POLICY ISSUE
INFORMATION

June 23, 2000 SECY-00-0137

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: RESPONSE TO STAFF REQUIREMENTS MEMORANDUM DATED DECEMBER 21, 1998 -- SECY-98-232 – SEAMAN NUCLEAR'S APPLICATION TO DISTRIBUTE PORTABLE GAUGES TO GENERAL LICENSEES

PURPOSE:

To inform the Commission of the staff's assessment of the Seaman Nuclear Corporation request, including consideration of Agreement State comments and the Materials Risk Study.

SUMMARY:

The staff intends to deny Seaman Nuclear's request to distribute the C-300 portable moisture density gauge to general licensees. Previously, in SECY-98-232, the staff had informed the Commission of its intent to grant Seaman's request. The Commission disapproved the staff's plans, and directed the staff to consult with the Agreement States, and to consider the Materials Risk Study. The staff has completed those actions, reconsidered the Seaman request, and concluded that the Seaman gauge does not meet the safety requirements of 10 CFR 32.51(a)(2)(iii) with respect to accident conditions.

BACKGROUND:

In December 1997, Seaman submitted an application that requested authorization to distribute the Seaman C-300 portable moisture density gauge to general licensees. Currently, the Commission has authorized Seaman to distribute this gauge to specific licensees only. The staff initially determined that the gauge met the criteria established in 10 CFR 32.51, for generally licensed devices. However, because granting Seaman's request might have established a significant precedent, the staff consulted with the Commission regarding the aforementioned determination (SECY-98-232).

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In response to SECY-98-232, the Commission issued a Staff Requirements Memorandum (SRM) dated December 21, 1998 (Attachment 1), which disapproved the staff's plans to authorize distribution of the Seaman gauge to general licensees. The Commission directed the staff to consult with the Agreement States -- specifically the States of California and North Carolina -- about the application, and to consider the recommendations of the Materials Risk Study ("Risk Analysis and Evaluation of Regulatory Options for Nuclear Byproduct Material Systems," NUREG/CR-6642, published February, 2000). The staff was also directed to provide the Commission with an assessment of the States' comments, its findings, and a recommendation on whether to grant Seaman's request.

On July 28, 1999, the staff held a one-day workshop with the Agreement States, to discuss issues relating to Seaman's application. Representatives from nine states participated, including: Arizona, California, Ohio, Illinois, Iowa, Maryland, New York, North Carolina, and Texas. During the meeting, participants discussed the Materials Risk Study, Seaman's voluntary accountability program, and concerns about the use of portable moisture density gauges by general licensees. In addition, on August 5, 1999, all Agreement States were invited to submit written comments on this matter. All meeting attendees and all written comments submitted by the States opposed distribution of the gauges to general licensees. Of the 14 States that submitted written comments, nine listed a decrease in accountability as their primary reason that these devices should not be generally licensed. Training was the second most cited reason, with six of the States pointing out that inadequate training could lead to an increase in incidents, resulting in excessive radiation exposures to users and the public. Lack of reciprocity provisions for general licensees was mentioned by five Agreement States. (Agreement State comments are provided as Attachment 2.) On January 27, 2000, Seaman provided a response (Attachment 3) to the Agreement State comments.

DISCUSSION:

The staff has considered the State comments, Seaman's response to the comments, and the Materials Risk Study, as well as Seaman's application and supplementary information, and concluded that the Seaman gauge should not be authorized for distribution to generally licensed persons, as discussed below. This is a change from the staff position in SECY-98-232.

1. Applicable Safety Requirements

The key safety requirements applicable to this case are specified in 10 CFR 32.51(a)(2). This section requires that an applicant demonstrate that a generally licensed device can: (1) be safely operated by persons not having training in radiological protection, and (2) under both ordinary conditions of use and accident conditions, it is unlikely that any person would receive radiation exposures in excess of specified criteria (15 rems to the whole body, 200 rems to the skin or extremities, and 50 rems to other organs). The staff believes that Seaman has adequately demonstrated that under ordinary conditions of use, the C-300 portable gauge can be safely operated by persons who have not received radiation protection training, and it is unlikely that any person would receive radiation doses exceeding the specified criteria. However, the staff has concluded that Seaman has not adequately demonstrated that the device meets the requirements applicable to potential accident conditions.

2. Accident Scenarios

Each year, an average of 20 to 25 specifically licensed portable moisture density gauges are damaged in construction or transportation accidents. These accidents range in severity from damage to the gauge housing, to complete destruction of the gauge, including dislodging the sources. Since users of generally licensed devices are not required to receive radiological protection training, the likelihood for a correct response to an accident -- to restrict access to the damaged device -- is reduced. The Seaman application postulates a crushing accident scenario, in which the sources remain in the shielded position. For that scenario, the calculated doses meet the requirements of 10 CFR 32.51. However, the staff believes that a more severe accident needs to be evaluated, where a gauge is severely damaged, and the sources are unshielded or dislodged. Although Seaman maintains that such an accident involving a Seaman gauge has never occurred, such accidents involving other portable gauges have occurred. For example, in 1999, an incident occurred in Wyoming in which a truck struck a gauge, while the sources were in the retracted position. In that incident, the gauge was completely torn apart, and the cesium-137 source was separated from the gauge housing and shielding. In addition, Agreement States have reported two incidents, in the last 2 years, regarding unshielded portable gauge sources being discovered in scrap-processing facilities. In both cases, the sources remained leak-free, but the body of the gauge, which contains the shielding, was completely absent.

The Seaman gauge contains a 0.37 gigabecquerel (10 millicurie) cesium-137 source and a 1.85 gigabecquerel (40 millicurie) americium-241 source. The unshielded cesium-137 source produces a dose rate of approximately 300 millisievert/hour (30 rem/hour) at a distance of 1 centimeter. If an untrained worker or member of the public were to put the unshielded source in his pocket, bringing the source into contact with the body, the 2 sievert (200 rem) accident dose criterion for skin, as specified in 10 CFR 32.51 (a)(2)(iii), would be exceeded within 1 hour.

In addition, portable moisture density gauges are more frequently stolen than other devices. The Nuclear Materials Events Database shows the rate of loss or theft of portable moisture density gauges has remained at about 40 to 45 devices per year, for the last 3 years. Currently, under a specific license, users are required, by 10 CFR 20.1801 and 20.1802, to properly secure their devices while they are in storage, to prevent damage, loss, or theft. To emphasize the importance of these security measures, the staff issued Information Notices (Attachments 4 and 5) in 1993 and 1998, that express concern about portable gauge incidents, and emphasize the importance of maintaining security of portable gauges. Distribution of these devices to general licensees, who are subject to less rigorous requirements than specific licensees, could lead to a higher rate of loss and theft. This, in turn, could lead to an increased number of incidents involving possession of gauges by untrained members of the public. Improper use or handling of a lost or stolen device by a member of the public could result in excessive radiation exposures.

3. Risk Analysis

The term “unlikely” in 10 CFR 32.51(a)(2) is not quantitatively defined with respect to potential radiation doses from accidents involving generally licensed devices. To put the term “unlikely” in context, the staff, as directed by the Commission, evaluated the likelihood of any person receiving radiation exposures under various scenarios involving accident conditions, in light of the Materials Risk Study (“Risk Analysis and Evaluation of Regulatory Options for Nuclear Byproduct Material Systems,” NUREG-6642).

The Materials Risk Study estimates the probability and dose consequences for a wide spectrum of potential accidents involving specifically licensed portable gauges containing sources similar to the Seaman device. The Study estimates that the overall accident risk (combining probability and consequences for over one hundred accident scenarios) is about 0.1 to 1 millirem whole body dose per year per device (Section 3.24.4). The Study does not evaluate generally licensed gauges similar to the Seaman device, because they are not currently authorized under the general license.

An example of a common accident scenario considered in the Study is damage to a portable gauge from impact during construction activity, resulting in loss of shielding. The Study estimates that the annual frequency of such an accident is 9.9E-4 per device for loss of shielding, with an estimated resulting whole body dose of 9 millirems.[1] The projected dose of 9 millirems is small, but, as discussed above, the dose could be much higher if the unshielded source came into contact with the body.

With respect to the potential for higher doses from accidents, the study states: "The estimated accident doses (given that the accident occurs), if adequate precautions are not taken, exceed by a considerable amount those that would cause significant health effects." The total whole body doses calculated for scenarios that fall under the "Sequences to be Prevented with High Assurance" range from 112 millirems to 960 rem, assuming the accident occurs. Access controls, training, and radiation safety programs would reduce accident risk. Allowing portable gauges to be distributed to generally licensed persons would significantly reduce these safety requirements.

The staff has not attempted to quantify the term "unlikely", but it is the staff's judgment that if the Seaman gauge were generally licensed, the probability of accidents which could result in radiation doses above the specified criteria would increase significantly, above risk levels specified as "low" for exempt devices under 10 CFR 32.23, and above probability levels which would be considered unlikely. Based on the Materials Risk Study, the staff has concluded that if the Seaman gauge were distributed to general licensees, the probability of excessive radiation exposures under accident conditions, including accidents following thefts, would increase for: (1) general licensee workers, who are not required to receive training in radiation protection; and (2) members of the public, because distribution of these devices would be subject to less rigorous regulatory control, and could lead to a higher rate of loss, theft, and accidents, resulting in an increased number of incidents involving improper handling by this population. Therefore, the staff has concluded that the Seaman gauge does not meet the requirements of 10 CFR 32.51(a)(2) with respect to accident conditions.

4. Agreement State Comments

The staff finds that the Agreement State comments (Attachment 2) opposing distribution of the portable gauge to general licensees are persuasive, particularly the comments raising concerns

[1] For comparison, note that the probability of such an incident is about 10 times greater than the probability specified as "low" in 10 CFR 32.23 for exempt devices. Section 32.23 provides quantitative guidance on risk for exempt products. "Low" is one failure per year per 10,000 devices which would cause doses exceeding 0.5 rem to the whole body or 7.5 rem to the extremities or skin , and "negligible" is one such failure per year per one million devices.

about increased incidents resulting from loss of control of devices. Accordingly, the staff agrees that the decreased level of accountability associated with generally licensed devices would increase the probability of incidents which could lead to radiation overexposures. Furthermore, as previously noted, because users of generally licensed devices are not required to receive radiological protection training, the likelihood of a correct response to an accident is reduced, which also leads to an increased probability of incidents which could lead to radiation overexposures.

5. Seaman's Response to the Agreement State Comments

Seaman's response (Attachment 3) to the Agreement State comments covers a broad range of issues, but does not adequately address the key issue, which is the potential increased risk from accidents. With respect to this issue, Seaman notes that the States did not provide data to support their claims that distribution of the Seaman gauge to generally licensed persons would increase the rate of construction accidents, and the rate of loss and theft for the devices. Seaman maintains that the accident risk is acceptably small, and states that neither Seaman nor the NRC has identified any instance where a portable gauge has been found in a steel mill or landfill, and that there is no evidence that generally licensed gauges would be a more frequent target of thieves than specifically licensed gauges.

In fact, as discussed above, Agreement States have reported two incidents where unshielded portable gauge sources were discovered in scrap-processing facilities. In both cases, the sources remained leak-free, but the body of the gauge, which contains the shielding, was completely absent. Although it is believed that no excessive radiation exposures resulted from either of these events, it should be noted that the sources were detected because radiation monitors were installed at the processing facilities. For scrap facilities which do not have such monitors, the probability of detecting a source before it causes exposure to a member of the public, or is melted, is reduced.

In addition, the staff disagrees with Seaman's position that generally licensed gauges are no more likely to be stolen than specifically licensed gauges. The staff recognizes that the devices are valuable, and will be protected against theft by both general and specific licensees. However, the staff believes that the security requirements associated with specific licenses reduces the risk of theft.

Seaman also states that its proposed voluntary accountability program would decrease the risk of loss of devices. In its accountability program, Seaman would contact its customers at least yearly. Seaman would then report, to NRC, any customers who had not responded to requests, or who could not account for their devices. Because there is no regulatory requirement for general licensees to respond to Seaman's requests for information, several States commented that this voluntary accountability program would not be adequate. In addition, the Seaman device falls within the criteria for mandatory annual registration in the proposed rule for generally licensed devices, currently under consideration by the Commission. Nevertheless, the staff believes that mandatory registration would not ensure adequate safety for these

devices, if they were generally licensed. Mandatory registration would improve accountability for generally licensed devices, but it would not address the potential consequences of accidents. The staff believes that radiation safety training, as required for users under a specific license, reduces the potential for accidents where human error is a factor, and increases the probability that workers will properly respond to accidents, should they occur.

CONCLUSION:

In 10 working days, the staff plans to proceed to deny the Seaman application to authorize distribution of portable gauges to general licensees, on the grounds that the application does not meet the safety requirements of 10 CFR 32.51(a)(2)(iii), with respect to potential accident conditions. Please note the following:

1. The staff will prepare and issue a denial letter to Seaman. Seaman would have a right to request a hearing on the denial, pursuant to 10 CFR Part 2, Subpart L.

2. The Agreement States will be notified of the action.

3. As directed in the SRM dated December 21, 1998, the staff has established screening mechanisms for determining whether individual issues should be referred for possible coordination with Agreement States. Coordination with the States is a part of developing rulemaking plans in accordance with Management Directive 6.3. For licensing actions received by Regional Offices, unusual or special issues are referred to the Office of Nuclear Material Safety and Safeguards (NMSS) via a Technical Assistance Request (TAR). State coordination will be addressed as part of the TAR responses. NMSS-originated actions will similarly be coordinated with the States.

4. This paper contains predecisional information, and the paper and any associated SRM should not be released to the public until the staff issues its decision on the Seaman application.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

/RA/

William D. Travers
Executive Director
for Operations

Attachments:
1. SRM dated December 21, 1998
2. State Comments
3. Seaman Response to State Comments
4. Information Notice 93-18
5. Information Notice 98-01

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