changes to strengthen controls over sealed sources.
S. 1043 A bill to provide for the security of commercial nuclear power plants and facilities designated by the Nuclear Regulatory Commission Sec. 6	Changes the definition of byproduct material to include naturally occurring and accelerator produced radioactive material and, within 4 years, transition regulatory authority over this material from non-agreement states to the Nuclear Regulatory Commission.	None.
S. 1005 The Energy Policy Policy Act of 2003 Title IX Subtitle D—Nuclear Energy Sec. 946	Instructs the Secretary of Energy to establish a research and development program to develop alternatives to sealed sources that reduce safety, environmental, or proliferation risks to workers using the sources or the public.	Directs the Secretary of Energy to conduct a survey of industrial applications of large radioactive sources. Requires the survey to include information on the management and disposal of sealed sources.
S. 1045 Low-Level Radioactive Waste Act of 2003	Directs the Secretary of Energy to (1) identify options for disposal of low-level radioactive waste, (2) develop a report for Congress on a permanent disposal facility for greater-than-Class C waste, and (3) submit to Congress a plan to ensure continued recovery of greater-than-Class C waste until a permanent disposal facility is available.	None.

(Continued From Previous Page)

Legislation	Major Efforts	Study Requested
S. 1161 Foreign Assistance Authorization Act, fiscal year 2004 Title III Sec. 301—308 Radiological Terrorism Threat Reduction Act of 2003	Authorizes the Secretary of Energy to engage in activities with the International Atomic Energy Agency to (1) propose and conclude agreements with up to 8 countries under which the countries would provide temporary secure storage for orphaned, unused, and surplus sealed sources, (2) promote the discovery, inventory, and recovery of sealed sources in member nations, and (3) authorizes the Secretary of Energy to make voluntary contributions to the International Atomic Energy Agency to achieve the aforementioned goals.	None.

Source: GAO.

Results of Survey of Agreement States

United States General Accounting Office

Agreement State Survey on Security of Radioactive Sources

Background

The U.S. General Accounting Office (GAO), the investigative arm of Congress, is reviewing the regulation of radioactive materials in the United States. Congress has asked the GAO to answer the following questions:

1. What is the known universe of radiological sources in the United States and how many have been lost, stolen, or abandoned?
2. How effective are federal and state controls over radiological sources?
3. What efforts are underway since September 11, 2001, to improve the controls over radiological sources?

As part of our review, we are conducting surveys of state radiation control agencies, including agreement and non-agreement states, Puerto Rico, Guam, and the District of Columbia. The principal aims of this survey are to obtain information from each state on the number and types of radiological sources being regulated by the state and obtain states' views on the effectiveness of the current federal and state regulatory framework.

Your cooperation in completing this survey is essential for an accurate and timely report to the Congress on the current state of regulatory control over radioactive materials. To be included in our report, your response within 3 weeks of receipt is greatly appreciated.

Directions for Completing this Questionnaire

Please complete this questionnaire and return it via email (**ColesR@gao.gov**), fax (**202-512-6880**), or FedEx within 3 weeks of receipt. GAO will take steps to safeguard the privacy of your responses.

If you have any questions about the survey, please contact:

Ryan T. Coles
Office: 202-512-6888
E-mail: ColesR@gao.gov

Peter Ruedel
Office: 202-512-8753
E-mail: RuedelP@gao.gov

Heather Von Behren
Office: 202-512-6768
E-mail: VonBehrenH@gao.gov

If you prefer to return the survey via FedEx, the return address is:

U.S. General Accounting Office
Attention: Ryan T. Coles
Natural Resources and Environment
441 G Street, NW Room 2T23
Washington, DC 20548

Due to increased security put in place following the anthrax incidents of October 2001, please do not use the U.S. Postal Service to return surveys to GAO.

Although this questionnaire may require input from various individuals, we ask that one person assume responsibility for coordinating its completion. Please list that person's name below in case we have questions or need follow-up. Thank you.

Name:

Title:

Telephone #:

E-mail:

1

PROGRAM INFORMATION

1. **First, we'd like to get some basic information about your state's radiation control program. Please provide the following information.**

   Program name:

   State department/division/office (e.g. Department of Health):

   City the main office is located in:

   State:

   Current director of program:

2. **Please list your program's total budget for the following calendar years:**

2000 (Actual)	**$51,463,128 (N=30)**
2001 (Actual)	**$56,975,299 (N=31)**
2002 (Actual)	**$59,712,939 (N=32)**
2003 (Projected)	**$61,039,121 (N=31)**

3. **What are the sources of your program's funding? (*Mark all that apply* ☒) (N=35)**

94.3%	Fees charged to licensees
45.7%	Appropriations from state general fund
60.0%	Other, please specify:

4. **How many full-time equivalent (FTE) staff does your program currently employ? (N=35)**

   754

2

5. Of the total number of staff reported in question #3, how many FTEs do you have in the following categories?

Category of Staff	Number
Inspectors	
License reviewers	
Other Technical Staff	
Other Non-Technical Staff	

6. How many of your technical staff (including inspectors and license reviewers) are professionally certified (e.g. certified health physicists, nuclear medicine technologists, etc.)?

7. How many staff were employed in your state in the following categories on January 1, 1998? (N=34)

Category of Staff	Number on January 1, 1998
Inspectors	
License reviewers	
Other Technical Staff	
Other Non-Technical Staff	
TOTAL	**750**

8. Over the next five years, do you estimate your total full-time equivalent positions will increase or decrease for technical and non-technical staff? (*Mark only one response ☒ for each type of staff*) (N=34)

Technical Staff		Non-Technical Staff	
17.7%	Increase	17.7%	Increase
11.8%	Decrease	11.8%	Decrease
70.6%	Stay about the same	70.6%	Stay about the same

9. In what year did your agreement with the NRC, or its predecessor, the Atomic Energy Commission, first enter into force?

1	**9**		

3

Specific Licensing Activities of the Agreement States

10. Please complete the following table on the total number of active specific licenses for Atomic Energy Act materials issued by your state as of December 31, 2002:

10 CFR part(s) or the applicable agreement state equivalent	Active licenses as of December 31, 2002
Part 32	**380 (N=29)**
Part 33	**248 (N=29)**
Part 34	**417 (N=29)**
Part 35	**4,795 (N=29)**
Part 36	**134 (N=29)**
Part 39	**167 (N=29)**
Part 40	**137 (N=28)**
Part 70	**95 (N=27)**
Total	**10,611 (N=32)**
Naturally occurring radioactive materials	**153 (N=20)**
Accelerator produced radioactive materials	**324 (N=19)**

11. Next, we'd like to obtain data on the number of active specific licenses issued by your state program as of December 31, 2002 and how often licensees are inspected. ***Enter number and mark only one response ☒ in each row for most common inspection frequency within that particular code. If none, please enter "0" (zero).*** **(N=35)**

29 — **Please check this box if the license information below includes non-Atomic Energy Act materials (i.e. naturally occurring or accelerator produced radioactive materials)**

NRC license tracking system program code and license use	Number of licensees	Most Common Inspection Frequency Within This Code
03250 Introduction of byproduct material in exempt concentrations into products or materials, and transfer of ownership or possession	**8 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

4

NRC license tracking system program code and license use		Number of licensees	Most Common Inspection Frequency Within This Code
03251	Application of byproduct material into devices exempt from regulation under §30.15	**0 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03252	Manufacture of resins containing scandium-46 designed for sand-consolidation in oil wells	**2 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03253	Manufacture, distribution, and transfer of exempt quantities of byproduct material	**15 (N=32)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03256	Manufacture, preparation, or transfer of capsules containing carbon-14 urea for “in vivo” diagnostic use in humans	**14 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

5

NRC license tracking system program code and license use		Number of licensees		Most Common Inspection Frequency Within This Code
03254	Manufacture, process, produce, or initially transfer self-luminous products containing tritium, krypton-85 or promethium-147	**6 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03255	Manufacture, process, produce, or initially transfer gas and aerosol detectors containing byproduct material	**1 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03240	Manufacture or initially transfer generally licensed devices under §31.5	**74 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03241	Manufacture, assemble, repair, or initially transfer luminous safety devices for use in aircraft	**1 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

6

NRC license tracking system program code and license use		Number of licensees	Most Common Inspection Frequency Within This Code
03242	Manufacture or initially transfer calibration or reference sources containing americium-241	**5 (N=32)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03243	Manufacture or initially transfer ice detection devices containing strontium-90	**1 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03244	Manufacture and distribution of byproduct material for in-vitro clinical or laboratory testing under general license	**25 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
02511	Manufacture, preparation, or transfer for commercial distribution of radioactive drugs containing byproduct material for medical use under part 35.	**62 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

7

NRC license tracking system program code and license use		Number of licensees		Most Common Inspection Frequency Within This Code
02513	Manufacture and distribution of sources or devices containing byproduct material for medical use	**20 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
01100	Academic type A specific license of broad scope	**100 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03211	Manufacturing and distribution type A specific license of broad scope	**11 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03610	Research and development type A specific license of broad scope	**57 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

8

NRC license tracking system program code and license use		Number of licensees	Most Common Inspection Frequency Within This Code
01110	Academic type B specific license of broad scope	**21 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03211	Manufacturing and distribution type B specific license of broad scope	**8 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03611	Research and development type B specific license of broad scope	**7 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
01120	Academic type C specific license of broad scope	**31 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

9

NRC license tracking system program code and license use		Number of licensees		Most Common Inspection Frequency Within This Code
03213	Manufacturing and distribution type C specific license of broad scope	**1 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03612	Research and development type C specific license of broad scope	**14 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03310	Industrial radiography fixed location	**95 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03320	Industrial radiography temporary job sites	**379 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

10

NRC license tracking system program code and license use	Number of licensees		Most Common Inspection Frequency Within This Code
02120 02121 Medical institution	**2,519 (N=32)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02200 02201 Medical private practice	**1,805 (N=32)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02220 02231 02240 Mobile medical service	**187 (N=32)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02210 Eye applicators (strontium-90)	**74 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

11

NRC license tracking system program code and license use		Number of licensees	Most Common Inspection Frequency Within This Code
02300	Teletherapy	**55 (N=33)**	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02310	Stereotactic radiosurgery—gamma knife	**45 (N=33)**	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02400	Veterinary non-human	**110 (N=33)**	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
02410	In-vitro testing laboratories	**147 (N=33)**	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

12

NRC license tracking system program code and license use		Number of licensees	Most Common Inspection Frequency Within This Code
02500	Nuclear pharmacies	**280 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03510	Irradiators self shielded less than 10,000 curies	**176 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03511	Irradiators other less than 10,000 curies	**17 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03520	Irradiators self shielded greater than 10,000 curies	**9 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

13

NRC license tracking system program code and license use		Number of licensees		Most Common Inspection Frequency Within This Code
03521	All other irradiators greater than 10,000 curies	**40 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03110	Well logging byproduct and/or special nuclear material tracer and sealed sources	**70 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03111	Well logging byproduct and/or special nuclear material sealed sources only	**40 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03112	Well logging byproduct only	**64 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

14

NRC license tracking system program code and license use	Number of licensees	Most Common Inspection Frequency Within This Code
03120 Fixed gauges	**1,193 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03121 Portable gauges	**3,715 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03122 Analytical instruments	**369 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03123 Gas chromatographs	**212 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required
03124 Other measuring systems	**146 (N=33)**	☐ More than once per year ☐ Once a Year ☐ Every 2-3 Years ☐ Every 4-5 Years ☐ Over 5 Years ☐ Inspection Not Required

15

NRC license tracking system program code and license use		Number of licensees		Most Common Inspection Frequency Within This Code
03221	Instrument calibration service only—source less than 100 curies	**104 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
03222	Instrument calibration service only—source greater than 100 curies	**21 (N=33)**	☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

16

12. **Please complete the following table for radioactive materials licenses issued by your state program that are NOT LISTED IN YOUR RESPONSE TO QUESTION 11.** ***Enter the license use, number of active licenses issued by your program, and mark only one response ☒ in each row for most common inspection frequency within that particular use.***

License use	Number of licensees		Most Common Inspection Frequency Within This Code
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

17

License use	Number of licensees		Most Common Inspection Frequency Within This Code
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required
		☐ ☐ ☐ ☐ ☐ ☐	More than once per year Once a Year Every 2-3 Years Every 4-5 Years Over 5 Years Inspection Not Required

Please copy and paste above table for additional uses.

13. In your opinion, which 3 uses of radioactive materials, from the license uses listed in questions 11 and 12, require the strictest and least strict regulation to protect *public health and safety*?

Strictest regulation	Least strict regulation
1.	1.
2.	2.
3.	3.

14. In your opinion, which 3 uses of radioactive materials, from the license uses listed in questions 11 and 12, require the strictest and least strict regulation to ensure *security*? (i.e. to prevent the materials' use by terrorists in a radiological weapon)

Strictest regulation	Least strict regulation
1.	1.
2.	2.
3.	3.

19

General License Tracking

15. Does your state program require generally licensed devices to be registered? ***Mark only one response* ☒) (N=31)**

80.6%	Yes, all generally licensed devices are required to be registered. (***skip to question 17***)
16.1%	Yes, but only certain generally licensed devices are required to be registered.
3.2%	No, generally licensed devices are not required to be registered with the state. (***skip to question 19***)

16. If only certain generally licensed devices are required to be registered, what criteria determine the devices required to be registered with the state program?

17. If generally licensed devices are required to be registered with your state program, does the program maintain a database of registered generally licensed devices? ***Mark only one response* ☒)**

- ☐ Yes
- ☐ No ***(skip to question 19)***

18. If yes, how many generally licensed devices are currently registered in your state?

19. If your state program does not require any generally licensed devices to be registered or your state program does not maintain a database of registered generally licensed devices, how many such devices would you estimate are present in your state?

20

SPECIFIC AND GENERAL LICENSE TRACKING OVERSIGHT

20. Briefly describe how your program maintains data on materials licenses and inspections.

21. Please estimate the percentage of inspections of your licensees that are currently overdue.

22. Are your databases (i.e. licensing records, computer files containing licensee information) periodically validated to ensure that licensees are still active (i.e. still conducting business)? ***Mark only one response*** **☒) (N=35)**

97.1%	Yes
2.9%	No ***(skip to question 25)***

23. How often do you validate your databases? ***Mark only one response*** **☒) (N=32)**

46.9%	More than once per year
40.6%	Once a year
9.4%	Every 2-3 years
3.1%	Every 4-5 years
0.0%	Over 5 years

24. What steps are taken to validate information in your databases?

25. Does your state have a program to identify and recover abandoned sources? ***Mark only one response*** **☒) (N=35)**

94.3%	Yes
5.7%	No ***(skip to question 27)***

26. Briefly describe your state's program to identify and recover abandoned sources.

21

ENFORCEMENT ACTIONS

27. What enforcement actions are available to your state's program to ensure laws and regulations are followed? (*Mark all that apply* ☒) (N=35)

0.0%	No enforcement actions available ***(skip to question 31)***
100%	Notices of violation/citations
77.1%	Fines/civil penalties
88.6%	License suspension
97.1%	License termination
57.1%	Facility closure
71.4%	Imprisonment/criminal penalties
45.7%	Other, please specify:

28. Please complete the following table on your state program's enforcement activities over the past five years. If none, please enter "0" (zero):

	Number of enforcement actions per year				
Enforcement action	**1998**	**1999**	**2000**	**2001**	**2002**
Notices of violation only (without other action)	2,135 (N=24)	2,675 (N=25)	3,056 (N=27)	2,845 (N=28)	2,568 (N=28)
Fines/civil penalties	45 (N=23)	50 (N=24)	47 (N=24)	66 (N=26)	57 (N=25)
License suspension	3 (N=25)	3 (N=26)	8 (N=26)	9 (N=27)	9 (N=27)
License termination	24 (N=25)	25 (N=26)	26 (N=26)	27 (N=27)	53 (N=27)
Facility closure	1 (N=24)	0 (N=25)	1 (N=25)	0 (N=25)	1 (N=25)
Imprisonment/criminal penalties	0 (N=24)	0 (N=25)	2 (N=25)	0 (N=26)	2 (N=26)
Other:	7 (N=15)	6 (N=16)	14 (N=16)	56 (N=19)	87 (N=19)

22

29. How are fines/civil penalties collected by your program utilized? (N=35)

25.7%	Available for use by the state radiation control program
45.7%	Deposited into state general fund
11.4%	Other, please specify:
20.0%	Not applicable

30. Please briefly describe any enforcement cases since January 1, 1998, that have been difficult to resolve, have generated above average public or press interest, have challenged your regulatory authority, or have or will result in high clean up costs financed by state or federal funds.

23

EFFECTIVENESS OF CONTROLS OVER RADIOACTIVE MATERIALS

31. To what extent, if at all, do you agree that communications and coordination needs to be improved between your state program and the following group? (*Mark only one response* ☒ *in each row*)

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
a) the U.S. Nuclear Regulatory Commission (NRC) (N=35)	8.6%	2.9%	28.6%	28.6%	31.4%	0.0%
b) the U.S. Department of Energy (DOE) (N=35)	11.4%	20.0%	25.7%	22.9%	5.7%	14.3%
c) the Environmental Protection Agency (EPA) (N=35)	11.4%	14.3%	25.7%	28.6%	17.1%	2.90%
d) the Food and Drug Administration (FDA) (N=35)	2.9%	5.7%	20.0%	25.7%	35.7%	8.6%
e) the U.S. Department of Justice (DOJ) (N=35)	8.6%	14.3%	14.3%	8.6%	8.6%	45.7%
f) the U.S. Department of Transportation (DOT) (N=35)	5.7%	14.3%	28.6%	28.6%	14.3%	8.6%
g) other agreement states (N=35)	2.9%	0.0%	8.6%	20.0%	68.6%	0.0%
h) non-agreement states (N=35)	2.9%	0.0%	11.4%	25.7%	57.1%	2.9%
i) Organization of Agreement States (OAS) (N=34)	0.0%	2.9%	5.9%	23.5%	67.6%	0.0%
j) Conference of Radiation Control Program Directors (CRCPD) (N=34)	0.0%	2.9%	5.9%	17.6%	73.5%	0.0%

24

32. To what extent, if at all, do you agree with the following statements? (*Mark only one response ☒ in each row*) (N=35)

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
a) Communications and coordination needs to be improved between federal agencies with regulatory authority for radioactive materials	34.3%	34.3%	17.1%	14.3%	0.0%	0.0%
b) The current division of regulatory authority for radioactive materials between NRC, DOE, EPA, DOT and FDA is the most effective means of federal regulation	0.0%	2.9%	5.7%	20.0%	71.4%	0.0%
c) Consistent radiation protection standards need to be developed that would apply across all federal and state regulatory programs.	48.6%	31.4%	5.7%	8.6%	5.7%	0.0%
d) My state program *currently* has sufficient budgetary resources to effectively regulate radiological sources	8.6%	20.0%	25.7%	28.6%	17.1%	0.0%
e) My state program *currently* has sufficient technology (e.g. radiation survey meters, laboratory resources) to effectively regulate radiological sources	11.4%	31.4%	34.3%	17.1%	5.7%	0.0%
f) My state program *currently* has ***sufficient*** personnel to effectively regulate radiological sources	8.6%	31.4%	25.7%	25.7%	8.6%	0.0%
g) My state program *currently* has ***qualified*** personnel to effectively regulate radiological sources	22.9%	42.9%	17.1%	11.4%	5.7%	0.0%
h) NRC's Nuclear Materials Events Database (NMED) accurately and completely reflects incidents involving radioactive materials in my state	14.3%	25.7%	34.3%	17.1%	5.7%	2.9%

25

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
i) DOT's regulations adequately ensure safe and secure transport of radioactive materials	0.0%	40.0%	48.6%	8.6%	2.9%	0.0%
j) The federal government should have a greater role in regulating radioactive material in the United States	0.0%	0.0%	2.9%	40.0%	57.1%	0.0%
k) Additional federal training could improve regulation of radioactive material in my state	31.4%	28.6%	20.0%	11.4%	8.6%	0.0%
l) My state's public safety/law enforcement agencies need additional training to respond to radiological incidents	22.9%	31.4%	28.6%	8.6%	5.7%	2.9%
m) My state program can effectively respond to a radiological incident with its current resources	5.7%	22.9%	45.7%	20.0%	5.7%	0.0%
n) In the event of a major radiological incident, adequate federal resources can be brought to bear in a timely manner	5.7%	34.3%	20.0%	20.0%	5.7%	14.3%
o) My state program is adequately addressing the post-September 11th heightened security concerns involving malicious use of radioactive material (i.e. possible use as a "dirty bomb")	11.4%	42.9%	31.4%	11.4%	2.9%	0.0%
p) *Over the next five years*, my state program will have sufficient budgetary resources to effectively regulate radiological sources	8.6%	20.0%	25.7%	20.0%	17.1%	8.6%
q) *Over the next five years*, my state program will have sufficient technology (e.g. radiation survey meters, laboratory resources) to effectively regulate radiological sources	8.6%	25.7%	31.4%	22.9%	5.7%	5.7%

26

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
r) *Over the next five years*, my state program will have ***sufficient*** personnel to effectively regulate radiological sources	8.6%	20.0%	34.3%	20.0%	11.4%	5.7%
s) *Over the next five years*, my state program will have ***qualified*** personnel to effectively regulate radiological sources	8.6%	31.4%	22.9%	25.7%	5.7%	5.7%

33. Please fill in the following table on the number of reportable incidents (under NRC or equivalent agreement state regulations) involving radiological materials that have occurred in your state from 1998 through 2002. If no incidents, please enter "0" (zero).

Type of incident	Number of incidents per year				
	1998	1999	2000	2001	2002
Equipment malfunction	48 (N=24)	32 (N=26)	26 (N=25)	33 (N=25)	47 (N=26)
Radiation overexposure	18 (N=26)	33 (N=26)	33 (N=28)	32 (N=28)	21 (N=28)
Lost, stolen, or abandoned materials	100 (N=28)	129 (N=27)	129 (N=27)	167 (N=28)	220 (N=28)
Medical events	101 (N=24)	107 (N=24)	123 (N=27)	114 (N=27)	91 (N=26)
Transportation events	30 (N=26)	37 (N=26)	47 (N=28)	38 (N=28)	34 (N=27)
Leaking sealed sources	9 (N=25)	20 (N=27)	19 (N=27)	14 (N=27)	23 (N=28)
TOTAL	341 (N=29)	388 (N=29)	408 (N=30)	454 (N=30)	540 (N=30)

34. For those materials that have been reported lost, stolen, or abandoned from 1998 through 2002, how many were subsequently recovered? (N=22)

235

27

INTEGRATED MATERIALS PERFORMANCE EVALUATION PROGRAM

35. Do you conduct periodic internal evaluations of your program's effectiveness? (*Mark only one response* ☒) (N=35)

100%	Yes
0.0%	No

36. Apart from the Integrated Materials Performance Evaluation Program, does an outside party regularly evaluate your program? (*Mark only one response* ☒) (N=35)

91.4%	Yes
8.6%	No

37. In your opinion, how adequate or inadequate are the following Integrated Materials Performance Evaluation Program performance indicators in evaluating your state's radiological protection programs? (*Mark only one response* ☒ *in each row*)

Performance indicator	Very adequate	Generally adequate	Generally inadequate	Very inadequate	Not applicable
a) Status of evaluation program (N=35)	42.9%	48.6%	2.9%	0.0%	5.7%
b) Technical quality of inspections (N=35)	57.1%	37.1%	5.7%	0.0%	0.0%
c) Quality of technical staffing and training (N=35)	48.6%	40.0%	8.6%	2.9%	0.0%
d) Technical quality of licensing actions (N=35)	48.6%	48.6%	2.9%	0.0%	0.0%
e) Quality of response to incidents and allegations (N=35)	40.0%	51.4%	8.6%	0.0%	0.0%
f) Sealed source and device evaluation program (N=34)	8.8%	44.1%	5.9%	0.0%	41.2%
g) Low-level radioactive waste disposal program (N=34)	5.9%	17.6%	8.8%	0.0%	67.6%
h) Legislation and program elements required for compatibility (N=35)	42.9%	40.0%	14.3%	0.0%	2.9%

28

38. What are the strengths of the Integrated Materials Performance Evaluation Program?

39. What are the weaknesses of the Integrated Materials Performance Evaluation Program?

40. Briefly, what improvements, if any, should be made to the Integrated Materials Performance Evaluation Program process?

41. Overall, is the Integrated Materials Performance Evaluation Program process an adequate means to assess the effectiveness of your state's regulatory program? (*Mark only one response* ☒) (N=35)

100%	Yes
0.0%	No

29

TRANSPORTATION OF RADIOACTIVE MATERIALS

42. Does your program regulate the transportation of radioactive material through your state? (N=35)

97.1%	Yes
2.9%	No

43. Do you require licensees to notify your program of shipments of radioactive material? (N=35)

97.1%	Yes
2.9%	No ***(skip to question 46)***

44. If yes, which types of cargo do you require that your program be notified of shipments of?

45. Which of the following types of shipments does your state monitor? (N=35)

60.0%	Spent nuclear fuel
57.1%	DOE waste material (i.e. shipments to the Waste Isolation Pilot Plant)
51.4%	Byproduct material with high radioactivity
37.1%	Other, please specify:
2.9%	No shipments monitored

46. Please describe any coordination efforts undertaken by your state with other state and/or federal agencies regarding the transportation of radioactive material.

47. What are the strengths of the current regulations on transporting radioactive materials?

48. What are the weaknesses of the current regulations on transporting radioactive materials?

30

49. Under current regulations, to what extent is the transportation of radioactive materials vulnerable to terrorist sabotage or other malicious use?

31

IMPACT OF SEPTEMBER 11 TO YOUR STATE'S REGULATORY PROGRAM

50. What impact, if any, has the September 11, 2001 terrorist attacks had on your state's program in the following areas? (*Mark only one response ☒ in each row*)

	No Impact	Minor Impact	Moderate Impact	Significant Impact	No changes made since Sept 11, 2001
a) State radiological protection laws (N=33)	54.5%	15.2%	6.1%	3.0%	21.2%
b) State radiological protection regulations (N=33)	39.4%	39.4%	9.1%	0.0%	12.1%
c) License review procedures (N=34)	20.6%	44.1%	23.5%	5.9%	5.9%
d) Inspection frequency (N=34)	55.9%	29.4%	8.8%	0.0%	5.9%
e) Inspection procedures (N=34)	17.6%	38.2%	38.2%	2.9%	2.9%
f) Number of enforcement actions (N=32)	71.9%	12.5%	12.5%	0.0%	3.1%
g) Severity of enforcement actions taken (N=34)	60.6%	21.2%	15.2%	0.0%	3.0%
h) Incident response procedures (N=34)	14.7%	35.3%	32.4%	14.7%	2.9%
i) Incident investigation procedures (N=34)	20.6%	47.1%	20.6%	5.9%	5.9%
j) Coordination with federal agencies (N=34)	2.9%	23.5%	44.1%	23.5%	5.9%
k) Coordination with other states (N=34)	29.4%	35.3%	26.5%	2.9%	5.9%
l) Coordination with state law enforcement/public safety agencies (N=34)	2.9%	32.4%	38.2%	26.5%	0.0%
m) Financial support from state legislature (N=33)	63.6%	9.1%	0.0%	6.1%	21.2%
n) Monitoring of transportation of radioactive material through your state (N=33)	45.5%	18.2%	27.3%	6.1%	3.0%
o) Federal financial aid to your state program (N=33)	63.6%	9.1%	3.0%	3.0%	21.2%
p) Federal training support to your state program (N=33)	60.6%	21.1%	9.1%	0.0%	18.2%
q) Federal technology support to your state program (N=33)	57.6%	21.2%	3.0%	0.0%	18.2%

32

51. Please describe specific efforts that have been initiated or considered by your state since September 11, 2001, to better safeguard radiological sources.

52. In your opinion, should post-September 11 security measures be developed and enforced by the NRC under the common defense and security authority given it by the Atomic Energy Act or by the agreement states under their health and safety authority? Why? (N=34)

States = 82.4%; NRC = 5.9%; Both = 11.8%

53. Does your state have sufficient resources to support these new efforts or are additional resources needed? (N=35)

Yes = 34.3%; No = 65.7%

33

CHANGES NEEDED AT THE FEDERAL LEVEL

54. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the regulation of radioactive material to protect *public health and safety*?

#1.

#2.

#3.

55. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the *security* of radioactive material?

#1.

#2.

#3.

56. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the *transportation* of radioactive material?

#1.

#2.

#3.

34

57. Please use the space below to list any additional information about issues related to radioactive sources or concerns raised in this survey.

Thank you for your assistance in our survey.

35

Results of Survey of Non-Agreement States

United States General Accounting Office

Non-Agreement State Survey on Security of Radioactive Sources

Background

The U.S. General Accounting Office (GAO), the investigative arm of Congress, is reviewing the regulation of radioactive materials in the United States. Congress has asked the GAO to answer the following questions:

1. What is the known universe of radiological sources in the United States and how many have been lost, stolen, or abandoned?

2. How effective are federal and state controls over radiological sources?

3. What efforts are underway since September 11, 2001, to improve the controls over radiological sources?

As part of our review, we are conducting surveys of state radiation control agencies, including agreement and non-agreement states, Puerto Rico, Guam, and the District of Columbia. The principal aims of this survey are to obtain information from each state on the number and types of radiological sources being regulated by the state and obtain states' views on the effectiveness of the current federal and state regulatory framework.

Your cooperation in completing this survey is essential for an accurate and timely report to the Congress on the current state of regulatory control over radioactive materials. To be included in our report, your response within 3 weeks of receipt is greatly appreciated.

Directions for Completing this Questionnaire

Please complete this questionnaire and return it via email (**ColesR@gao.gov**), fax (**202-512-6880)**, or FedEx within 3 weeks of receipt. GAO will take steps to safeguard the privacy of your responses.

If you have any questions about the survey, please contact:

Ryan T. Coles
Office: 202-512-6888
E-mail: ColesR@gao.gov

Peter Ruedel
Office: 202-512-8753
E-mail: RuedelP@gao.gov

Heather Von Behren
Office: 202-512-6768
E-mail: VonBehrenH@gao.gov

If you prefer to return the survey via FedEx, the return address is:

U.S. General Accounting Office
Attention: Ryan T. Coles
Natural Resources and Environment
441 G Street, NW Room 2T23
Washington, DC 20548

Due to increased security put in place following the anthrax incidents of October 2001, please do not use the U.S. Postal Service to return surveys to GAO.

Although this questionnaire may require input from various individuals, we ask that one person assume responsibility for coordinating its completion. Please list that person's name below in case we have questions or need follow-up. Thank you.

Name:

Title:

Telephone #:

E-mail:

1

PROGRAM INFORMATION

1. **First, we'd like to get some basic information about your state's radiation control program. Please provide the following information.**

   Program name:

   State department/division/office (e.g. Department of Health):

   City the main office is located in:

   State:

   Current director of program:

2. **Please list your program's total budget for the following calendar years:**

2000 (Actual)	**$3,825,733 (N=10)**
2001 (Actual)	**$4,340,987 (N=10)**
2002 (Actual)	**$4,661,911 (N=10)**
2003 (Projected)	**$5,331,768 (N=11)**

3. **What are the sources of your program's funding? (*Mark all that apply* ☒) (N=12)**

50.0%	Fees charged to licensees
83.3%	Appropriations from state general fund
50.0%	Other, please specify:

4. **How many full-time equivalent (FTE) staff does your program currently employ? (N=12)**

   92

2

5. **Of the total number of staff reported in question #3, how many FTEs do you have in the following categories?**

Category of Staff	Number
Inspectors	
License reviewers	
Other Technical Staff	
Other Non-Technical Staff	

6. **How many of your technical staff (including inspectors and license reviewers) are professionally certified (e.g. certified health physicists, nuclear medicine technologists, etc.)?**

7. **How many staff were employed in your state in the following categories on January 1, 1998? (N=12)**

Category of Staff	Number on January 1, 1998
Inspectors	
License reviewers	
Other Technical Staff	
Other Non-Technical Staff	
TOTAL*	**90**

8. **Over the next five years, do you estimate your total full-time equivalent positions will increase or decrease for technical and non-technical staff? (*Mark only one response ☒ for each type of staff*)**

Technical Staff (N=12)		Non-Technical Staff (N=11)	
16.7%	Increase	9.1%	Increase
8.3%	Decrease	0.0%	Decrease
75.0%	Stay about the same	90.9%	Stay about the same

3

LICENSING ACTIVITIES OF THE NON-AGREEMENT STATES

9. As of December 31, 2002, how many active licenses are currently issued by your state program for the production and/or use of naturally occurring or accelerator produced radioactive materials (N=12)

2751

10. Next, we would like to obtain information on licenses issued by your program for uses of naturally occurring radioactive material and accelerator produced radioactive material ***Enter the license use, mark whether it is for naturally occurring OR accelerator produced radioactive material, and enter the number of active licenses issued by your state program. Mark only one response ☒ in the column for most common inspection frequency within each license use.***

Use #1:

Type of Material	Number of licenses		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Use #2:

Type of Material	Number of licenses		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

4

Use #3:

Type of Material	Number of licenses	Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐ More than once per year
☐ Accelerator produced		☐ Once a Year
		☐ Every 2-3 Years
		☐ Every 4-5 Years
		☐ Over 5 Years
		☐ Inspection Not Required

Use #4:

Type of Material	Number of licenses	Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐ More than once per year
☐ Accelerator produced		☐ Once a Year
		☐ Every 2-3 Years
		☐ Every 4-5 Years
		☐ Over 5 Years
		☐ Inspection Not Required

Use #5:

Type of Material	Number of licenses	Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐ More than once per year
☐ Accelerator produced		☐ Once a Year
		☐ Every 2-3 Years
		☐ Every 4-5 Years
		☐ Over 5 Years
		☐ Inspection Not Required

5

Use #6:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Use #7:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Use #8:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

6

Use #9:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Use #10:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Use #11:

Type of Material	Number of licensees		Most Common Inspection Frequency Within This Code
☐ Naturally occurring		☐	More than once per year
☐ Accelerator produced		☐	Once a Year
		☐	Every 2-3 Years
		☐	Every 4-5 Years
		☐	Over 5 Years
		☐	Inspection Not Required

Please copy and paste above table for additional uses.

7

11. In your opinion, which 3 uses of radioactive materials—byproduct, naturally occurring, or accelerator produced—require the strictest and least strict regulation to protect *public health and safety*?

Strictest regulation	Least strict regulation
1.	1.
2.	2.
3.	3.

12. In your opinion, which 3 uses of radioactive materials—byproduct, naturally occurring, or accelerator produced—require the strictest and least strict regulation to ensure *security*? (i.e. to prevent the materials' use by terrorists in a radiological weapon)

Strictest regulation	Least strict regulation
1.	1.
2.	2.
3.	3.

8

LICENSE TRACKING OVERSIGHT

13. Briefly describe how your program maintains data on materials licenses and inspections.

14. Please estimate the percentage of inspections of your licensees that are currently overdue.

15. Are your databases (i.e. licensing records, computer files containing licensee information) periodically validated to ensure that licensees are still active (i.e. still conducting business)? *Mark only one response* ☒) (N=11)

81.8%	Yes
18.2%	No ***(skip to question 18)***

16. How often do you validate your databases? *Mark only one response* ☒) (N=9)

11.0%	More than once per year
33.3%	Once a year
44.4%	Every 2-3 years
11.1%	Every 4-5 years
0.0%	Over 5 years

17. What steps are taken to validate information in your databases?

18. Does your state have a program to identify and recover abandoned sources? *Mark only one response* ☒) (N=12)

33.3%	Yes
66.7%	No ***(skip to question 20)***

9

19. Briefly describe your state's program to identify and recover abandoned sources.

10

ENFORCEMENT ACTIONS

20. What enforcement actions are available to your state's program to ensure laws and regulations are followed? (*Mark all that apply* ☒) (N=12)

- 16.7% No enforcement actions available ***(skip to question 24)***
- 83.3% Notices of violation/citations
- 58.3% Fines/civil penalties
- 58.3% License suspension
- 66.7% License termination
- 58.3% Facility closure
- 25.0% Imprisonment/criminal penalties
- 0.0% Other, please specify:

21. Please complete the following table on your state program's enforcement activities over the past five years. If none, please enter "0" (zero):

	Number of enforcement actions per year				
Enforcement action	**1998**	**1999**	**2000**	**2001**	**2002**
Notices of violation only (without other action)	302 (N=9)	340 (N=9)	265 (N=9)	303 (N=9)	519 (N=10)
Fines/civil penalties	5 (N=6)	4 (N=6)	7 (N=6)	10 (N=6)	7 (N=6)
License suspension	0 (N=7)	0 (N=7)	0 (N=7)	1 (N=7)	0 (N=7)
License termination	0 (N=6)	0 (N=6)	0 (N=6)	1 (N=6)	2 (N=7)
Facility closure	0 (N=6)	0 (N=6)	0 (N=6)	0 (N=6)	0 (N=6)
Imprisonment/criminal penalties	0 (N=5)	0 (N=5)	0 (N=5)	0 (N=5)	0 (N=5)
Other:	0 (N=1)	0 (N=1)	0 (N=1)	1 (N=1)	0 (N=1)

11

22. How are fines/civil penalties collected by your program utilized? (N=12)

16.7%	Available for use by the state radiation control program
41.7%	Deposited into state general fund
16.7%	Other, please specify:
33.3%	Not applicable

23. Please briefly describe any enforcement cases since January 1, 1998, that have been difficult to resolve, have generated above average public or press interest, have challenged your regulatory authority, or have or will result in high clean up costs financed by state or federal funds.

12

EFFECTIVENESS OF CONTROLS OVER RADIOACTIVE MATERIALS

24. To what extent, if at all, do you agree that communications and coordination needs to be improved between your state program and the following group(s)? (*Mark only one response* ☒ *in each row*) (N=12)

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
a) the U.S. Nuclear Regulatory Commission (NRC)	0.0%	8.3%	16.7%	8.3%	66.7%	0.0%
b) the U.S. Department of Energy (DOE)	8.3%	16.7%	41.7%	25.0%	8.3%	0.0%
c) the Environmental Protection Agency (EPA)	8.3%	16.7%	8.3%	41.7%	25.0%	0.0%
d) the Food and Drug Administration (FDA)	0.0%	16.7%	0.0%	41.7%	41.7%	0.0%
e) the U.S. Department of Justice (DOJ)	8.3%	25.0%	0.0%	25.0%	8.3%	33.3%
f) the U.S. Department of Transportation (DOT)	8.3%	16.7%	8.3%	41.7%	0.0%	25.0%
g) agreement states	0.0%	8.3%	8.3%	33.3%	25.0%	25.0%
h) other non-agreement states	0.0%	8.3%	16.7%	33.3%	16.7%	25.0%
i) Organization of Agreement States (OAS)	0.0%	8.3%	0.0%	16.7%	50.0%	25.0%
j) Conference of Radiation Control Program Directors (CRCPD)	0.0%	0.0%	0.0%	25.0%	75.0%	0.0%

13

25. **To what extent, if at all, do you agree with the following statement? (*Mark only one response ☒ in each row*) (N=12)**

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
a) Communications and coordination needs to be improved between federal agencies with regulatory authority for radioactive materials	8.3%	33.3%	0.0%	50.0%	0.0%	8.3%
b) The current division of regulatory authority for radioactive materials between NRC, DOE, EPA, DOT and FDA is the most effective means of federal regulation	0.0%	8.3%	8.3%	25.0%	50.0%	8.3%
c) Consistent radiation protection standards need to be developed that would apply across all federal and state regulatory programs.	50.0%	8.3%	8.3%	83.3%	0.0%	0.0%
d) My state program *currently* has sufficient budgetary resources to effectively regulate radiological sources	0.0%	8.3%	8.3%	0.0%	33.3%	0.0%
e) My state program *currently* has sufficient technology (e.g. radiation survey meters, laboratory resources) to effectively regulate radiological sources	8.3%	16.7%	41.7%	0.0%	33.3%	0.0%
f) My state program *currently* has ***sufficient*** personnel to effectively regulate radiological sources	0.0%	16.7%	0.0%	8.3%	75.0%	0.0%
g) My state program *currently* has ***qualified*** personnel to effectively regulate radiological sources	8.3%	33.3%	16.7%	33.3%	8.3%	0.0%
h) NRC's Nuclear Materials Events Database (NMED) accurately and completely reflects incidents involving radioactive materials in my state	8.3%	8.3%	16.7%	25.0%	0.0%	41.7%

14

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
i) DOT's regulations adequately ensure safe and secure transport of radioactive materials	16.7%	33.3%	16.7%	16.7%	8.3%	8.3%
j) The federal government should have a greater role in regulating radioactive material in the United States	16.7%	0.0%	25.0%	16.7%	33.3%	8.3%
k) Additional federal training could improve regulation of radioactive material in my state	33.3%	25.0%	16.7%	25.0%	0.0%	0.0%
l) My state's public safety/law enforcement agencies need additional training to respond to radiological incidents	50.0%	8.3%	33.3%	8.3%	0.0%	0.0%
m) My state program can effectively respond to a radiological incident with its current resources	0.0%	16.7%	41.7%	33.3%	8.3%	0.0%
n) In the event of a major radiological incident, adequate federal resources can be brought to bear in a timely manner	8.3%	0.0%	58.3%	8.3%	16.7%	8.3%
o) My state program is adequately addressing the post-September 11th heightened security concerns involving malicious use of radioactive material (i.e. possible use as a "dirty bomb")	0.0%	0.0%	25.0%	41.7%	33.3%	0.0%
p) *Over the next five years*, my state program will have sufficient budgetary resources to effectively regulate radiological sources	0.0%	8.3%	16.7%	0.0%	66.7%	8.3%
q) *Over the next five years*, my state program will have sufficient technology (e.g. radiation survey meters, laboratory resources) to effectively regulate radiological sources	0.0%	25.0%	25.0%	16.7%	25.0%	8.3%

15

Group	Very great extent	Great extent	Moderate extent	Some Extent	Little or no extent	No Basis to Judge
r) *Over the next five years*, my state program will have ***sufficient*** personnel to effectively regulate radiological sources	0.0%	8.3%	0.0%	8.3%	75.0%	8.3%
s) *Over the next five years*, my state program will have ***qualified*** personnel to effectively regulate radiological sources	0.0%	8.3%	33.3%	25.0%	25.0%	8.3%

26. Please fill in the following table on the number of reportable incidents (under your state regulations, if any) involving naturally occurring or accelerator produced radiological materials that have occurred in your state from 1998 through 2002. If no incidents, please enter "0" (zero).

Type of incident	Number of incidents per year				
	1998	1999	2000	2001	2002
Equipment malfunction	0 (N=7)	0(N=7)	0(N=7)	0(N=7)	0(N=7)
Radiation overexposure	0 (N=7)	0(N=7)	2 (N=8)	2(N=7)	1(N=7)
Lost, stolen, or abandoned materials	26 (N=9)	32(N=9)	13 (N=10)	18 (N=10)	19 (N=10)
Medical events	6 (N=7)	4 (N=7)	0 (N=8)	2 (N=8)	5 (N=8)
Transportation events	16 (N=8)	23 (N=8)	9 (N=8)	10 (N=9)	5 (N=8)
Leaking sealed sources	1 (N=7)	0 (N=7)	0 (N=7)	0 (N=7)	0 (N=7)
TOTAL	115 (N=11)	140 (N=11)	89 (N=11)	94 (N=11)	109 (N=12)

27. For those materials that have been reported lost, stolen, or abandoned from 1998 through 2002, how many were subsequently recovered? (N=12)

10

16

NON-AGREEMENT STATE PERFORMANCE EVALUATION

28. Do you conduct periodic internal evaluations of your program's effectiveness? (*Mark only one response* ☒) (N=12)

- 66.7% Yes
- 33.3% No

29. Does an outside party (i.e. consultants or auditors) regularly evaluate your program? (*Mark only one response* ☒) (N=12)

- 8.3% Yes
- 91.7% No

17

TRANSPORTATION OF RADIOACTIVE MATERIALS

30. Does your program regulate the transportation of radioactive material through your state? (N=12)

25.0%	Yes
75.0%	No

31. Do you require licensees to notify your program of shipments of radioactive material? (N=12)

16.7%	Yes
83.3%	No ***(skip to question 34)***

32. If yes, which types of cargo do you require that your program be notified of shipments of?

33. Which of the following types of shipments does your state monitor?

100%	Spent nuclear fuel
85.7%	DOE waste material (i.e. shipments to the Waste Isolation Pilot Plant)
100%	Byproduct material with high radioactivity
62.5%	Other, please specify:

34. Please describe any coordination efforts undertaken by your state with other state and/or federal agencies regarding the transportation of radioactive material.

35. What are the strengths of the current regulations on transporting radioactive materials?

36. What are the weaknesses of the current regulations on transporting radioactive materials?

37. Under current regulations, to what extent is the transportation of radioactive materials vulnerable to terrorist sabotage or other malicious use?

18

IMPACT OF SEPTEMBER 11 TO YOUR STATE'S REGULATORY PROGRAM

38. What impact, if any, has the September 11, 2001 terrorist attacks had on your state's program in the following areas? (*Mark only one response ☒ in each row*) (N=12)

	No Impact	Minor Impact	Moderate Impact	Significant Impact	No changes made since Sept 11, 2001
a) State radiological protection laws	50.0%	8.3%	0.0%	0.0%	41.7%
b) State radiological protection regulations	58.3%	8.3%	0.0%	0.0%	33.3%
c) License review procedures	41.7%	8.3%	16.7%	0.0%	33.3%
d) Inspection frequency	54.6%	9.1%	0.0%	9.1%	27.3%
e) Inspection procedures	41.7%	8.3%	8.3%	0.0%	41.7%
f) Number of enforcement actions	66.7%	0.0%	0.0%	0.0%	33.3%
g) Severity of enforcement actions taken	66.7%	0.0%	0.0%	0.0%	33.3%
h) Incident response procedures	16.7%	16.7%	8.3%	41.7%	16.7%
i) Incident investigation procedures	16.7%	8.3%	33.3%	16.7%	25.0%
j) Coordination with federal agencies	8.3%	41.7%	8.3%	25.0%	16.7%
k) Coordination with other states	25.0%	25.0%	16.7%	8.3%	25.0%
l) Coordination with state law enforcement/public safety agencies	16.7%	33.3%	8.3%	33.3%	8.3%
m) Financial support from your state legislature	58.3%	0.0%	0.0%	0.0%	41.7%
n) Monitoring of transportation of radioactive material through your state	33.3%	25.0%	8.3%	0.0%	33.3%
o) Federal financial aid to your state program	41.7%	8.3%	16.7%	0.0%	33.3%
p) Federal training support to your state program	50.0%	16.7%	16.7%	0.0%	16.7%
q) Federal technology support to your state program	58.3%	8.3%	8.3%	0.0%	25.0%

19

39. Please describe specific efforts that have been initiated or considered by your state since September 11, 2001, to better safeguard radiological sources.

40. Does your state have sufficient resources to support these new efforts or are additional resources needed? (N=12)

91.6% of states responding to the survey indicated they do not have sufficient resources to support new efforts.

8.3% of states responding to the survey indicated they have sufficient resources to support new efforts.

20

CHANGES NEEDED AT THE FEDERAL LEVEL

41. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the regulation of radioactive material to protect *public health and safety*?

#1.

#2.

#3.

42. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the *security* of radioactive material?

#1.

#2.

#3.

43. In your opinion, what are the 3 most significant changes (in rank order) that could be made at the federal level to improve the *transportation* of radioactive material?

#1.

#2.

#3.

44. Please use the space below to list any additional information about issues related to radioactive sources or concerns raised in this survey.

Thank you for your assistance in our survey.

22

Comments from the Nuclear Regulatory Commission

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 26, 2003

Mr. Robert A. Robinson
Managing Director, Natural Resources and Environment
United States General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Robinson:

I would like to thank you for the opportunity to review and submit comments on the draft report, "NUCLEAR SECURITY: Federal and State Action Needed to Improve Security of Sealed Radioactive Sources" (GAO-03-804).

We believe the draft report does not fully present either the current status of our efforts to improve the security of high-risk radioactive sources or the large effort that we have devoted to this issue over the past eighteen months. It also reflects a limited outline of our existing statutory framework and does not recognize that several of its recommendations would require statutory changes at both Federal and State levels.

This report perpetuates one of the main problems of an earlier GAO report (GAO-03-638), namely its failure to focus on high-risk radioactive sources, which are of greatest concern for malevolent use by a terrorist. As I wrote you in commenting on that report, the vast majority of radioactive sources in use in the United States and abroad are not useful to terrorists. For example, iodine-131 and technetium-99m should not be included in any list of radionuclides of concern, as your draft report does in two places.

The Commission has already done the following to improve the security of high-risk radioactive sources:

1) Together with the Department of Energy (DOE) we have defined the radionuclides of concern and action levels for those radionuclides. Working with appropriate Federal agencies, particularly the Department of State (DOS), we have sought to reconcile the DOE/NRC definition of high-risk radioactive sources with that being developed by the International Atomic Energy Agency (IAEA) in its draft TECDOC-1344. We believe that international consensus will soon be reached on TECDOC-1344 so that we can reach international consistency on this critical definition.

2) We, together with DOE and DOS, have ensured that the United States has taken a leadership role in developing the draft IAEA Code of Conduct on Safety and Security of Radioactive Sources, a document which we hope will be finalized at the September IAEA General Conference Meeting.

3) The Commission has issued numerous advisories on security of sources, the most important of which was the advisory issued on March 17, 2003, at the initiation of Operation Liberty Shield. Working with our Agreement State colleagues, we assembled a list of approximately 2100 NRC or Agreement State licensees whose licenses permit them to possess greater than NRC/DOE action level quantities of the radionuclides of concern, and promptly issued the advisory to them. That advisory specified the

2

additional security measures which we felt appropriate with the Nation at the orange threat level.

4) The Commission issued an Order to large panoramic irradiators on June 6, 2003, the detailed security measures of which are safeguards information under Section 147 of Atomic Energy Act.

5) The Commission has established a Materials Security Working Group involving both the Agreement States and the Conference of Radiation Control Program Directors (CRCPD) to ensure close coordination in the development of additional security orders to those licensees possessing category 1 or 2 quantities of radionuclides of concern as defined in TECDOC-1344 (a slight variation from the DOE/NRC action levels) and to deal with other materials security issues. The Commission discussed resolution of this issue with the leadership of the Organization of Agreement States (OAS) and CRCPD on June 6, 2003.

The Commission has plans in place to do the following:

1) In the very near term the Commission, in partnership with the Agreement States, will determine an initial inventory of high-risk radioactive sources (e.g., sources containing category 1 and 2 quantities of radionuclides of concern as defined in the latest version of TECDOC-1344) in the possession of all NRC and Agreement State licensees.

2) The Commission will develop a requirement for tracking such sources, as envisioned in the draft IAEA Code of Conduct on Safety and Security of Radioactive Sources.

3) The Commission will develop, in consultation with DOS and other agencies, an export and import control system for high-risk radioactive sources, again as envisioned in the IAEA Code of Conduct, and ensure the compatibility of our system with those of other countries.

The Commission fully recognizes that cooperation with our Agreement State colleagues is vital to the success of our efforts. The Commission must also work within the existing statutory framework. That framework reserves to the Commission the common defense and security authorities of the Atomic Energy Act. Moreover, section 147 of the Atomic Energy Act permits only the Commission, not the States, to prescribe that detailed security measures to protect byproduct material or special nuclear material be protected as safeguards information. These considerations have guided the Commission's approach to the security of high-risk sources in Agreement States. The possibility of State budget shortfalls played absolutely no role in the Commission's decision-making.

We have issued the June 5, 2003 Order to panoramic irradiator licensees based on the existing statutory framework. These additional security measures go beyond what would be required in a safety framework; they are actually done under common defense and security.

The Commission is not opposed to potential changes in our statutory framework and will explore such changes in the Materials Security Working Group. However, we are also not prepared to advocate any such changes today. Any changes at the Federal level will almost certainly entail change in State laws. Any such effort to amend statutes at both the Federal and

3

State levels will take time. In the meantime, the Commission intends to work with the States to the maximum extent possible under existing statutes and in particular to utilize agreements pursuant to section 274i of the Atomic Energy Act to contract with the Agreement States for assistance in security inspections.

The enclosure provides specific comments on these matters . Should you have any questions about the NRC's comments, please contact either Mr. William Dean, at (301) 415-1703, or Ms. Melinda Malloy, at (301) 415-1785, of my staff.

Sincerely,

William Travers

William D. Travers
Executive Director
for Operations

Enclosure: Specific Comments on Draft Report GAO-03-804

cc: Ryan Coles, GAO

GAO Contact and Staff Acknowledgments

GAO Contact

Gene Aloise (202) 512-6870

Acknowledgments

In addition to the individual named above, Ryan T. Coles, Robert G. Crystal, Doreen S. Feldman, Judy K. Pagano, Terry L. Richardson, Peter E. Ruedel, Rebecca Shea, and Heather W. Von Behren also made key contributions to this report.

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