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Report to the Chairman, Environment, Energy, and Natural Resources Subcommittee, Committee on Government Operations, House of Representatives

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NUCLEAR REGULATION

Better Criteria and Data Would Help Ensure Safety of Nuclear Materials

GAO/RCED-93-90

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Resources, Community, and
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The Honorable Mike Synar
Chairman, Environment, Energy,
and Natural Resources Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we review certain aspects of the Nuclear Regulatory Commission's (NRC) nuclear materials program. This report makes several recommendations to improve NRC's management of this program. It also contains a matter for consideration by the Congress on the need for nuclear materials licensees to provide financial assurance.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Chairman of the Commission; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

This work was performed under the direction of Victor S. Rezendes, Director, Energy and Science Issues, who can be reached at (202) 512-3841 if you or your staff have any questions. Other major contributors to this report are listed in appendix VIII.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

Nuclear materials—some intensely radioactive—are widely used in instruments that identify flaws in construction materials for bridges and other structures, as well as in medicine for such uses as injections to diagnose and treat diseases like cancer. The Nuclear Regulatory Commission (NRC) regulates the safe use and control of these materials. NRC enforces its regulations in one of two ways—by NRC itself or by states that enter into agreements with NRC (agreement states). Agreement states assume regulatory responsibility and must have programs that are compatible with NRC's and adequate to protect public health and safety.

Concerned about whether NRC is ensuring that the public is adequately protected from these nuclear materials, the Chairman, Environment, Energy, and Natural Resources Subcommittee, House Committee on Government Operations, asked GAO to review (1) the comparability of NRC's programs for agreement states and NRC-regulated states, including assessments of the effectiveness of both programs, and (2) NRC's actions on GAO's recommendations in a related 1988 report.[1]

Background

The Atomic Energy Act of 1954, as amended, designated NRC as the agency responsible for establishing, among other things, a licensing and inspection program for radioactive materials not used in nuclear weapons or by utilities for producing electricity. Misuse of these materials has resulted in serious radiation burns, accumulation in the body that could later contribute to cancer or genetic defects, and even premature death. NRC has two programs to control nuclear materials—one for NRC-regulated states that have opted not to assume NRC's regulatory authority and the other for agreement states. Through its five regional offices, NRC regulates about 8,000 licenses in industries, hospitals, and research facilities in 21 NRC-regulated states. NRC's second program oversees 29 agreement-state programs that regulate about 15,000 similar licenses. NRC discontinued its authority after these states agreed to meet and maintain its regulatory standards. NRC may temporarily suspend or revoke state programs that are not in compliance.

In its 1988 report, GAO made four recommendations to improve NRC's materials licensing, inspection, and enforcement programs.

[1]Nuclear Regulation: Stricter Controls Needed for Radioactive Byproduct Material Licenses (GAO/RCED-89-15, Oct. 12, 1988).

Results in Brief

NRC lacks good criteria and data to evaluate the effectiveness of its two materials programs. NRC has an overall goal to adequately protect the public from radiation, which it fulfills by licensing and inspecting nuclear activities and by taking enforcement actions to ensure compliance with its rules and regulations. However, NRC has not established common performance indicators—inspection backlogs, radiation overexposures, or number of violations—that can be measured to determine if its goal is being met. Therefore, NRC cannot ensure that it is effectively managing its radioactive materials program and properly overseeing public health and safety. Further, because its two programs are independent of each other, with each program using different indicators to measure effectiveness, NRC cannot determine whether the public in each state is receiving the same minimum level of protection. NRC also does not require comparable data to be collected and summarized in the same format for both programs. Therefore, NRC lacks the information needed for making informed program decisions through, for example, identifying trends and patterns that signal the need for changes.

For agreement-state programs, NRC does not have specific criteria or procedures to determine when to suspend or revoke an inadequate or incompatible program. NRC program officials believe that questions of adequacy and compatibility must be determined by good professional judgment and prefer to work with agreement states to correct and improve their programs rather than to revoke them. Consequently, NRC has never found a state program to be incompatible or inadequate, although one program was so poorly run that the governor—not NRC—returned program authority to NRC. For the NRC-regulated state programs, NRC's review of the regional offices' program management does not provide an overall assessment of whether the programs are adequate to protect public health and safety.

NRC has acted on all but one of the recommendations GAO made in 1988. It has not required a minimum level of financial assurance that licensees can pay for the cleanup of accidental releases of radioactive materials. Consequently, the government may be held liable for cleanup, which can exceed $2 million for a single release.

Principal Findings

Programs Lack Common Set of Performance Indicators

NRC uses different indicators to measure the effectiveness of its two programs. For agreement states, NRC uses 29 indicators in a biennial questionnaire that has over 100 questions. For NRC-regulated states, NRC annually reviews its regional offices' program management for goals and accomplishments, using a broader, more general questionnaire with about 22 questions. NRC program officials do not believe they need to have comparable performance indicators to ensure program effectiveness. But without such indicators, NRC cannot ensure that a minimum level of safety is afforded to all or determine when any state falls short of that minimum.

NRC Needs Comparable Management Information

Partly because NRC uses different performance indicators and assesses for different time periods, it does not require or collect the same information for the two programs. Therefore, NRC lacks information on the effective management of the nuclear materials program overall. NRC does not believe it has to collect information in the same format for both programs to determine whether they are effectively protecting public health and safety. Also, the nationwide information it collects and reports on is inaccurate or incomplete. Such reports as NRC's Quarterly Report to the Congress on Abnormal Occurrences are of limited value in identifying significant incidents of radiation exposure occurring nationwide. GAO identified at least four occurrences omitted from NRC's quarterly reports, including radiation-related deaths. Even NRC officials doubt the accuracy of the reporting when only 24 percent of the occurrences (22 of 91 over 5 years) were reported from the 29 agreement states, which regulate twice as many licensees as NRC. Without accurate and comparable data, NRC and the Congress cannot be as effective as possible in evaluating trends and patterns for the two programs in order to make informed decisions about the programs' directions.

Revocation Process Has Several Flaws

NRC has vague, rather than specific, criteria or procedures for suspending or revoking an agreement-state program. For example, an agreement state must adopt certain new NRC regulations within 3 years for its program to be considered compatible. Yet noncompliance with this requirement does not trigger the revocation process because NRC does not define which or how many requirements must be deficient before the program is declared incompatible or inadequate. According to program officials, NRC depends

on its staff's good professional judgment to determine program adequacy and prefers to work with states to achieve compliance.

As a result, although several states do not meet NRC's requirements, no state program has been declared inadequate or incompatible. Without specific criteria and procedures, it is questionable whether NRC can successfully initiate the revocation process and whether the Commission is adequately protecting the public in all states. Further, because NRC lacks common performance indicators to measure its programs, it does not know whether its NRC-regulated state program is as protective as agreement-state programs—even those that might be found inadequate. Therefore, it would be inappropriate for NRC to revoke an agreement-state program until the Commission can ensure that the NRC-regulated state program is at least as effective.

NRC Has Not Required Minimum Financial Assurance for Licensees

NRC has acted on all but one of the recommendations in GAO's 1988 report. However, NRC has not required at least a minimum level of financial assurance that licensees can pay for the cleanup of accidental spills and releases of radioactive material.

Recommendations

Because of the inconsistent way in which NRC evaluates the effectiveness of its two materials programs in achieving the goal of adequately protecting the public from radiation, GAO recommends, among other things, that the Chairman, NRC, establish (1) common performance indicators in order to obtain comparable information to evaluate the effectiveness of both programs in meeting NRC's goal and (2) specific criteria and procedures for suspending or revoking an agreement-state program. If the NRC-regulated state program is found to meet the new performance indicators, NRC should suspend or revoke any agreement-state program that is incompatible with or inadequate in meeting the performance indicators.

Matter for Congressional Consideration

Because of NRC's slow progress in requiring licensees to have financial assurance for covering accidental spills or releases of radioactive material, the Congress may wish to consider enacting legislation requiring NRC to establish a minimum level of financial assurance.

Agency Comments

GAO discussed the facts presented in this report with the Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support

and other NRC officials, who generally agreed with the facts but offered some clarifications that were incorporated where appropriate. As requested, GAO did not obtain written comments on a draft of this report.

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Abbreviations

AO	abnormal occurrence
AS	agreement states
GAO	U.S. General Accounting Office
NRC	Nuclear Regulatory Commission
RCP	radiation control program

Introduction

To allow and encourage the development of peaceful uses of nuclear materials, the Congress passed the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011-2296), and title II of the Energy Reorganization Act of 1974 (42 U.S.C. 5841-5851). As a result, millions of individuals, companies, and organizations throughout the United States are able to use various kinds of radioactive materials for research and development, medical diagnosis and treatment, industrial, academic, and consumer activities. Some of the materials, however, are highly radioactive and potentially dangerous to the user and the public if not handled properly. Consequently, the Congress established the Nuclear Regulatory Commission (NRC) to ensure through a licensing and inspection program that nuclear materials are used properly. NRC's nuclear materials program controls most commercial uses of nuclear materials, excluding nuclear power plants and nonpower reactors, which are controlled under a separate NRC program.

The Congress has amended the legislation on state regulation of nuclear materials several times. In 1959 the Congress authorized NRC to discontinue its regulatory authority over radioactive materials in states with programs that are compatible with the Commission's program for regulation of such material and are adequate to protect public health and safety—referred to as agreement states. In 1978 the Congress required NRC to periodically review agreement-state programs for their adequacy in protecting public health and safety and their compatibility with NRC's regulatory requirements. And finally, in 1980 the Congress allowed NRC to temporarily suspend all or part of a state's program if such action was required to protect public health and safety.

Radiation Sources and Harmful Effects

People are exposed to two sources of radiation—natural and artificial. Natural radiation is given off constantly by naturally occurring radioactive materials all around us, in the ground, in the walls of buildings, and even in our bodies. Artificial sources of radiation include medical and dental x-rays, radioactive materials injected into the body for medical diagnosis or treatment, and radiation from consumer products such as smoke detectors. People receive an average of about 300 millirems of radiation annually from natural or background sources.[1] People receive an average annual dose of about 60 millirems from artificial radiation, primarily from medical and dental x-rays.

[1]A millirem, which is 1/1,000 rems, is a measure of the amount of radiation to body tissues in terms of radiation's estimated biological effect compared with x-rays. The amount of radiation from a chest x-ray is approximately 15 millirems.

The two major uses of artificial radiation regulated under the nuclear materials program are industrial radiography and medicine. In industrial radiography, radiation is used to identify flaws in manufactured products, such as the metal castings or welded pipelines used in structures like bridges and natural gas lines. The approach is the same as taking an x-ray of a person's chest or teeth—flaws in the products will show up on the films. In medicine, nuclear medicine procedures for diagnostic and therapeutic applications involve the internal administration of radiopharmaceuticals by either intravenous injection or oral ingestion. Therapeutic uses of radioactive material are primarily involved in the treatment of cancer. Nuclear medicine procedures can also involve external administration of radiation. NRC's nuclear materials program does not include medical and dental x-rays, which are regulated by the states.

Exposures to radiation can have harmful effects, such as radiation burns, cancer, and genetic defects. Even death can occur if very large doses of radiation are received. For example, one severe accident with nuclear materials occurred in 1985 when a private radiation therapy institute in Brazil moved to new premises, leaving behind a radiation unit with a radioactive source. The source was sold for scrap to a junkyard owner who, after noticing that it glowed blue in the dark, distributed fragments to several families. Ultimately, 20 persons were admitted to a hospital and 4 died.

Further, the Director of the Radiation Emergency Assistance Center/Training Site,[2] informed us that radiation from nuclear materials has been a causal or contributing factor in 18 deaths in the United States since 1975. Seventeen of the deaths involved nuclear medicine. The other death involved a severe accident in California in 1979: A man received a very serious radiation burn from a radiography source. The source was accidentally left at a job site, and he put it in his back pocket for about 45 minutes. The radiation dose exceeded 20,000 rems to a small area of his body, burning his flesh, which had to be surgically removed. The man died in 1981. In addition, NRC officials informed us of 19 other deaths in which radiation was a causal or contributing factor.

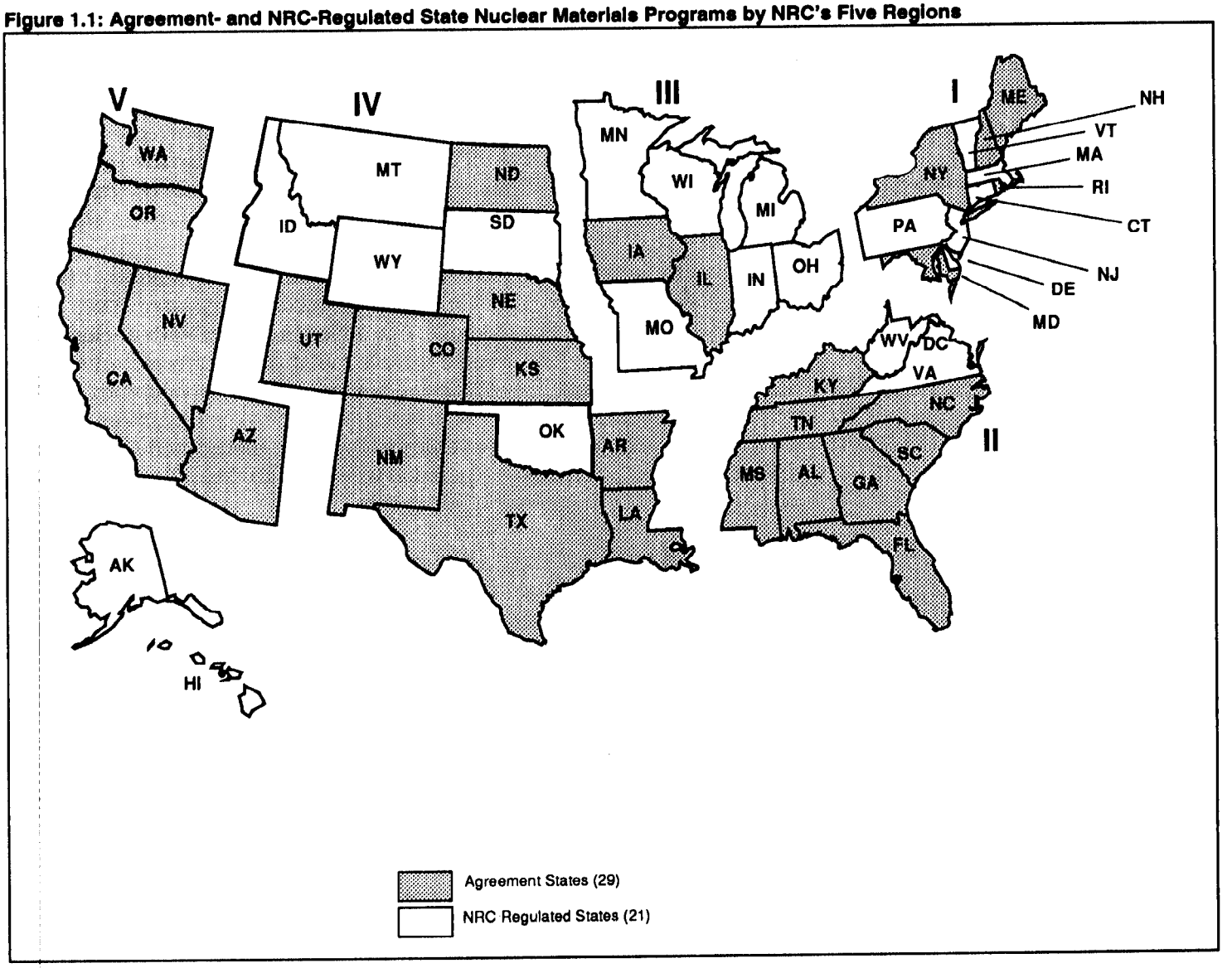
Regulation of Nuclear Materials

NRC has developed two distinct nuclear materials programs. One controls nuclear materials in states that do not choose to regulate the materials—called NRC-regulated states—and the other oversees states that

[2]Established in 1976 by the Department of Energy, the Oak Ridge, Tennessee, Center provides 24-hour assistance with local, national, and international radiation accidents.

elect to control these materials themselves—called agreement states. Figure 1.1 shows the agreement and NRC-regulated states within the geographical area of NRC's five regional offices.

Figure 1.1: Agreement- and NRC-Regulated State Nuclear Materials Programs by NRC's Five Regions



Source: NRC data.

Both programs require licensing, inspection, and enforcement. NRC and the agreement states issue licenses to individuals or organizations to possess and use certain types and quantities of nuclear materials for a specified purpose. Most of the licenses are for industrial/commercial, medical, and academic institutions. One licensee may have multiple licenses, each of which is subject to NRC regulation. As of July 1992, the agreement states regulated about two-thirds, or 15,000, of all nuclear materials licenses, while NRC regulated about one-third, or 8,000 such licenses.

To receive a license, an individual or organization must submit an application that outlines how and where the nuclear material will be used, the training and other qualifications of the individuals involved in the activity, and the radiation safety program to be established. NRC regulations also specify the testing, reporting, inspecting, and record-keeping requirements for the licensee. Furthermore, the regulations, as well as a number of internal policies, specify the actions NRC and agreement states must take before and after issuing a license. NRC and agreement states review license applications, inspect licensees, and take enforcement action against those licensees that do not comply with the regulations. Except for academic licensees, NRC licensees pay fees for NRC to review and administer their licenses. In the agreement states, most states require some type of fee. While NRC does not provide funds directly to the agreement states, it provides training to agreement-state inspectors and covers the cost of developing regulations applicable to the materials licensing program.

NRC-Regulated State Program

NRC administers the NRC-regulated state program in 21 states and territories through five NRC regional offices and headquarters. NRC's Office of Nuclear Material Safety and Safeguards develops the policies for licensing and inspecting licensees, while NRC's five regional offices issue licenses to qualified individuals, businesses, and other institutions and inspect them to determine whether they are handling the specific radioactive materials according to regulations developed by NRC headquarters. To oversee the regional offices' licensing, inspection, and enforcement in NRC-regulated states, NRC conducts annual reviews of its five offices, which administer almost all of the licenses. To ensure consistency in the administration of the NRC-regulated state program between the regional offices and headquarters, NRC also employs the following: (1) daily contact between headquarters and the regional offices; (2) issuance of technical assistance requests and guidance; and (3) monthly telephone conferences involving all five regions and headquarters.

Agreement-State Program

The agreement-state program oversees 29 agreement states that have chosen to regulate radioactive materials. To transfer NRC's authority to a state, NRC and the governor of the state sign an agreement that declares that NRC has discontinued its authority to regulate nuclear materials and that the state agrees to take over the responsibility. The first state to enter into an agreement was Kentucky on March 26, 1962; the last state was Maine on April 1, 1992. (See app. I.) Only one state, Idaho, in 1991, has discontinued its agreement.

To become an agreement state, a state must certify to NRC that it has a program for adequately controlling radiation hazards to protect public health and safety. The state establishes its authority to enter into such agreements by passing enabling legislation. NRC must then determine that the state's radiation control program has regulations in place that are compatible with the Commission's regulations and that the state's licensing, inspection, and enforcement programs are adequate to protect public health and safety. Each agreement also provides that the state will use its best efforts to maintain continuing compatibility with new regulations that NRC requires. NRC must review agreement-state programs periodically and can revoke or suspend all or part of an agreement if the state's program is found to be inadequate or incompatible.

The agreement-state program is administered at headquarters by NRC's Office of State Programs, which provides training and technical assistance to agreement states, integrates federal regulatory activities, and maintains cooperative and liaison activities between NRC and the states. The office also formally evaluates each agreement state every other year. Agreement-state officers in NRC's regional offices provide oversight in the field and primarily report to NRC's Office of State Programs at headquarters.

Objectives, Scope, and Methodology

The Chairman, Environment, Energy, and Natural Resources Subcommittee, House Committee on Government Operations, asked us to review certain aspects of NRC's nuclear materials program. As subsequently agreed, we reviewed (1) the comparability of NRC's program for agreement states and for NRC-regulated states, including NRC's assessments of the effectiveness of both programs, and (2) NRC's actions on our recommendations from an earlier report.[3] We also examined the

[3]Nuclear Regulation: Stricter Controls Needed for Radioactive Byproduct Material Licenses (GAO/RCED-89-15, Oct. 12, 1988).

need for increasing inspections of radiographers at temporary job sites and outside the state in which the radiographer is licensed.

We focused our work on the efforts of NRC headquarters, NRC regional offices, and agreement states to regulate nuclear materials. At NRC headquarters, we met with Commission staff and staff in the offices of Nuclear Material Safety and Safeguards, Executive Director for Operations, Governmental and Public Affairs, Analysis and Evaluation of Operational Data, State Programs, Investigations, Enforcement, General Counsel, and the Inspector General. We also discussed NRC's and the agreement states' regulation of materials with representatives of the Organization of Agreement States and the Conference of Radiation Control Program Directors, Inc. The Organization comprises all of the agreement states and meets annually to discuss materials licensing and regulation, communication between NRC and the agreement states, and other matters of mutual interest. The Conference comprises all of the radiation control program directors from the 50 states and also meets annually to address radiation protection issues at the federal, state, and local levels of government.

At NRC headquarters, we reviewed the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974; NRC's regulations; Federal Register notices; guidelines; annual reports; inspection reports; and radiation incident reports. Some of the more important NRC reports we reviewed included annual reviews of NRC's regional offices' materials programs, biennial evaluations of agreement-state programs, quarterly reports to the Congress on abnormal occurrences of radiation events, and the 1990 and 1991 Annual Report—Nonreactors, prepared by the Office for Analysis and Evaluation of Operational Data.

We visited four NRC regional offices: King of Prussia, Pennsylvania; Atlanta, Georgia; Glen Ellyn, Illinois; and Arlington, Texas. We spoke with the regional and deputy regional administrators; licensing, inspection, and enforcement officials; agreement-state officers; and other staff. We reviewed pertinent correspondence and NRC's questionnaire to the five regional offices (see app. VI), observed NRC inspections of three licensees, obtained responses from NRC regions to similar questions asked of agreement states in NRC's questionnaire to the agreement states (see app. V), and reviewed reports supporting NRC's statistics on the nuclear materials program. We also visited three agreement states—Maryland, Tennessee, and Texas—and spoke with each state's administrator and staff in the states' radiation protection control program. We reviewed and

summarized pertinent information from the latest agreement-state responses to NRC's questionnaire (see app. II) and observed NRC inspectors on three state inspections of licensees.

We discussed the facts presented in this report with the Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support and other NRC headquarters officials. NRC officials generally agreed with the facts but offered some clarifications that were incorporated where appropriate. However, as requested, we did not obtain written agency comments on this report. We conducted our review from November 1991 through December 1992 in accordance with generally accepted government auditing standards.

Good Criteria and Data Missing in Both of NRC's Nuclear Materials Programs

NRC does not have good criteria and data to evaluate the effectiveness of its radioactive materials programs in adequately protecting the public from radiation in either agreement states or NRC-regulated states. First, NRC does not have an agreed-upon, common set of performance indicators that can be used to evaluate both programs. Instead, NRC uses different indicators to measure the effectiveness of each program. It is therefore questionable whether all states are receiving the same minimum level of protection. Second, NRC does not require all programs to collect and summarize the same data, and the national reports it produces for the Congress, such as abnormal radiation occurrences, are incomplete. As a result, NRC does not have the oversight information necessary for making informed management decisions. Third, NRC does not have specific criteria or procedures to suspend or revoke an agreement-state program, and, in fact, no agreement-state program has been revoked. However, one state's program was so poorly run that on its own initiative it returned the regulatory authority for the program to NRC. Finally, reviews by NRC of its regional offices do not provide an overall assessment of whether the NRC-regulated state program adequately protects the public. NRC officials say that the procedures and oversight for each program ensure adequate public health and safety.

NRC Lacks Common Set of Performance Indicators

NRC operates its two programs independently of each other and has not agreed upon a common set of performance indicators to measure the effectiveness of its agreement-state and NRC-regulated state programs in achieving its goal of adequately protecting the public from radiation. Instead, NRC uses different performance indicators to measure effectiveness. NRC is required to control nuclear materials in NRC-regulated states and to ensure that agreement states maintain regulations that are compatible with NRC's regulations and have adequate radiation control programs to protect public health and safety. Although some separate indicators are appropriate, such as whether agreement states enacted new legislation, a common set of performance indicators to ensure the protection of public health and safety should be applied to both programs.

To evaluate the effectiveness of agreement states, NRC biennially reviews each agreement state's program using 29 indicators. (See app. IV.) The 29 indicators are set forth in NRC's "Guidelines for NRC Review of Agreement State Radiation Control Programs," which was published as an NRC policy statement in the June 4, 1987, Federal Register.[1] For each of the 29

[1]The policy statement was revised and reissued on May 28, 1992. The indicators were not substantially changed.

indicators, NRC has established guidelines that the agreement states are to comply with. Further, NRC has developed over 100 specific questions relating to the 29 indicators in such areas as personnel, licensing, and compliance. For example, in the compliance area, agreement states are asked to provide the number of inspections that are overdue, as measured by required frequencies; the number of licensees that were terminated; and the number of licensees coming into the state under reciprocity.[2] In the personnel area, agreement states are asked to provide the number of staff years they employ per 100 licenses in the state. NRC categorizes the 29 indicators as either directly related to the state's ability to protect the public health and safety (category I) or related to functions and activities that support the state's program and help identify underlying problems with category I indicators (category II).

In contrast, NRC uses different indicators to evaluate the effectiveness of the NRC-regulated state program. Unlike the specific indicators for agreement states, those for the NRC-regulated state program are broad and general. In addition, NRC evaluates the NRC-regulated state program annually, rather than biennially, and regionally, rather than by state. NRC's questionnaire for the regional offices contains 22 questions—none of which is the same as those used for the agreement-state program. Although many of the questions relate to enforcement actions, the primary question for inspections and licensing asks the regions to compare actual expenditures and accomplishments with planned and budgeted expenditures. For example, regions are to report the total number of inspections budgeted and completed, but not the details required of the agreement states such as the inspections that are overdue or those for closed facilities. (See app. VI.)

Two indicators that NRC uses to evaluate the agreement-state program demonstrate the differences between the two programs: the number of overdue inspections and the ratio of staff to licenses. NRC considers the former to be critical to protecting public health and safety.

For overdue inspections, NRC requires that both programs meet established inspection frequencies by type of licensee, but it specifically requests the number of backlogged inspections only from the agreement states. Although NRC reviews the regional offices' responses on planned and actual inspections of licensees, this information does not enable NRC to determine the number of inspections needed to meet the required

[2]A situation in which an NRC-regulated or agreement state accepts the license from another state and allows the licensee to operate in its state without having to be licensed again.

frequencies and therefore the number that are overdue. In fact, when we requested the information on the inspection backlog for NRC-regulated states, NRC did not have it in the same format as it did for the agreement states and had to create it.

The same is true of staff ratios. While agreement states must have a ratio of 1 to 1.5 staff per 100 licenses, NRC's region-based program allocates resources on the basis of a comparable ratio of staff to licenses. For NRC-regulated states, NRC does not ask for the staff-to-licenses ratio. When we requested the information, NRC did not have it in the same format as it did for the agreement states and had to create it. (See app. III for detailed information on these and other indicators.)

What is most important, however, is that both programs should be held to the same minimum standards—measured by common performance indicators—that are necessary to ensure that public health and safety are adequately protected. If NRC believes that the indicators it requires for agreement states are valid for determining whether a program is adequate to protect the public, then these indicators should apply to both programs. For example, if NRC determines that 1 staff per 100 licenses is necessary for an adequate program, then it should establish that ratio as a performance indicator and ensure that it is met in both agreement and NRC-regulated states. However, NRC has not agreed upon a common set of performance indicators that could be applied to both programs and that would enable NRC to measure objectively and quantitatively the effectiveness of its programs.

NRC program officials told us that they operate the programs autonomously and do not believe that all program measures need to be comparable. They believe that the good staff they have reviewing the programs ensure the effectiveness of both programs. They also believe that each program's procedures and oversight ensure adequate public health and safety. This view is supported by the Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support, who has been responsible for overseeing both programs since November 1991. Nonetheless, a common set of performance indicators is a necessary management tool that can be used to ensure a minimum level of safety and to enable NRC to determine when any agreement or NRC-regulated state falls short of that minimum. Without such indicators, NRC cannot assure the public that it is being adequately protected.

NRC Lacks Standard Management Information

Partly because NRC does not have a common set of performance indicators, it does not collect comparable information in the same format for both programs to properly evaluate its nuclear materials programs. In addition, NRC does not routinely track historical data on the performance of the programs over time or analyze its regional office data on a state-by-state basis. Furthermore, the national information NRC compiles, such as abnormal radiation occurrences, is incomplete. Without standard and complete information, NRC cannot evaluate the overall effectiveness of its programs in terms of protecting health and safety and make appropriate management decisions about program direction.

Programs Collect Dissimilar Information

Because NRC uses different performance indicators for its agreement-state and NRC-regulated state programs, much of the information that it regularly collects is different for each program. NRC also collects this information at different times—annually for the NRC-regulated state program and every 2 years at varying months for agreement states. For the NRC-regulated state program, NRC collects information on the numbers and types of violations that it finds, certain enforcement actions, and the resulting civil penalties or fines that are imposed. However, no such information is collected from all agreement states. Thus, comparable NRC statistics do not exist nationwide for determining if program changes need to be made in these areas. For example, NRC does not know the total number of violations by type that are occurring across the country and cannot analyze, at a national level, the effect of enforcement actions. Such information is essential in determining future enforcement strategies. Other differences in the performance indicators discussed earlier, such as the effects of inspection backlogs and the number of staff per 100 licenses, similarly limit the amount of information that management can use to make its program decisions.

Furthermore, NRC does not compile historical program data or state-by-state data. When we asked for information on how the agreement states complied with NRC regulations over a period of years, NRC had to create the compilation. Historical and individual state data can help identify trends and determine whether a problem in one state is part of a pattern or a unique situation; different strategies are required to correct these problems. For example, if information shows that one type of licensee is receiving repeat violations in many states, the overall strategy may be to temporarily increase inspections of that type of licensee in all states. When we asked NRC to provide information for the NRC-regulated states similar to that provided for the agreement states, NRC used

information that its regional offices had in their data bases. However, because NRC regions do not collect and maintain information in the same format that agreement states do, much of the information provided was estimated. In addition, the information was submitted by region and not broken out by state. (See app. III.)

Until June 1984, NRC compiled licensing statistics, including the number of licenses and the types of licensees, and presented the information for each state for both programs. According to NRC officials, NRC stopped compiling the data because the Conference of Radiation Control Program Directors, Inc., was developing a report that would include similar data for the two programs, and NRC believed that it was appropriate to reduce the impact of collecting this information on the states.

Nationwide Reports Are Unreliable

The few reports that attempt to compile/present national data are incomplete or inaccurate. NRC prepares two reports—a quarterly report to the Congress on significant radiation incidents, usually referred to as abnormal occurrences, and an annual report that analyzes and evaluates data such as radiation events that are less significant than abnormal occurrences. Another report is prepared by the Conference of Radiation Control Program Directors, Inc. We found that these reports were incomplete or contained inaccuracies and that some agreement states did not submit the requested information. As a result, reliable information is not available to NRC, the Congress, or the states to identify patterns and trends and determine appropriate changes for the programs.

Abnormal Occurrences Report to the Congress

NRC's quarterly reports to the Congress on abnormal occurrences, required by law, are incomplete in identifying the extent of significant incidents of exposures to radioactive materials that are occurring nationwide. This information is important for determining whether incidents that appear to be isolated events may be part of a recognizable pattern when examined on a national scale. With this information, NRC and the Congress could allocate program resources more effectively.

However, we identified several abnormal occurrences that should have been, but were not, in NRC's quarterly reports to the Congress. For example, a 1988 radioactive leak at a Georgia radiation facility was not included. The contamination was considerable, meeting the reporting criteria, and cost the federal government, according to the Director of the Georgia Radiation Control Program, between $35 million and $40 million to correct. However, Georgia (an agreement state) did not formally write

up the incident as an abnormal occurrence. Although NRC discussed the occurrence in its annual report on radiation events—which was not submitted to the Congress—it did not report the occurrence to the Congress as required.

Similarly, a 1987 abnormal occurrence in Texas was not reported. A radiography company employee received a radiation burn to his hand, with the estimated exposure well above the criteria for reporting. Texas, an agreement state, submitted a report to NRC's Region IV's agreement-states officer, who forwarded the report to NRC's Office of State Programs. However, that office never submitted the report to NRC's Office for Analysis and Evaluation of Operational Data for inclusion in the quarterly report. Also, around 1989 an incident occurred at a semiconductor company in Idaho in which an individual was exposed to levels of radiation that met the reporting criteria. This event was not reported in NRC's quarterly report to the Congress.

In trying to determine the number of deaths related to the nuclear materials programs, we identified several radiation-related deaths that were not reported in the quarterly reports as abnormal occurrences. In 1981 a 31-year-old industrial radiographer died from radiation burns in Oklahoma, an NRC-regulated state. Although NRC officials were aware of this death, it was not reported to the Congress as an abnormal occurrence because NRC could not establish that the radiation exposure resulted from material subject to licensing by NRC or the agreement state. In 1980 seven deaths at a Texas hospital occurred in which radiation was cited as a causal or contributing factor because of the incorrect administration of nuclear medicine to patients, referred to as a medical misadministration. NRC officials were not aware of this occurrence, and the event was not reported to the Congress.

While these unreported radiation occurrences raise questions about the completeness of the quarterly reports, it appears that further nonreporting may be occurring in the agreement states. Table 2.1 shows that of the 91 abnormal occurrences reported to the Congress from January 1, 1986, through December 31, 1990, only 22 came from agreement states, even though agreement states regulated about twice as many licenses during that period. (See app. VII for additional details on abnormal occurrences.)

Table 2.1: Abnormal Occurrences Reported to the Congress (Jan. 1, 1986, through Dec. 31, 1990)

Type of regulator	Number of states	Number of licenses	Percent of licenses	Abnormal occurrences reported	Percent of occurrences
NRC	21	8,000	35	69	76
Agreement states	29	15,000	65	22	24
Total	**50**	**23,000**	**100**	**91**	**100**

When questioned about the disparity, NRC officials said that they doubted the accuracy of the reporting when agreement states had only 24 percent of the incidents but 65 percent of the licenses. NRC officials said that they would expect at least the same level of abnormal occurrences for both programs because of the similarity of types of licenses in both programs. According to the Director of NRC's Office of Nuclear Material Safety and Safeguards, there is a presumption within NRC that not all of the agreement states are reporting abnormal occurrences.

Neither the agreement states nor NRC officials could explain such a disproportionate share of abnormal occurrences from the NRC regions. Nor has NRC tried to determine why the agreement states have a lower number of reported abnormal occurrences. One possibility is that NRC does not require agreement states to report abnormal occurrences. Reports from agreement states are voluntary and before May 1977 were not even requested by NRC. In its January 1992 correspondence to the agreement states regarding the abnormal occurrence reports, NRC said it would "very much appreciate [the agreement states'] cooperation in furnishing [the] information to [NRC]." Another possibility is that the agreement states may not understand how to report abnormal occurrences. According to the agreement-state officer in NRC's Region III, confusion exists over what incidents should be categorized as abnormal occurrences and the mechanism to be used for reporting and transmitting the information to NRC so that it reaches the appropriate person. In addition, because agreement states do not have to submit a report indicating they had no occurrences, it is unknown whether they had no occurrences or just neglected to report them.

NRC Annual Report on Radiation Events

The other NRC report, also prepared by the Office for Analysis and Evaluation of Operational Data, "Annual Report—Nonreactors," is similarly flawed. The annual report is an overview and summary of reported radiation events from both agreement and NRC-regulated states that includes information on, among other things, excessive personnel radiation exposures; lost, abandoned, and stolen radioactive materials;

and medical misadministrations. The report's purpose is to identify events with significant safety concerns, their causes, and the trends indicated by the events, and ultimately to recommend to NRC actions to resolve the underlying problems. However, when asked about the report during testimony before NRC's Commissioners in September 1992, NRC officials said that they were unable to draw any conclusions about both programs regarding public and worker overexposures of radiation because of the limited information in the report.

Furthermore, our review of the two most recent reports (1990 and 1991) indicates that the reports are inaccurate and incomplete and therefore do not provide reliable nationwide information for identifying trends and underlying problems. For example, the 1991 report stated that 40 events involving workers' overexposure to radiation occurred in the 16 agreement states that had responded. However, NRC's supporting information showed that 12 of the events did not actually occur in 1991 and, for another 17 events, the actual occurrence date is not shown. Further, only 15 of the 29 agreement states had responded. Thus, the information is not only inaccurate but may also not be representative of all the agreement states.

The 1990 report had similar problems and was particularly weak in agreement-state data. For example, the report stated that only 42 of the 309 events reported came from agreement states; but it did not indicate the number of agreement states that had reported. In regard to specific types of events, the report stated that only three events of workers' overexposure occurred in agreement states; an internal NRC document showed 65 such events. Finally, the report stated that 467 medical misadministrations had occurred in NRC-regulated states and that a separate report would be issued in 1991 on the agreement states. However, the agreement-state report was never issued, according to an NRC official, because too little information was received from the agreement states.

National Association Report

Data collected from an independent association representing state radiation control program directors are also not reliable. The Conference of Radiation Control Program Directors, Inc., collects and reports information that may be useful to the states in managing their programs, such as the number of inspections conducted, the amount of funds spent on state programs, and the number of licensees in the state. However, according to the Conference's staff, the data base has not been useful because many of the states do not submit the data necessary to keep the information current. As a result, the Conference has had to make

projections on the basis of outdated data. The staff also said that comparisons are becoming less and less reliable because of the gaps in the information that is submitted.

Revocation Process Is Beset With Problems

NRC's process for revoking an agreement-state program that is incompatible or inadequate to protect public health and safety has several basic flaws. These flaws raise questions about whether the agency adequately ensures public health and safety.

By law, NRC must periodically review agreement-state programs for their adequacy in protecting public health and safety and their compatibility with NRC's regulatory standards. NRC may revoke or temporarily suspend a state program that does not adequately protect public health and safety or that is not compatible with NRC's regulatory standards. However, NRC does not have clear, specific criteria or procedures for revoking an agreement-state program. At least partly as a result, NRC has never revoked a state program, even though one state had so much trouble regulating its program that it voluntarily returned to NRC-regulated status. Furthermore, evaluations by NRC of the regional offices' NRC-regulated state programs do not state whether these programs are adequate. Even if NRC were to revoke an inadequate state program, without information on the effectiveness of programs in the NRC-regulated states, it is unknown whether public health and safety in such a state would be any better protected under NRC's-regulated state program.

Specific Revocation Criteria and Procedures Are Missing

NRC does not have specific criteria or procedures for temporarily suspending or revoking an agreement-state program. Also, the criteria contained in NRC's 1987 policy statement are vague and appear to be contradictory. For example, the guidelines for the indicator "Status and Compatibility of Regulations," a category I indicator necessary to protect public health and safety, requires an agreement state to adopt certain new NRC regulations within 3 years to remain compatible. The guidelines for the indicator "Personnel" requires a staffing level of 1 to 1.5 person years per 100 licenses. However, NRC's policy statement on how the guidelines will be applied allows deficiencies in the indicators to exist without programs being suspended or revoked.

Furthermore, NRC has no specific criteria for how many and which indicators an agreement state must be deficient in or for how long a period the program may remain deficient before NRC will act to suspend or revoke

a state's agreement. NRC policy states that if NRC has no significant category I findings, the program is adequate to protect public health and safety and is compatible with NRC's program. In contrast, under this policy, if NRC finds that a state has one or more significant category I findings, the program is not necessarily considered inadequate or incompatible. In this case, NRC's policy is to notify the state that its deficiencies may seriously affect its ability to protect public health and safety and that improvement in certain areas is critical. The policy further states that no significant category I items will be left unresolved over a prolonged period—but defines neither significance nor the length of a prolonged period. Finally, the policy states that NRC will consider finding a state inadequate and instituting proceedings to suspend or revoke an agreement-state program if the state does not improve or if additional significant category I deficiencies develop. Again, however, the policy uses vague terms rather than specific thresholds requiring action and consequently does not provide agreement states, or NRC itself, with clear criteria for suspending or revoking a state's program.

NRC believes, according to program officials, that the determination of whether the safety and health of the public is adequately protected is made by good professional judgment and that specific criteria are not needed. According to the former administrator of NRC's Region IV, NRC has never defined the point at which it would terminate a state's program. As a result, state officials do not know specifically what will trigger a finding of inadequacy or incompatibility and ultimate revocation. For example, the directors of both the Texas and Tennessee programs said that they did not know when or under what conditions NRC would take such actions.

NRC also does not have any specific procedures in place describing the steps and processes to suspend or revoke an agreement-state program and to reassert its own authority. This includes procedures for providing the required notice and an opportunity for a hearing to the state, legal standards for determining when a state is not in compliance with the law, and plans for acquiring staff to take over a state program. According to NRC officials, they do not want to spend their resources writing procedures for revoking a program because they may never initiate such action. However, without specific criteria that establish when a state program is inadequate and when and how the revocation process will be implemented, it is questionable whether NRC can successfully initiate the process and whether it is adequately protecting the public in all states. Furthermore, NRC's policy has allowed agreement states to continue running programs with deficiencies for years, as we discuss below.

Adequacy of Both Programs Is Suspect

Several factors contribute to the questionable adequacy of both the agreement-state and NRC-regulated state programs. The actual assessments of both the agreement-state programs and the NRC-regulated state programs raise concerns about these programs' adequacy in protecting public health and safety. Furthermore, as discussed previously, the lack of common performance indicators and clear revocation criteria also raise concerns about the programs' adequacy.

Some Agreement-State Programs Not Found Adequate or Compatible

In NRC's most recent biennial assessments of the agreement-state programs we reviewed (see app. II), several states' programs did not receive findings of adequacy or compatibility. However, NRC is required to ensure that agreement states have adequate radiation control programs to protect public health and safety and that these states maintain programs compatible with NRC's regulatory requirements. For five agreement states, NRC was not able to make a finding that their programs were adequate to protect public health and safety. In 13 agreement states, NRC was unable to make a finding of compatibility between the states' and NRC's regulatory requirements.

NRC could not make a finding that five agreement states—Iowa, New Hampshire, New York, Nebraska, and Tennessee—adequately protected public health and safety. Iowa's program was not found adequate because of problems with the state's licensing actions and enforcement procedures. For example, one of Iowa's licensees had not submitted the updated information needed for renewing its license, and Iowa was not aware of this problem after inspecting the licensee. This licensee was of particular concern to NRC because the licensee possesses a large irradiator,[3] and without the updated information required for renewal, its safety was questionable.

Similarly, NRC did not find New York's program adequate because of licensing and enforcement deficiencies. This program is carried out by three separate state agencies and one agency of the city of New York. For example, New York State's incinerator facilities for medical wastes were not inspected prior to issuance of the license, although such inspection is required by NRC guidelines. The two responsible agencies—the New York State Department of Health and the New York State Department of Environmental Conservation—each thought the other agency had inspected the facilities.

[3]An irradiator is a facility that includes radioactive material and is used to irradiate material.

Nebraska did not receive a finding of adequacy because of the status of its inspection program. A total of 93 licensees were overdue for inspection. The backlog of inspections was of major significance because it had increased since the last NRC review. A related deficiency was Nebraska's staff-to-100-licenses ratio of .81, which is not considered by the terms of the NRC policy statement to be sufficient to maintain a viable program.

Finally, Tennessee did not receive a finding of adequacy because of the status of its inspection program. Like Nebraska, the number of overdue inspections had increased since NRC's last review. Tennessee had 130 licensees overdue for inspection, with the number of high-priority licensees (those presenting the greatest potential risk) overdue for inspection increasing from 2 to 39. Some of these were overdue by more than 3 years. Furthermore, some newer licensees had not received an initial inspection after they had received their licenses.

Of the 90 amendments to NRC's materials program regulations since 1971, agreement states were required to adopt 43 that were directly related to protecting public health and safety. According to the most recent biennial NRC assessments we reviewed, however, NRC could not make a finding of compatibility in 13 state programs because these states had not adopted new NRC regulations: Iowa, Kansas, Kentucky, Louisiana, Maryland, Nebraska, New Hampshire, New Mexico, New York, North Dakota, Tennessee, Texas, and Washington. For example, Nebraska had not adopted 10 regulations within the required 3 years. These involved such areas as transportation of radioactive materials, industrial radiography, bankruptcy notification of licensees, and reporting of medical misadministrations. In addition, the two previous NRC reviews of Nebraska disclosed the same problem. Therefore, Nebraska has not had compatible regulations for approximately 6 years—from 1984 to 1990.

NRC Reluctant to Revoke or Suspend Agreement-State Programs

Despite the problems with the states cited above, NRC is reluctant to say that an agreement-state program is incompatible or inadequate because it believes it would then have to initiate legal action against the state, according to NRC officials. Such action could be costly and lengthy if the state did not want the federal government to take over its program. Also, in the absence of relevant procedural rules, it is doubtful that NRC could successfully initiate legal proceedings against a state. In addition, NRC prefers to work informally with the states to obtain compliance. As a result, NRC has never revoked or suspended any agreement-state program.

By withholding findings of adequacy and compatibility rather than temporarily suspending or revoking an agreement state's program, NRC provides little incentive for agreement states to comply with NRC's compatibility and adequacy requirements. Some agreement-state programs have not had findings of compatibility or adequacy for years. Furthermore, agreement states are aware of NRC's reluctance to take back an agreement-state program, according to agreement-state officials. According to a special assistant to one of the NRC Commissioners, the states have not had incentives to comply because they know that NRC will not take aggressive action to suspend or revoke their programs. For example, the administrator of Maryland's program said that, to his knowledge, NRC has never threatened to revoke a state's program and that Maryland will never be terminated as long as most of its program is acceptable.

Idaho's experience demonstrates the consequences of NRC's reluctance to revoke a state program. Idaho's is the only agreement-state program returned to NRC, and the state governor—not NRC—initiated the action. Idaho returned the program voluntarily in 1991, choosing not to adequately fund the program. Although NRC had identified long-standing staffing and funding problems with Idaho's program, it did not temporarily suspend or revoke the program. In fact, NRC was aware of these problems in Idaho as early as October 1987 but continued to find the state program adequate for protecting the public and compatible with NRC's regulations. For example, in October 1987 NRC reported that Idaho's program was adequate and compatible, even though Idaho had no full-time staff qualified and experienced in the regulation of radioactive materials, as NRC requires and the state had not adopted two regulations needed to maintain compatibility with NRC's program. Subsequent reviews showed additional problems, such as an increasing inspection backlog. But, as before, NRC found the program in July 1989 to be adequate and compatible. In June 1990 additional positions needed for the program were not included in the state's budget. Since the program had been inadequately funded over the years by Idaho's legislature, the governor notified NRC in March 1991 that the state was returning the program to NRC. NRC accepted the return of Idaho's program in April 1991.

Although NRC did not suspend or terminate the program prior to the governor's letter, NRC and Idaho officials had extensive correspondence and meetings between 1987 and 1991 to discuss the status of the program and to assist the state in continuing its program. According to NRC officials,

NRC's letter in February 1991 requesting the status of the program within 48 hours initiated the state's decision to return the program.

Regional Office Reviews Do Not Provide Support for Revocation

Even if NRC did revoke an inadequate agreement-state program, it is questionable whether NRC would provide better protection for that state's citizens because the effectiveness of the NRC-regulated state program is unknown. NRC reviews of regional offices do not produce the overall assessment provided by the agreement states. That is, the regional office reviews do not summarize whether the regional offices have adequate programs to protect the public health and safety—NRC provides such summaries for the agreement-state programs. This lack of information, combined with the lack of common performance indicators, makes it nearly impossible to determine whether these programs are being adequately managed to protect the public.

In addition, this situation casts doubt on the efficacy of NRC's revoking an inadequate or incompatible agreement-state program. If an agreement-state program has a significant number of overdue inspections, for example, it cannot be assumed that this deficiency will be corrected if the state is taken into the NRC-regulated state program. NRC cannot be assured that corrections will be made through its regional offices because, without standard performance indicators, NRC does not know whether its program is as protective as agreement-state programs—even those that might be found inadequate. Therefore, it would be inappropriate for NRC to revoke an agreement-state program until it could ensure that the NRC-regulated state program is adequate.

Conclusions

NRC lacks good criteria and data to evaluate the effectiveness of its nuclear materials programs to adequately protect the public from radiation. Because NRC has set up two autonomous programs—one for agreement states and the other for NRC-regulated states—a common set of performance indicators is essential for NRC to ensure that its goal to adequately protect the public from radiation is being met and to determine when an agreement or NRC-regulated state falls short of that goal. Given this lack of common indicators and the dissimilarity between the two programs, it is virtually impossible to determine what minimum activities are necessary for protecting the public and whether any state in either program is meeting those performance indicators. Common indicators are needed to ensure that the basic, minimum level of safety established by NRC is achieved in all states.

The programs also lack comparable, accurate information that is critical to assessing their strengths and weaknesses. Furthermore, because of the errors and/or incomplete information that is compiled, particularly in reports to the Congress identifying radiation occurrences and deaths, decisionmakers do not have reliable information. With such basic management weaknesses, NRC cannot assure the public that it is receiving adequate protection under either program.

NRC is responsible for ensuring the public safety and health in all states—even those that establish their own programs. Therefore, NRC is required to ensure that the agreement states establish adequate and compatible programs and is authorized to terminate the agreement of any state that has not complied. However, NRC has no specific procedures and only vague criteria for suspending or revoking an agreement-state program that is inadequate or incompatible. The criteria are so general that no agreement-state program has ever been revoked, even when unstaffed, as Idaho was, and when NRC reported that it could not make findings of adequacy or compatibility in several other states. Specific procedures could provide a state with required notice and an opportunity for a hearing before an agreement could be revoked. These procedures could, in addition, provide a period of time after NRC notifies an agreement state for (1) the state to correct the deficiencies and retain its agreement and (2) NRC to notify the Congress of the proposed action and request the additional staff that may be needed to assume an agreement-state's regulatory responsibilities. In addition, specific revocation criteria would clarify performance requirements for agreement states and could foster better state compliance.

Since NRC does not use common performance indicators for both agreement- and NRC-regulated state programs, it has no assurance that the NRC-regulated state program is any better than or as good as the agreement-state program. Therefore, we cannot recommend that NRC revoke agreement-state programs that it finds inadequate because we do not know whether the citizens of such states will be any better protected under the NRC-regulated state program.

Recommendations

Because of the inconsistent way in which NRC evaluates the effectiveness of its two materials programs in achieving the goal of adequately protecting the public from radiation, we recommend that the Chairman, NRC, establish (1) common performance indicators in order to obtain comparable information to evaluate the effectiveness of both the

agreement-state and NRC-regulated state programs in meeting NRC's goal and (2) specific criteria and procedures for suspending or revoking an agreement-state program. Once NRC ensures the effectiveness of the NRC-regulated state program using the new performance indicators, it should take aggressive action to suspend or revoke any agreement-state program that is incompatible or inadequate with the performance indicators.

We further recommend that the Chairman (1) require agreement states to report abnormal occurrences so that NRC can include the occurrences in its quarterly report to the Congress and (2) take appropriate action to ensure that the information on radiation events in agreement states is reported completely and accurately.

Financial Assurance and Radiography Inspections Raise Concerns

NRC has acted on three of the four recommendations we made in a 1988 report on licensing, inspection, and enforcement in the nuclear materials program.[1] NRC has (1) added criteria for denying licenses and conducting prelicense inspections, (2) implemented a pilot program to improve the quality and timeliness of license renewals, and (3) established financial penalties for the repetition of minor violations.

Nevertheless, NRC has not completed regulations that would require licensees to provide at least a minimum level of financial assurance that they can pay for the cleanup of accidental spills and releases of radioactive material. We recommended such action in 1988 after NRC stopped its earlier rule-making on financial assurance. Without such assurance, the government may have to pay if licensees cannot. DOE estimated that cleanup costs for a single accident can exceed $2 million. NRC's staff is preparing an options paper for Commission reconsideration to determine whether there is a need to go forward with a rule-making to require material licensees to have financial assurance.

Radiography has long been viewed by NRC and agreement states as a difficult area to regulate; numerous radiation incidents occur in radiography.[2] Although we made no recommendations on radiography in our previous report because of ongoing NRC actions, we identified inspection concerns that were primarily related to radiographers working at temporary job sites or outside their licensed state (referred to as reciprocity). Inspections by NRC and agreement states are very few in these cases, and NRC has not established goals for reciprocity inspections. As discussed in chapter 2, however, NRC does not have accurate nationwide information, such as the number and types of violations and radiation incidents, on which to make informed program decisions about managing its nuclear materials programs. Therefore, it is impossible to determine whether the efforts NRC and the states are making in the radiography area are adequate to protect the public.

[1]Nuclear Regulation: Stricter Controls Needed for Radioactive Byproduct Material Licenses (GAO/RCED-89-15, Oct. 12, 1988).

[2]Radiography is the process of producing pictures on sensitive surfaces by a form of radiation other than light.

Financial Assurance Needed for Radioactive Material Cleanups

NRC has not acted on our 1988 recommendation to issue final regulations requiring licensees to provide a minimum level of financial assurance that they can pay for the cleanup of accidental spills and releases of radioactive materials. As we reported in 1988, NRC licensees are required to pay for cleanup costs following an accident or facility closure. Cleanup costs can be expensive. For example, one licensee paid about $1 million to clean up accidental contamination. However, when licensees have been unable to pay, NRC has had to find other sources. For example, NRC obtained about $385,000 from the Environmental Protection Agency when a licensee could not pay to clean up a contaminated facility.

Despite its continuing concerns about financial assurance, NRC has not acted on our recommendation to complete a rule-making on this issue. In June 1985 NRC published an Advanced Notice of Proposed Rule-making requiring licensees to ensure that funds would be available for accidental spills and releases. However, NRC terminated the rule-making about 2 years later. NRC explained that this type of regulation is difficult to formulate because of the many variables involved in a radiation accident and because of uncertainty about the appropriate amount of assurance necessary for the various licensees. NRC also believed that private insurance for financial assurance may be unavailable, thereby jeopardizing the continued business operations of some licensees.

A 1990 study by the Department of Energy's Sandia National Laboratory assessed the economic risks of accidents at materials facilities.[3] The study pointed out that only a small percentage (about 5 percent) of the approximately 23,000 total nuclear material licensees have operations in which potential releases could result in cleanup costs in excess of $2 million. It further stated that although most releases and cleanup costs are minor, some less frequent incidents could result in very high cleanup costs. The study established recommended levels of financial assurance coverage needed for five categories of nuclear materials licensees. NRC staff are developing an options paper for the NRC Commissioners to determine whether there is a need to again go forward with a financial assurance rule-making. NRC has not set a completion date for the paper.

While health and safety factors are one consideration in determining the need for financial assurance, the potential cost to the taxpayer is another. We recognize the difficulties in developing a comprehensive program for all possible releases of radioactive material. However, without some level

[3]Department of Energy, Economic Risk of Contamination Cleanup Costs Resulting from Large Nonreactor Nuclear Material Licensee Operations (NUREG/CR-5381, Mar. 1990).

of financial assurance in place, the government remains vulnerable for any cleanup costs that licensees are unable to pay. Even a limited level of financial assurance would reduce the government's risk of paying for future accidents.

Radiography Area Reveals Problems

Two other areas that primarily involve radiography inspections show the need for accurate, standard information on which to base a common set of performance indicators: inspections at temporary job sites and of licensees operating outside their licensed states (called reciprocity). NRC has long considered radiographers a problem group of nuclear materials licensees. According to NRC and agreement state officials, radiography work is both the most difficult area to regulate and the most significant area needing inspection. Radiographers use sealed radioactive material sources in a device to identify defects in pipes, welds, and steel structures. They work at permanent and temporary job sites both within and outside their state of license. Permanent sites are permanent buildings set up to handle inspection of industrial products, such as metal castings. Temporary sites are such places as pipelines and bridge pilings. Because NRC was taking action to improve radiography training and certification when we were preparing our 1988 report, we did not make any recommendations on radiography at that time. NRC is currently developing regulations to improve these areas.

Although NRC considers that radiographers at temporary job sites and those under reciprocity are highly vulnerable to misusing radioactive material, both NRC and agreement-state inspections of these areas are minimal. In addition, the established goal for inspecting temporary job sites is far from met, and NRC has no goal for inspecting licensees under reciprocity. As a result, it is not known whether the limited inspection activity in these situations is adequate to protect the public.

Goals Are Unmet and Few Temporary Job Sites Are Inspected

In spite of a goal for inspections of temporary job sites, NRC and the agreement states are conducting few such inspections. NRC established a goal to annually inspect temporary job sites for 25 percent of its radiography licensees. However, although it appears that some agreement states and NRC regions are inspecting temporary job sites for more than 25 percent of their radiography licensees, NRC officials estimate that, overall, only about 10 percent of the temporary job sites are being inspected annually either by NRC or the agreement states. NRC did not have specific inspection information by state or region and was only able to

give us an overall estimate. NRC does not track whether its regional offices or agreement states are meeting the 25-percent goal.

Radiography work at temporary job sites is considered more likely to have exposure problems than other work involving radiation. According to NRC officials, NRC found a number of recurring problems in its inspection of radiographers' field activities because most exposure incidents occur during field radiography work, as opposed to radiography work done at permanent facilities. Many of the officials we talked to in the agreement states and at NRC regional offices agreed with this view. For example, Texas inspectors said that they find more violations with radiographers operating in the field. According to these officials, radiographers operate differently when they know inspectors are present: Radiographers are more likely to use their equipment correctly and wear their personal monitoring devices properly. They are also likely to pay more attention to how they handle radioactive materials.

According to NRC officials, NRC has been unable to comply with its inspection goal because of limited staffing and other priorities. An agreement-state official from Tennessee cited similar reasons for noncompliance. However, realistic goals should be set to determine the minimum level of performance necessary to adequately protect the public from radiation exposure. These goals should be based on accurate nationwide information on such factors as types of violations by types of licensees and on actual and potential risks of radiation exposure, such as radiation incidents, which, as discussed in chapter 2, NRC does not have.

No Goals for and Few Inspections of Licensees Submitting Reciprocity Notices

NRC has set no goals for inspecting licensees licensed in one state but operating in another under a reciprocity notice, and few inspections are conducted. Many of the reciprocity notices involve radiographers whose work can be conducted at a temporary or permanent site. All the agreement-state and NRC officials with whom we talked believe that inspection of reciprocity sites is an area that should be improved.

NRC and the agreement states require out-of-state licensees to notify them in writing (reciprocity notice) at least 3 days prior to performing licensed activities in their state of planned activities, locations, dates, and radioactive materials. However, NRC regions and agreement states inspect very few licensees that file reciprocity notices. NRC and the agreement states inspected about 3 percent of the notices they received during their respective reporting periods. (See apps. II and III.) For example, NRC

Region I, which is responsible for six states, inspected 7 of 300 notices, or about 2 percent. Several agreement states conducted no reciprocity inspections at all. For example, Oregon received 146 notices and Iowa received 100, but neither conducted any inspections.

NRC and agreement states cite several reasons for their limited oversight of reciprocity notices. According to Tennessee officials, who inspected less than 1 percent of the work performed under reciprocity notices, they cannot inspect their own licensees, let alone licensees from other states, because of staffing problems. Texas officials said they inspected very few reciprocity notices (37 of 515, or about 7 percent) because the notices were received too late to adjust their inspection schedules. According to the agreement-state officer for NRC Region II, the reciprocity area is the first to be overlooked when a state starts having trouble with staffing and funding. NRC officials cite similar reasons for limited attention to this area. According to NRC officials, NRC has not set a goal for inspecting reciprocity notices because of limited staffing; it cannot even comply with its goal for radiographers at temporary job sites. NRC officials also said that the reciprocity notices do not allow enough time to schedule visits because the regional offices are far from the sites to be inspected.

NRC officials generally agree that reciprocity is another area that should receive more attention in order to provide adequate public and worker protection. However, without better nationwide information on where NRC should best direct its resources, the appropriate amount of inspection activity needed for inspecting reciprocity sites is unknown.

NRC Acts on GAO Recommendations

NRC has taken several administrative actions to address three of our 1988 recommendations to improve its licensing and enforcement. First, to prevent the potential adverse effects of licensing dishonest or careless applicants, we recommended that NRC develop specific criteria for denying licenses and define the circumstances that would require a prelicense on-site inspection or verification of information. NRC took action on both issues. In June 1989 NRC issued a policy and guidance directive on when and how to deny an application for a nuclear materials license. The directive states, among other things, that applications for nuclear materials licenses should be denied if an applicant has not submitted adequate information after (1) NRC has requested additional information, (2) the applicant has had at least 30 days in which to provide the needed information, and (3) the applicant has failed to respond or its response is not adequate. In February 1989 NRC updated its guidance for the conduct

of licensing visits to applicants' sites. In doing so, NRC now requires, rather than recommends, prelicensing visits for applications involving large nuclear materials programs, such as those for hospitals.

Second, because NRC took up to a year or longer to renew nuclear materials licenses, some licensees might have been allowed to operate in an unsafe manner until their renewals were reviewed. Therefore, we recommended that broad-scope licensees, such as universities or medical facilities that use many radioactive materials at numerous locations, be required to begin their license renewal actions 1 year in advance of expiration and that NRC conduct inspections before renewing the licenses. NRC is currently pilot-testing procedures that its Region III developed in January 1992 for license renewal notification and a pre-application conference for broad-scope licensees. The procedures are intended to provide a structured process for improving the quality and timeliness of renewal applications. They provide for establishing early contact with broad-scope licensees due for renewal and meeting with those licensees to provide guidance on recent changes in NRC expectations for such licenses. According to the procedures, the region's licensing section chief will assign individual reviewers to licensees well in advance of a 6-month lead time.

According to NRC Region III officials, the procedures have initially resulted in several successes. For example, one licensing site visit identified significant internal management problems and a possible breakdown in the site's licensing and inspection programs. The licensee corrected the problems. Another inspection resulted in the identification of staff weaknesses, which the licensee corrected, precluding future, stronger enforcement actions.

Additionally, NRC increased the inspection frequency for broad-scope medical licensees from every 2 years to every year. As a result, the licensees are to be inspected within 1 year of their renewal date. Also, NRC headquarters is planning to revise its standard review plan for reviewing broad-scope licensees. NRC has solicited regional office comments on a draft revision and plans to seek comments from the affected licensees in 1993 or 1994. NRC plans to revise the standard review plan after it has analyzed both sets of comments.

Third, NRC did not have specific criteria directing the use of financial penalties against licensees that repeatedly violated what NRC considered to be minor regulations, such as training, radiation monitoring, and

record-keeping. Because we believe such penalties may motivate a licensee to improve its controls, we recommended that NRC review its policies for imposing financial penalties to determine whether more explicit guidance is needed. NRC revised its enforcement policy and manual in October 1988 to clarify that licensees that repeatedly commit minor violations may be subject to civil penalties. In February 1992 NRC again clarified its policy to allow for the escalation of the level of severity of a violation if it is repetitive. (Violations range in severity from level I—the most significant—to level V—the least.) Thus, a repeated lower level violation could be increased to a level at which a civil penalty could be imposed.

NRC also issued an Enforcement Manual, effective May 1990, that provides criteria to determine when NRC should take escalated enforcement actions. The manual contains a graduated enforcement scheme to be applied from the first repetition of a violation through the third, and for other situations. In making these and other changes, NRC acknowledges the added significance of a licensee's failure to implement effective corrective action for the previous violations.

Conclusions

NRC has taken corrective action to address most of the problems we identified in our 1988 report. However, it has not yet acted on our recommendation that nuclear materials licensees be required to provide financial assurance that they can pay for their accidental spills or releases. We recognized in our 1988 report the difficulty inherent in developing a comprehensive assurance program and consequently recommended a minimum level of assurance. We continue to believe that some minimum level of financial assurance is necessary to limit the federal government's liability for an accidental spill or release of radioactive material—particularly since a single incident could cost in excess of $2 million. Given NRC's slow progress on this issue, congressional intervention may be necessary to establish financial assurance requirements that will at least limit the potential expenditure of federal funds.

Two areas show the need for accurate and complete information on which to establish a common set of performance indicators: radiographers' temporary job sites and reciprocity notices that are primarily for radiographers operating out of their licensed states. Although NRC and agreement state officials believe these areas need a significant inspection presence, very few inspections are conducted. For temporary job sites,

NRC's 25-percent goal for all states has not been achieved, and NRC can only estimate the shortfall because it does not track such information. For reciprocity notices, no goal has been established, and in some cases no inspections are done. However, as we discussed in chapter 2, NRC does not have accurate, nationwide information to assess the potential risks and determine the appropriate level of emphasis to place on these inspections through a common set of performance indicators. Because both NRC and agreement states reported that the small number of inspections in this area was partly the result of limited resources, it is critical that the resources be targeted primarily to the areas that are likely to present the most risk to workers and the public.

Matter for Consideration by the Congress

Because NRC has not acted on our 1988 recommendation on financial assurance, the Congress may wish to consider enacting legislation requiring NRC to establish a reasonable, minimum level of financial assurance that licensees must provide for accidental spills or releases of radioactive material.

Date Agreement States Entered Nuclear Materials Program

Agreement states	Effective date of agreement
Kentucky	3/26/62
California	9/01/62
Mississippi	7/01/62
New York	10/15/62
Texas	3/01/63
Arkansas	7/01/63
Florida	7/01/64
North Carolina	8/01/64
Kansas	1/01/65
Oregon	7/01/65
Tennessee	9/01/65
New Hampshire	5/16/66
Alabama	10/01/66
Nebraska	10/01/66
Washington	12/31/66
Arizona	5/15/67
Louisiana	5/01/67
Colorado	2/01/68
Idaho[a]	10/01/68
North Dakota	9/01/69
South Carolina	9/15/69
Georgia	12/15/69
Maryland	1/01/71
Nevada	7/01/72
New Mexico	5/01/74
Rhode Island	1/01/80
Utah	4/01/84
Iowa	1/01/86
Illinois	6/01/87
Maine	4/01/92

[a]On Apr. 26, 1991, NRC accepted the return of Idaho's program.

Agreement-State Data by State

Table II.1: Selected Data on Agreement States

State	Review date	State adequate	State compatible	Incidents or alleged incidents		Staff per hundred licensees	Percent of budget generated by fees
				Reports	Investigated		
Ala.	6/14/91	Yes	Yes	35	17	.7	75
Ariz.	6/15/90	Yes	Yes	29	24	1.4	70
Ark.	1/11/91	Yes	Yes	49	21	1.47	13
Calif.	1/18/91	Yes	Yes	461	415	1.38	95
Colo.	4/19/91	Yes	Yes	23	4	1.18	55
Fla.	3/01/91	Yes	Yes	197	67	1.69	46
Ga.	10/18/91	Yes	Yes	19	6	1.2	100
Ill.	2/09/90	Yes	Yes	121	57	1.6	37
Iowa	7/20/90	[a]	[a]	14	12	.85	44
Kans.	2/01/91	Yes	[a]	2	2	1.03	80
Ky.	4/26/90	Yes	[a]	20	11	1.1	50
La.	8/23/91	Yes	[a]	32	32	1.15	71
Md.	3/27/91	Yes	[a]	85	78	1.07	30
Miss.	9/13/91	Yes	Yes	19	10	1.13	100
N.C.	11/22/91	Yes	Yes	70	15	1.1	33
N.Dak.	6/07/91	Yes	[a]	4	2	2.08	12
Nebr.	6/15/90	[a]	[a]	3	3	.81	35
N.H.	1/27/89	[a]	[a]	4	4	1.66	21
N.Mex.	8/17/90	Yes	[a]	41	12	1.48	0
Nev.	4/26/91	Yes	Yes	35	20	1.80	25
N.Y.	10/19/90	[a]	[a]	61	51	1.35	Varies
Oreg.	3/08/91	Yes	Yes	53	11	1.06	60
R.I.	11/22/91	Yes	Yes	7	5	1.5	33
S.C.	3/22/91	Yes	Yes	13	6	3.2	60
Tenn.	12/13/91	[a]	[a]	94	30	1.4	74
Tex.	4/20/90	Yes	[a]	343	145	1.7	100
Utah	2/09/90	Yes	Yes	15	6	1.95	50
Wash.	8/24/90	Yes	[a]	74	45	1.38	100
Total				**1,923**	**1,111**		

[a]NRC reported that it was not able to find that the agreement-state's program was adequate to protect public health and/or that it was compatible with the regulatory programs of NRC.

Source: Data were primarily obtained from agreement-state questionnaires. In a few instances, data were missing or not appropriate and had to be developed with the assistance of the agreement state officers. The schedules were subsequently reviewed and verified by NRC headquarters.

Table II.2: Agreement States' Licensing

State	Review date	Total licenses	Major licenses	Licenses terminated	Close-out inspections
Ala.	6/14/91	467	11	74	0
Ariz.	6/15/90	295	13	50	17
Ark.	1/11/91	266	8	24	12
Calif.	1/18/91	2,271	120	206	[a]
Colo.	4/19/91	436	9	75	3
Fla.	3/01/91	1,052	36	150	6
Ga.	10/18/91	658	26	103	4
Ill.	2/09/90	900	68	143	4
Iowa	7/20/90	219	6	5	2
Kans.	2/01/91	341	7	8	3
Ky.	4/26/90	359	7	38	0
La.	8/23/91	550	23	67	3
Md.	3/27/91	516	22	94	38
Miss.	9/13/91	320	7	52	5
N.C.	11/22/91	504	36	75	0
N.Dak.	6/07/91	87	3	16	5
Nebr.	6/15/90	177	9	14	0
N.H.	1/27/89	90	2	18	[a]
N.Mex.	8/17/90	253	7	31	17
Nev.	4/26/91	142	3	15	0
N.Y.	10/19/90	1,909	54	62	41
Oreg.	3/08/91	287	13	32	5
R.I.	11/22/91	68	2	10	1
S.C.	3/22/91	313	19	15	1
Tenn.	12/13/91	554	33	47	3
Tex.	4/20/90	1,753	[a]	[a]	[a]
Utah	2/09/90	220	8	41	0
Wash.	8/24/90	370	32	37	8
Total		**15,377**	**584**	**1,502**	**178**

[a]Data not available.

Source: Data were primarily obtained from agreement-state questionnaires. In a few instances, data were missing or not appropriate and had to be developed with the assistance of the agreement-state officers. The schedules were subsequently reviewed and verified by NRC headquarters.

Table II.3: Agreement States' Inspections and Civil Penalty Authority

State	Review date	Inspections completed	Number overdue[a]	Reciprocity			Civil penalty authority
				Notice	Inspections		
					Number	Percent	
Ala.	6/14/91	250	2	400	4	1.0	Yes
Ariz.	6/15/90	248	31	54	2	3.7	Yes
Ark.	1/11/91	219	0	149	12	8.0	Yes
Calif.	1/18/91	749	0	112	15	13.4	Yes
Colo.	4/19/91	217	0	197	1	.5	Yes
Fla.	3/01/91	945	1	174	2	1.1	Yes
Ga.	10/18/91	296	0	277	6	2.2	Yes
Ill.	2/09/90	771	30	367	2	.5	Yes
Iowa	7/20/90	88	0	100	0	0	Yes
Kans.	2/01/91	141	28	108	4	3.7	Yes
Ky.	4/26/90	150	2	581	7	1.2	Yes
La.	8/23/91	481	29	474	11	2.3	Yes
Md.	3/27/91	264	89	240	21	8.7	Yes
Miss.	9/13/91	195	0	1,002	15	1.5	No
N.C.	11/22/91	671	0	94	15	16.0	Yes
N.Dak.	6/07/91	80	16	25	2	8.0	Yes
Nebr.	6/15/90	68	93	97	2	2.1	Yes
N.H.	1/27/89	31	43	25	3	12.0	No
N.Mex.	8/17/90	219	11	86	1	1.2	No
Nev.	4/26/91	35	0	24	4	16.7	No
N.Y.	10/19/90	745	46	251	16	6.4	3 No, 1 Yes
Oreg.	3/08/91	151	0	146	0	0	No
R.I.	11/22/91	34	0	29	0	0	No
S.C.	3/22/91	270	2	248	2	.8	Yes
Tenn.	12/13/91	153	83	253	2	.8	Yes
Tex.	4/20/90	[b]	[b]	515	37	7.2	Yes
Utah	2/09/90	160	25	45	1	2.2	Yes
Wash.	8/24/90	305	6	36	7	19.4	No
Total		**7,936**	**537**	**6,109**	**194**		

(Table notes on next page)

[a]Not all agreement states reported all their overdue inspections because NRC changed its reporting format.

[b]Data not available.

Source: Data were primarily obtained from agreement-state questionnaires. In a few instances, data were missing or not appropriate and had to be developed with the assistance of the agreement-state officers. The schedules were subsequently reviewed and verified by NRC headquarters.

NRC-Regulated State Data by NRC Regional Offices

Table III.1: Selected Data on NRC-Regulated States

NRC region	Review date	Incidents or alleged incidents: Reported	Incidents or alleged incidents: Investigated	Staff per hundred licensees	Percent of budget generated by fees
I	FY 1991	243	25	1.5	100
II	FY 1991	138	63	1.7	100
III	FY 1991	25	20	1.4	100
IV	FY 1991	92	21	1.6	100
V	FY 1991	25	18	2.6	100
Total		**523**	**147**		

Table III.2: NRC-Regulated States' Licensing

NRC region	Review date	Total licenses	Major licenses	Licenses terminated	Close-out inspections
I	FY 1991	2,700	100	200	25
II	FY 1991	945	61	65	3
III	FY 1991	2,593	231	300	10
IV	FY 1991	820	116	123	0
V	FY 1991	319	17	29	0
Total		**7,377**	**525**	**717**	**38**

Table III.3: NRC-Regulated States' Inspections and Civil Penalty Authority

NRC region	Review date	Inspections completed	Inspections overdue	Reciprocity: Notices received	Reciprocity: Inspections: Made	Reciprocity: Inspections: Percent	Civil penalty authority
I	FY 1991	613	638	300	7	2.3	Yes
II	FY 1991	440	2	35	2	5.7	Yes
III	FY 1991	692	25	50	2	4.0	Yes
IV	FY 1991	318	4	220	6	2.7	Yes
V	FY 1991	133	2	112	5	4.5	Yes
Total		**2,196**	**671**	**717**	**24**		

Source: Data were primarily obtained from NRC regional officials using the same questionnaire format agreement states had used. The schedules were subsequently reviewed and verified by NRC headquarters.

Twenty-Nine Indicators Used in Agreement-State Reviews

A. Legislation and Regulations

1. Legal authority (category I)[1]
2. Status and compatibility of regulations (category I)

B. Organization

3. Location of radiation control program (RCP) within state organization (category II)[2]
4. Internal organization of the RCP (category II)
5. Legal assistance (category II)
6. Technical advisory committees (category II)

C. Management and administration

7. Quality of emergency planning (category I)
8. Budget (category II)
9. Laboratory support (category II)
10. Aministrative procedures (Category II)
11. Management (category II)
12. Office equipment and support services (category II)
13. Public information (category II)

D. Personnel

14. Qualifications of technical staff (category II)
15. Staffing level (category II)
16. Staff supervision (category II)
17. Training (category II)
18. Staff continuity (category II)

E. Licensing

19. Technical quality of licensing actions (category I)
20. Adequacy of product evaluations (category I)
21. Licensing procedures (category II)

[1]Directly related to the state's ability to protect the public health and safety.

[2]Related to functions and activities that support the agreement-state's program and help identify underlying problems with category I indicators.

F. Compliance

22. Status of inspection program (category I)
23. Inspection frequency (category I)
24. Inspector's performance and capability (category I)
25. Responses to incidents and alleged incidents (category I)
26. Enforcement procedures (category I)
27. Inspection procedures (category II)
28. Inspection reports (category II)
29. Confirmatory measurements (category II)

Selected Excerpts From Agreement-State Questionnaire

This appendix contains selected parts of a biennial asssessment NRC used to evaluate agreement-state programs.

EVALUATION OF AGREEMENT STATE RADIATION CONTROL PROGRAM

PART I
PROGRAM GUIDELINES
AND COMPREHENSIVE STATE QUESTIONNAIRE

Name of State Program _____

Date report prepared _____

I. LEGISLATION AND REGULATIONS

A. Legal Authority (Category I)

NRC Guidelines: Clear statutory authority should exist, designating a State radiation control agency and providing for promulgation of regulations, licensing, inspection and enforcement. States regulating uranium or thorium recovery and associated wastes pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) must have statutes enacted to establish clear authority for the State to carry out the requirements of UMTRCA.

Questions:

1. Please list all currently effective legislation that affects the radiation control program (RCP).

2. Does your State have the authority to:

   a. apply civil penalties?
   b. collect fees?
   c. require performance bonds or sureties for decommissioning licensed facilities?
   d. require performance bonds or sureties for clean-up of licensed facilities after a contamination accident?
   e. require long term care funds for uranium mill or low-level waste facilities?

   (Please provide separate answers for low-level waste or uranium mill rules)

3. Are your regulations subject to a "Sunset" or equivalent law? If so, explain and include the next expiration date for your regulations.

B. Status and Compatibility of Regulations (Category I)

NRC Guidelines: The State must have regulations essentially identical to 10 CFR Part 19, Part 20 (radiation dose standards, effluent limits, waste manifest rule and certain other parts), Part 61 (technical definitions and requirements, performance objectives, financial assurances) and those required by UMTRCA, as

implemented by Part 40. The State should adopt other regulations to maintain a high degree of uniformity with NRC regulations. For those regulations deemed a matter of compatibility by NRC, State regulations should be amended as soon as practicable but no later than 3 years. The RCP should have established procedures for effecting appropriate amendments to State regulations in a timely manner, normally within 3 years of adoption by NRC. Opportunity should be provided for the public to comment on proposed regulation changes. (Required by UMTRCA for uranium mill regulation.) Pursuant to the terms of the Agreement, opportunity should be provided for the NRC to comment on draft changes in State regulations.

Questions:

1. What is the effective date of the last compatibility-related amendment to the state's regulations?

2. Referring to the latest NRC chronology of amendments, identify those that have not been adopted by the State, explain why they were not adopted, and discuss any actions being taken to adopt them.

3. Briefly describe your State's procedures for amending regulations in order to maintain compatibility with the NRC within the three year time frame, showing the ~~average~~ normal length of time anticipated to complete each step if possible.

4. How is the public involved in the process of adopting new regulations?

5. At what stage does the NRC have the opportunity to comment on draft changes to State regulations?

6. Identify the person responsible for developing new or amended regulations affecting agreement materials.

B. Budget (Category II)

NRC Guidelines: Operating funds should be sufficient to support program needs such as staff travel necessary to conduct an effective compliance program, including routine inspections, follow-up or special inspections (including pre-licensing visits) and responses to incidents and other emergencies, instrumentation and other equipment to support the RCP, administrative costs in operating the program including rental charges, printing costs, laboratory services, computer and/or word processing support, preparation of correspondence, office equipment, hearing costs, etc. as appropriate. Principal operating funds should be from

sources which provide continuity and reliability, i.e., general tax, license fees, etc. Supplemental funds may be obtained through contracts, cash grants, etc.

Questions:

1. How does your funding provide continuity and reliability?

2. Show the amount for funds for the RCP for the current fiscal year obtained from:

   a. State general fund

   b. Fees

   c. Federal grants and contracts (identify)

   d. Other

   e. Total:

3. Show the total amounts in the current RCP budget allocated for the following (if contract costs are incurred, e.g, in LLW regulation, please include):

   a. Administration

   b. Radioactive materials

   c. X-ray

   d. Environmental surveillance

   e. Emergency planning

   f. LLW regulation (only, do not include site development)

   g. U-mill regulation

   h. Other (radon, non-ionizing, operator credentialing, etc. Please identify).

   i. Total:

4. What percentage of your radioactive materials program is supported by fees?

5. Overall, is funding sufficient to support all of the program needs? If not, what are the problem areas?

V. PERSONNEL

A. Qualifications of Technical Staff (Category II)

NRC Guidelines: Professional staff should have a bachelor's degree or equivalent training in the physical and/or life sciences. Additional training and experience in radiation protection for senior personnel including the director of the radiation protection program should be commensurate with the type of licenses issued and inspected by the State. Written job descriptions should be prepared so that professional qualifications needed to fill vacancies can be readily identified.

Questions:

1. Do all professional personnel hold a bachelor's degree or have equivalent training in the physical or life sciences?

2. What additional training and experience does the RCP director have in radiation protection?

3. What additional training and experience are required of the senior personnel?

4. Do written position descriptions describe the duties, responsibilities and functions of each professional position in the RCP and the qualifications needed by applicants?

B. Staffing Level (Category II)

NRC Guidelines: Professional staffing level should be approximately 1-1.5 person-year per 100 licenses in effect. RCP must not have less than two professionals available with training and experience to operate RCP in a way which provides continuous coverage and continuity. For States regulating uranium mills and mill tailings current indications are that 2-2.75 professional person-years' of effort, including consultants, are needed to process a new mill license (including in situ mills) or major renewal, to meet requirements of Uranium Mill Tailings Radiation Control Act of 1978. This effort must include expertise in radiological matters, hydrology, geology, and structural engineering.

Questions:

1. Complete a table listing the professional (technical) person-years of effort applied to the agreement or radioactive material program by individual. Include the name, position, fraction of time spent in the following areas: administration, materials licensing & compliance, emergency response, LLW, U-mills, other. If these regulatory responsibilities are divided between offices, the table should be consolidated to include all personnel contributing to the radioactive material program. If

consultants were used to carry out the program's RAM responsibilities, include their efforts. The table heading should be:

NAME POSITION AREA OF EFFORT FTE%

2. Is the staffing level adequate to meet normal and special needs and backup? If not, explain.

3. Do you currently have vacancies? If so, when do you expect to fill them?

4. Does your state maintain the minimum staffing level of 1 person-year for each 100 specific licenses?

5. Does your staff always include a minimum of two trained professional members to provide continuous coverage for the radioactive materials program?

C. Staff Supervision (Category II)

NRC Guidelines: Supervisory personnel should be adequate to provide guidance and review the work of senior and junior personnel. Senior personnel should review applications and inspect licenses independently, monitor work of junior personnel, and participate in the establishment of policy. Junior personnel should be initially limited to reviewing license applications and inspecting small programs under close supervision.

Questions:

1. What duties are assigned to junior personnel?

2. How is their work monitored?

3. How do senior personnel participate in the development of program policy?

4. Identify your senior personnel assigned to monitor the work of junior personnel.

D. Training (Category II)

NRC Guidelines: Senior personnel should have attended NRC core courses in licensing orientation, inspection procedures, medical practices and industrial radiography practices. (For mill States, mill training should also be included.) The RCP should have a program to utilize specific short courses and workshops to maintain appropriate level of staff technical competence in areas of changing technology.

Question:

1. Prepare a table listing the year each of your technical personnel attended the following NRC training courses:

NAME	LICENSING	INSPECTION	MEDICAL	RADIOGRAPHY
Example:				
J. Oldtimer	1976	1973	1972	1979
M. Kidd	1990	-	1991	-

2. Prepare a similar table listing the year each of your technical personnel attended the following NRC training courses:

NAME	5 WK HP	WELL LOGGING	ENGINEERING	TRANS.

3. Please list the course name and year each of your staff attended any other NRC courses or workshops.

4. If any of your materials staff currently need NRC training, please identify the employees and the courses needed.

5. Other than the NRC training courses, describe training opportunities offered to your staff.

6. Explain how new employees are trained.

E. Staff Continuity (Category II)

NRC Guidelines: Staff turnover should be minimized by combinations of opportunities for training, promotions, and competitive salaries. Salary levels should be adequate to recruit and retain persons of appropriate professional qualifications. Salaries should be comparable to similar employment in the geographical area. The RCP organization structure should be such that staff turnover is minimized and program continuity maintained through opportunities for promotion. Promotion opportunities should exist from junior level to senior level or supervisory positions. There also should be opportunity for periodic salary increases compatible with experience and responsibility.

Questions:

1. Identify the technical staff who left the Agreement program during this period and, if possible, give the reasons for the turnovers.

2. Is your salary schedule adequate to recruit and retain staff?

3. If not, compare your salary schedule with similar employment alternatives in the same geographical area, such as

industrial, medical, academic employers or other State agencies.

4. What opportunities are there for promotion within the RCP organizational structure without a staff vacancy occurring?

V. LICENSING

A. Technical Quality of Licensing Actions (Category I)

NRC Guidelines: The RCP should assure that essential elements of applications have been submitted to the agency, and which meet current regulatory guidance for describing the isotopes and quantities to be used, qualifications of persons who will use material, facilities and equipment, and operating and emergency procedures sufficient to establish the basis for licensing actions. Prelicensing visits should be made for complex and major licensing actions. Licenses should be clear, complete, and accurate as to isotopes, forms, quantities, authorized uses, and permissive or restrictive conditions. The RCP should have procedures for reviewing licenses prior to renewal to assure that supporting information in the file reflects the current scope of the licensed program.

Questions:

1. Prepare a table showing the State's major licensees listing licensee name, number and type.

INCLUDE:

- o Broad Licenses
- o LLW Disposal
- o LLW Brokers (All Types)
- o Manufacturers and Distributors
- o Uranium Mills
- o Irradiators (Other than Self-Contained)
- o Nuclear Pharmacies
- o Other Licenses With a Potential Significance for Environmental Impact

The table heading should be:

Licensee Name License Number License Type

2. Identify any major, unusual or complex licenses issued or renewed in this period.

3. List the licensees (name and license number) subject to contingency plans requirements and give the status of their plans (approved, under review, etc.).

4. Discuss any variances in licensing policies and procedures or exemptions from the regulations granted during the period.

5. What criterion does the State use to determine the need for a prelicensing visit?

6. How do you ensure up-to-date information has been submitted prior to a license renewal?

C. Licensing Procedures (Category II)

NRC Guidelines: The RCP should have internal licensing guides, checklists, and policy memoranda consistent with current NRC practice. License applicants (including applicants for renewals) should be furnished copies of applicable guides and regulatory positions. The present compliance status of licensees should be considered in licensing actions. Under the NRC Exchange-of-Information program, evaluation sheets, service licenses, and licenses authorizing distribution to general licensees and persons exempt from licensing should be submitted to NRC on a timely basis. Standard license conditions comparable with current NRC standard license conditions should be used to expedite and provide uniformity in the licensing process. Files should be maintained in an orderly fashion to allow fast, accurate retrieval of information and documentation of discussions and visits.

Questions:

1. Are current NRC Regulatory Guides furnished to reviewers?

2. Other than Reg Guides, list any NRC or State review plans and model licenses used by your reviewers.

3. Are checklists used by the reviewers maintained in the files?

4. What internal licensing guides and procedures has the State developed?

5. What NRC or State licensing guides and regulatory positions are furnished to new and renewal license applicants?

6. How do reviewers determine the present compliance status of licensees when considering licensing actions?

7. For what length of time are licenses issued?

8. Explain how soon-to-expire licenses are tracked to assure either timely applications are received or procedures initiated to terminate the license.

9. What mechanism exists to assure that SS&D registrations, advisories to licensees and service licenses issued by the State are distributed to the NRC?

10. Have you developed your own standard license conditions?

11. How do you verify that your standard conditions are comparable to the current NRC conditions?

12. How is your SS&D registry kept current?

13. Describe the system used to advise licensees of pertinent changes in regulations and regulatory procedures.

14. Describe your procedures for maintaining the license files (How are files and folders arranged? Are telephone contacts and visits documented? Who is responsible for filing materials in folders?).

15. In what circumstances do license reviewers accompany inspectors?

VI. COMPLIANCE

A. Status of Inspection Program (Category I)

NRC Guidelines: The State RCP should maintain an inspection program adequate to assess licensee compliance with State regulations and license conditions. The RCP should maintain statistics which are adequate to permit Program Management to assess the status of the inspection program on a periodic basis. Information showing the number of inspections conducted, the number overdue, the length of time overdue and the priority categories should be readily available. There should be at least semiannual inspection planning for the number of inspections to be performed, assignments to senior versus. junior staff, assignments to regions, identification of special needs and periodic status reports. When backlogs occur the program should develop and implement a plan to reduce the backlog. The plan should identify priorities for inspections and establish target dates and milestones for assessing progress.

Questions:

1. Prepare a table identifying the Priority 1, 2, and 3 licenses with inspections that are overdue by more than 50% of their scheduled frequency. Include the licensee name, inspection priority, the due date, and the number of months the inspection is overdue. The list should include initial inspections that are overdue. The table heading should be:

Licensee Name	Insp. Freq. (Years)	Due Date	Months O/D

2. Describe your action plan for completing your overdue inspections. If there is a backlog of

   (1) inspections with an inspection frequency of 3 years or less that are overdue by more than 50% of their scheduled frequency , or

   (2) inspections with lower inspection frequencies that are overdue by more than 100% of their scheduled frequency,

   please include with the questionnaire a written action plan for eliminating the backlog.

   The written action plan should contain inspection priorities, numerical and time frame goals for reducing the backlog, provide a method to measure the program's progress, and provide for management review of the program's success in meeting the goals.

3. How many on-site close-out inspections prior to license termination were made during the reporting period?

4. How many on-site close-out inspections are pending at this time?

5. How many reciprocity notices were received in the reporting period?

6. How many reciprocity inspections were conducted?

7. Other than reciprocity licensees, how many field inspections of radiographers were performed?

8. What percentage is this of your total number of radiographer licensees?

9. How is statistical information about the inspection program maintained?

10. Project the total number of inspections needed to be done annually to meet your inspection priorities.

11. Project the number of inspections per inspector required per month and per year in order to avoid backlogs.

12. How are inspection schedules planned, how are the dates and personnel assignments made, and how frequently are the plans updated?

13. How are initial inspections identified when they become overdue?

14. Describe your inspection priorities for inspecting terminating licenses.

B. Inspection Frequency (Category I)

NRC Guidelines: The RCP should establish an inspection priority system. The specific frequency of inspections should be based upon the potential hazards of licensed operations, e.g., major processors, broad licensees, and industrial radiographers should be inspected approximately annually -- smaller or less hazardous operations may be inspected less frequently. The minimum inspection frequency including for initial inspections should be no less than the NRC system.

Questions:

1. Identify individual licensees or groups of licensees the State is inspecting more frequently than called for in the State's inspection priority system and discuss the reason for the change.

2. How are inspection priorities assigned to licenses, and where are they recorded?

3. Discuss any variances in the State's priorities from the NRC priority system and the reasons for the variances.

4. Describe the State's policy for unannounced inspections and exceptions to the policy.

5. Describe the State's policy for conducting follow-up inspections.

C. Inspector's Performance and Capability (Category I)

NRC Guidelines: Inspectors should be competent to evaluate health and safety problems and to determine compliance with State regulations. Inspectors must demonstrate to supervision an understanding of regulations, inspection guides, and policies prior to independently conducting inspections. The compliance supervisor (may be RCP manager) should conduct annual field evaluations of each inspector to assess performance and assure application of appropriate and consistent policies and guides.

Questions:

1. Prepare a table showing the number and types of supervisory accompaniments made during the reporting period. Include:

   Supervisor Inspector License Category Date

2. Were all inspectors accompanied at least annually by the compliance supervisor during the reporting period? If not, explain.

3. How do new inspectors become qualified to conduct independent inspections?

D. Responses to Incidents and Alleged Incidents (Category I)

NRC Guidelines: Inquiries should be promptly made to evaluate the need for on-site investigations. On-site investigations should be promptly made of incidents requiring reporting to the Agency in less than 30 days (10 CFR 20.403 types). For those incidents not requiring reporting to the Agency in less than 30 days, investigations should be made during the next scheduled inspection. On-site investigations should be promptly made of non-reportable incidents which may be of significant public interest and concern, e.g. transportation accidents. Investigations should include in-depth reviews of circumstances and should be completed on a high priority basis. When appropriate, investigations should include reenactments and time-study measurements (normally within a few days). Investigation (or inspection) results should be documented and enforcement action taken when appropriate. State licensees and the NRC should be notified of pertinent information about any incident which could be relevant to other licensed operations (e.g., equipment failure, improper operating procedures). Information on incidents involving failure of equipment should be provided to the agency responsible for evaluation of the device for an assessment of possible generic design deficiency. The RCP should have access to medical consultants when needed to diagnose or treat radiation injuries. The RCP should use other technical consultants for special problems when needed.

Questions:

1. In this reporting period, did any incidents occur that involved equipment or source failure or approved operating procedures that were deficient? If so,

   a. How and when were other State licensees who might be affected notified?

   b. Was the NRC notified?

2. For incidents involving failure of equipment or sources, was information on the incident provided to the agency responsible for evaluation of the device for an assessment of possible generic design deficiency? Please provide details for each case.

3. If the RCP utilized medical or technical consultants for an emergency during the reporting period, please describe the circumstances for each case.

4. In the reporting period, were there any cases involving possible criminal wrongdoing that were looked into or are presently undergoing review? If so, please describe the circumstances for each case.

5. What criteria is used to determine the need and response time for on-site inspections of reported incidents?

6. Are there written procedures for looking into allegations or other reports of possible wrong doing by licensees, for example,

   a. Protecting the identity of allegers or persons requesting that their identities not be made available for public disclosure?

   b. Obtaining documentation (e.g., signed statements, copies of records)?

   c. Obtaining the services of persons with specialized training and experience such as conducting and documenting formal interviews?

   d. Obtaining necessary legal counsel for inquires into wrong doing?

   e. Guidance for staff when allegations or inspections disclose the possibility of willful violations of regulatory requirements or other evidence of criminal wrong doing?

E. Enforcement Procedures (Category I)

NRC Guidelines: Enforcement Procedures should be sufficient to provide a substantial deterrent to licensee noncompliance with regulatory requirements. Provisions for the levying of monetary penalties are recommended. Enforcement letters should be issued within 30 days following inspections and should employ appropriate regulatory language clearly specifying all items of noncompliance and health and safety matters identified during the inspection and referencing the appropriate regulation or license condition being violated. Enforcement letters should specify the time period for the licensee to respond indicating corrective actions and actions taken to prevent recurrence (normally 20-30 days). The inspector and compliance supervisor should review licensee responses.

Licensee responses to enforcement letters should be promptly acknowledged as to adequacy and resolution of previously unresolved items. Written procedures should exist for handling escalated enforcement cases of varying degrees. Impounding of material should be in accordance with State administrative procedures. Opportunity for hearings should be provided to assure impartial administration of the radiation control program.

Questions:

1. If during the reporting period the State issued orders, applied civil penalties, sought criminal penalties, impounded sources, or held formal enforcement hearings, identify these cases and give a brief summary of the circumstances and results for each case.

2. What enforcement measures are available to the State to provide a deterrent to licensee noncompliance with regulations or license provisions?

3. Are there written procedures establishing severity levels for violators?

4. Are there written procedures for escalated enforcement?

5. If the RCP can apply civil penalties, have procedures been established to determine when they apply and the amounts?

6. Describe the State's provisions for criminal penalties.

7. Are enforcement letters issued within 30 days following inspections?

NRC-Regulated State Questionnaire

This appendix contains selected parts of an annual assessment used to evaluate NRC-regulated state programs.

NMSS 1990 REGIONAL QUESTIONNAIRE

This questionnaire is for the purpose of obtaining information about regional NMSS licensing and inspection activities. The space provided is not adequate for responding to the questions, so we ask that you provide separate sheets for each question and response. Include as part of the response a copy of any pertinent written internal procedure which you have developed and have in place. We ask you to transmit one copy of the responses to John Hickey at least ten days before the visit.

1. Using the current version of your regional staffing plan related to the NMSS program, specify the approximate percentage of time that each individual spends on the following activities: fuel cycle licensing, fuel cycle inspection, materials licensing, materials inspection, safeguards activities, and inspections of decommissioned facilities and reactors.

2. Provide a summary of actual expenditures and accomplishments as compared to operating plan/budgeted expenditures and accomplishments, for FY89 and FY90 to date.

3. Are there any changes needed in the estimate of workload projection (licensing actions and inspections conducted) for the current fiscal year? If so, please provide your suggested changes with justification. Are there any foreseeable barriers to completing inspection modules in accordance with Manual Chapters 2600 and 2800?

4. Are regional administrative support functions performed in a timely manner? Are changes needed in the manner in which these support functions are performed? If so, please be prepared to discuss the changes needed which would result in optimal administrative support for the programs.

5. Please provide your comments on the programs for interaction of Headquarters with your Region. Please include your comments on the usefulness of the conference calls, licensing workshops, executive management seminars, inspection accompaniments, telephone calls on case reviews, technical assistance provided on a day-to-day basis, standard review plans, guides, etc. Include in your comments your suggestions and recommendations for modifications, changes, improvements, etc., in the interaction programs.

6. Summarize regional initiatives to improve the quality of inspections and license reviews, particularly those aimed toward preventing licensee safety problems, or those aimed at licensees performing their transportation activities in a safe manner.

7. Summarize the total number of inspections of transportation activities at MC 2800 program licensed facilities, including average staff hours per inspection and brief summary of most typically observed violations, including any escalated enforcement actions. (Procedure 86740). Summarize the number of referrals (from Regions II and V) which were processed by your region regarding enforcement action against licensee shippers in your region who made errant shipments to either of the three commercial low level waste burial sites. Summarize the completion status of the annual inspections of transportation activities at MC 2600 licensed fuel facilities and a brief summary of findings. Describe whether transportation activities were included on any of the major team inspections of fuel facilities. Summarize the completion status of inspections of transportation activities at MC 2500 (2515 & 2545) licensed reactor facilities. (MC procedures 86721, 86740, or 83750). Please provide your evaluation of whether Core Inspection Procedure 83750 has been adequate in providing sufficient effort in the inspection of transportation activities. If possible, please provide a summary of the staff hours expended on transportation as a percent of the staff hours expended against Procedure 83750.

8. Provide a training summary for each inspector and reviewer in tabular form.

   a. For each inspector, state which courses listed in Manual Chapter 1245 have been completed, when oral boards were completed, what types of inspections the inspector is certified for, and which courses were waived and the reason.

   b. For each license reviewer, state which courses listed in Manual Chapter 1245 have been completed, and which types of licenses the reviewer is authorized to sign.

OE INPUT INTO NMSS NATIONAL PROGRAM REVIEW PROCESS

1. What types and frequency of training is conducted by the regions in enforcement matters? Training for new employees and regional personnel? How is enforcement guidance/instructions given out to regional personnel? Has training been given especially on repetitive violations, enforcement discretion under V.G.1 and Severity Level V violation?

2. Are repetitive violations being identified?
   a) to licensee during close out
   b) to section chief during discussion of inspectors findings?

3. How are repetitive violations being documented?
   a) Is there a paragraph in cover letter
      1. Standard boiler plate paragraph option in preparing?

   b) Are they identified in NOV as repeats

   c) If other violations, is an enforcement conference held? Safety significance?

4. When a violation is repeated a third time, what action should be taken?

5. Have inspectors had cases of repeat violations in inspections since new guidance issued by OE?

6. How have inspectors exercised discretion under V.G.1 during inspections of licensees?

7. When and for what types of violations are 591's being used?

8. How are repetitive violations, non-cited violations, and open items tracked?

9. If there is a tracking system, do inspectors preview output prior to inspection and closeout old violations and flag repeats?

10. Could OE have copy of tracking system output of example license?

11. Who does audit on tracking systems to assure input by?

12. How many Severity Level IV and V violations were disputed by the licensee during the current FY?

13. How many Severity Level IV and V violations were withdrawn during the current FY?

14. Do the regions perform internal audits, other than the normal concurrence process, of inspection reports and Severity Level IV and V violations?

History of Abnormal Occurrences

Table VII.1: Abnormal Occurrences Reported to the Congress (Jan. 1, 1986, through Dec. 31, 1990)

Program	Medical	Radiography	Other	Total	Repeats
NRC-regulated states	48[a]	9	12	69	5
Agreement states	10	10	2	22	2
Total	**58**	**19**	**14**	**91**	**7**

[a]There were eight additional medically related abnormal occurrences reported during this period. Because they were at federal facilities, which only NRC regulates, they were deleted from this table to make the numbers comparable between the NRC-regulated states and the agreement states.

Repeat Violations

U.S. Testing Company, Inc., UNITECH Services Group, San Leandro, California; Radiographer (Abnormal Occurrence Report Numbers AS 87-1 and 87-13)

On February 17, 1987, the Arizona Radiation Regulatory Agency ordered the firm to cease all radiography work in Arizona. Two workers had received exposures in excess of regulatory limits. The Arizona agency found on inspection that the radiographers were not properly trained. (In this case only one abnormal occurrence (AO) was prepared, even though two radiographers were overexposed.)

On June 17, 1987, NRC issued an order for the firm to cease operations until several corrective actions were taken. Inspectors identified numerous safety violations, including (1) permitting individuals to perform radiography after failing one or more certification examinations, (2) allowing individuals to perform radiography before all training and examinations were complete, and (3) allowing individuals with expired certificates to perform radiography.

Cleveland Clinic Foundation, Cleveland, Ohio; Medical Therapeutic Misadministration (AO 86-24 and 90-5)

Between October 6 and 8, 1986, a patient received a series of therapeutic exposures that resulted in a radiation dose of about 67 percent more than was prescribed.

On February 15, 1990, a patient received 50 percent more cobolt-60 radiation than was prescribed. This case was unique—the patient seemed to improve after the misadministration.

Washington Hospital Center, Washington, D.C.; Medical Therapeutic Misadministration (AO 86-4 and 90-6)

On February 7, 1986, the wrong patient received a cobalt-60 teletherapy treatment of 150 rads to the abdomen.

On February 16, 1990, the wrong patient received 45 rem to the lungs.

University of Cincinnati Medical Center; Medical Therapeutic Misadministration (AO 86-19 and 90-21)

In late 1984 a high-activity I-125 source leaked, causing 2,087 rad to be delivered to the patient's thyroid. This was not initially submitted as an AO but was later reevaluated when AO criteria changed.

In August 1990, 86 I-125 seeds (small sources) were improperly located when implanted in the patient. The 16,000 rads prescribed for the prostate was absorbed by other tissue about 3 inches from the desired spot. The seeds were relocated to the proper location and, according to the attending physician, there were no adverse health effects.

Abbott Northwestern Hospital, Minneapolis, Minnesota; Medical Therapeutic Misadministration (AO 89-3 and 89-9)

On January 23, 1989, a patient received 250 rad to the left femur, instead of the right femur. The technician had marked the wrong leg. This was the first of 12 treatments, and the patient was judged to not have any problems as a result.

On May 23, 1989, a patient received the wrong radiopharmaceutical—Iodine-131 instead of Iodine-123.

Sacred Heart Hospital, Cumberland, Md.; Medical Therapeutic Misadministration (AO AS 88-5 and AS 88-6)

Between August 8 and 26, 1988, a patient received 1,400 rad to the wrong part of the body.

Between September 1987 and October 1988, 33 "terminal" patients received doses 75 percent greater than prescribed, because of the technician's failure to reprogram the computer to reflect a different source.

St. Mary's Medical Center, Gary and Hobart, Indiana; Medical Therapeutic Misadministration and Poor Management Controls (AO 90-10 and 90-11)

On March 19, 1990, a patient received a therapy dose of 250 rems to the wrong part of his spine.

On March 28, 1990, NRC received allegations about treatments at St. Mary's and another hospital, because the same doctor was involved. NRC concluded that the hospitals did not keep adequate records on patient treatment plans.

Abnormal Occurrences at Federal Facilities

Eight abnormal occurrences were reported at federal facilities, regulated by NRC.

Tripler Army Hospital, Hawaii; Medical Therapeutic Misadministration (AO 86-14 and 90-14)

On June 17, 1986, a patient received about 62 times the prescribed dose.

On June 19, 1990, a patient received the correct prescribed dose. Unfortunately, the technician failed to ask if the woman was breastfeeding her infant child. The child was estimated to receive a thyroid dose of about 30,000 rad, causing the thyroid to lose its function. The child will require thyroid hormone supplements for life, to permit normal growth and development.

This was the only federal facility that had repeat violations.

VA Hospital, Boise, Idaho (AO 87-6)

On April 1, 1987, a patient received the wrong radiopharmaceutical.

VA Hospital, Hines, Illinois (AO 87-17)

Hospital management was cited for failing to report two misadministrations as required, making false statements, destroying evidence, and attempting to influence the testimony of a witness.

VA Hospital, Albuquerque, New Mexico (AO 88-4)

On November 23, 1987, a patient was given the wrong radiopharmaceutical.

VA Hospital, Los Angeles, California (AO 88-11)

On June 9, 1988, a patient received a dose of technetium-99m which was 1,000 times the prescribed dose. This is a short half-life material, and the attending physician did not anticipate adverse health effects.

VA Hospital, San Diego, California (AO 90-25)

On November 26, 1990, a patient received the wrong nuclear medicine—technetium 99m rather than the prescribed indium-111.

National Institutes of Health, Bethesda, Maryland (AO 87-11)

On June 3, 1987, a patient was given an incorrect radiopharmaceutical. There was no adverse effect to the patient, according to the attending physician.

Major Contributors to This Report

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