NRC GTCC WASTE ACTIVITIES

Steven L. Baggett and William R. Lahs
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington D.C. 20555

ABSTRACT

The Nuclear Regulatory Commission (NRC) has conducted surveys to better define the status of surplus sources that exceed 10 CFR Part 61 Class C concentrations. Several thousand NRC and Agreement State licensees possess sealed sources which when no longer needed, must be stored indefinitely, since disposal at a low-level waste disposal facility is unavailable and transfer of the source to other licensees maybe too expensive. This paper presents the findings of that survey and several recommendations to reduce the likelihood of loss of sources that presently must be stored.

This NRC survey of 2,202 Nuclear Regulatory Commission (NRC) and Agreement State specific licensees, projects that there are about 27,000 greater than Class C sources in the possession of specific licensees in the United States. About 4,600 sources are no longer needed and could be disposed of or transferred. About 2,000 sources would be disposed of if a site were available. The minimum volume needed to store these sources, less the transportation packaging and shielding, is about 3,000 cubic centimeters. The staff also estimated that there are about 20,000 general licensees possessing about 65,000 GTCC sources of which 9,200 source are no longer needed for their original application. About 2,700 of these sources would be disposed of if a site was available.

Although the number of GTCC sources is large, only modest facilities would be required to store all these sources securely and safely. The problem of licensee disposal of GTCC sources could be resolved if the DOE would accept these sources at a storage facility. Further, if DOE were to establish a firm schedule of fees for ultimate disposal of GTCC sealed sources, the vendors of GTCC sources might be willing to provide commercial facilities for storage of unwanted GTCC sources.

BACKGROUND

Several thousand entities possess GTCC sealed sources under NRC and Agreement State specific and general licenses. Because there is no commercial low-level waste disposal facility for unwanted GTCC sources, licensees must store GTCC sources rather than dispose of them. Although, short-term storage of GTCC sources does not, by itself, create any safety problems, the lack of an available method to dispose of such sources increases the likelihood of loss, improper disposal, or unauthorized transfer.

Many small entities possess GTCC sources. A significant number will likely cease to exist or will otherwise need to terminate licensed activities using GTCC sources before the issue of ultimate disposal is resolved. In the past, vendors were often willing to take sealed sources back from customers who wished to terminate licensed activities. Many vendors are no longer willing to do this because the ultimate cost of disposal is unknown. One Agreement State licensee is currently accepting GTCC sources, but at a cost in excess of $20,000 per source, which is too expensive for many small entities.

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Amendments Act) stipulates that disposal of GTCC waste is the responsibility of the Federal government, and specifically the responsibility of DOE. DOE has provided information about its plans for management of GTCC waste in its draft Environmental Restoration and Waste Management Five-Year Plan, and in a September 14, 1989, briefing to the NRC's Advisory Committee on Nuclear Waste. DOE set forth a three phase strategy for GTCC waste management. The three phases are the development of DOE capacity for (1) interim storage, now contemplated in the 1991 to 1996 time frame; (2) dedicated storage in the period 1997 to 2010; and (3) disposal in an NRC-licensed facility as early as 2010. For the interim storage phase, DOE is planning to restrict storage to limited amounts of GTCC waste identified as presenting an immediate health and safety problem. Although licensees possessing discrete sealed sources account for the largest number of licensees generating GTCC waste, discrete sealed sources used by material licensees will account for a small fraction of the total volume of GTCC waste. According to a DOE report, published in February 1987, entitled, Recommendations for Management of Greater-Than-Class-C Low- Level Radioactive Waste, and from staff estimates, the largest amount of GTCC waste, in terms of both volume and radioactivity, will come from the decommissioning of major facilities, such as reactors and fuel cycle facilities.

The greatest problem currently observed with use of sealed sources by general licensees is the failure to maintain control over the devices containing sealed sources. On a few occasions, devices have been disposed of as trash, sold as scrap, or turned over to brokers for resale. Similar problems have been experienced with specific licensees,

although the cause of loss of control is usually somewhat different. In the case of general licensees, loss of control is believed to be related mainly to the licensee forgetting that the device contains radioactive material or lacking knowledge of required transfer and disposal procedures. In the case of specific licensees, loss is due more to lack of security, not performing surveys, or financial pressures that cause breakdown of control.

NRC has an ongoing effort to address the problems associated with loss of control of devices used under a general license. Rulemaking has been initiated that will permit NRC to periodically send a letter to general licensees to verify that the general licensee has the device and is aware of its regulatory responsibility in using, storing, and disposing of the device.

This verification letter system would increase NRC visibility with general licensees and is intended to reduce substantially the number of non-compliance issues, particularly device accountability problems, including those devices containing GTCC sources.

Nature and Extent of the Problem

The NRC staff has evaluated data from a survey of 2,202 NRC and Agreement State specific licensees. Of these 2,202 specific licensees, 1,332 had 7,340 GTCC sources or sources contained in devices. Of the licensees having GTCC sources, about four percent indicated difficulty in disposing of their sources. Approximately ten percent of all GTCC sources are currently being stored rather than used.

Although not part of the survey, information available in the General License Data Base indicates that about 20,000 general licensees are projected to possess GTCC sources. GTCC sources are contained in fixed gauges used in factories as a way of monitoring a production process and ensuring quality control. For example, fixed gauges are used in bottling plants to make sure that each bottle contains the right amount of product. Extrapolating information from the General License Data Base and additional data from past studies of general licensees, the staff estimates that general licensees in the United States possess about 70,000 GTCC sources.

In total, the staff projects that about 25,000 general and specific licensees currently possess about 100,000 GTCC sources. Of these sources, about 9,000 are in storage rather than in use. Extrapolating from responses of specific licensees who indicated a desire to promptly dispose of GTCC sources, the staff estimates that 5,000 GTCC sources are currently being stored because of the lack of disposal methods or affordable commercial storage facilities.

Storage of this number of GTCC sources is not difficult. The facilities required to store these sources are, in most cases, quite modest. The problem is to maintain control over the stored sources for extended periods of time. Incidents detected by, or reported to, NRC and the Agreement States, involving improper transfer or disposal of sealed sources, frequently occur when licensee personnel are unaware of the nature of stored equipment. The probability of improper transfer or disposal increases with time as licensee personnel who have knowledge of the stored sources are replaced, or licensees go out of business.

Five Agreement States have taken possession of 15 GTCC sources that licensees have abandoned. In addition, four abandoned sources are being held by three NRC licensees, based on requests from NRC's Regional Office in Arlington, Texas. Although this number is currently small, changes in the economy affecting the financial status of licensees could increase this number. Simply stated, some licensees that terminate operations cannot find ways to divest themselves of their GTCC sources at reasonable costs, if at all.

Additionally, DOE has recently taken possession of one GTCC source that a licensee had abandoned and was found by a member of the general public.

Radiological Risk of GTCC Sources

Some GTCC sources are inherently and immediately dangerous if unshielded or ruptured. These are mainly cesium-137 sources of the size used for teletherapy (several hundred curies). These sources yield high external radiation levels when unshielded. The chemical form of the radionuclide is usually cesium chloride, which is both dispersible and soluble, and also presents an internal radiation hazard if the source is ruptured. Such a source was involved in the Goiania, Brazil accident.

There have been several incidents involving small activity GTCC sources. Devices containing small activity sources have been melted in scrap recycling centers. Also, device shielding has been compromised when molten steel has spilled on the device. These incidents do not usually pose significant radiological risks. The risk is roughly proportional to the amount of activity and the degrees of dispersibility and solubility. Americium-241 gauge sources are typically not readily dispersible nor soluble. Although small-activity cesium-137 sources may be dispersible, experience has shown that the cesium-137 is volatilized when melted and is recovered from the effluent cleanup system of the foundry.

The vast majority of the GTCC sources are small activity and do not present an immediately life-threatening situation if accidentally exposed or ruptured. However, if control is lost, they can cause unacceptable radiation exposure, as well as contamination which is costly to clean up. Devices containing these less-hazardous GTCC sources may be either specifically or generally licensed. The

decision to generally or specifically license the devices is based on engineered safety, level of training required, type of facilities required, and expected conditions of operation. All GTCC sources are of concern if lost or abandoned. The defining properties of GTCC sources are their half-lives (greater than a few tens of years) and high specific activity; thus, all such sources could persist in the environment for sometime.

In summary, there are few large cesium-137 sources in use or storage, and, based on inspection, are believed to be well-controlled. Smaller GTCC sources do not usually pose an acute life-threatening risk, if control is lost. However, they can cause unacceptable radiation exposure and, if ruptured, costly decontamination operations. The number of these sources held by licensees is large, and they are used and stored under conditions where they are more susceptible to loss of control for a variety of reasons. This large population of relatively small GTCC sources is of more immediate concern and is the focus of the NRC's ongoing effort to enhance control of GTCC sources.

OPTIONS REGARDING GTCC SOURCES CURRENTLY IN USE

DOE Storage Prior to Disposal

Storage of unwanted GTCC sources at DOE facilities, prior to their disposal in an NRC-licensed facility, best addresses current needs. There should be few technical problems associated with storage of GTCC sealed sources at DOE facilities. The total combined volume of the estimated 5,000 specifically and generally licensed sources that would be stored if a site were available is small--about 3,000 cubic centimeters. These sources could be stored in a modest, but properly shielded, hot cell or, if individually shielded, in small containers in a small building.

DOE is currently planning for interim storage of abandoned GTCC sources which present an immediate health and safety problem. The problem of abandoned radioactive material, however, is not limited to GTCC sources, although it may be more acute for GTCC sources because of inability to dispose of these materials. The issue of abandoned radioactive material is discussed in more detail in the strategy section.

Fee Schedule for DOE Storage and Disposal

The NRC believes this is a high priority issue. As a result, NRC has requested DOE to establish charges for disposal of discrete sealed sources separate from the issue of the cost of disposal of other types of GTCC waste. Ultimately, these sealed sources will account for a minor fraction of the costs of disposing of GTCC wastes. Therefore, DOE should be able to set a guaranteed fee schedule for accepting sealed sources even though the ultimate costs for the disposal of all GTCC wastes might remain unresolved. If the cost of disposal issue were resolved for GTCC sources, vendors and other larger licensees might be willing to accept these sources from small entities for a reasonable storage fee, until such time as DOE is prepared to accept them for long term storage or disposal.

Financial Assurance

NRC could initiate a rulemaking with a narrowly-defined scope that would require financial assurance for GTCC sealed sources. Such a rule would require knowledge of the cost of disposal. It has the potential of reducing the number of abandoned sources, particularly if the fees for disposal are modest.

NRC Storage

NRC could develop its own capabilities and facilities to recover and store abandoned radioactive material. Such facilities would be very costly both in dollars and manpower. Further, NRC would need to obtain legislative authority.

The NRC rejected this option because DOE has the legislative authority and has accepted responsibility for ultimate disposal of all GTCC wastes.

OPTIONS FOR FUTURE DISTRIBUTION OF GTCC SOURCES

Cease Distribution

NRC could stop the distribution of new GTCC sources until a disposal method is established. However, the benefits derived from the use of these sources to improve product quality, enhance production safety, control process lines, and analyze materials appears too great to justify stopping distribution. Manufacturers do recycle some GTCC sources. However, most such sources are not recycled for a variety of reasons such as not meeting current design standards, not being compatible with new devices and uses, and manufacturer's concern for product liability, etc. Further, the useful life of new sources would be expected to extend into the time period when some type of economically affordable interim or dedicated storage facility would be available.

Cost Disclosure

NRC could initiate a rulemaking which would require vendors selling GTCC sources to specific licensees to disclose the liabilities and possible costs associated with disposal of GTCC sources. Such disclosure may deter marginal firms from seeking to use or possess sources under a specific license.

An effort to essentially accomplish the same objective is underway as part of a rulemaking that establishes a formalized tracking system for general licensees. Moreover, a

financial assurance rule, as discussed earlier, would be equally effective if applied to new GTCC sources and would provide more positive protection than cost disclosure. The cost-disclosure requirement will be reconsidered in the development and implementation of the current general license rule.

Vendor Accountability

For sources already licensed, NRC could require all vendors to take back unwanted sources. This options appears impractical at this time because such a rule would only be workable after DOE has established timing for receipt of the sources and fee schedules for DOE storage and disposal. If, however, DOE does not provide such information in a timely manner, further consideration could be given to requiring vendors to accept return of new sources which they sell.

NRC could, if budgeted to do so, establish a central "real time" accountability system for specific licenses using sealed sources. However, because of the extremely large number of source transfers made per year, such a system would be NRC resource intensive, would tend not to be a real time accounting system, and would only nominally improve the present licensing and inspection inventory control practices. Thus, the NRC has rejected such a system at this time.

STRATEGY FOR BETTER ASSURING SAFE STORAGE AND DISPOSAL OF ABANDONED RADIOACTIVE MATERIAL AND GTCC SOURCES

Based on consideration of the options just noted, some of which are not mutually exclusive, the NRC has developed a proposed strategy which addresses the problem. This strategy, is predicated on promptly obtaining a clear and positive response from DOE on a protocol for recovery of abandoned radioactive material, timing for DOE to receive GTCC sources, and the fee schedules for storage and disposal.

Because these areas are interrelated, letters requesting the above DOE actions were sent to the appropriate DOE offices responsible for these activities. If the above strategy cannot be implemented, further consideration of the options noted above would be warranted.

PROPOSED STRATEGY FOR EMERGENCY ACCEPTANCE OF ABANDONED RADIOACTIVE MATERIAL DISPOSAL OF GTCC SOURCES

The first necessary step in developing the staff's proposed strategy to better assure safe interim storage and disposal of GTCC sources is to seek from DOE a protocol for emergency acceptance by DOE of abandoned radioactive material. DOE is the only Federal agency which has both the authority and the broad capability to accept radioactive material which is no longer under the control of a responsible person as a result of insolvency, abandonment, or other circumstances. This includes GTCC sources as well as other NRC-regulated radioactive materials. The NRC regions are not adequately equipped to receive and store such materials. Since the Energy Reorganization Act of 1974, the Energy Research and Development Administration or DOE has effectively performed this function in a limited number of instances, but usually only after some protracted negotiations. The States have also recovered and stored some abandoned radioactive materials, but there is increasing reluctance to do so, because of limited capabilities and, with respect to GTCC sources, there is no mechanism in place for eventual disposal. It is speculated that abandonment of GTCC sources may become an increasing problem, because there is no present disposal capability.

A pre-established protocol is needed for emergency acceptance under which DOE will take possession of abandoned radioactive materials without time-consuming negotiations, or treatment as unique cases. Procedures have been established for rapid deployment of the DOE Radiological Assistance Team to respond to emergency situations involving radioactive materials. These procedures need to be expanded, or a similar procedure established, for recovery of abandoned radioactive materials. If this protocol is not developed, the staff would continue, as it has in recent years, to seek assistance from DOE or the States on a case-by-case basis. Alternatively, NRC could, at considerable costs, develop its own capabilities and facilities to recover and store abandoned radioactive materials, if budgeted to do so and if legislative authority were obtained.

PROPOSED STRATEGIES FOR SAFE STORAGE AND DISPOSAL OF GTCC WASTE SOURCES

While implementing any of these staff-proposed strategies to better assure safe storage and eventual disposal of GTCC waste sources, it is also necessary to obtain from DOE a commitment as to when it will accept GTCC sources for eventual disposal, including the associated fee schedules. There are, however, several possibilities, in a DOE response, which will influence NRC strategies to better assure safe storage and eventual disposal in a NRC-licensed facility. With respect to timing, DOE could indicate that it will be prepared to accept GTCC waste sources soon, i.e., within approximately a year, or it could indicate that it will not accept such waste for several years or more. With respect to fee schedule, costs of disposal might be modest, i.e., roughly equivalent to, or less than, the initial cost of the source, or they could be substantially greater. Depending on these outcomes, proposed NRC strategies to better ensure safe storage and eventual disposal by DOE in its NRC-licensed facility are as follows:

a) Acceptance by DOE, in the near term, and modest fee charges.

The problem would largely be solved. The NRC could establish, by rule, a requirement that the licensee pay the disposal charge to DOE at the time a new license is issued, or, for existing licenses, at the time of license renewal. A similar requirement for general licensees could be included in the ongoing rulemaking for annual notification of licensee status, as well as a similar requirement governing sale of new GTCC sources by vendors. If DOE is not prepared to accept such funds, the rule could require a simple escrow account to be established by the licensee.

b) Acceptance by DOE, in the near term, but high disposal fee charges.

The NRC rulemaking approach could be similar to (a) above, except that it could allow some reasonable period to build an escrow account. Financial capabilities of new licensees would need to be demonstrated. One result of high fee charges for disposal coupled with rules to assure capability of payment, would be to reduce the number of new GTCC sources sold in the commercial sector. There would also be some licensees currently in possession of GTCC sources that cannot pay a high disposal fee, the number of such cases being dependent on the magnitude of the disposal fees. As such cases arise, it would be necessary to obtain as much of the disposal fee as possible, coupled with exercising DOE's emergency authority for safe storage and disposal of radioactive material.

c) Acceptance by DOE not available in the near term, but modest disposal fee charges established.

The staff would develop an NRC rule covering financial assurance of future disposal charges similar to option (a). However, some licensees will need to divest themselves of GTCC sources before DOE will accept them. The staff would explore with the commercial sector, e.g., source and device vendors, interest in storage of sources before acceptance by DOE. There would undoubtedly be a service charge associated with this activity. Arrangements could be established to transfer escrow funds for DOE disposal to the commercial storage licensee, which would hold the funds until DOE accepts the sources. Alternatively, NRC could explore establishing similar arrangements with individual States or State waste disposal compacts.

d) Acceptance by DOE not available in the near term, and high disposal fee charges.

The NRC would develop a rule covering building escrow funds for eventual disposal, seek commercial or State interest in interim storage, and be prepared to cope with abandoned GTCC sources. This strategy includes components of options (a), (b), and (c), as described above.

CONCLUSION

In summary, large numbers of GTCC discrete sealed sources are currently unwanted and being stored by specific and general licensees. These GTCC sealed sources present a potential hazard to public health and safety, if specific or general licensees lose control of the sources through negligence or inability to sustain a financially viable company. There is a current need to provide a mechanism either for ultimate disposal or for transfer to storage facilities capable of long-term, secure control of GTCC sources. The responsibility for ultimate disposal of all GTCC waste rests with DOE.

The NRC has considered numerous issues, options and strategies to enhance control of GTCC sources and to better ensure proper disposal. The current strategy includes consideration of several of these issues and options, but is predicated on obtaining from DOE clear commitments regarding acceptance of abandoned radioactive material, timing for receipt of GTCC waste sources, and fee schedules. Depending on DOE's progress on the issues described, further consideration of the issues and options outlined may be necessary.