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COUNCIL ON RADIONUCLIDES AND RADIOPHARMACEUTICALS POSITION PAPER ON LOW LEVEL RADIOACTIVE WASTE DISPOSAL.

INTRODUCTION

The Council on Radionuclides and Radiopharmaceuticals (CORAR) is concerned with the lack of progress in providing reliable general access to long-term disposal facilities for low level radioactive waste (LLRW). There continues to be uncertainty of access to safe and economically viable LLRW sites for manufacturers, hospitals and research establishments. Since July 1, 2008 users of radioactive material in 36 states have no place to dispose of their Class B and C LLRW. In a report from the National Academy of Sciences it is recognized that denial of access could interrupt the supply of vitally necessary biomedical products and services to society (1).

CORAR is comprised of representatives of the major manufacturers of radiopharmaceuticals, radioactive sources and research radionuclides used in the USA for therapeutic and diagnostic medical applications and for industrial, environmental and biomedical research.

The manufacture and use of these radioactive products unavoidably involves the generation of LLRW. Manufacturers and users must comply with stringent regulations, pay costly licensing fees and control occupational and patient radiation exposure. Despite these factors, the use of radioactive materials is often necessary because it is safer, provides more accurate results and, in some applications, is the only method that works. Radiometric methods are often more cost effective than other methods, providing research and healthcare opportunities that would otherwise be prohibitively expensive.

Society needs these products and services. Society also expects these products and services to be delivered and the waste disposed of safely and at reasonable cost. CORAR strongly supports the maintenance of safe and economically viable LLRW disposal capacity. It is the objective of our member organizations to meet society's needs for safe and effective products and services.

DEFINITION OF LLRW

LLRW results from discarded materials from the production of, use of or contact with radioactive materials. The most common components are empty glass and plastic containers, pipets, disposable clothing and gloves, laboratory bench top coverings, obsolete tools, equipment, and scrap from remodeling facilities where radioactive materials were handled.

LLRW involves numerous, mostly beta and gamma emitting, radionuclides that lose half their radioactivity in periods ranging from a few hours to thousands of years. Alpha emitting radionuclides are limited to only trace quantities. LLRW is solid waste and is not permitted to contain free liquid. Used nuclear fuel, mixed waste and the longer lived radionuclides are placed in different categories than LLRW and must conform to special handling, treatment, and disposal requirements specified for these waste types. The Nuclear Regulatory Commission provides a regulatory definition of LLRW in the Code of Federal Regulations [(2)].

SOURCES OF LLRW

LLRW is produced during the manufacture of products used in nuclear medicine, biomedical research and industrial quality control and safety. The first step in the manufacturing process is to irradiate materials to make them radioactive. Irradiation unavoidably creates unwanted radionuclides which must then be separated from the product radionuclides and treated as LLRW. In the irradiation process the reactor or accelerator machines that are used to make the radionuclides are themselves irradiated and become radioactive. When machine parts are replaced the discarded parts must be disposed as LLRW.

In the process of formulating, dispensing and packaging radioactive products, vessels, pipets and protective clothing that have come in contact with the radioactivity must be treated as LLRW. The purity and quality requirements for radioactive products are so very exacting that as much as 95% of the original radioactive material may be rejected as waste. This results in most of the LLRW being generated during the manufacturing process, with much less LLRW produced by the use of these products.

It is fortunate that most of the manufacturing occurs in only a few facilities. This results in a large part of the LLRW being generated at a few manufacturing locations where economies of scale provide the necessary expertise to minimize, consolidate, treat, package and temporarily store this waste prior to disposal. Most waste classified by the DOE as industrial LLRW is, in fact, biomedical waste generated by manufacturers while making products used for biomedical applications in tens of thousands of hospital and university facilities. If these few manufacturing facilities did not exist, hospitals and universities would have to manufacture the radioactive products that they need. This would result in thousands of major waste generators, mostly located in urban and suburban residential areas. This would likely require duplication of facilities and operations resulting in higher volumes of waste nationwide. Instead, current practice ensures that the LLRW generated at hospitals and universities and other research facilities is relatively small and due primarily to the use of radioactive products in medicine and research.

PRODUCTS THAT GENERATE LLRW

Over one hundred radionuclides are used in thousands of different products. The primary radionuclides used in life science research, including biomedical, environmental and agricultural research, and development of natural resources, are tritium, carbon-14, phosphorus-32, phosphorus-33, sulfur-35 and iodine-125. These radionuclides have been the primary research tool for most of the researchers who were awarded Nobel prizes for medicine and physiology in the past twenty-five years. They also played a pivotal role in the development of technologies which are the foundation of the biotechnology industry.

Colbalt-60, gallium-67, technetium-99m, iodine-123, iodine-125, iodine-131, xenon-133, iridium-192, gold-198 and thallium-201 are the radionuclides primarily used in medical diagnosis, therapy and research. These are used to diagnose cancer and heart disease and to image potentially diseased organs including bone, liver, brain, and thyroid. Radionuclides are also used to cure cancer, Graves disease and other disorders otherwise difficult to treat.

Tritium, cobalt-60, nickel-63, strontium-90, cesium-137, iridium-192 and americium-241 are used in industrial safety gauges and process controls, industrial research and non-destructive testing, safety lights and luminous dials, smoke detectors, nuclear medicine instrument calibration sources, sources used to check the safety of welds in construction and to sterilize foods and medical equipment.

LLRW MANAGEMENT AND CONTROL

Industry has taken the lead in controlling and minimizing LLRW. Manufacturers have the advantage of applying economies of scale to the management of waste. They can ensure adequate operating and storage space, optimal facility and process design, use of industrial scale handling equipment, adequate staffing levels and dedicated management, technical, regulatory compliance and safety expertise.

A natural and common facet of good business is the management commitment to reduce and control waste. The first consideration is to prevent the creation of waste by minimizing the source materials used. Industry then plans operations to minimize waste, prevent unnecessary contact of non-radioactive materials with radioactive materials and segregate radionuclides to allow decay in storage of short lived radionuclides. Strict inventory and process control with maximum use of automated and computerized systems and full use of bar coding, data tracking, inspection and auditing techniques assure the highest quality control over waste minimization and preparation for disposal.

Technical capabilities practiced by manufacturers include effective monitoring and detection procedures to ensure that segregation of radionuclides is optimized. Shredding, compaction, incineration and super compaction, as appropriate, are used to reduce waste volume. Product recycling and sophisticated repurification techniques further reduce the consumption of radioactive materials and minimize the fraction of radioactivity in process from becoming waste. Waste is also reduced when clothing equipment and facilities are repaired and cleaned to be reused instead of being discarded to waste.

Nationwide, LLRW generation has been reduced considerably in the last fifteen years. Manufacturers have made a significant contribution to this reduction and have often been promoted as role models to other waste generators by local regulatory agencies. Waste volume continues to decrease as new technologies are developed and as more radioactive material users update their waste management programs. It is likely that LLRW generation will continue to decrease in the decades ahead.

Another important aspect of LLRW management is the high level of safety that has been maintained. This should not be surprising given that the manufacture and use of radioactive materials is the most intensely regulated activity in the nation. In order to comply with the exacting regulations from the many federal, state and local regulatory agencies, manufacturers have long needed to closely manage operations, provide intensive safety audits and subject new processes to rigorous technical evaluations. Regulations ensure that the highest level of control and vigilance is sustained throughout the entire LLRW handling chain, from the generator's site, through transit, to the disposal site. This is reinforced by the potential of severe penalties including fines, adverse publicity, and denial of access to a disposal site for even minor infractions of extremely detailed regulatory requirements. The results are conspicuous, there has never been an accident with LLRW from manufacturers that has resulted in harm to anyone, neither worker nor the public. This record includes the period over thirty-five years ago, before modern disposal technology was available.

LLRW DISPOSAL

Radioactive material users, regulators and concerned citizens agree that the best long-term method for handling LLRW is to appropriately package the material and dispose of it in a facility specifically designed for long-term disposal of waste. The disposal facility should be provided with comprehensive monitoring systems and should have the capability of promptly recognizing, retrieving and repackaging any waste that needs this treatment. The waste must be retained and monitored until the radioactivity has decayed to levels that are low compared with ambient natural background levels. This is not a new proposal; such disposal facilities exist and have been operating successfully for many years. The problem with current disposal facilities is that access is limited to generators from specific regions or for certain classes of LLRW. Furthermore, access can be changed abruptly, causing uncertainty for long-term disposal for most generators.

LLRW disposal facilities are costly to establish, operate and maintain. The total cost of establishing, operating and closing a LLRW facility is not significantly influenced by the quantity of waste disposed. This is because transportation and operating costs, which depend on the volume of waste handled, are much less than the essentially fixed costs to establish, maintain and close a site. Two sites in the country each accepting half the nation’s LLRW are expected to cost nearly twice as much as one site taking the same waste. This results in the need to minimize the number of sites to ensure economic viability. Two or three sites should continue to be sufficient to dispose of all the LLRW in the USA.

There is public concern that maintaining a few sites will require generators to arrange for their waste to be transported long distances. The public perceives that the transportation of LLRW poses a significant hazard. Although there may be transportation accidents, the risks are no different than from any well maintained trucking operation. The waste form, packaging used and radioactivity quantity limitations all ensure that a transportation accident will have negligible radiological safety consequence. There has never been a radiologically significant transportation accident with LLRW or any other shipment of radioactive material. The industry has over 50 years of transportation experience. Moreover, the number of LLRW shipments is expected to remain a tiny fraction of the country's transportation and this fraction will get smaller as the volume of LLRW continues to decline.

When considering the whole LLRW transportation and disposal process it is clear that the maintenance and/or development of fewer sites is more likely to ensure economic viability. If only a few sites are established or maintained, it is feasible that most of the costs can be shared by the generators without burdening taxpayers. Furthermore, strong economic viability together with the ability to adequately staff a few sites will ensure that safety is optimized.

PROGRESS TOWARD ESTABLISHING LONG TERM DISPOSAL CAPACITY

To establish long-term disposal capacity, public laws encourage states to form compacts to establish regional LLRW sites [(3) (4)]. Congress intended that the states would form a few regional compacts. It was thought that placing a site in each region was more fair than expecting a site to accommodate waste generated in other regions of the country. CORAR is disappointed that Congressional intentions to provide a few regional sites have not been fulfilled. The compact process has taken much longer than anticipated. Furthermore, instead of two or three sites, the process appeared to be progressing towards sixteen sites that could not all be economically feasible. Currently, only one new facility is under development and is only intended for the use of the Texas Compact. A final license for the Texas site is expected soon.

Meanwhile most commercial LLRW generators have had access to three disposal sites. The LLRW disposal site in Richland, Washington, provides access for disposing LLRW containing reactor produced radionuclides to generators in eleven states that are members of the Northwest Interstate Compact and the Rocky Mountain Compact. The Richland disposal site is available to all U.S. generators for disposal of LLRW containing accelerator produced radionuclides. Generators in other states have had access for disposing LLRW at the Barnwell, S.C. site and disposing Class A LLRW (excluding sealed sources and biological waste) at the Clive, Utah site.

Since July 1, 2008 access to the Barnwell, S.C. site is restricted to generators from three states in the Atlantic Interstate LLRW Management Compact. The availability of long-term Class B and C LLRW disposal capacity is now denied to generators in 36 states. This forces thousands of hospitals, educational establishments, research institutes, and manufacturers to store their LLRW on site for an undetermined time. Such interim storage at the generator's site is not favored by responsible generators, their neighbors or regulators. It involves a need for continuous surveillance, increased regulatory inspection, and potential for repackaging and multiple handling with additional occupational radiation exposure when long-term disposal capacity eventually becomes available. This increases the financial liability for site decommissioning resulting in increased cost of financial surety arrangements required by regulation for many licensees.

Some commentators have recommended that separate sites be made available for industry and for institutional wastes. However, this proposal will add more unnecessary sites and degrade their economic viability. Manufacturers, utilities, hospitals, educational establishments and government agencies generate similar LLRW forms involving identical radionuclides that should be disposed in a common facility to enable all generators to benefit from cost-sharing and enhanced safety.

Public opinion polls indicate that most people support the development of long-term disposal capacity. Neighbors of existing sites appreciate the benefits the site brings to the local community as well as the safe operations. However, there has been considerable resistance to accepting a new site from activist groups and some potential host communities. The affected public does not always perceive the site selection process to be fair. The congressional intent to promote a siting system that could be fair has been further undermined by the development of compacts comprised of noncontiguous states. This development combines unfairness to the local public with the need for long-distance trucking from remote states which the public is also adverse to. It is apparent that the congressional intent to promote fairness will not be realized.

Another concern is that the cost of disposal has been artificially high for most generators due to monopolistic practices involving surcharges to fund local activities unrelated to waste disposal. A position statement by the Health Physics Society provides several examples of the very high costs of treating and disposing LLRW [(5)]. CORAR is concerned that in the absence of a competitive market for LLRW disposal the costs of disposal to those generators who still have access will continue to escalate to unsupportable levels.

There is widespread concern that lack of access for disposal and rising LLRW disposal costs will jeopardize critical biomedical research and undermine the nations' effort to contain healthcare costs. It is clear that there needs to be a change in direction in developing disposal capacity. CORAR supports the development of long-term disposal capacity and supports the Congressional intentions in promoting the compact process. It is clear, however, that the compacts need to consolidate and form a limited number of truly regional compacts formed of contiguous states. It is also clear that current Federal Law allows compacts to further consolidate.

It is also clear that the process of siting a LLRW facility must be made more acceptable to potential host communities. If fewer sites were planned it would be more practical to offer substantial compensation to host communities. LLRW site selection should be considered in conjunction with siting other facilities serving society such as hazardous waste sites, prisons, etc. What is needed is a comprehensive program for balancing the siting of undesirable facilities and providing suitable compensation when trade-offs are otherwise impractical. Since society wants to share the benefits, a way must be found to fairly share the costs.

Meanwhile, generators in 36 states do not have viable access for disposing their Class B and C LLRW containing relatively large quantities of radioactivity. It appears likely that it could take about ten years to establish a new LLRW site to accommodate these generators. Certain LLRW is unnecessarily classified by excessively conservative disposal site criteria as Class B or C radwaste. While radioactive material licensees have an excellent history of properly managing LLRW, it is widely recognized that safety and security is optimized when LLRW is promptly disposed at a LLRW disposal site.

RECOMMENDATIONS

Until a new LLRW disposal site is established CORAR recommends that an existing DOE LLRW site be made available for non-DOE LLRW disposal. [6] This will require that the site is qualified by the Nuclear Regulatory Commission to meet the requirements for commercial disposal in the federal regulations [2].

CORAR recommends that disposal sites should develop realistic disposal criteria to enable LLRW to be appropriately classified and safely disposed.

CORAR urges federal and state regulators and legislators and the National Governors Association to work together in a common effort to realize the intent of Congress to provide economically viable, safe and secure disposal capacity in a way acceptable to the public. We need this new initiative to ensure that society can continue to benefit from the products and services involving radioactive materials.

REFERENCES

1. The National Academy of Sciences, “The Impact of Low-Level Radioactive Waste Management Policy on Biomedical Research in the United States.” Washington, D.C., 2001.

2. U.S. Nuclear Regulatory Commission, “Licensing Requirements for Land Disposal of Radioactive Waste.” 10CFR 61, Federal Register, October 1, 2007 (Volume 72, Number 189).

3. Low-Level Radioactive Waste Policy Act of 1980.

4. Low-Level Radioactive Waste Policy Amendments Act of 1985.

5. Health Physics Society, Background Information on “Low-Level radioactive Waste Management Needs a Complete and Coordinated Overhaul.” McLean, VA., September 2005.

6. A.D. Pasternak, California Radioactive Materials Management Forum, “Assuring Access to LLRW Disposal Facilities for Non-DOE Users of Radioactive Materials: Solutions “Outside the Box”.” “Waste Management Conference, February 24-28, 2008, Phoenix, AZ.