



HEALTH PHYSICS SOCIETY

“Specialists in Radiation Safety”

August 23, 2006

Chief, Rules and Directives Branch
Mail Stop T6-D59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Brian Dodd, Ph.D.

President

10313 Cogswell Avenue
Las Vegas, NV 89134-5902
Telephone: 702 219 9021
Fax: 702 254-2346
Email: bdc.mail@cox.net

Dear Sir or Madam:

As President of the Health Physics Society (HPS), it is my pleasure to provide you with comments on the Nuclear Regulatory Commission's (NRC) Low Level Radioactive Waste Program, on behalf of the HPS. These comments are provided in accordance with the [Federal Register Notice Volume 71, No. 130, Friday, July 7, 2006](#) as modified by [Federal Register Notice Volume 71, No. 144, Thursday, July 27, 2006](#).

The HPS is an independent non-profit scientific organization of professionals in the science and practice of radiation safety. The HPS first issued a formal position statement regarding low level waste disposal and management issues in 1993, which it has continued to revise four times as low level waste disposal issues evolved over the years. The most recent revision to our low level waste position statement was in September 2005 and is titled “Low-Level Radioactive Waste Management Needs a Complete and Coordinated Overhaul.” In addition, the HPS issued a background information document providing detailed discussion of the positions and recommendations made in this most recent position statement.

We are very pleased that the NRC is now taking the initiative to review it's low level radioactive waste program, particularly with the intent of developing priorities and strategies to improve the program. We feel HPS position statements and background documents directly address the issues and questions you have posed in the Federal Register Notice. However, rather than simply submit these documents we felt it would be useful to reference those portions of the HPS documents we feel directly respond to your questions. Therefore, the enclosure to this letter provides answers to selected specific NRC questions by referencing the appropriate sections of the HPS documents.

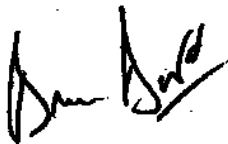
The format of the enclosure does not provide a clear setting of priorities for the many actions we recommend. Therefore, I would like to provide an overview of the HPS response that reflects our priorities.

The HPS considers the highest priority of the low level radioactive waste program is to provide for the permanent disposal of all radioactive waste for all generators in all states in a manner (1) that is protective of workers, the public, and the environment, (2) that is reliable, predictable, adaptable and economical, and (3) that does not harm generators, states, or facilities that are currently operating in a manner consistent with (1) and (2).

The HPS considers the highest priority actions to improve the low level radioactive waste program are to (1) change the waste classification system to a risk-based system that does not depend on source of origin or legislative statute, particularly for low-activity radioactive waste, and that is harmonized with other hazardous waste disposal systems, (2) ensure disposal facilities exist for all Class B and C waste, particularly sealed sources, (3) make a generalized provision for very low level radioactive material to exit the regulatory system, and (4) open existing radioactive and hazardous waste disposal facilities to waste materials that pose similar risks for which the design of the facility is protective of the public and environment.

I hope that you find the details in the enclosure provide strategies and actions support our priority in the performance and improvement of the NRC low level radioactive waste program so the nation can have a reliable, predicable, adaptable, and economical national hazardous waste program that manages waste, of any kind, in a protective manner.

Sincerely,

A handwritten signature in black ink, appearing to read "Brian Dodd", with a stylized flourish at the end.

Brian Dodd, Ph.D.

Enclosure

Enclosure to HPS President Brian Dodd's Letter of August 23, 2006



HEALTH PHYSICS SOCIETY

Specialists in Radiation Safety

HEALTH PHYSICS SOCIETY

COMMENTS TO THE

NUCLEAR REGULATORY COMMISSION

REQUEST FOR COMMENTS ON

THE NRC LOW-LEVEL RADIOACTIVE WASTE PROGRAM

August 23, 2006

Offices of the Executive Secretary, 1313 Dolley Madison Blvd., Suite 402, McLean, VA, 22101

Phone: (703) 790-1745 **Fax:** (703) 790-2672 **Email:** hps@burkinc.com **Web site:** www.hps.org

Comments responding to selected questions posed by the Nuclear Regulatory Commission (NRC) refer to the following attachments to this enclosure:

Attachment 1: “LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT NEEDS A COMPLETE AND COORDINATED OVERHAUL,” Position Statement of the Health Physics Society, September 2005

Attachment 2: Background Information on “LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT NEEDS A COMPLETE AND COORDINATED OVERHAUL,” September 2005

Attachment 3: “CLEARANCE OF MATERIALS HAVING SURFACE OR INTERNAL RADIOACTIVITY,” September 1999

Regarding the Current LLW Disposal Regulatory System

1. What are your key safety and cost drivers and/or concerns relative to LLW disposal?

Comment 1:

a. Our key safety concerns relative to LLW disposal are safety of workers and the public and the protection of the environment. Please see Attachment 1, position 1 and Attachment 2, Position 1 discussion.

b. Our cost concerns relative to LLW disposal are that high costs to waste generators will impede the use of nuclear technologies that provide significant benefits to society. Please see Attachment 1, position 2 and Attachment 2, Position 2 discussion.

2. What vulnerabilities or impediments, if any, are there in the current regulatory approach toward LLW disposal in the U.S., in terms of their effects on:

a. Regulatory system reliability, predictability, and adaptability;

Comment 2.a:

(1) We feel the current radioactive waste classification system, which is based on origin or legislative stature of the radioactive waste, and the lack of risk-based integration with other forms of hazardous waste impedes the establishment of regulatory system reliability, predictability, and adaptability. Please see Attachment 1, position 3.a and 3.b and Attachment 2, Position 3.a and Position 3.b discussion.

(2) In March 2006 the National Academies National Research Council’s (NANRC) Committee on Improving Practices for Regulating and Managing Low-Activity Radioactive Waste issued its report “Improving the Regulation and

Management of Low-Activity Waste.” Recommendation 1 of that report calls for a risk-informed regulation of Low-Activity Waste through integrated strategies developed by the regulatory agencies. We endorse this recommendation in that it is consistent with Attachment 1, position 3.a and 3.b.

(3) We feel the lack of access to non-Department of Energy (DOE) waste generators to all permitted disposal facilities and to DOE owned and operated facilities impedes the establishment of regulatory system reliability and predictability. Please see Attachment 1, position 3.c and Attachment 2, Position 3.c discussion. This is also consistent with the NRC position given in Appendix V of the Government Accountability Office (GAO) report GAO-06-604, “Low Level Radioactive Waste Management.” The NRC stated “we believe it is in the national interest to begin exploring the alternatives identified in Appendix II that would potentially provide a better legal and policy framework for new disposal options for commercial generators of LLRW,” with recognition that one of the options offered is to use DOE disposal facilities for commercial waste.

b. Regulatory burden (including cost); and,

Comment 2.b: We feel the lack of alternative disposal options that would be available under a risk-based, integrated waste disposal system results in high costs of low level waste disposal. This is particularly true for low-activity waste (LAC)/very low level waste (VLLW). Please see Attachment 1, position 2 and Attachment 2, Position 2 discussion

c. Safety, security, and protection of the environment?

Comment 2.c: We feel the lack of regulatory system reliability, predictability and adaptability and the high cost of waste disposal, which are results of the impediments discussed above, encourage waste generators to store waste on-site rather than send it for permanent disposal. See Attachment 1, position 1 and Attachment 2, Position 1 discussion.

Can the Future Be Altered?

5. What actions could be taken by NRC and other federal and state authorities, as well as by private industry and national scientific and technical organizations, to optimize management of LLW and improve the future outlook?

Comment 5:

a. Please see Attachment 1, recommendations 1 through 4 and Attachment 2, Recommendations 1 through 4 discussions for specific actions that can be taken by NRC and other federal and state authorities, as well as by private industry and national scientific and technical organizations.

- b. It should be noted that the NANRC report cited the different regulatory regimes for uranium and thorium generated by Atomic Energy Act (AEA) and non-AEA activities as being an example of where a risk-informed regulations would improve the current system and recommendation 4 of the report calls for harmonization of AEA and non-AEA waste disposal. This observation and recommendation supports and is consistent with the recommendation in Attachment 1, Recommendation 3.
- c. In addition to these actions, we feel an integral part of a risk-based, integrated hazardous waste disposal system is the existence of a material clearance pathway. Please see Attachment 3.

The fundamental position for material clearance is contained in Attachment 3, position (7), which supports the adoption of ANSI 13.12 as a basis for a clearance rule. The standard recognized efforts of the International Atomic Energy Agency (IAEA) that were ongoing at the time of publication in 1999, and it recognized the need to adopt standards that would be consistent with those used in international commerce.

Since publication of ANSI/HPS N13.12, various regulatory bodies, including the U.S. Nuclear Regulatory Commission and the IAEA, have continued to consider clearance issues. In particular, the IAEA efforts resulted in two key publications: 1) IAEA Safety Standards Series No. RS-G-1.7 (*Application of the Concepts of Exclusion, Exemption and Clearance* - 2004) and 2) IAEA Safety Reports Series No. 44 (*Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance* - 2005). In 2005, the Health Physics Society was requested to establish a writing group to evaluate the IAEA recommendations and determine if it is possible to harmonize their recommendations with ANSI/HPS N13.12. The Health Physics Society agreed, and the writing group has been established. This writing group is currently reviewing the basic assumptions, data, radiation exposure scenarios, and results presented by the IAEA as compared to those that form the basis of ANSI/HPS N13.12. The expectation is that a revised national industry consensus standard will be published within the next two years. The goal is that the revised standard will be in harmony with the IAEA position so that it can be endorsed by the U.S. Nuclear Regulatory Commission and achieve international consistency.

We believe the revised standard will serve as a basis for radioactive material clearance rulemaking, which will provide an important aspect of an integrated waste disposal system that has regulatory reliability, predictability and adaptability.

- d. It should be noted that the NANRC report cited the lack of a generalized provision for wastes that contain very low concentrations of radioactivity to exit the regulatory system as an example of where risk-informed regulations

would improve the current system. This observation supports Comment 5.c above.

(Question 5 continuation) Which of the following investments are most likely to yield benefits:

- a. Changes in regulations;
- b. Changes in regulatory guidance;
- c. Changes in industry practices;
- d. Other (name).

Comment 5 continued:

- e. Recommendation 2 in the NANRC report recommends an approach for implementation of a risk-informed system. We endorse this approach and recommend it provides a model for any or all of the actions recommended in our positions and in this comment. The report advocates for a “stepwise, simplest-is-best” approach relying mainly on existing authorities under current statutes that uses a “four-tiered approach: (1) changes to specific facility licenses or permits and individual licensee decisions; (2) regulatory guidance to advise on specific practices; (3) regulation changes; or if necessary, (4) legislative changes.”

With this approach, investments are first made in areas that are easiest to accomplish under the existing regulatory framework, with investments in increasingly harder processes when it is necessitated.

6. Are there actions (regulatory and/or industry initiated) that can/should be taken in regard to specific issues such as:

- a. Storage, disposal tracking and security of GTCC waste (particularly sealed sources);

Comment 6.a: Please see Attachment 1, recommendation 4 and Attachment 2, Recommendation 4 discussion.

- b. Availability and cost of disposal of Class B and C LLW;

Comment 6.b:

- (1) Please see Attachment 1, recommendation 5 and Attachment 2, Recommendation 5 discussion. Although the recommendation calls for Congressional direction to federal agencies it may be possible that some of the specific alternatives and actions presented could be accomplished by regulatory or industry initiative without Congressional direction.

(2) More recently the HPS has made a recommendation in a formal communication with the Government Accountability Office in response to their request for input on low level waste management. We recommend the Environmental Impact Statement (EIS) now being prepared by DOE for a GTCC waste facility be expanded to include consideration of Class B and C waste, particularly sealed sources. If Class B and C disposal options are removed from many of the states by unilateral action of the State of South Carolina and the Barnwell waste disposal facility, the EIS for using the DOE GTCC facility will be done, even if the facility is not operational, such that non-DOE Class B and C waste will have disposal pathway once the facility is open. We believe this is consistent with the GAO recommendation in their report GAO-05-967 of September 2005, "Security of Unwanted Radiological Sources," calling for the Secretary of Energy and the Chairman of the NRC to collaborate on the implications and feasibility of non-GTCC waste from sealed radiological sources at DOE sites.

c. Disposal options for deleted uranium;

Comment 6.c: Please see Attachment 1, recommendation 3 and Attachment 2, Recommendation 3 discussion.

e. Disposal options for low-activity waste (LAW)/very low level waste (VLLW);

Comment 6.d: Please see Attachment 1, position 3.b and recommendation 2 and Attachment 2, Position 3.b and Recommendation 2 discussions.

g. Material Clearance

Comment 6.g: Please see Comment 5.c above.

7. What unintended consequences might result from the postulated changes identified in response to questions 5 and 6?

Comment 7: One unintended consequence would be the disruption of the activities of those states and facilities that are providing disposal facilities under the provisions of the Low-Level Radioactive Waste Policy Act (LLRWPA), as amended. While the HPS calls for an overhaul of low level waste management, it for the purpose of providing risk-based safe, efficient, and economical disposal of all radioactive waste to all states and all generators but it is not intended that it be at the expense of undoing low level waste management where it is working. It is possible that if the changes advocated by the HPS were to occur some generators and states that are currently operating under the LLRWPA may wish to re-examine their system. However, that would be voluntary on their part and any changes they may make would, presumably, be to their benefit.

8. What specific actions can NRC take to improve coordination with other federal agencies so as to obtain a more consistent treatment of radioactive wastes that possess similar or equivalent levels of biological hazard?

Comment 8: Please see Attachment 1, position 3.a and 3.b, Attachment 2, Position 3.a and 3.b discussion, and Comment 2.a above.



HEALTH
PHYSICS
SOCIETY

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT NEEDS A COMPLETE AND COORDINATED OVERHAUL

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

Adopted: October 1993
Revised: May 1995
Updated: July 1998
Revised: July 1999
Revised: September 2005

Contact: Richard J. Burk, Jr.
Executive Secretary
Health Physics Society
Telephone: 703-790-1745
Fax: 703-790-2672
Email: HPS@BurkInc.com
<http://www.hps.org>

Low-level radioactive waste (LLRW) is an inevitable byproduct of beneficial uses of radioactive materials in the United States. It arises from medical research, diagnosis and treatment of diseases, industrial processes, national defense, and electric power generation—all vital to our national interests. LLRW will continue to be generated, requiring the availability of disposal methods and sites so that society can continue to enjoy the full benefits of the use of radioactive materials. Safe and effective methods and standards for processing, transport, and disposal of LLRW are well established.

The 1980 LLRW Policy Act, as amended in 1985, established a framework for the states to provide for safe disposal of LLRW and encouraged the creation of regional compacts to develop an appropriate network of disposal sites. The deadlines established for the development of new sites have passed, with no new sites being opened. Political, judicial, and administrative obstacles have blocked the development of sites and have limited the disposal options for higher-activity classes of waste within existing sites. Disposal options for the highest-activity classes of waste are limited and may no longer exist for a majority of the states after 2008. In addition, the current regulatory framework results in excessive and overly restrictive requirements for disposal of the lowest-activity class of waste. The effect of these obstacles and restrictions is to interfere with optimal use of radioactive materials in medicine, research, energy production, and technology. The use

of all available options, including private, commercial, and federal facilities, can facilitate the orderly, safe, and efficient disposal of radioactive waste.

The current state of affairs for LLRW disposal has led the Health Physics Society to take the following **positions**.

- 1. The goal of managing LLRW is to ensure the safety of workers and the public and to protect the environment. To achieve this goal, disposal, not long-term storage, is the best and safest long-term approach.**
- 2. The Health Physics Society believes that lack of competition in LLRW disposal options results in excessively high costs to waste generators, which impede the use of nuclear technologies that provide significant benefits to society.**
- 3. The Health Physics Society believes that the regulatory framework for management and disposal of LLRW needs a complete and coordinated overhaul.**

The **fundamental changes** needed to LLRW management include the following:

- a. Waste classification and disposal requirements for any type of radioactive waste should be based on its potential risk to public health and safety, not on its origin or legislative stature.**
- b. Risk-informed waste-disposal requirements for radioactive materials should be consistent and integrated with waste disposal for nonradioactive hazardous waste.**
- c. The LLRW Policy Act should be amended or replaced to:**
 - i. allow non-Department of Energy (DOE) waste generators access to all existing licensed and permitted disposal facilities.**
 - ii. allow non-DOE waste generators access to disposal facilities owned and operated by the DOE.**
 - iii. provide a new waste-disposal capacity for all LLRW at a facility currently operated by DOE or by private industry on land owned by the federal government.**

Based on these positions, the Health Physics Society makes the following **recommendations**. Although some of these recommendations are available with no significant change in the regulatory framework, they are all consistent with the regulatory framework changes given above.

1. Based on Positions 3.a and 3.b, we endorse the approach for a waste-disposal classification system proposed by the National Council on Radiation Protection and Measurements (NCRP 2002).
2. Based on Position 3.b, we strongly support the Environmental Protection Agency efforts to move forward with a rulemaking to promulgate regulations allowing disposal of low-activity radioactive waste (LARW) and low-activity mixed waste (LAMW) at Resource Conservation and Recovery Act (RCRA) Subtitle C sites.
3. Based on Position 3.b, we support the use of uranium mill-tailings sites regulated under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for disposal of radioactive materials that are appropriate for these sites. Examples of potentially appropriate materials are certain non-11e.(2) byproduct material such as the LARW and LAMW noted in 2 above; technologically enhanced naturally occurring radioactive materials (TENORM); high-volume, low-activity waste from reactor decommissioning; and certain low-activity resins from operating reactors.
4. Based on Position 3.c, we strongly support DOE efforts to prepare an Environmental Impact Statement under the National Environmental Policy Act to evaluate additional alternatives for disposal of greater-than-Class C wastes. These include deep geological disposal facilities, existing LLRW disposal facilities (both commercial and federal), and new facilities (both commercial and federal) at federal sites or on private land.
5. Based on Position 3.c, we urge Congress to direct federal action to ensure that disposal options and capacity for Class B and Class C waste will exist for all states in the future. This can be achieved by use of commercial or private facilities on federal or private lands to mitigate significant adverse consequences to generators of these wastes.

Reference:

National Council on Radiation Protection and Measurements. Report 139, Risk-Based Classification of Radioactive and Hazardous Chemical Wastes, Bethesda, Maryland. Issued 31 December 2002.

* The Health Physics Society is a nonprofit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.



HEALTH PHYSICS SOCIETY

Specialists in Radiation Safety

**Background Information on
“LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT NEEDS A COMPLETE AND
COORDINATED OVERHAUL”**

Position Statement of the Health Physics Society*

**Adopted: October 1993, Revised: May 1995, Updated: July 1998, Revised: July 1999,
Revised: September 2005**

Approved by the Scientific and Public Issues Committee
Drafted with the assistance of the Legislation and Regulation Committee

Introduction

The Health Physics Society (HPS) initially issued a position statement in October 1993 titled “Low-Level Radioactive Waste.” In that statement the HPS expressed concern over the way in which the Low-Level Radioactive Waste (LLRW) Policy Act of 1980, as amended in 1985, was being implemented. The position statement was then revised in May 1995 to focus on the issue that disposal facilities were not being developed, resulting in waste being stored at the sites where it was generated. This revision established the Society position that disposal, not temporary storage, is the safest approach. In July 1998 the position statement was updated to reflect obstacles encountered in California and Texas in trying to site a disposal facility. In July 1999, the Society revised the position statement once again. In that revision the Society took the position that the LLRW Policy Act unnecessarily restricts access to available disposal sites and impedes open commercial development of additional facilities. In 2005 the Society revised the position statement again, giving it a different title.

This document provides background supporting information for the revised position statement issued in September 2005 titled “Low-Level Radioactive Waste Management Needs a Complete and Coordinated Overhaul.” It should be considered an adjunct to the position statement and is not a stand-alone document.

Rationale for the September 2005 Revision

The 1980 LLRW Policy Act, as amended in 1985, established a framework for the states to provide for safe disposal of LLRW and encouraged the creation of regional compacts to develop an appropriate network of disposal sites. However, 20 years after the last amendments to the act, disposal facilities and options for LLRW remain limited, do not provide options for disposal of all classes of LLRW, and are expensive. Since 9/11/2001, concern for the security of radioactive

material, including radioactive waste, has been greatly heightened. During this same period the availability of disposal facilities for the wastes having the highest radioactivity content, i.e., Class B, Class C, and greater-than-Class C (GTCC) waste, became uncertain. The disposal facility in Barnwell, South Carolina, announced it would no longer take Class B and Class C waste from other than its compact states after 2008. The disposal facility in Clive, Utah, ceased actions to try to obtain a license to dispose of Class B and Class C waste, and the projected disposal facility for GTCC waste, i.e., Yucca Mountain, continues to be delayed by a court ruling regarding the environmental performance standards. These issues and others have increased interest and concern within Congress. For example, the Senate Energy and Natural Resources Committee, which commissioned a report by the Government Accountability Office (GAO) on the disposal capacity projections for LLRW (GAO 2004), held a hearing in September 2004 on Low-Level Radioactive Waste Oversight. The committee subsequently commissioned a study by the National Academy of Sciences' Board of Radioactive Waste Management and commissioned another report by the GAO, which is to be completed in the fall of 2005 in anticipation of another hearing on waste issues.

In other radioactive waste-related activity, the Environmental Protection Agency (EPA) issued an Advanced Notice of Proposed Rulemaking (ANPR) for management of low-activity radioactive waste mixed with chemical hazardous waste (EPA 2003). The Nuclear Regulatory Commission (NRC) did work on rulemaking for disposition of solid materials. Further, Congress enacted legislation that classified certain naturally occurring or accelerator-produced radioactive materials (NARM) as byproduct material under the Atomic Energy Act (AEA). All these actions had implications for radioactive waste disposal.

The HPS provided public comments for these recent initiatives and activities. These included public comment on the EPA ANPR (HPS 2004a), public written testimony to the Senate Energy and Natural Resources Committee for its hearing (HPS 2004b), a joint position statement with the Organization of Agreement States on the need to reclassify NARM under the AEA (HPS 2005a), and responses to questions from the GAO regarding our written testimony to the Senate (HPS 2005b).

Each of these HPS documents contained positions and recommendations related to some aspect or aspects of LLRW disposal. The Scientific and Public Issues Committee decided to consolidate these positions and recommendations into a single document in the form of a revised position statement. Although the previously cited documents discussed issues concerning orphan sources and disposition of radioactive material, these topics are not incorporated in this position statement.

Position 1 – The goal of managing LLRW is to ensure the safety of workers and the public and to protect the environment. To achieve this goal, disposal, not long-term storage, is the best and safest long-term approach.

This position is carried forward from previous versions of the position statement. The continuing concern is that the lack of disposal options results in temporary storage of waste at or near the generator sources, which comprise thousands of sites nationwide. Clearly, the final disposal of waste in centralized, properly designed and secured disposal facilities is safer and presents a higher level of security than thousands of temporary, widely distributed storage facilities. In addition, temporary storage facilities impose an unnecessary cost on the generators and increase the likelihood of loss of control if facilities close and go out of business without transferring the waste to another facility.

Position 2 – The Health Physics Society believes that lack of competition in LLRW disposal options results in excessively high costs to waste generators, which impede the use of nuclear technologies that provide significant benefits to society.

Although long-term disposal options for Class A wastes are available, lack of competition results in excessively high costs to waste generators. These excessive costs have impeded the use of nuclear technologies that provide significant benefits to society. Such technologies are used to diagnose medical illnesses, treat cancers, conduct research, develop new pharmaceuticals, preserve our food supply, and generate over 20% of our nation's electricity from commercial nuclear power plants. We believe that reducing the price of waste disposal would stimulate more research, leading to more innovative/efficient technologies that could significantly improve the quality of life of our society. However, these beneficial technologies (such as those discovered by biomedical research) continue to be impeded due to the high cost of radioactive waste disposal.

We base our position on the following:

Waste-disposal costs for government contracts held by the Department of Energy (DOE) and the Army Corps of Engineers are approximately \$5 per ft³ for disposal of Class A LLRW at the Clive, Utah, disposal facility. For waste generators that do not have access to these government contracts, waste-disposal costs often exceed \$200 per ft³ for Class A LLRW. In addition, there are high costs for disposal of mixed waste (i.e., waste that is regulated for both its radioactive and hazardous chemical content) and radioactively contaminated biological waste. The cost for treatment and disposal of mixed waste from biomedical research activities typically ranges from \$150 to \$1,500 per gallon and can be greater than \$10,000 per gallon. In comparison, the cost for treatment and disposal of biological waste from biomedical research without radioactive contamination typically ranges from \$1 to \$20 per pound. Recognizing that much of biological waste is aqueous (about eight pounds per gallon), this converts to \$8 - \$160 per gallon, typically 10% of the cost of biomedical mixed waste.

A National Research Council (NRC) report published in 2001 (NRC 2001) strongly supports HPS' concern regarding the costs of waste disposal. The HPS acknowledges that the report from the NRC (NRC 2001) concluded that the disposal capacity at sites regulated by the NRC were

sufficient for biomedical needs for the next several decades. However, this report also concluded that the central issue in biomedical research is the cost of managing LLRW. While it noted the impacts of LLRW management varied depending on the local demographics and size of the research institution, the NRC further concluded that cost was an important issue to virtually all research institutions.

In the public comments submitted to the EPA in response to its Advance Notice of Proposed Rulemaking (ANPR) titled *Approaches to an Integrated Framework for Management and Disposal of Low-Activity Radioactive Waste: Request for Comment; Proposed Rule* (EPA 2003) several stakeholders, including the University of California (UC), the National Institutes of Health, the University of Nebraska, the University of Michigan, the Council on Radionuclides and Radiopharmaceuticals (CORAR), the HPS, and the state of Nebraska, underscored the economic impacts due to the high costs of waste disposal. In fact, CORAR agreed with EPA's concern that the high cost of waste disposal resulted in less than optimal health care practices. Moreover, CORAR noted that the referenced report by the NRC published in 2001 indicated that EPA regulations of mixed waste have already caused the elimination of some biomedical research and have increased the cost of research and health care (CORAR 2004).

Following are some examples of this concern from the letters to the EPA:

UC, commenting on behalf of the three DOE National Laboratories it manages, attested that the high cost and difficulty of disposing of low-activity mixed waste (LAMW) discourages some types of research conducted at its facilities. Therefore, UC adopted a general policy that no research be carried out that generates waste for which there is no disposal route. UC also supported EPA's efforts to allow more disposal options as a means to alleviate constraints on its research (UC 2004). Similarly, several UC campuses and private biomedical research centers are no longer conducting research using large animals or long-lived radioactive materials due to the unavailability of licensed treatment/disposal facilities and/or the high costs for disposal of radioactively contaminated biological waste and mixed waste.

The following specific examples were previously provided to the GAO by Cedars-Sinai Medical Center:

Animal studies at our institution are required to pay the expense of disposal out of their own grant funds. The institution does not cover the cost of this type of disposal.

- 1. Historically our institution's Cardiology research programs have used large animals such as dogs, pigs, etc. These programs have been suspended for years. Experiments utilizing radioactive compounds have proven to be too expensive for grants to pay for the disposal. One animal fills an entire 30-gallon drum.*

Cardiology research at our institution has generated breakthrough technology such as the Swan-Ganz Catheter. Drs. Swan and Ganz developed this catheter using large animals and radioactive tracers at our institution.

The use of sealed sources to treat the plaque on cardiac vessels was also research that was carried out with members of our cardiology staff. Over the years, sealed sources from iodine-125, to vanadium, strontium and phosphorous were all explored.

- 2. Currently our Neuroscience Institute is conducting research on blood brain barrier utilizing rats. For a 200 gm rat, only 20 microcuries of tritium or carbon 14 are utilized. The program has had to slow their research production of animals due to the costs of disposal. Each group of 60 rats requires disposal in a 30-gallon drum. Each drum costs approximately \$5,000 for 1.2 millicuries of radioactive waste. Typically, this research generates approximately 60 drums per month.*

This research on blood brain barrier is to discover a way to directly target and treat life-altering and life-ending brain tumors. These tumors are very resilient and most often recur after surgical resection. When they recur, they are more aggressive than initially presented and a treatment like Radiation Therapy or Gamma knife, etc. has even less efficacy. The life-span of these patients is usually measured in months.

Recently the research program was brought back on track due to the implementation of some very expensive imaging technology. This technology has assisted the program with the reduction of the amount of radioactive materials used per animal experiment.

A colleague at Harbor-UCLA Medical Center added to this point: “Research using C-14 and H-3 labeled materials is nearly dead. People are using mass spectrometry techniques with C-13 and H-2 (stable nuclides) instead, even though they are less sensitive and more expensive.”

The Pharmaceutical Research and Manufacturers of America (PhRMA) stated the pharmaceutical and biotechnology industry invests over \$32 billion annually in discovering and developing new medicines. It also offered strong support encouraging EPA and the Nuclear Regulatory Commission to work together to allow disposal of LAMW and low-activity radioactive waste (LARW) at Resource Conservation and Recovery Act (RCRA) Subtitle C and RCRA Subtitle D sites. They provided a comparison of waste-disposal costs, which concluded that disposal of radioactive materials at sites other than an LLRW facility was 100-fold less expensive (PhRMA 2004).

The University of Nebraska cited similar observations on the high cost of waste disposal, stating that the disposal costs for a 30-gallon drum of nonscintillation LAMW at an NRC-licensed facility was 4,450% higher than managing a similar nonradioactive waste stream at an RCRA Subtitle C facility.

The state of Nebraska, Nebraska Health and Human Services, submitted comments to EPA regarding the economic impacts associated with disposal of waste generated by treatment of drinking water wastes at local municipalities. These wastes, which contain low levels of NORM, are generated by a large number of water treatment facilities across the United States. The state of Nebraska supported the EPA’s proposed approach to allow use of RCRA facilities for disposal of LAMW and LLRW as a means for reducing the economic burden of waste disposal (NE 2004).

Since the promulgation of 10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Waste* (>20 years ago), untreated radioactively contaminated biological waste has not been disposed of at shallow land burial facilities. Such waste containing either low concentrations of carbon-14 and hydrogen-3 or short-lived radionuclides stored for decay to background radiation levels has been incinerated. Biomedical research using radioactive materials that generated biological waste containing higher concentrations of carbon-14 and hydrogen-3, or many other long-lived radionuclides, is no longer being conducted. The loss of value of this research tool is difficult to quantify, but is estimated to be substantial.

Position 3 – The Health Physics Society believes that the regulatory framework for management and disposal of LLRW needs a complete and coordinated overhaul.

The **fundamental changes** needed to LLRW management include the following:

Position 3.a – Waste classification and disposal requirements for any type of radioactive waste should be based on its potential risk to public health and safety, not on its origin or legislative stature.

The use of a risk-informed approach for evaluating options for land disposal of LLRW should be applied independently of the origin of the radioactive materials. As stated by the National Academy of Sciences, *“Regulations focused on [low-level radioactive] waste’s origins have led to inconsistencies relative to their likely radiological risks”* (NRC 2003). These inconsistencies in regulation result in a fractionated, complicated, and inefficient regulatory framework that has contributed to the high cost of waste disposal without increasing the protection of public health and safety.

A risk-informed approach should be applied to NORM, technologically enhanced NORM (TENORM), NARM, and all other radioactive materials. For example, uranium mill tailings produced prior to the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) may not be disposed of in existing Title II uranium tailings sites without further acts of Congress. Likewise, other ore tailings containing similar radionuclides and posing a similar level of risk may not be disposed of in mill-tailings impoundments.

Position 3.b – Risk-informed waste-disposal requirements for radioactive materials should be consistent and integrated with waste disposal for nonradioactive hazardous waste.

As noted above, the current system of regulatory control of radioactive materials is severely fractionated with EPA, NRC, and individual states having authority under various laws. This fractionated control leads to inconsistency, inefficiency, and unnecessarily expensive public health protection policies, as discussed in the HPS Position Statement *“Compatibility in Radiation-Safety Regulations”* (HPS 2000).

The HPS believes that appropriate rulemaking by the EPA and NRC applying a classification framework based on the potential risk to public health and safety will achieve equitable

protection from the hazards of radioactive and chemical waste, while at the same time moving toward a more efficient framework of regulatory control over radiation exposure in this country.

Although the EPA ANPR (EPA 2003) requested comments on the most effective use of RCRA Subtitle C facilities for disposal of LAMW, it also requested comment on a variety of wastes regulated under the AEA. These wastes include certain wastes governed by the AEA, certain wastes generated by the extraction of uranium and thorium, a variety of wastes characterized as TENORM, and certain types of decommissioning wastes.

The EPA acknowledged that some wastes regulated under the AEA are excluded from regulations as “unimportant quantities” (i.e., source materials containing less than 0.05% uranium or thorium), while others are regulated down to the last atom. Additionally, the EPA acknowledged that the current practice of LLRW disposal resulted in costly waste-management practices and appeared to have an adverse impact on the health care industry to levels that were less than optimal. To address these issues, EPA solicited stakeholder input to find solutions needed to minimize the current practice of imposing dual regulatory authority for controlling disposal of these types of regulated wastes.

Although the EPA requested comments on a variety of issues as specified in the ANPR, the following three questions appeared most important:

1. How can the disposal of LAMW be simplified?
2. Is it feasible to dispose of other LARW in hazardous waste sites?
3. What nonregulatory approaches might be effective in managing LAMW and other LARW?

To minimize dual regulatory authority, the EPA acknowledged that such an integrated framework would also require changes to regulations established by the NRC and Agreement States under the AEA. In fact, the EPA noted a similar regulatory approach that was successful previously in eliminating dual regulations (FR 2001). This approach required deferral of EPA’s authority under RCRA, thus allowing disposal of mixed wastes at sites regulated by the NRC, under Title 10 Code of Federal Regulations, Part 61. The EPA believed that such a rulemaking was justifiable since adequate protection of human health and the environment was ensured under the existing NRC standards. The EPA also stated that both agencies could pursue a similar and compatible rulemaking to further harmonize the management of certain regulated waste streams outlined in the proposed rulemaking. Such a rulemaking would afford the same level of protection. The EPA stated that this approach would also reduce the regulatory burdens imposed by two separate regulatory regimes. To support this objective, the EPA would consider proceeding with a rulemaking that would allow disposal of waste streams that contain certain concentrations of radioactive materials at one of the 20 existing RCRA-regulated facilities. However, for this approach to succeed, the NRC must defer its authority under the AEA to allow disposal of licensed materials at sites regulated under RCRA, Subtitle C.

In April 2004, the HPS submitted comments on this rulemaking initiative, commending the EPA for its leadership in embarking on this important task (HPS 2004a). In addition to addressing the necessary radiation standards successfully employed to protect human health and safety, our

comments addressed technical issues regarding the movement and fate of radioactive and hazardous materials in the environment. We noted that the movement of radioactive materials in the environment would generally share the same parameters as the chemical compounds of which they are a part, except to the extent that radioactive decay hastens their degradation. We included reference to a report by the California Office of Environmental Health Hazard Assessment that concluded that biodegradation times of many RCRA hazardous wastes containing heavy metals are on the order of over 200,000 years and, thus, comparable to many of the long-lived radionuclides. As such, we suggested a concept based on the half-lives of chemicals and radionuclides should be considered to better shape the definition of LAMW and LARW.

Position 3.c – The LLRW Policy Act should be amended or replaced to:

- i. allow non-Department of Energy (DOE) waste generators access to all existing licensed and permitted disposal facilities.**
- ii. allow non-DOE waste generators access to disposal facilities owned and operated by the DOE.**
- iii. provide a new waste-disposal capacity for all LLRW at a facility currently operated by DOE or by private industry on land owned by the federal government.**

This position was first adopted by the HPS in the 1999 revision of this position statement.

The 1980 LLRW Policy Act, as amended in 1985, established a framework for the states to provide for safe disposal of LLRW and encouraged the creation of regional compacts to develop an appropriate network of disposal sites. The deadlines established for the development of new sites have passed with no new sites being opened. Political, judicial, and administrative obstacles have blocked sites from development and have limited the disposal options for higher-activity classes of waste in existing sites. Disposal options for the highest-activity classes of waste are limited and may no longer exist for a majority of the states after 2008. Complex regulatory obstacles have thwarted other sites in North Carolina, Pennsylvania, Illinois, and Nebraska. The LLRW Policy Act now unnecessarily restricts access to available disposal sites and impedes open commercial development of additional facilities.

Present knowledge and technology are sufficient to allow safe disposal of radioactive waste. Comprehensive regulations and practices are in place for the design, operation, and closure of LLRW disposal sites. The use of all available options, including federal and private commercial facilities on federal or private land, can facilitate the orderly, safe, and efficient disposal of radioactive waste.

Recommendation 1 – Based on Positions 3.a and 3.b, we endorse the approach for a waste-disposal classification system proposed by the National Council on Radiation Protection and Measurements (NCRP 2002).

National Council on Radiation Protection and Measurements (NCRP) Report No. 139, *Risk-Based Classification of Radioactive and Hazardous Chemical Wastes*, issued 31 December 2002, provides a risk-based framework for revising the manner in which radioactive and hazardous materials are classified. We believe that the framework laid out in NCRP Report 139 is an appropriate basis for implementing Positions 3.a and 3.b of this position statement.

This report incorporates the following principles:

1. The classification system is generally applicable to any waste that contains radionuclides, hazardous chemicals, or mixtures of the two.
2. Wastes that contain hazardous substances are classified based on consideration of health risks to the public that arise from waste disposal.
3. The waste classification system includes an exempt class of waste.

Recommendation 2 – Based on Position 3.b, we strongly support Environmental Protection Agency efforts to move forward with a rulemaking to promulgate regulations allowing disposal of low-activity radioactive waste (LARW) and low-activity mixed waste (LAMW) at Resource and Conservation Recovery Act (RCRA) Subtitle C sites.

We strongly support EPA efforts to move forward with a rulemaking to promulgate regulations that would allow disposal of LARW and LAMW at RCRA Subtitle C sites. The regulatory control required under RCRA is expected to provide adequate levels of protection, subject to an appropriate environmental impact analysis. We strongly encourage EPA, NRC, and state agencies to work closely together to move this rulemaking forward in a coordinated manner.

Recommendation 3 – Based on Position 3.b, we support the use of uranium mill-tailings sites regulated under the Uranium Mill Tailings Radiation Control Act (UMTRCA) for disposal of radioactive materials that are appropriate for these sites. Examples of potentially appropriate materials are certain non-11e.(2) byproduct material such as the LARW and LAMW noted in 2 above; TENORM materials; high-volume, low-activity waste from reactor decommissioning; and certain low-activity resins from operating reactors.

We support a nonregulatory approach that would allow disposal of low levels of candidate materials at uranium mill-tailings sites regulated under the UMTRCA. Efforts have been made by the National Mining Association (NMA) and the Fuel Cycle Facility Forum (FCFF) to explore an option that should be considered to ease the nation's low-level waste disposal capacity problem. NRC has existing policy guidance (NRC 1999) regarding the direct disposal of certain radioactive materials at uranium mill-tailings facilities. These facilities normally

contain “11e.(2)” byproduct material¹ (also known as “mill tailings”), which are wastes generated from the processing of ores principally for their source material content. NMA and FCFF believe that the existing policy that severely restricts non-11e.(2) material from being disposed of in mill-tailings piles needs amending. These two groups are proposing that NRC liberalize its criteria for determining what types of non-11e.(2) materials could be appropriately disposed in licensed uranium mill-tailings impoundments by developing generic waste acceptance criteria for such materials. These generic waste acceptance criteria would be based on the same safety acceptance criteria as used to demonstrate that 11e.(2) materials (tailings) could be safely disposed in a mill-tailings impoundment and would serve as the basis for disposal of non-11e.(2) candidate waste streams that are chemically, physically, and radiologically similar to 11e.(2) materials, which are covered under UMTRCA.

The current restrictions on disposal of non-11e.(2) byproduct in UMTRCA-licensed facilities is another manifestation of waste management based on the origin of the waste and not the relative risk it presents to human health, the environment, or national security. Uranium mill tailings, for example, possess many chemical, physical, and radiological similarities to LARW and LAMW and NORM waste generated by a variety of non-uranium-milling processes. Yet, despite being virtually identical to 11(e).2 byproduct, differences in origin of LARW and LAMW result in denial of a vast, underutilized disposal resource that could otherwise be available to many licensees throughout the United States for non-11(e).2 byproduct materials.

Another advantage of liberalizing 11(e).2 disposal in UMTRCA facilities would be creating an alternative disposal outlet for vast quantities of Class A LLRW. In decommissioning uranium fuel-cycle facilities to levels that will allow unrestricted release under 10 CFR 20, Subpart E, Radiological Criteria for License Termination (LTR), large volumes of LLRW, typically containing low levels of uranium/thorium-bearing materials, are generated. The large volumes of wastes generated at these facilities are the result of efforts to comply with the LTR that leads to remediation at levels that are approximately the same concentrations as measured in the natural environment. Since the uranium/thorium-bearing waste streams generated at uranium fuel-cycle facilities and many DOE sites are less hazardous than those present in the tailings impoundment, these solid materials would be ideally suited for disposal in UMTRCA facilities.

There are significant advantages to disposing of additional types of waste at UMTRCA facilities. First, by statute, these facilities must be turned over to the government (DOE) for long-term custodial care in perpetuity. In addition, NRC regulations require that all mill tailings must be protected for a period of 200 to 1,000 years with no active maintenance and only passive controls. This will provide greater protection than that offered by RCRA or at disposal sites regulated under 10 CFR Part 61. We believe that this alternative fits well within the context of a nonregulatory alternative² for disposal of potentially large volumes of decommissioning wastes that are similar in nature and pose less hazard than those wastes presently contained in uranium mill-tailings facilities.

¹ So called because it is defined in Section 11(e).2 of the AEA.

² Nonregulatory approaches should be viewed as statutory actions that exist within the scope of an existing framework. Nonregulatory approaches should not be viewed as removal of such wastes from regulatory control or deregulation of LLRW. Moreover, this term was used to specifically address information requested by EPA under its ANPR (EPA 2003).

A fundamental concern associated with the direct disposal of non-11e.(2) byproduct material in uranium mill-tailings impoundments is that, if such material contains RCRA hazardous wastes, it could then subject the entire impoundment to regulation by EPA or delegated states under RCRA. Similar jurisdictional overlap might occur if any non-11e.(2) byproduct material containing NORM subject to state regulation is disposed of in a mill-tailings impoundment. This potential for dual or overlapping jurisdiction raises questions about the eventual transfer of custody of mill tailings to DOE, the long-term custodian. UMTRCA requires Title II licensees to transfer custody of their uranium mill-tailings facilities to DOE upon license termination, and DOE is required by Section 83 of the AEA to take the mill tailings and other property necessary for the proper disposal of 11e.(2) byproduct material. Since UMTRCA contains no provision requiring that DOE take custody of, or title to, materials other than 11e.(2) byproduct material, disposal of other materials could, without congressional action, pose an impediment to license termination and transfer of custody to DOE as the long-term steward.

Although DOE is only required to take title to and custody of 11e.(2) byproduct material under UMTRCA, the department has the authority under 42 USC § 10171(b) to accept custody of AEA wastes other than 11e.(2) byproduct material under the Nuclear Waste Policy Act of 1980, including non-11e.(2) byproduct material, provided that:

1. NRC requirements for site closure are satisfied.
2. transfer of title and custody to DOE is without cost to the federal government.
3. federal ownership and management of the site is necessary or desirable to protect public health and safety and the environment.

Several categories of wastes have already been proposed for disposal in uranium mill-tailings impoundments, including secondary process wastes generated during the capture of uranium in side-stream recovery operations, sludge and residues generated during treatment of mine water containing suspended or dissolved source material, NORM, and TENORM. Some fuel-cycle facilities have expressed an interest in seeking NRC approval to dispose of special nuclear materials in existing tailings impoundments. To address these and other issues, the NRC began its inquiry into this matter approximately 10 years ago.

The existing disposal capacity at a single uranium mill-tailings site can easily exceed 20-40 million metric tons. We further recommend that the committee seek additional information regarding the level of funding that may be required in the development of generic waste-disposal criteria in order to expedite the classification and disposal of these radioactive wastes based on their risk and not their origin. Existing mill-tailings sites have sufficient capacity to accept most, if not all, of the fuel-cycle industry's low-activity, high-volume waste well into the foreseeable future.

Recommendation 4 – Based on Position 3.c, we strongly support DOE efforts to prepare an Environmental Impact Statement under the National Environmental Policy Act to evaluate additional alternatives for disposal of greater-than-Class C (GTCC) wastes. These include deep geological disposal facilities, existing LLRW disposal facilities (both commercial and federal), and new facilities (both commercial and federal) at federal sites or on private land.

Given the political uncertainty of licensing the federal repository at Yucca Mountain, which has been considered the most likely disposal alternative for GTCC waste, all alternatives for GTCC disposal should be fully explored.

In May 2005, the DOE issued in the *Federal Register* an Advanced Notice of Intent to prepare an Environmental Impact Statement (EIS) on waste disposal alternatives for GTCC LLRW (FR 2005). DOE intends that this EIS will enable DOE to select any new or existing disposal locations, facilities, and methods for disposal of GTCC LLRW as well as DOE waste with similar characteristics.

The LLRW Policy Act assigned to the federal government responsibility for the disposal of GTCC radioactive waste. This EIS will evaluate alternative locations and methods for disposal of these wastes. Potential disposal locations include deep geologic disposal facilities; existing LLRW disposal facilities, both commercial and DOE; and new facilities at DOE or other government sites or on private land. Methods to be considered include deep geologic disposal, greater confinement disposal configurations, and enhanced near-surface disposal facilities.

While we strongly support the evaluation of all alternatives to GTCC disposal, we suggest that use of the Waste Isolation Pilot Project (WIPP) in Carlsbad, New Mexico, be considered as part of this evaluation because extensive environmental reviews for disposal of candidate chemical hazardous and transuranic waste streams have already been conducted for this facility in support of rulemakings. We believe the geologic features and regulatory controls currently governing the use of this facility would adequately protect public health and safety for disposal of GTCC sources. We are very sensitive to the fact that the WIPP was initially approved with a clear understanding it would not be made available for non-defense-related waste and that a reversal of that promise to the people of New Mexico should not be done lightly. However, the great national need for a safe and timely disposal option for this most highly radioactive category of LLRW calls for an evaluation of all options. Therefore, we recommend stakeholder involvement in the decision-making process to consider allowing disposal of waste streams not originally destined for WIPP under the National Environmental Policy Act of 1969.

Recommendation 5 – Based on Position 3.c, we urge Congress to direct federal action to ensure that disposal options and capacity for Class B and Class C waste will exist for all states in the future. This can be achieved by use of commercial or private facilities on federal or private lands to mitigate significant adverse consequences to generators of these wastes.

While disposal options for Class A radioactive waste are expensive, inconsistent and, in some cases, unnecessarily overly restrictive, disposal options for Class B and Class C wastes are of particular concern because they may become nonexistent for a majority of the states in 2008. Currently Class B and Class C waste disposal is available in Washington State to the 11 member states of the Northwest and Rocky Mountain Compacts and in South Carolina for all other states. However, South Carolina has passed legislation requiring the disposal facility to stop accepting Class B and Class C waste from states other than the three members of the Atlantic Compact in 2008. This would leave 36 states without a disposal option for the highest radioactive classes of LLRW.

We believe that use of the Waste Control Specialist (WCS) site in Texas offers the potential for disposal of Class B and C LLRW should South Carolina continue to prohibit access to its site to nonmember states after 2008. It is our understanding that the Texas legislature has the political resolve to assist state government agencies responsible for licensing this facility to completion. Moreover, the local community in areas surrounding Andrews, Texas, is firmly supportive of opening this site, in large part due the economic benefits that this facility will bring forward. However, use of WCS by noncompact members is contingent upon the Texas Compact shouldering the burden of allowing access to the WCS site for disposal of Class B and C LLRW. For this approach to be successful, bilateral agreements between Texas (as the host state of the Compact) and any one or more of the remaining states, District of Columbia, and Puerto Rico may be needed. Should Texas opt to prohibit access to the WCS site to any nonmember state as allowed under the LLRW Policy Act, then congressional action in changing the LLRW Policy Act may be necessary to prevent significant adverse consequences to generators of Class B and C wastes, as well as the biomedical community for disposal of tissue wastes containing radioactive material.

Other alternatives that warrant consideration are to authorize:

1. Access to both compact and noncompact states for disposal of LLRW at a facility operated by the DOE, or
2. Commercial construction and operation of an LLRW disposal facility, including construction on land owned by the federal government if privately owned sites cannot be identified or approved by the states. Under this approach, congressional action may be necessary to construct a facility that could be operated by private industry³ and licensed by the NRC.

Under either of these approaches, congressional action may be needed to remove statutory impediments prohibiting access for disposal of LLRW to compact and noncompact states alike.

³ Such a concept is currently being implemented for disposition of surplus weapons-grade plutonium at the Savannah River Site located near Aiken, South Carolina.

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* The Health Physics Society is a nonprofit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 6,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the Department of Defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society. The Society may be contacted at 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101; phone: 703-790-1745; fax: 703-790-2672; email: HPS@BurkInc.com.



HEALTH
PHYSICS
SOCIETY

CLEARANCE OF MATERIALS HAVING SURFACE OR INTERNAL RADIOACTIVITY

POSITION STATEMENT OF THE HEALTH PHYSICS SOCIETY*

Adopted: September 1999
Reaffirmed: March 2001

Contact: Richard J. Burk, Jr.
Executive Secretary
Health Physics Society
Telephone: 703-790-1745
Fax: 703-790-2672
Email: HPS@BurkInc.com
<http://www.hps.org>

The Health Physics Society* welcomes the opportunity to participate in the process initiated by the Nuclear Regulatory Commission for development of standards for the clearance of materials having surface or internal radioactivity. The Society believes that the definition of clearance levels is an important part of the standards that provide for the safe handling, use, and disposal of radioactive materials.

The position of the Society relative to radiation protection regulations and standards for the general public have been established in previous Position Statements of the Society. Portions of these positions relative to the clearance of materials having surface or internal radioactivity are:

- (1) we support regulations for radiation protection that are based on the National Council of Radiation Protection and Measurements' (NCRP) recommendations for dose limits for individual members of the public;**
- (2) we recommend that constraints¹ be applied to all regulated, non-medical, non-occupational sources of radiation exposure to the general public, excluding indoor radon, such that no individual member of the public will receive in any one year a total effective dose equivalent (TEDE)² exceeding 100 mrem (1 mSv)³ from all such sources combined; and,**
- (3) we recommend that dose limits be applied only to individual members of the public, not to the collective dose to population groups.**

Expansion and clarification of these recommendations specific to clearance of materials having surface or internal radioactivity further leads the Society to take the position that:

- (4) **we recommend that regulations for radiation protection be based on consensus standards of the American National Standards Institute (ANSI) issued by the Health Physics Society Standards Committee in keeping with the intent of Public Law 104-113 “National Technology and Transfer Act of 1995” and OMB Circular A-119 “Federal Participation in the Development and Use of Voluntary Consensus Standards”;**
- (5) **we recommend that primary radiation protection standards be all pathway TEDE standards with screening levels related to quantities that can be measured such that compliance with these levels will result in the primary dose standards being met for reasonable and likely scenarios;**
- (6) **we recommend that these screening levels be derived with consideration of the principle of as low as reasonably achievable (ALARA); and,**
- (7) **we support the adoption of ANSI Standard N13.12 (1999), “*Surface and Volume Radioactivity Standards for Clearance*”, which is consistent with positions (1) through (6) above.**

ANSI Standard N13.12

Clearance is the removal from further control, of any kind, of items or materials that may contain residual levels of radioactivity. In 1964, the Health Physics Society, under the auspices of ANSI, began the technical evaluation of clearance, resulting in early drafts of ANSI N13.12. These early drafts of the clearance standard were based primarily on detection levels that could be achieved using field instruments, with secondary concerns about the potential individual doses that may result. An early draft version of ANSI N13.12 was consistent with the surface contamination limits that were published by the U.S. Atomic Energy Commission in the 1974 version of Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors*, which is still in use today.

In 1993, the Health Physics Society Standards Committee, in agreement with ANSI Committee N13, established a technical writing group to develop the final N13.12 clearance standard. The charter of the writing group was to develop a consensus clearance standard that would be protective of public health based on the recommendations of the International Commission on Radiological Protection (ICRP). Recommendations of the NCRP that have been adopted as the regulatory basis in this country are consistent with those of the ICRP. The standard was also chartered to consider both surface and volume radioactive contamination, consider radiation detection issues, and consider international issues such as the clearance principles outlined by the International Atomic Energy Agency and international trade implications for recycled or reused items or materials.

The final clearance standard was approved in August 1999 as N13.12, *Surface and Volume Radioactivity Standards for Clearance*. This standard provides both the individual dose criterion of 1 mrem per year for clearance and derived screening levels for groups of similar radionuclides. The standard also allows for clearance, when justified on a case-by-case basis, at higher dose levels when it can be assured that exposures to multiple sources (including those not covered by the standard) will be maintained ALARA and will provide an adequate margin of safety below the public dose limit of 100 mrem/y (TEDE). It was recognized that there were several complex issues that would make it difficult to fully implement the clearance standard. As a result, some of these issues were defined to be beyond the scope of the standard, including: naturally occurring

radioactive materials, radioactive materials in or on persons, release of a licensed or regulated site or facility for unrestricted use, radioactive materials on or in foodstuffs, release of land or soil intended for agricultural purposes, materials related to national security, and process gases or liquids.

Footnotes

¹ “Constraints” refer to restrictions placed on sources or practices in order to achieve the dose limits that apply to an individual.

² The total effective dose equivalent (TEDE) is the sum of the absorbed doses that will be delivered to the separate organs or tissues during the lifetime of an individual from one year’s intake of radionuclides plus irradiation by external sources, with each organ or tissue dose weighted for the type of radiation producing the dose and with an estimate of the risk that the organ or tissue will develop a radiation induced cancer or result in a genetic effect.

³ The Sievert (Sv) is the international (SI) unit of dose equivalent or of effective dose equivalent; 100 mrem = 1 millisievert (mSv). The Society endorses the use of SI units; however, because U. S. regulatory agencies continue to use traditional units in regulations, this position statement uses the traditional unit for dose equivalent, i.e., mrem, throughout the document.

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