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

CHAIRMAN

April 15, 2002

The Honorable Edward J. Markey
United States House of Representatives
Washington, D.C. 20515-2107

Dear Congressman Markey:

I am responding on behalf of the Nuclear Regulatory Commission (NRC) to your letter of December 4, 2001, concerning the NRC policies and procedures for the protection of nuclear materials from theft or diversion. As discussed in earlier correspondence, the recent terrorist attacks have focused attention on the need to review policies and practices related to safeguards and physical security measures for civilian nuclear facilities.

The questions you raised were in three areas: (1) the missing fuel rods from the Millstone Unit 1 spent fuel pool; (2) the U.S. Department of Energy, Office of Inspector General, audit report on accounting for government-owned nuclear material; and (3) the risk of terrorist attacks involving radioactive sources. Rather than summarize the answers here, I refer you to the enclosure, which provides detailed answers to each of your questions. Answers to questions you raised in your earlier letters, dated November 15, 19, and 27, 2001, were provided in separate correspondence. Because NRC's review of policies and practices is ongoing, the enclosed answers to your questions are founded on the information that is available at this time.

If you have further comments or questions, please contact me. The Commission will release this letter publicly upon confirmation of receipt of the letter by your office or within 5 days, whichever is sooner.

Sincerely,

Richard A. Meserve

Enclosure: Responses to Questions

RESPONSE TO QUESTIONS

Enclosure

Questions about the Disappearance of Two Spent Fuel Rods from the Millstone Unit 1 Spent Fuel Pool

Question 1: Your February 1, 2001, letter stated that in accordance with 10 CFR 70.51(c), "a power reactor licensee is required to establish, maintain and follow written material control and accounting procedures that are sufficient to enable the licensee to account for the special nuclear material (SNM) in its possession." In light of the fact that Northeast Utilities apparently has been unable to account for the whereabouts of these two missing fuel rods for more than 20 years, and only uncovered the loss of these fuel rods during document review carried out in connection with the decommissioning of Unit 1, do you believe that the licensee has complied with this requirement? Why or why not?

Answer:

As described in the attached inspection report, the U.S. Nuclear Regulatory Commission has identified two apparent violations of NRC requirements: 1) failure to maintain special nuclear material control and accountability in accordance with 10 CFR 70.51 and 2) failure to report in a timely manner missing licensed material in accordance with 10 CFR 20.2201(a)(ii). These apparent violations are being considered for escalated enforcement in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG 1600. Additional violations for other reporting, transportation, or disposal requirements discussed in your letter have been determined to be the consequence of loss of control of the fuel pins. Therefore, consistent with past practice, the NRC is considering escalated enforcement only for the principal violations identified.

Before making a final enforcement decision, the NRC afforded the licensee an opportunity to respond to the apparent violations in writing or to request an open predecisional enforcement conference. The licensee submitted a response in writing on March 28, 2002, and the NRC staff is currently evaluating that response. Accordingly, no final enforcement decision has been made.

The maximum daily civil penalties authorized for imposition by the Atomic Energy Act may be considered. However, the determination of the final amount of any proposed civil penalty will be based on the significance of the violations, the surrounding circumstances, and past precedents.

Question 2: Your February 1, 2001, letter also states that "in accordance with 10 CFR 70.51(d), a power reactor licensee is required to conduct a physical inventory of all SNM in its possession at intervals not to exceed 12 months." Given the fact that the two fuel rods apparently were not identified as missing in any physical inventory conducted by Northeast Utilities for over 20 years and were not identified as missing until document reviews conducted in connection with the decommissioning of Millstone Unit I in 2000, do you believe that Northeast Utilities has complied with this requirement? Why or why not?

Answer:

Please see the answer to Question 1.

Question 3: Your letter states that "in accordance with 10 CFR 70.54(a) and 74.15(a), the licensee must submit a Nuclear Material Transaction Report to the Nuclear Material Management and Safeguards System (NMMSS), operated for both NRC and the Department of Energy, every time its facility transfers (or receives) SNM." Given the fact that the FRAP report's review suggests that the fuel rods may have been transferred to facilities in California, Washington, or South Carolina, do you believe that the Northeast Utilities' reporting of transfers of SNM have been compliant with this regulation? Why or why not?

Answer:

Please see the answer to Question 1.

Question 4: Your letter also states that "in accordance with 10 CFR 70.53(a)(1) and 74.13(a)(1), "at least twice a year, the licensee must submit material balance reports concerning SNM received, produced, possessed, transferred, consumed, disposed of, or lost, and an inventory compensation report to NMMSS." Given the fact that these two fuel rods were unaccounted for 20 years and have still not been found, do you believe that Northeast Utilities has complied with this regulation? Why or why not?

Answer:

Please see the answer to Question 1.

Question 5: Your letter also states that there are penalties for transporting of or disposing of materials improperly, based on the circumstances of each case. What penalties have been imposed in this case? What findings preceded those penalties? If no penalties have been imposed, please explain.

Answer:

Please see the answer to Question 1.

Question 6: In your February 1, 2001 letter, you stated that a variety of civil and criminal penalties can be imposed for violations of Commission regulations, including fines of up to $100,000 per day prior to 1986 and fines of up to $110,000 beginning in 1986. If all of the aforementioned applicable regulations cited in your letter of February 1, 2001, were violated by the licensee in this instance, what would be the maximum civil monetary penalty, assuming full application of the $100,000-110,000 per day civil penalty mentioned in your letter?

Answer:

Please see the answer to Question 1.

Question 7: Your letter indicates that violations of NRC regulations are subject to both civil enforcement actions and criminal penalties and that the NRC staff was still investigating this matter. You further indicate that "when complete, we will apply the Enforcement Policy to determine the appropriate enforcement action." Have you made any determination with respect to what enforcement action the NRC plans to take with respect to this matter? If so, what did you decide? If not, when will you complete your determination?

Answer:

Please see the answer to Question 1.

Question 8: Your letter states that "The NRC staff notes.. that any civil sanction may be limited by the statute of limitations; 28 U.S.C. § 2462, 'Time for commencing proceedings,' which is applicable to the NRC as well as other government agencies." As you know, this statute provides that "Except as otherwise provided by Act of Congress, an action, suit or proceeding for the enforcement of any civil fine, penalty, or forfeiture, pecuniary or otherwise, shall not be entertained unless commenced within five years from the date when the claim first accrued if, within the same period, the offender or the property is found within the United States, in order that proper service may be made thereon."

Question 8(a): In the case of violations which were not revealed to the Commission for twenty years, when does the government's claim "first accrue" - on the date the violation first occurred or the date when it was first reported to or discovered by the Commission? In your response, please provide the appropriate citations of the case law relating to this specific matter.

Answer:

Consistent with judicial precedent, NRC has, as a general matter, interpreted 28 U.S.C. § 2462 to provide that a claim first accrues on the date of the violation, not when the Agency discovered or reasonably should have discovered the violation. *See, e.g. United States v. Core Laboratories*, 759 F. 2d 480,482 (5th Cir. 1985) and cases cited therein; *3M Company v. Browner*, 17 F. 3d 1453, 1460-63 (D.C. Cir. 1994). Similarly, the legislative history of Section 234 of the Atomic Energy Act indicates that the Department of Justice construed 28 U.S.C. § 2462 as running from the time the violation occurs. Richard Kliendienst, then Deputy Attorney General, stated in a letter to Representative Chet Holifield, Chairman of the Joint Committee on Atomic Energy, that: "We also believe that a 5-year limitation period running from the time of the violation is preferable to a 1-year limitation period running from the date of notification. Since the 5-year statute of limitations under 28 U.S.C. § 2462 is applicable to all civil penalties except where the governing statute provides otherwise, it appears preferable to have the proposed legislation silent on this point." Atomic Energy Commission Omnibus Legislation: Hearing before the Joint Committee on Atomic Energy, 91st Cong., 1st Sess., 5 (1969).

When a licensee fraudulently conceals a violation, the statute of limitations is tolled. The doctrine of equitable tolling because of fraudulent concealment is read into every Federal statute of limitations. *See Holmberg v. Armbracht*, 327 U.S. 392, 397 (1946). For NRC to employ this doctrine, three elements must be satisfied: (1) wrongful concealment of actions by the licensee; (2) failure of NRC to discover operative facts that are the basis of the cause of action within the limitations period; and (3) NRC's due diligence until discovery of the facts. *United States v. Firestone Tire & Rubber Co.*, 518 F. Supp. 1021, 1036 (N.D. Ohio E.D.1981). With respect to the Millstone 1 missing fuel pins there is no evidence to suggest that the licensee fraudulently concealed a violation.

Question 8(b): If the licensee's violations continued over a period of 20 years (since they failed to report the missing materials despite regular reporting requirements), how does this affect the applicable statute of limitations?

Answer:

With respect to continuing violations, under 28 U.S.C. § 2462, absent concealment, the claim first accrues when the course of conduct ceases. *See Newell Recycling Co. v. U.S. EPA*, 231 F. 3d 204, 206 (5th Cir. 2000). Because each day of the violation is a separate violation for purposes of computing a civil penalty pursuant to Section 234a. of the Atomic Energy Act, 42 U.S.C. § 2282, NRC could issue civil penalties for as far back as the limitations period, or 5 years, for a continuing violation.

One court has held, with respect to a continuing violation of the Consumer Protection Act, that where the violation consisted of a continuing failure to immediately report a product defect, the 28 U.S.C. § 2462 statute of limitations did not start running at the time of the failure to report, but when the report was actually filed, or when the manufacturer had actual knowledge that the regulator was adequately informed. *United States v. Advance Machine Co.*, 547 F. Supp. 1085, 1091 (D. Minn. 1982).

Question 8(c): Does the Commission believe that a lengthier statute of limitations might be needed to be added to the Atomic Energy Act, inasmuch as 28 U.S.C. § 2462 explicitly provides that such a longer statute shall apply if Congress has chosen to enact one? If not, can't a licensee simply avoid the imposition of civil penalties by concealing or failing to reveal a violation for five years?

Answer:

When a licensee fraudulently conceals a violation, the statute of limitation is tolled. *See* Answer to Question 8(a), *supra.* In addition, as noted above, with respect to a continuing violation of the Consumer Protection Act, one court has held that where the violation consisted of a continuing failure to immediately report a defect, the 28 U.S.C. § 2462 statute of limitations did not start running at the time of the failure to report, but when the report was actually filed (or the regulatee knew that the agency was adequately informed). *United States v. Advance Machine Co.*, 547 F. Supp. 1085, 1091 (D. Minn. 1982).

Accordingly, there appears to be no need to extend the 5-year statute of limitations to permit enforcement action for fraudulently concealed violations or for failures to report a violation.

Question 9: In your February 1, 2001 letter, you stated that "following the completion of the NRC's inquiry [into the Millstone matter], we will consider whether industry-wide generic action is warranted." In light of what you now know, and in light of both the events of September 11 and the International Atomic Energy Agency's recent warning regarding heightened risks of theft or diversion of radioactive materials, do you believe that industry-wide generic action is warranted, to assure that other licensees review its inventories of nuclear materials to determine if other discrepancies exist? Why or why not?

Answer:

The NRC inquiry (i.e., inspection) into this matter has been completed and the inspection report was issued on February 27, 2002 (attached). The findings of the inspection report and other recommendations will be considered by the Commission in light of recent events, and following that assessment a decision will be made as to any generic actions to be imposed on licensees.

Question 10: In your February 1, 2001 letter, you say "The NRC staff is still investigating why the Millstone 1 anomaly was not identified in 1980 or in later years by the licensee or NMMS[S]. Based on the results of our investigation, we may elect to require additional actions at other facilities."

Question 10(a): Has the NRC staff reached any conclusions regarding why the two missing fuel rods were not discovered by the licensee or NMMS[S]? If so, what did you conclude? If not, when will you complete consideration of this matter?

Answer:

The NRC inspection report (attached) determined that the loss of accountability of the two spent fuel rods from assembly MS-557 occurred because of several instances in which personnel failed to follow the material control and accounting procedures in place at the time and because of inadequacies of the procedures themselves. Further details on the licensee's lack of discovery are in Section 2.2 b of the report.

It appears that Millstone did not intentionally transfer the rods (if they were transferred at all) to another site (GE-Vallecitos, Barnwell, or Hanford). Consequently, Millstone did not provide the Nuclear Materials Management and Safeguards System (NMMSS) with documentation of the transfer. Therefore, NMMSS has no record of the lost fuel rods being transferred to another facility. In semi-annual reports of inventory submitted to NMMSS, Millstone has carried and continues to carry the missing rods as part of the inventory of the fuel assembly from which they were removed. In recent reports of inventory to NMMSS, Millstone has included a concise note stating that the inventory number may be overstated because it includes two rods whose locations are unknown.

Question 10(b): Was this just an isolated incident, or evidence of a more widespread phenomenon?

Answer:

NRC has no evidence of a more widespread phenomenon of this type of incident occurring within the nuclear power industry. The findings of the inspection report and other recommendations will be forwarded to the Commission for consideration of generic actions.

Question 10(c): If the NMMS[S] was unable to identify shipper-receiver differences or inventory differences in this case, does that suggest fundamental problems with the Nuclear Material Accounting Database? If so, what changes will you propose to correct these deficiencies?

Answer:

The NMMSS is used to identify discrepancies in the records supplied by the shipper and receiver for transferred special nuclear material (SNM). It appears that Millstone did not knowingly ship the fuel rods offsite and therefore did not report any such shipment to NMMSS. The low-level waste sites at Barnwell and Hanford do not perform inspection verifications of the SNM contents of shipments they receive, because of radiation exposure concerns, and would not have been aware if they had received the fuel rods in a shipment that was not itemized to have included SNM. If they had become aware that the shipment contained SNM before burial, they would have resolved the issue at that time. The NRC inspection and the licensee's investigation did not identify any records at GE Vallecitos to indicate receipt of the fuel rods. The NMMSS system is not intended or designed to identify an occurrence in which fuel rods were apparently shipped unknowingly. Because the NMMSS functioned as designed, this occurrence does not indicate a problem with the data base.

Question 10(d): Have you elected to require any additional actions at other facilities as a result of your investigations? If so, please describe them. If not, why not?

Answer:

NRC has not yet decided if any additional actions are warranted at other facilities. The final report for the Millstone inspection was issued February 27, 2002 (attached). The results of that inspection and other recommendations for possible generic actions will be forwarded to the Commission for consideration.

Question 11: An October 5, 2001 NRC press release reports that "The Nuclear Regulatory Commission staff is sending a team to Millstone Unit I to evaluate the comprehensiveness of Northeast Utilities' investigation into the circumstances surrounding the loss of two fuel rods. The NRC team will arrive at the Millstone plant, in Waterford, Conn., on Tuesday. The four-member team will spend about two weeks on site and also will evaluate the company's root-cause analysis." The press release indicates that an inspection report will be submitted within 30 days of the completion of the inspection. Please provide me with a copy of this report.

Answer:

Because of delays in licensee production of the root-cause report, and extensive follow-up efforts by the NRC inspection team, such as interviews with GE Vallecitos personnel, the inspection did not conclude until December 21, 2001, with a public exit meeting held with the licensee on January 15, 2002. The Millstone inspection report was issued February 27, 2002, and a copy is attached.

Question 12: In your February 1, 2001 letter, you indicated that both the Richland, Washington, and Barnwell, South Carolina, facilities "could retrieve waste, if necessary, because of the existence of records for the location of specific disposals." You also indicated that "because the fuel rods remain highly radioactive longer than low-level radioactive waste, there is a potential for higher doses to possible intruders after the Part 61 controls [which rely on 100 years of active institutional controls, government land ownership, and engineered barriers] are no longer in effect."

Question 12(a): If you determine that the spent fuel rods may be located at the South Carolina or Washington sites, will you order retrieval of these materials? If so, how will this be done? If not, why not?

Answer:

It is premature for NRC to determine whether retrieval of the rods will be needed. NRC is currently working with the States of Washington and South Carolina, and the Millstone plant licensee to identify and assess the environmental and health and safety impacts associated with retrieval and with leaving the rods in place. Because of the radiological controls in place at any of the possible locations of the missing rods, the NRC believes that there is no current threat to public health.

Question 12(b): Why don't the records at Washington and South Carolina clearly indicate whether or not the fuel rods were disposed of there? Doesn't this indicate a more widespread problem with the record-keeping system? If so, what will you do to ensure that the problem is corrected? If not, why not?

Answer:

The records do not clearly indicate the disposal of the spent fuel rods because, if the fuel rods were shipped to either disposal site, the licensee has indicated that the shipment was inadvertent and the contents were misidentified. Thus, the disposal records would not have shown spent fuel. One possible explanation for the licensee's misidentification of the fuel rods is that the fuel rods may have been mistaken for local power range monitors, which are authorized for disposal at low-level waste facilities. The local power range monitors are very similar in appearance to the fuel rods, but are not spent fuel.

Question 12(c): If retrieval of the materials is not undertaken, will you extend the Part 61 controls beyond the 100-year period currently in the regulation in order to protect against exposure to possible intruders? If such controls are not extended, isn't there a potential threat to public health, safety and the environment?

Answer:

NRC, the States of Washington and South Carolina, and the licensee, are evaluating the potential environmental and health and safety impacts of disposal of the two missing fuel rods at either of the low-level waste sites. The licensee (Dominion) has submitted a safety analysis of the disposal of the fuel rods at Barnwell or Hanford, which concluded that the presence of the rods would not pose an increased risk to the public, workers, or the environment. A copy of this report is enclosed. NRC and the States of Washington and South Carolina are reviewing this report and have submitted comments and questions for Dominion to address. After Dominion addresses these comments and questions, NRC and the States will make a determination on how to proceed. It is premature to speculate what, if any, additional long-term controls might be needed if retrieval of the material is not undertaken.

Question 12(d): You said in your letter that another potential hazard would be potential migration of radionuclides into the groundwater that would eventually expose members of the public to radiation. You also said that the severity of the hazard would depend on factors such as the specific radionuclides in the waste and site-specific characteristics, such as how fast the groundwater moves. What is the nature of the hazard, based on the amounts of plutonium and uranium in the two spent fuel rods and the movement of groundwater at the South Carolina and Richland sites?

Answer:

Results from the ongoing environmental monitoring and radiation protection programs at the sites have demonstrated that there is no significant risk to the public or workers at this time from operations at each site. As noted in the response to the previous question, the licensee (Dominion) has prepared a safety analysis of the disposal of the fuel rods at Barnwell or Hanford (i.e., Richland) which concluded that the presence of the rods would not pose an increased risk to the public, workers, or the environment. NRC and the States of Washington and South Carolina are reviewing this report and have submitted comments and questions for Dominion to address. After Dominion addresses these comments, NRC and the States will make a final determination on this matter.

Question 13: In your February 1, 2001 letter, you said that it is unlikely that the two spent fuel rods were stolen, because "The very high radiation level of the material makes theft difficult, dangerous, and very unlikely" and "amount and chemical form of the fissile material contained in the two spent fuel rods make it unlikely, in our judgment, that the rods could be used to assist in the manufacture of a weapon." The FARC report reached similar conclusions. However, the September 11th terror attacks have demonstrated that terrorists may be willing to commit suicide in order to cause harm to America, and may be willing to devote many years to the planning and execution of such an attack.

Question 13(a): In light of the events of September 11th, have you re-evaluated the possibility that the fuel rods may have been stolen or diverted?

Answer:

The events of September 11th have not provided any information that would change our assessment that the fuel rods were not stolen. The licensee's investigation found no evidence to indicate the fuel rods may have been stolen. The NRC inspection team reviewed the licensee's analysis of this scenario and agreed with the licensee's conclusion. The very high radiation level of the material (contact radiation level of approximately 1600 R/hr in 1980) would have made theft difficult, dangerous, and highly unlikely.

Question 13(b): Isn't it possible that rather than trying to use the fissile material from these weapons for a nuclear explosive device or weapon, terrorists might want to use it for a crude radiological weapon, or "dirty bomb" aimed at dispersing radioactive materials in a populated area?

Answer:

As stated in the reply to the previous question, NRC has no indication that the Millstone fuel rods were stolen from the site, the low-level waste sites, or the GE fuel facility in Vallecitos, CA. Therefore, there is no evidence that the Millstone fuel rods could be used for a radiological dispersal device.

Question 13(c): What would be the worst-case public health, safety, and environmental consequences of detonation of a "dirty bomb" fabricated from the two Millstone spent fuel rods?

Answer:

As noted in the attached inspection report, NRC concurs with the licensee that missing fuel rods are most likely in a licensed low-level waste disposal facility. However in the unlikely event that fuel rods could be stolen, because of the physical configuration of the fuel rods, it would be difficult to construct a radiological dispersion device (i.e., "dirty bomb") using this source of radioactivity. If such a device were constructed, the impact to public health, safety, and the environment from its detonation would depend on the amount of explosives used, the location of the detonation, and a large number of physical and environmental variables. Acute fatalities, from radiation exposure, could occur among those people in close proximity to the blast. However, more people might be killed by the shrapnel caused by the conventional explosive than by radiation exposure. Depending on the location and the amount of explosive used, contamination could be spread over a large area, resulting in extensive contamination and the possibility of exposures exceeding the NRC regulatory annual limit for members of the public (100 millirem). Exposures in excess of public dose limits do not imply that either prompt or latent health consequences would be observed.

Questions on the October 26, 2001, U.S. Department of Energy Inspector General Report on Accounting for Government-Owned Nuclear Materials Provided to Non-Department Domestic Facilities

The October 26, 2001 report found that U.S. Department of Energy (DOE) inventories indicated that "significant quantities of Government-owned special nuclear material were held by at least two NRC licensees despite the fact that the facilities no longer existed." In the first instance, the special nuclear material involved was a significant quantity of plutonium that was reported to be stored at an NRC facility as of September 2000, even though NRC did not believe it had held plutonium since 1996. In the second instance, DOE records indicated that a significant quantity of Government-owned plutonium was held at a plant whose NRC license terminated in 1993 and at which no materials were known to be stored. According to the report, NRC officials were unable to explain the discrepancies.

Question 1: In each of these cases, what has NRC done to resolve the discrepancy?

Answer:

The system that the DOE Office of Inspector General (OIG) audited is the Nuclear Material Management and Safeguards System (NMMSS). NMMSS is the data base used jointly by DOE and NRC for tracking certain nuclear materials. NRC is reviewing records to assist DOE in resolving the discrepancies for the two facilities that no longer exist and for which NMMSS records indicate there are still significant quantities of plutonium remaining at the sites. For the one site currently undergoing decommissioning, licensee records and confirmatory decommissioning survey measurements preliminarily indicate that most of material was shipped to DOE over 20 years ago for disposal, and that the amount of plutonium remaining on site is less than 200 grams. The licensee is in the process of reviewing its records and submitting the appropriate transfer reports to reconcile the NMMSS inventory data. For the site that had its license terminated in 1993, NRC is retrieving and reviewing transfer and inventory records to resolve the NMMSS discrepancy. However, procedures in place at the time of decommissioning make it unlikely that large quantities of SNM remain at the site. NRC also is coordinating with DOE to resolve the NMMSS nuclear material inventory discrepancies at other NRC-licensed facilities identified as a result of the DOE-OIG audit.

Question 2: Has the NRC been able to account for the whereabouts of these materials and arrange for their proper disposal? Is NRC certain that the materials are in the possession of individuals who are authorized to possess them?

Answer:

As discussed in response to Question 1, NRC is retrieving and reviewing records for the two facilities to confirm that the material has been properly transferred. In addition, NRC is identifying NMMSS reporting errors in order to reconcile the NMMSS discrepancies.

Question 3: If the NRC has not yet located the materials, what steps will be taken to locate and properly dispose of them?

Answer:

Based on a preliminary review of data and discussions with the licensees, NRC believes that the material was properly disposed of and that the discrepancies in NMMSS are the result of reporting and/or data entry errors. NRC's ongoing examination of the records for these two facilities is expected to confirm that preliminary conclusion.

Question 4: What actions has the NRC taken, and what actions will the NRC take in the future, to ensure that this does not happen again?

Answer:

NRC has agreed to work with DOE to address the inaccuracies addressed in the DOE-OIG audit report and to improve NMMSS. NRC is examining several options to support this work effectively and efficiently. In addition, DOE and NRC have funded an ongoing project to convert NMMSS to state-of-the art software to achieve overall system improvements and operating efficiency.

Question 5: Why did the NRC direct the use of the Sealed Source Registry to be discontinued?

Answer:

The Sealed Source Registry was a separate file in NMMSS that tracked SNM sources by serial number. In 1984, NRC concluded that, for safeguards information and material control and accounting (MC&A) of SNM, it no longer needed the serial number information generated from the sealed source module of NMMSS, and therefore, recommended that the software for the module did not need to be maintained. Hence, the instruction to report sealed sources, containing SNM, by serial number, was deleted. However, as noted in the response to question 6, the decision to cease reporting of serial number information may be revisited during the NRC's top-to-bottom review of the Agency's safeguards and security programs. Moreover, the requirement to report plutonium in sealed sources under the appropriate material composition code remains.

Question 6: What steps is the NRC taking to ensure that tracking of such materials is resumed and that the improperly stored materials are properly disposed of, especially in light of the events of September 11 and reports that terrorist are actively seeking radioactive materials for use in improvised radiological dispersion devices? If no steps are being taken, please fully justify.

Answer:

As discussed in response to Question 5, information concerning these sources is still reported. NRC and DOE are working together to improve coordination and oversight of ongoing NMMSS reporting and tracking. As a result of the terrorist attacks of September 11, 2001, the Commission directed the staff to thoroughly reevaluate NRC's safeguards and physical security programs. This reevaluation is a comprehensive analysis involving all aspects of the Agency's safeguards and physical security programs, including MC&A requirements.

Question 7: A recommendation made in the report is that a "comprehensive confirmation of all balances of Government-owned materials" be jointly developed and implemented by DOE and the NRC. Does the NRC agree with this recommendation? Why or why not? Has the NRC allocated sufficient resources to ensure that this recommendation can be carried out quickly? Why or why not?

Answer:

NRC shares DOE's concern over discrepancies between the licensee records and the information contained in the NMMSS and has agreed to work with DOE to address such discrepancies and improve NMMSS. NRC is examining several options to support this work effectively and efficiently. In addition, DOE and NRC have funded an ongoing project to convert NMMSS to state-of-the-art software to achieve overall system improvements and operating efficiency.

Question 8: Another recommendation made in the report is that "enhanced procedures for the accounting of Government-owned materials" be jointly developed and implemented by DOE and the NRC. Does the NRC agree with this recommendation? Why or why not? Has the NRC allocated sufficient resources to ensure that this recommendation can be carried out quickly? Why or why not?

Answer:

As discussed in response to Questions 4 and 7, NRC is examining several options to resolve the NMMSS inaccuracies and improve system operation. NRC will reprogram resources as necessary to support the chosen corrective action plan.

Question 9: Does the NRC agree that a similar system should be created to track non-Government-owned materials? Why or why not? Does the NRC agree with this recommendation? Why or why not? Has the NRC allocated sufficient resources to ensure that this recommendation can be carried out quickly? Why or why not?

Answer:

NRC regulations concerning reporting to NMMSS make no distinction between Government-owned and non-Government-owned material. Therefore, NMMSS already includes the same types of information for non-Government-owned source and SNM, so a new system is not required.

Questions on Risk of Terrorist Attacks Involving Radioactive Sources

I have been informed that approximately 2 million sources may have been distributed in the United States (excluding very low-level sources such as those used in some smoke detectors). These sources are used in a wide array of applications, including medicine, research, and various industrial processes or other commercial uses. While some estimate that about 500,000 of these are no longer needed, they have not been disposed of, and each year the NRC is said to receive approximately 375 reports of lost, stolen, or abandoned radioactive sources - a figure that may understate the actual numbers since many lost or stolen items may never be reported. While the radioisotopes used for such applications may not be usable to produce a nuclear explosive device, there is a potential for them to be used to fashion a crude radiological devices or "dirty bomb." I am concerned that such a device could be used to contaminate critical infrastructure, disrupt our nation's financial markets, impede normal economic activity, or paralyze government functions.

Question 1: How many radioactive sources (excluding smoke detectors) are currently licensed by the Commission in the United States? Please provide a breakdown of the types of sources and categories of users of such sources (e.g., research, medical, industrial, commercial, etc.).

Answer:

There are approximately 2 million radioactive sources licensed by NRC and its Agreement States. The sources may be categorized according to type of radiation, quantity of radioactive material, and use.

Type of radiation: Radioactive sources typically emit gamma, neutron, alpha, or beta radiation. Because gamma and neutron radiation are more penetrating, these sources pose the greatest external radiation hazard. As alpha and beta radiation are less penetrating, alpha and beta sources are a low external hazard. However, if alpha and beta sources are broken open, the released material poses an internal radiation hazard to persons who accidentally inhale or ingest the radioactive material.

Quantity of radioactive material: Sources typically range in quantity from 37,000 becquerels (1 microcurie) to over 100 trillion becquerels (3000 curies) per source. There are a few special-purpose sources that exceed this quantity.

Use: Sources are used for the following purposes: medical diagnosis and treatment; measuring and gauging; calibration; research; irradiation of products; industrial radiography; and light and heat production.

The categories of users of sources are:

Medical facilities: Medical diagnosis and treatment, research
Universities: Research
Industrial firms: All uses except medical
Government agencies: All uses

Question 2: The NRC's web site reports on several instances of companies being fined for failures to properly control radioactive sources since August of this year, including sources containing americium-241, cesium-137, and iridium-192. According to the press releases on the web site, these sources were either lost, stolen, or improperly disposed of. I have been informed that each year, the NRC receives approximately 375 reports of lost, stolen, or abandoned radioactive sources. Is this true?

Answer:

Yes, in some years approximately 375 sources, or devices containing sources, have been reported lost, stolen or abandoned. However, recent data indicate some improvement. The annual average for the 5-year period 10/01/1996 to 9/30/2001 is approximately 300 lost, stolen, or abandoned sources per year, including 300 for the 12-month period ending 9/30/2001. As addressed in the answer to Question 3, many of these sources or devices were subsequently found.

Question 3: For the past five years, please indicate: a) how many reports of lost, stolen or abandoned radioactive sources NRC received; b) in how many of those cases were the materials recovered; c) the total amount of each radioisotope that has been reported missing and not yet recovered, along with the half-life of each radioisotope; and d) in how many of the reported cases was the responsible party fined, listing the responsible party and the amount of the fine for each such case.

Answer:

Table 1, below, lists, for the past 5 years, sources that were reported to NRC as lost, stolen, or abandoned, in accordance with the requirements in 10 CFR 20.2201(a)(1)(i) and 10 CFR 20.2201(a)(1)(ii), and similar Agreement State regulations. The source of the data presented below is NRC's Nuclear Materials Events Database (NMED). Table 1 also lists the approximate number of sources that were found.[1]

Table 2, below, lists the isotope and estimated amount of each isotope (activity) remaining for sources lost during the last five years and not reported as having been found. Unless otherwise indicated, the activity in Table 2 is the activity reported when the isotope was lost or stolen, without calculation of radioactive decay for most radionuclides. We excluded from Table 2 those isotopes whose half-lives are less than or equal to 18 days. Specifically, lost, stolen, or abandoned iodine-131 (with an 8-day half-life); molybdenum-99 (66.7-hour half-life); phosphorus-32 (14- day half-life); palladium-103 (17-day half-life); and technetium-99m (6-hour half-life) have such short half-lives that they soon decay rapidly to levels such that the lost sources pose no discernable health and safety risk after a few days.

Table 3, below, lists the 16 NRC licensees who paid civil penalties for the loss of control of licensed material during the last five years. These 16 cases are a subset of the 54 cases that resulted in escalated enforcement for loss of control of material during the five year period. Effective February 16, 2001, the NRC amended its ``General Statement of Policy and Procedure for NRC Enforcement Actions," (NUREG-1600) (Enforcement Policy or Policy) to establish separate base civil penalty amounts for loss, abandonment, or improper transfer or disposal of sealed sources and devices containing NRC-licensed material. These base civil penalties are at least three times the cost for proper disposal of the source. Under this policy change, nearly all future violations associated with the loss of control of licensed material will result in imposition of a civil penalty. Six of the most recent of the 16 cases in which civil penalties were imposed during the last five years were processed under this new enforcement policy.

It should be noted that this information on civil penalties is limited to actions involving NRC licensees. The Agreement States implement their enforcement programs in accordance with applicable state laws and regulations. The NRC does not maintain information on Agreement State enforcement programs or actions.

---

[1]The number provided is based on a key word search for "found" and "recovered" in NMED entries.

Table 1. Estimate of recovery rate for lost, stolen, abandoned sources 10/01/1996 - 09/30/2001

Sources lost, stolen, abandoned	Found	Not found	% not found
1495	660	835	56%

Table 2. Estimate of the total amount of each isotope that has been reported missing and not yet found, 10/01/1996 - 09/30/2001.

Isotope	Half Life[2]	Activity (Ci)
Americium-241	432 y	11.2
Barium-133	10.7 y	0.0003
Carbon-14	5730 y	0.0023
Cadmium-109	464 d	0.1
Cesium-137	30 y	11.3
Californium-252	2.6 y	0.0001
Cobalt-60	5.3 y	0.0004
Iron-55	2.7 y	0.0420
Gadolinium-153	242 d	0.7
Hydrogen-3	12.4 y	2700[3]
Iodine-125	60 d	0.2
Iridium-192	74 d	7.0[4]
Krypton-85	10.7 y	1.9
Nickel-63	96 y	0.6
Polonium-210	138 d	0.6
Promethium-147	2.6 y	1.4
Sulfur-35	87.4 d	0.02
Strontium-89	50.5 d	0.0040
Strontium-90	29.1 y	1.3
Uranium-235	7E+8 y	.0006
Uranium-238	4.5E+09 y	.0102

[2] The source of this data is Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," published by the United States Environmental Protection Agency.

[3]Thefts and losses of tritium exit signs and other-self luminous devices.

[4]Corrected for radioactive decay (74 day half-life).

Table 3. Escalated enforcement cases in which civil penalties were imposed 10/01/1996 - 09/30/2001

Licensee	Civil Penalty
Mattingly Testing Services, Inc.	$15,000
Ohio State University	$2,500
Lower Bucks Hospital	$2,700
West Virginia University	$2,750
Anheuser Busch, Inc.	$2,750
New Jersey University of Medicine & Dentistry	$3,000
Palmerton & Parrish, Inc.	$3,000
Sci Engineering	$3,000
Midwest Testing, Inc.	$3,000
Mathy Construction Co.	$3,000
Turabo Corp.	$3,000
Wisconsin, University of	$3,000
Grand View Hospital	$4,400
Oconee, Unit 1	$50,000
Western Soil, Inc.	$500
Department of The Army - Rock Island Arsenal	$8,000

Question 4: A security expert recently suggested to me that a radioactive source as small as 1 curie could be effectively used as a terrorist weapon. Is this true? What would be the worst-case public health, safety, and environmental consequences if a terrorist acquired a 1-curie source and detonated it in a crude "dirty bomb" in a populated area? What if the terrorist milled the source into fine particles (e.g., 1-micron average diameter) and detonated it in a populated area?

Answer:

Under typical conditions, a 1-curie source, either intact or dispersed by a bomb, would not be an effective weapon because very few people, if any, would be exposed to doses of radiation sufficient to cause death or radiation injuries. However, a bomb could spread low-level contamination over an area up to several city blocks, possibly resulting in restriction of the area until the area was surveyed and decontaminated.

Assuming the highest possible risk factors, which involve only a limited number of the many isotopes in use, a few people closest to the explosion might inhale enough radioactive material to obtain internal radiation doses exceeding the NRC regulatory annual limit for members of the public (100 millirem), but they would not be expected to experience any prompt or latent health effects as a result.

Question 5: In the aftermath of the September 11th attacks, is the Commission at all concerned about the potential for radiological sources to be used as weapons by a terrorist organization? If not, why not?

Answer:

Yes, the Commission is concerned about this potential terrorist threat and has advised its licensees to enhance security of their sources to ensure that they are not used as terrorist weapons. NRC believes that the potential threat should be evaluated in context with the threat from other readily available hazardous materials so that public resources are appropriately and prudently used to protect the public.

Question 6: Is the Commission satisfied that existing measures are adequate to protect and secure radioactive sources from theft or diversion? If not, please explain what specific measures the Commission is considering to better protect and secure radioactive sources from theft or diversion. If so, why is it that so many sources cannot be accounted for?

Answer:

In light of the terrorist attacks on September 11, 2001, the Commission has taken action to ensure that security and control measures have been increased. Additionally, the Commission is conducting a thorough review of security requirements, which will consider all aspects of security for radioactive sources, including more stringent transportation requirements, increased guard forces, alarms, physical barriers, inspections, background checks, and verifications of authorizations.

Question 7: What measures exist to assure that radioactive sources that are no longer needed are properly disposed of?

Answer:

Specific licensees are required periodically to conduct inventories of sources, and promptly report losses to NRC. These inventory records are subject to inspection by NRC. In addition, before September 11, 2001 NRC implemented a registration program for the more risk-significant generally licensed sources. This registration program includes a tracking system database that will help ensure that licensees transfer unused sources to approved recipients.

In February 2001, the Commission implemented a policy stating that any violation involving the improper disposal of a source would be subject to a civil penalty, and that the civil penalty would be at least three times the cost of proper source disposal. The stated intent of this policy was to improve licensee performance in the control and disposal of sources (i.e., to make it more economical to dispose of the source properly than to lose control of it).

For those cases where an improperly disposed of source is found, NRC works with the affected State, the Conference of Radiation Control Program Directors, Inc., (CRCPD), and DOE to ensure that the source is disposed of in a safe manner, and the responsible party is identified and held accountable. As a part of these ongoing efforts, NRC has provided funding for a CRCPD source recovery program.

Question 8: Many industrial processes (such as fluid-level sensing and others) use radioactive sources. In the past, using radioactive sources may have been the most technologically advanced and/or economic means of accomplishing the task in question. However, advances in optics and other technologies may provide other, equally cost-effective options. Given the numerous reports of missing radioactive materials, as well as the danger these materials pose, what does the NRC do to ensure that those seeking licenses to use radioactive materials for industrial processes actually need them and have no other cost-effective alternatives? If no actions are currently being taken to ensure that these materials are not needlessly disseminated, why not?

Answer:

NRC approves license applications after making a determination that: (1) the application is for a purpose authorized by the Atomic Energy Act of 1954, as amended; and (2) that there is reasonable assurance that its manner of use is adequate to protect health and minimize danger to life or property. With respect to the evaluation of alternate technologies, the Commission's statutory authority does not authorize or require that NRC evaluate or require the use of alternate technologies. Therefore, NRC does not address this issue as part of the licensing process.