NCRP

Managing the Disposition of Low-Activity Radioactive Materials

PROGRAM

Forty-First
Annual Meeting

March 30–31, 2005

Crystal Forum
Crystal City Marriott
1999 Jefferson Davis Highway
Arlington, Virginia

National Council on
Radiation Protection
and Measurements

NCRP

Program Summary

Wednesday, March 30, 2005

Opening Session

8:15 a.m. **Welcome**
Thomas S. Tenforde, *President*
National Council on Radiation Protection and Measurements

Second Annual Warren K. Sinclair Keynote Address

8:30 a.m. Introduction of the Lecturer
Thomas S. Tenforde

Contemporary Issues in Risk-Informed Decision Making on Waste Disposition
B. John Garrick
Garrick Consulting

Managing Low-Activity Radioactive Materials—Challenges and Issues

Ruth E. McBurney and Michael T. Ryan,
Session Co-Chairs

9:15 a.m. **Improving the Regulation and Management of Low-Activity Radioactive Wastes**
Michael T. Ryan
Charleston Southern University

9:45 a.m. **Risk-Informed Radioactive Waste Classification and Reclassification**
Allen G. Croff
Oak Ridge National Laboratory, Retired

10:15 a.m. Break

10:45 a.m. **Managing Disposition of Potentially Radioactive Scrap Metal**
S.Y. Chen
Argonne National Laboratory

International Policies and Practices

Joel O. Lubenau, *Session Chair*

11:15 a.m. **Review of International Standards, Recommendations and Practices Related to the Management of Low-Activity Radioactive Materials**
Gordon Linsley
International Atomic Energy Agency

11:55 a.m. **Spanish Protocol for Radiological Surveillance of Metal Recycling. A Collaboration of Government and Industry**
Juan Pedro Garcia Cadierno
J.I. Serrano Renedo
E. Gil Lopez
Nuclear Safety Council of Spain

12:15 p.m. Lunch

U.S. Experiences in Managing Low-Activity Radioactive Materials

Jill A. Lipoti, *Session Chair*

1:30 p.m. **Current Radioactive Waste Disposal Industry Conditions and Trends**
Steven A. Romano
U.S. Ecology

1:50 p.m. **Scrap Metals Industry Perspective on Radioactive Materials**
C. Ray Turner
River Metals Recycling, LLC

2:10 p.m. **Radioactive Metal Processing Industry Perspective**
Al Johnson
Duratek

2:30 p.m. **Low-Activity Radioactive Materials Management at the U.S. Department of Energy**
Frank Marcinowski, III
U.S. Department of Energy

2:50 p.m. Break

3:10 p.m. **Nuclear Industry Experience with Safe Disposition of Radioactive Materials**
Ralph L. Andersen
Nuclear Energy Institute

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Formulating Tomorrow's Public Policy

Susan D. Wiltshire, *Session Chair*

3:30 p.m. **Formulation of Future Nuclear Waste Public Policy in America**
David H. Leroy
Leroy Law Offices

3:50 p.m. **Low-Activity Waste Management—An Analysis of Public-Interest Group Positions**
H. Keith Florig
Carnegie Mellon University

4:10 p.m. **Policy Development from the Industry Perspective**
William P. Dornsife
Waste Management Specialists

4:30 p.m. Break

Twenty-Ninth Lauriston S. Taylor Lecture on Radiation Protection and Measurements

5:00 p.m. **Introduction of the Lecturer**
R.J. Michael Fry
Oak Ridge National Laboratory, Retired

Nontargeted Effects of Radiation: Implications for Low-Dose Exposures
John B. Little
Harvard University School of Public Health

6:00 p.m. Reception in Honor of the Lecturer

Thursday, March 31, 2005

8:00 a.m. **A Tribute to the Life and Scientific Accomplishments of Lauriston S. Taylor**
Robert O. Gorson
Thomas Jefferson University, Retired

8:30 a.m. **Business Session**

9:30 a.m. Break

Update of Regulatory Efforts and Round Table Discussion

Susan M. Langhorst, *Session Chair*

10:00 a.m. **Overview of U.S. Environmental Protection Agency's Initiative on Disposition of Low-Activity Radioactive Waste**
Daniel Schultheisz
U.S. Environmental Protection Agency

10:10 a.m. **Update of Regulatory Efforts by U.S. Nuclear Regulatory Commission**
Carl J. Paperiello
U.S. Nuclear Regulatory Commission

10:20 a.m. **Implementation of U.S. Department of Energy Policies, Directives and Guidance for Radiological Control and Release of Property**
Andrew Wallo, III
Stephen Domotor
Gustavo Vazquez
U.S. Department of Energy

10:30 a.m. **Role of State Regulatory Agencies in the Disposition of Low-Activity Radioactive Materials**
Edgar D. Bailey
Conference of Radiation Control Program Directors, Inc.

10:40 a.m. **Questions and Discussion**
(all participants)

11:35 a.m. **Summary**
John F. Ahearne, *Rapporteur*
Sigma Xi

12:15 p.m. **Closing Remarks**
Thomas S. Tenforde, *President*
National Council on Radiation Protection and Measurements

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Abstracts of Presentations

Wednesday, March 30, 2005

Opening Session

8:15 a.m. **Welcome**
Thomas S. Tenforde, *President*
National Council on Radiation Protection and Measurements

Second Annual Warren K. Sinclair Keynote Address

8:30 a.m. **Introduction of the Lecturer**
Thomas S. Tenforde

Contemporary Issues in Risk-Informed Decision Making on Waste Disposition
B. John Garrick
Garrick Consulting

Understanding the risks of nuclear waste management practices is the core issue for societies seeking to reap the full benefit of nuclear science and technology. Knowledge of the risks is not only critical to public health and safety and protection of the environment, but to the very economic viability of a nuclear energy industry and medical and industrial uses of radioactive materials. Because of the very large volume of low-activity radioactive waste in comparison to high-level waste, decisions on the disposition of low-activity waste can end up being an important driver for decisions on the use of nuclear energy and users of radioactive materials in other applications. This is because of the possibility of industry having to provide disposal using technologies that are beyond those necessary to reasonably assure public health and safety and the costs of handling and transporting large quantities of waste material. The options vary from disposing of low-activity waste in low cost hazardous material sites or industrial waste landfills at multiple and convenient locations, to having to emplace the waste in facilities for much higher hazard radioactive wastes at inconvenient locations. There is even the possibility of having to put

some fraction of low-activity wastes in extremely expensive high-level radioactive waste repositories at one *very inconvenient* location. The differences in costs are enormous and decisions about the disposition of the waste are critical to future societies. Key issues include the characterization of the waste based on real hazards rather than on waste origins, credible health effects models, consistency of risk analyses for different types of waste, and rules and regulations that allow disposal and management of the wastes commensurate with the actual risks involved. Issues with the application of the risk sciences to support the necessary decision making are (1) the credibility and context of the calculated risks and (2) public understanding and acceptance of the results. The answer to making the right decisions is the application of the risk sciences to the various waste management options in a systematic, transparent and credible way, such that there is consistency across different waste types and, most importantly, public understanding and support.

Managing Low-Activity Radioactive Materials—Challenges and Issues

Ruth E. McBurney and Michael T. Ryan,
Session Co-Chairs

9:15 a.m. **Improving the Regulation and Management of Low-Activity Radioactive Wastes**

Michael T. Ryan
Charleston Southern University

This paper summarizes the first phase of a study in progress by a committee of the National Academy of Sciences Board on Radioactive Waste Management. The Board initiated the study after observing that statutes and regulations administered by the federal and state agencies that control low-activity radioactive wastes have developed as a patchwork over almost 60 years and usually reflect the enterprise or process that produced the waste rather than the waste's radiological hazard. Inconsistencies in the regulatory patchwork or its application may have led to overly restrictive controls for some low-activity wastes but the relative neglect of others. In the first phase of this study, the committee reviewed current low-activity waste inventories, regulations and management practices. This led the committee to develop five categories that encompass the spectrum of low-activity wastes and serve

to illustrate gaps and inconsistencies in current regulations and management practices. The committee completed its first phase with four findings that will lead into the final phase of the study. This paper is excerpted from the committee's interim report that was issued in October 2003.

9:45 a.m. **Risk-Informed Radioactive Waste Classification and Reclassification**

Allen G. Croff
Oak Ridge National Laboratory, Retired

Radioactive waste classification systems have been developed to allow wastes having similar hazards to be grouped for purposes of storage, treatment, transportation and/or disposal. As recommended in NCRP Report No. 139, *Risk-Based Classification of Radioactive and Hazardous Chemical Wastes*, a preferred classification system would be based primarily on the health risks to the public that arise from waste disposal and secondarily on other attributes such as the near-term practicalities of managing a waste. The system should also include provision for case-by-case exceptions based on regulatory judgment.

The current U.S. radioactive waste classification system is not based primarily on risk because the keystone definition—that of high-level waste (HLW)—is based on the source of the waste instead of its inherent characteristics related to risk. Source-based systems can lead to dysfunctional outcomes such as:

- wastes from sources not included in a particular definition being excluded even though the waste poses risks similar to the wastes the source was envisioned to produce. Such exclusion could lead to unacceptable risks although site-specific waste acceptance criteria should prevent this from occurring, or
- wastes being included in the definition because they come from the specified source posing substantially less risk than the source was envisioned to produce because the waste has been substantially altered by decay or processing. Such inclusion could lead to use of unnecessarily expensive treatment or disposal technologies.

Some of these outcomes may have become reality as evidenced by (1) numerous U.S. Department of Energy efforts to reclassify “low-hazard” wastes included in the definition of HLW to allow such wastes to be exempted from requirements for HLW to be managed by disposal in

the proposed repository at Yucca Mountain, Nevada and (2) difficulties in finding a disposal destination for "high-hazard" wastes included in the low-level waste classification. Such wastes have been the subject of considerable historical and ongoing discussion, litigation and legislation.

A second important feature of the U.S. radioactive waste classification system that is not based primarily on risk is there are no general principles or provisions for exempting materials from being classified as radioactive waste which would then allow management as nonhazardous materials. That is, there is no provision for determining that the radionuclides contained in a material pose a risk sufficiently low so as to allow the material to be managed by disposal as municipal or industrial waste, or by recycle into unrestricted use. Historical attempts of regulatory agencies to establish such provisions were unsuccessful because of public concern about the perceived risk from the residual radionuclide content. However, efforts in this regard have again been initiated and are ongoing although the outcome is still unknown.

This paper will elaborate the current radioactive waste classification in the United States, summarize the current status of issues and risk-informed alternatives related to waste classification and reclassification, and provide observations on potential future direction of efforts to address radioactive waste classification and reclassification issues.

10:15 a.m. Break

10:45 a.m. **Managing Disposition of Potentially Radioactive Scrap Metal**

S.Y. Chen
Argonne National Laboratory

In 2002, the National Council on Radiation Protection and Measurements (NCRP) issued its Report No. 141, *Managing Potentially Radioactive Scrap Metal*. The report evaluates management policy toward scrap metal generated in regulated facilities that have radiological concerns. This issue has arisen because of the increased number of such facilities that have undergone (or will undergo) the decommissioning process and be dismantled. These facilities include the nuclear facilities owned by the government (nuclear weapons complex), those owned by the nuclear industry (commercial nuclear power plants), and

those owned by other industries that involve the generation of naturally occurring radioactive materials (such as petroleum exploration and extraction). It is estimated that more than ten million metric tons of scrap metal will ultimately be generated in the United States.

Since only a small portion of the scrap metal will have been in contact with or near radioactive materials, the term potentially radioactive scrap metal (PRSM) has been applied, if it cannot be otherwise classified under existing laws or regulations. Effective management of such materials cannot be accomplished today because of the lack of a consistent risk-based policy and systematic regulatory provisions.

One primary method for solving this problem would be to develop a regulatory process that facilitates application of a comprehensive management strategy for disposition of the full range of PRSM. The strategy must address two important factors. First, it must be based on appropriate national and international policies; and second, it must provide an array of viable disposition options. For the latter, two basic approaches have been identified. One approach consists of options that require the disposition to remain within the regulated environment (such as disposal at a licensed low-level radioactive waste facility or recycled for internal use); the other opts for the release of materials outside of the regulatory control (*i.e.*, clearance). Clearance is a concept that helps establish a regulatory process for certifying the eligibility of materials for unrestricted release from an existing regulatory control; much like the existing approaches to controlling gaseous and liquid effluent releases. To this end, appropriate radiological criteria, on the order of a few tens of microsieverts per year to the average member of the critical group, have been established. A specific clearance criterion, set at 10 μSv y^{-1}, would correspond to the negligible individual dose (NID) established in NCRP Report No. 116. At or below the NID level, further optimization may not be warranted. Within the context of clearance, practical disposition options for PRSM would include disposal at a landfill with less rigorous radiological control than for radioactive waste (*i.e.*, either as hazardous or municipal waste), or recycling in the general commerce. Implementation of the clearance process, however, still needs to overcome such issues as public perception and acceptance by the metal industry. Efforts should continue to resolve these issues.

In recent years, regulatory agencies in the United States have made attempts to address the outstanding disposition issues (including clearance of materials) in a more consistent and uniform manner. These efforts include the renewed effort of the U.S. Nuclear Regulatory Commission to promulgate clearance rules for the release of solid materials from licensed facilities; the U.S. Department of Energy's effort on the disposition of scrap metal generated from its facilities and the U.S. Environmental Protection Agency's recent issuance of an Advance Notice of Proposed Rulemaking to address the disposition of low-activity radioactive waste. State regulators have also established release standards for the disposition of technologically enhanced naturally occurring radioactive material under their Suggested State Regulations for the Control of Radiation.

International Policies and Practices

Joel O. Lubenau, *Session Chair*

11:15 a.m. **Review of International Standards, Recommendations and Practices Related to the Management of Low-Activity Radioactive Materials**

Gordon Linsley
International Atomic Energy Agency

As the decommissioning of nuclear installations gathers pace globally, countries are looking to establish appropriate strategies for the management of materials containing low levels of radionuclides, preferably consistent with international guidance. The subject has been on the agenda of the relevant international organizations for more than two decades and it continues to be an important and sensitive international issue. One of the main reasons for the international interest relates to the potential for trade in such materials between countries.

There are established mechanisms for developing international standards in the areas of nuclear safety, radiation protection, transport, and radioactive waste management. These are organized through the auspices of the International Atomic Energy Agency and involve a leading role for international approving committees made up of representatives of national regulatory authorities. The mechanisms

have been applied to produce various standards relevant to the management of low-level radioactive materials. Of particular interest, in this context, are the recent efforts to develop criteria for the exclusion, exemption and clearance of materials from regulatory control.

Concern over the potential international trade in scrap metal containing very low levels of radionuclides and the associated implications for industry has resulted in advice being developed by a regional international organization, the United Nations Economic Commission for Europe, representing industry concerns.

Recommendations in this area have also been developed by the European Commission (EC) for use within the countries of the European Union. EC has also organized reviews of practices within its member countries for the management of low-activity radioactive materials. These reviews and presentations at international conferences have shown that the approaches being used in countries to manage these materials are not all the same—a reflection of the significant differences in national policies for the management of low-activity materials.

11:55 a.m. **Spanish Protocol for Radiological Surveillance of Metal Recycling. A Collaboration of Government and Industry**

Juan Pedro Garcia Cadierno
J.I. Serrano Renedo
E. Gil Lopez
Nuclear Safety Council of Spain

Although the use of radiological techniques are subject to controls, radioactive materials have been detected frequently in the metallic scrap in many countries. This fact has motivated the start of a set of measurements to detect and to prevent this kind of event at national and international scales.

The Spanish steel industry is one of the most important in the industrial sectors of the country. It strongly depends on the importation of steel scrap that it is used as raw material. Experience has shown that countries who import great quantities of scrap metal, often promote international initiatives in order to reduce the derived risks of the presence of radioactive material in the scrap.

Until an incident occurred in a Spanish steel factory in 1998, the presence of radioactive material in scrap metal was considered as a potential risk in Spain. This event made evident that the risk is real and its consequences are very important at both environmental and economic levels.

This incident was a direct cause for establishing the Spanish protocol by national authorities. In this sense, the Spanish authorities (Ministry of Industry, Tourism and Trade and the Nuclear Safety Council), the National Company for Radioactive Waste Management, the Association of companies dedicated to scrap recovery (Spanish Federation of Recovery), the Union of Iron and Steel Companies, and the main trade unions signed in 1999 the *"Protocol for collaboration on the radiation monitoring of metallic materials."*

This protocol has a voluntary commitment. Through a national system of radiological surveillance of metallic scrap and the resulting products obtained from its processing, the duties and rights of all participants are defined. It describes the national control and surveillance system. This system is comprised of a set of legal bases, operations of radiological devices, development of training and education plans for workers, safe management of radioactive materials detected, and the steps to follow by a company in case of radioactive detection in the processing of scrap metal. From November 1999 to December 2003, 302 pieces (sources and contaminated materials) have been detected. The number of subscribing industries is 74 (25 iron and steel companies, 47 recovering industries, and two aluminum melting factories). The main radioactive detections are naturally occurring radioactive materials (NORM) and sources. The main radioactive sources are ^{226}Ra and ^{137}Cs. The origin of these materials are mainly from Spain, European Union (United Kingdom, France and Portugal) and African countries.

Since the signature of the protocol, four incidents have been detected. All of these were due to the processing of a ^{137}Cs source. Three of these were in steel production companies and the other was in a company dedicated to recovery and processing (break up and segregation of the metallic scrap).

12:15 p.m. Lunch

NCRP

U.S. Experiences in Managing Low-Activity Radioactive Materials

Jill A. Lipoti, *Session Chair*

1:30 p.m. **Current Radioactive Waste Disposal Industry Conditions and Trends**

Steven A. Romano
U.S. Ecology

In 1980, the nation was served by three commercial low-level radioactive waste facilities (LLW) in South Carolina, Washington, and Nevada. These sites also accepted low activity radioactive material (LARM) and naturally occurring and accelerator produced radioactive material (NARM). To address what was considered an inequity, the LLW Policy Act was passed that year to encourage formation of interstate compacts to manage LLW on a regional basis. Almost 25 years later, Compacts formed under the subsequently amended Policy Act and ratified by Congress have yet to provide a single new disposal facility.

The nation is consequently now served by a diverse array of industry facilities accepting various categories of radioactive waste. Available facilities include full service Class A, B and C LLW and NARM disposal operations near Richland, Washington and Barnwell, South Carolina; a Class A and mixed waste disposal operation near Tooele, Utah that also accepts LARM and NARM; and certain hazardous waste and uranium and thorium mill tailings waste facilities that accept LARM and/or NARM. The Richland Facility may only accept LLW from 11 western states due to Northwest Compact import restrictions, and is effectively restricted to high activity NARM. While the Barnwell Facility is not yet geographically restricted (it will be in 2008 under current law), that site is at a decided competitive disadvantage to the Tooele, Utah operation for Class A waste and lower activity wastes. The Tooele Disposal Facility dominates the commercial Class A and mixed waste disposal market on the strength of its existing licenses and comparatively low state tipping fees. Significantly, the Toole Facility was privately developed outside of the Compact structure. In a further departure from the Policy Act's vision, the Tooele Facility now faces competition from hazardous waste facilities in Grand View, Idaho and Andrews, Texas that are permitted to accept specified LARM and NARM waste, and from a 11e.(2) mill tailings

disposal facility in Blanding, Utah. The latter facilities accept wastes primarily generated by the federal government.

To expand their existing disposal services, the Andrews, Texas hazardous waste and LARM disposal facility is seeking Class A, B and C and mixed waste disposal authority to serve the Texas Compact, the U.S. Department of Energy, and others. The Tooele, Utah operation initiated and later postponed proceedings to license disposal of Class B and C waste. In addition, other mill tailings disposal facilities are seeking authority and/or contracts to dispose of LARM. With the exception of the Andrews, Texas site, no new Compact facilities are on the drawing Board. The disconnect between present conditions and what Congress contemplated in 1980 has engendered federal rulemaking forays, national level studies, and Congressional inquiries to re-evaluate future access to disposal services. This paper will discuss current and potential future service provision by the commercial disposal industry in this context.

1:50 p.m. **Scrap Metals Industry Perspective on Radioactive Materials**

C. Ray Turner
River Metals Recycling, LLC

In February 1983, the metals industry in the United States experienced the first reported/confirmed accidental melting of radioactive materials in a steel mill. It was ^{60}Co. Twenty-one years later, the metals industry/worldwide has reported more than 85 accidental meltings of radioactive material, costing an average of $12 million to decontaminate the mill plus loss of business and community confidence. In one case, the cost of cleanup, including fines, decontamination, loss of business, and disposal, is expected to exceed $100 million.

It should be obvious that this most competitive industry cannot withstand the extensive cost of this kind of mishap. Thus, the metals industry began to install very sensitive radiation detection systems to prevent accidental melting of radioactive material. The industry has spent hundreds of millions of dollars in the last two decades continually upgrading the detection systems, and still has no system that is 100 percent foolproof.

As a result of the super-sensitive systems, the industry has now uncovered a less serious, but very expensive,

problem that involves naturally occurring radioactive materials (NORM). It is the position of the scrap and steel industry to reject any radioactive material that comes to their facilities. These facilities are not generally equipped to handle the special problems inherent to cleaning a load of scrap metal and removing an unknown hazard. The systems generally do not distinguish between NORM or man-made radioactive materials and just report an alarm count-rate at a very low standard deviation above background.

The industry has been asked many times by both state and federal agencies to desensitize their equipment in order to minimize low-level alarms. The issue to us is not one of eliminating low-level nuisance alarms caused by NORM, but one of preventing accidentally melting a discreet source that would require that the mill be shut down for decontamination, again costing millions of dollars. Since the systems are currently not capable of detecting a sealed source 100 percent of the time, it is not worth the risk to desensitize the equipment and chance another meltdown.

More recently, governments have tried to persuade the industry to melt some cleared materials from nuclear facilities that contain low levels of radioactivity. The industry has unequivocally refused to melt that material, partially due to fear of problems with baghouse dust, and partially due to knowledge of the extensive costs of remediation, for which there is no federal nor state aid. The problem with radioactive material in steel mills is not one of cleared material that can scarcely be detected using state-of-the-art radiation detectors, but one of losing detection capability of orphaned sources. One fear is that the background levels of specific loads will be increased to the point that detection of orphaned sources that could be in the load might not be detected. This industry, again, is not willing to take that risk. The iron and steel industry, as with any other type of industry, reserves the right to decide what raw material will, or will not, work for them. They have the right to demand absolute purity of the metals they are purchasing. They receive no state or federal support or incentives making it worth their while to melt slightly contaminated materials. There is little or no value to melting recycled metals that contain radioactive materials when there is an abundance of metals that are “pure.” The public demand is for “pure” products and, therefore, requires “pure” raw materials in its manufacture. It is like squeezing a loaf of

bread in a supermarket to get the freshest loaf. Consumers have that prerogative and will not soon relinquish it. Neither will the scrap and steel industry.

The problem is not one caused by the U.S. Department of Energy, or the nuclear industry, but one of orphaned sources that have become uncontrolled. Several hundred orphaned sources are still being lost each year, and many are never accounted for until they are melted. The industry must do everything possible to prevent this from happening.

The U.S. Environmental Protection Agency has embarked upon a pilot study at several ports of entry for sea-going vessels that hopes to yield good results in helping to prevent accidental melts. The effort involves installing a detection system inside a grapple used to unload bulk cargoes. The project has yielded valuable data during the last three years and has proven to be a viable system that will hold up against the constant abuse of unloading steel cargoes. Hopefully this will help prevent another accidental melt in the United States.

Steel mills in the United States have similarly installed multiple systems to further assist them in preventing accidental melts. Hopefully, someday we will have the orphaned source problem solved, leaving room for negotiations to address melting “cleared” material. That day has not yet come.

2:10 p.m. **Radioactive Metal Processing Industry Perspective**
Al Johnson
Duratek

The current U.S. economic environment for the disposition of radioactive materials, including very low activity metals, is currently driven by relatively low radioactive disposal costs and readily available disposal space. The recent spike in price and demand for recycled metal commodities provide little economic incentive to the nuclear industry (including waste processors and metal recyclers) to pursue the recycling of potentially contaminated metal. Large nuclear facility decommissioning projects, that typically represent the largest potential source of very low activity metals, receive some of the most favorable radioactive disposal prices in the market. This economic fact, combined with the relatively high perceived risk (both political and economic) of releasing potentially contaminated metals into the U.S. metals recycling market, make the

decision not to recycle suspect metals an easy one for most licensed radioactive facility managers and stakeholders. The potential impact of new U.S. Nuclear Regulatory Commission (NRC) clearance rules on the nuclear industry and on radioactive and nonradioactive metal processors will depend on the nature and specificity of the regulations. However, even with clearly defined clearance limits, the nonradioactive metals processors will likely continue to oppose widespread introduction of radioactive materials into the U.S. scrap metal recycling feed streams.

One alternative to both recycling and radioactive disposal pursued by a growing number of licensed facility managers involves the use of case-specific regulatory exemptions or other licensed processes to assay and clear suspect metals and other waste materials from radiological controls followed by industrial landfill disposal. A description of this type of program will be presented along with corresponding limits for release that provide reasonable risk versus cost-saving benefits over radioactive disposal. For example, over the past year, approximately four million pounds of suspect clean scrap metal (beams, piping, valves, etc.) were segregated from other radioactive waste streams, assayed and disposed at an industrial landfill at one waste processor location in Tennessee.

A second alternative (that is more costly than bulk assay and landfill disposal but competitive with radioactive waste disposal) incorporates the application of Radioactive Metal Melting and Beneficial Reuse Processing. Unlike simple commodity metals “recycling,” the “beneficial reuse” model utilizes a dedicated, licensed radioactive metal melting facility that converts radioactively contaminated metal into radioactive products for reuse in directed applications that ensure control of the licensed radioactive material. The history, capabilities and benefit of this type of program will be presented.

Lastly, a proposed concept for a centralized facility for the process and disposition of “very low activity” metals for “directed first use” will be presented for discussion. This proposed disposition process would include the receipt of “potentially clean” materials at a licensed facility equipped as a kind of centralized clearing house for the receipt, assay and disposition of materials that meet a set of predetermined clearance limits. The advantages to this type of approach would include a standardized method to

licensing the assay and clearance process and limits, an economy of scale for reducing the costs of materials disposition, and controlled, verifiable process for the release and directed first use of the materials outside of formal license controls. The economics and challenges of implementing this proposed approach, including discussions of what the radioactive and nonradioactive metals processing industry can do to work together to facilitate the implementation of new NRC clearance rules, will also be discussed.

2:30 p.m. **Low-Activity Radioactive Materials Management at the U.S. Department of Energy**

Frank Marcinowski, III
U.S. Department of Energy

The U.S. Department of Energy (DOE) is making significant progress toward accelerated cleanup of its legacy radioactively-contaminated facilities and sites leftover from decades of research and development and nuclear materials and weapons production activities. Sites like Rocky Flats, Fernald, Mound, Brookhaven National Laboratory (BNL), Battelle Columbus Laboratories, and Oak Ridge are working to complete cleanup within the next few years and are faced daily with decisions related to disposition of waste and material. One key to accelerated cleanup is optimizing the disposition of waste. Most of the waste generated in terms of volume has very low levels of radioactive contamination. This waste may take the form of contaminated soil, debris from demolition, or scrap metal and equipment. The cost of disposing of large volumes of waste can be prohibitive, so there is incentive to find innovative ways to disposition wastes.

This paper provides an historical perspective on development of DOE policy regarding release of materials for recycling, reuse or other disposition. The paper describes the current status of policy development in this area, such as development of a draft Programmatic Environmental Impact Statement and monitoring of related rulemaking at the U.S. Nuclear Regulatory Commission. The paper also provides an overview of draft DOE guidance on control and release of property with residual radioactive material.

DOE's accelerated cleanup activities continue, while minute progress is made on environmental analyses, inching ever closer to formal decisions about unrestricted release or clearance of slightly contaminated or suspect

materials. In the absence of formal policy decisions, DOE needs to manage significant quantities of waste and material from cleanup and site closure activities. A number of DOE sites have used the draft guidance, established administrative limits, and disposed, not recycled, slightly contaminated or suspect materials in landfills—in some instances DOE landfills and in some instances commercial landfills. The paper includes a discussion of recent "good practices," such as the application of administrative limits by BNL for cleanup of soils and Peconic River sediment, and a transfer of low-activity waste from the Battelle Columbus West Jefferson Site for bulk survey and release by a commercial contractor. BNL's disposal of this waste in a Subtitle D landfill was fully protective, supported by the State, and avoided an unnecessary $4.2 million in commercial low-level waste (LLW) disposal fees. At Battelle an estimated 80 percent of the demolition debris and 25 percent of the soil previously planned for disposal at a commercial low-level waste disposal facility, may undergo bulk survey and release. In both cases, the disposition options were fully protective of the environment, and the schedule and cost efficiencies were realized that allowed limited resources to be applied to higher risk activities. At Battelle Columbus, this innovative approach significantly reduced worker safety risks by avoiding the need to crush waste to meet commercial LLW disposal criteria.

2:50 p.m. Break

3:10 p.m. **Nuclear Industry Experience with Safe Disposition of Radioactive Materials**
Ralph L. Andersen
Nuclear Energy Institute

The U.S. Nuclear Regulatory Commission (NRC) currently authorizes seven generic procedures for the safe disposition of licensed radioactive material, including:

- transfer to an authorized recipient
- decay-in-storage
- release in gaseous and liquid effluents
- disposal into the sanitary sewer system
- disposal of certain low-activity wastes as if they were not radioactive
- incineration
- retention as residual radioactivity in conjunction with license termination

NRC also provides a method for licensees to apply to the Commission for case-by-case approval to dispose of specified types and quantities of licensed radioactive material in a manner not generically authorized in NRC regulations. Since 1983, more than 80 such applications have been submitted by licensees and a majority of these have been approved and safely implemented. Applications which have been approved by the Commission have involved low-activity materials and related estimated exposures that represent very small fractions of the applicable dose limits. The accumulation over the past 20 years of case-by-case approvals, and associated analyses of waste streams and exposure pathways, represents a robust and diverse database that can support development of generic standards for the safe disposition of low-activity materials. This is now of particular relevance because the NRC is pursuing rulemaking on generic standards for the safe disposition of solid radioactive materials.

This paper includes a summary of experience and insights gained from a review of 20 years of licensee applications for approval of specific disposal alternatives. The paper also includes a detailed review of three cases that help illustrate and support approaches that might be considered in generic rulemaking. Recommendations are made regarding how the review process for disposal requests might be made more effective and efficient in the future.

Formulating Tomorrow's Public Policy

Susan D. Wiltshire, *Session Chair*

3:30 p.m. **Formulation of Future Nuclear Waste Public Policy in America**

David H. Leroy
Leroy Law Offices

Government by popularly elected officials serving two-, four- or six-year terms is ill-designed to create and implement policy controlling highly unpopular and long-lived nuclear wastes. NIMBY (not in my back yard) is both a sentiment and an acronym known to most voters. NIMTOO (not in my term of office) is the preferred position of many local, state and federal politicians when nuclear issues arise.

Because the formulation of legislation or regulation of a controversial nature requires the building of coalitions, the taking of controversial positions, and potentially risks the alienation of large segments of the populace it is difficult to achieve.

Even when major nuclear waste legislation is implemented by Congress, it can be frustrated by a lack of popular support or noncompliance. Examples are the Nuclear Waste Policy Act of 1982 and the Low Level Radioactive Waste Policy Amendments Act of 1985. The scientific siting process specified by the former was thwarted by state pressures and congressional second thoughts. The latter was violated by popular resistance which effectively vetoed state and regional collaboration.

However, the daily needs of the nation require the ongoing refinement of government radioactive waste operations. This has produced policy by improvisation. Instead of major legislative initiatives or bold bureaucratic breakthroughs, future nuclear waste policy initiatives will be smaller, incremental and accomplished by more informal methods.

The practical tools for such uses are (1) memoranda of understanding between agencies; (2) interpretive guidance letters or rulings applied to existing texts; (3) the licensing of nonthreatening facilities accomplished with local community and public involvement under existing procedures; or (4) narrow, obviously necessary, simple and consensus-supported amendments to existing laws or rules.

The next opportunities in America for governmental policy change on nuclear waste issues will occur in the 2005 to 2009 presidential administration. Congress will also have a newly constituted membership. The November 2004 election results will significantly shape the direction and content of those changes, and possibly control whether major radioactive waste issues will be addressed at all.

The basis for such future policies may be the following:

- As to low-level wastes, a report is anticipated for release in Fall 2005 of the National Academy of Sciences Committee on Improving the Regulation and Management of Low-Activity Radioactive Wastes in the United States.
- As to high-level wastes, and the characterization of Yucca Mountain, presidential direction will have

significant impact. The Bush White House issued a policy paper in 2004 titled “Energy for a New Century” calling for advancing next-generation nuclear power technologies, the assurance of long-term waste storage standards, and expanded nuclear generation of electricity in the United States. An editorial in the October 30, 2004, *Las Vegas Sun*, referring to the presidential election, appeared under the bold headline “Yucca Lives or Dies on Tuesday.”

- As to state and regional participation or leadership on low-level waste storage initiatives, threatened private facility access limitations and sharply escalating commercial prices will drive a looming crisis. This creates a new round of public policy needs.
- In sum, the next political cycle in American will incessantly demand that elected officials at all levels face the call of needed solutions for nuclear waste policy. Predictably, they will duck the issues to the maximum extent possible, deferring the decisions as far as possible to successors or future terms of office. Necessity, therefore, will innovate new public policy tools and procedures.

3:50 p.m. **Low-Activity Waste Management—An Analysis of Public-Interest Group Positions**

H. Keith Florig
Carnegie Mellon University

The public dialogue over the proper disposition of low-activity radioactive waste (LARW) includes many stakeholders, each with a different motivation, and each applying different substantive arguments and tactics of persuasion. A number of public-interest nongovernmental organizations (NGOs) have been active in the LARW debate, offering a variety of arguments in opposition to both LARW recycle and the siting of new LARW disposal facilities. This presentation examines the rationales and values underlying these NGO positions on LARW disposition. NGOs are not monolithic. Each focuses on a particular domain (*e.g.*, safety and health, energy policy, economics) of most interest to its base of supporters.

NGOs tend to frame LARW decisions more broadly than do industry proponents or government regulators. NGO objections to proposed recycling and disposal initiatives are made on ethical, institutional, technical and broader energy-policy grounds. Fairness is a major theme, which

includes both procedural and distributional components. Procedural fairness concerns stem from historical and current contexts. The legacy of decision making on defense and nondefense activities involving radioactive materials is one of less-than-open processes. Thus, existing stockpiles of LARW are deemed to have been generated by politically illegitimate activities. Fairness concerns about current processes for deciding LARW policies include the imbalance in financial resources between proponents and opponents of LARW recycling and disposal siting, conflicts of interest for various parties with a duty to be objective, and continuing problems with openness and public participation (*e.g.*, future generations are not present to weigh in on LARW disposal decisions).

Distributional fairness seeks to assure balanced distribution of risks and benefits of a policy. Recycle is criticized because the benefits would accrue to owners of radioactive scrap, while the risks are born entirely by consumers of products with recycle content. Another distributional fairness issue concerns the possibility of unforeseen worst case scenarios in which hot particles leak through recycle and remanufacturing screening procedures, exposing some members of the public to doses higher than imagined.

Concerned NGOs are skeptical of technical arguments that waste repositories can be made secure from leakage or disturbance, especially over century time scales, and that recycling programs can avoid slipups or be free of corruption, given the large sums of money at stake. These doubts are based on the observation that the history of technological risk management is full of examples in which unexpected events occurred that were outside of the design bases used to create protection systems.

4:10 p.m. **Policy Development from the Industry Perspective**

William P. Dornsife
Waste Management Specialists

The major burden for the implementation of any option for disposition of low-activity radioactive waste will fall to the industries that generate the waste and provide waste management services. There are a number of critical issues that need to be considered and addressed before a comprehensive and sound program can be implemented.

Perhaps the most important issue confronting industry is the public concern and opposition that will likely occur to almost any proposed solution. This will likely be manifested by strong public opposition to the implementation of any practical solutions or by refusing to use any products that could be impacted by the solutions. This public concern could then lead to the more serious political opposition that could result in laws or regulations being implemented to prevent any solution from being implemented. This can only be countered by developing and providing factual and independent information on the potential health and safety risks and economic benefits. There is a need for a comprehensive study that evaluates all health and safety risks (including nonradiological) and economic benefits from a life-cycle standpoint for all of the alternatives for disposition of low-activity material.

Another important issue is the multiple and sometimes conflicting government agency jurisdiction, regulation and policy that now exist and will likely continue in the implementation of new options. Examples of current and future problems include:

- new U.S. Department of Transportation regulations that have exempt concentrations that may be lower than current exempt licensing levels or new proposed disposition levels;
- pre-78 11(e)(2) being regulated differently than other mill tailings; lack of national NORM (naturally occurring radioactive materials) standards with states having NORM regulations that are inconsistent or conflicting;
- implementation usually occurs at the state level with more stringent requirements;
- and low-level radioactive waste (LLRW) compact jurisdictional issues over the material. This overly burdensome regulatory structure may lead to industry hesitation to participate in the proposed solutions.

Since there is a system currently in place for disposition of some low-activity radioactive materials, albeit not consistent or entirely risk based, there is industry concern that new proposals may jeopardize the existing system. The question becomes, why not use the existing exemptions but make them easier to implement and more risk based? The other related concern is how to transition to a new system, since the current system must remain in place to continue to provide the limited solutions.

There are conflicts between the interests of various industry groups. There are strong industry interest groups that inhibit wider solutions for certain categories of waste because current regulations favor them or because some solutions are viewed to cause economic harm. For waste management service providers there is a concern about the potential market to justify investment or liability risks and the ability to receive the necessary permits or approvals required. There are liability and other risks for generators using low-activity radioactive waste disposition options, such as their exposure to additional regulatory oversight and the marketability of their products.

There are a number of difficult implementation issues that directly affect industry. For the generating facility there are issues relating to the control and transfer of materials leaving licensed facilities. For the waste management industry additional monitoring, design, and long-term care for disposal facilities will need to be considered. Worker exposure monitoring and control will need to be addressed at unlicensed facilities.

Taking all of this into consideration, the only real option that most industry stakeholders may be able to agree with may be land disposal in acceptable facilities, which may only be Resource Conservation and Recovery Act Subtitle C or mill tailings disposal facilities that also have a license to deal with the transfer, acceptance, worker exposure, and release issues.

4:30 p.m. Break

Twenty-Ninth Lauriston S. Taylor Lecture on Radiation Protection and Measurements

5:00 p.m. **Introduction of the Lecturer**
R.J. Michael Fry
Oak Ridge National Laboratory, Retired

Nontargeted Effects of Radiation: Implications for Low-Dose Exposures
John B. Little
Harvard University School of Public Health

6:00 p.m. Reception in Honor of the Lecturer

Thursday, March 31, 2005

8:00 a.m. **A Tribute to the Life and Scientific Accomplishments of Lauriston S. Taylor**
Robert O. Gorson
Thomas Jefferson University, Retired

8:30 a.m. **Business Session**

9:30 a.m. Break

Update of Regulatory Efforts and Round Table Discussion

Susan M. Langhorst, *Session Chair*

10:00 a.m. **Overview of U.S. Environmental Protection Agency's Initiative on Disposition of Low-Activity Radioactive Waste**
Daniel Schultheisz
U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) issued an Advance Notice of Proposed Rulemaking (ANPR) (68 FR 65120, November 18, 2003) to request public comment on options to promote a more consistent framework for the disposal of radioactive waste with low concentrations of radioactivity ("low-activity"). Radioactive waste disposal in the United States is marked by a fragmented regulatory system, with requirements that often focus on the origin or statutory definition of the waste, rather than the hazard of the material in question. Thus, some wastes that are inconsistently regulated, if regulated at all for their radiological properties, can sometimes present higher risks to the public than wastes that are more tightly controlled. The current system provides limited disposal options and can sometimes result in inefficient use of resources, inconsistent regulation, and potentially unaddressed risks.

It may be possible to enhance public protection by moving toward a system that provides disposal options appropriate for the hazard presented by the waste in question. EPA's ANPR focuses on the potential use, with appropriate conditions, of Resource Conservation and Recovery Act Subtitle C (RCRA-C) hazardous waste landfills for disposal of "low-activity" wastes. EPA envisions that the RCRA disposal technology would be offered as a new disposal option for these wastes.

The public comment period for EPA's ANPR generated more than 1,500 public comments. EPA continues to analyze the comments and to interact with stakeholders to determine the most appropriate action to address these issues.

10:10 a.m. **Update of Regulatory Efforts by U.S. Nuclear Regulatory Commission**

Carl J. Paperiello
U.S. Nuclear Regulatory Commission

On June 30, 1999, the U.S. Nuclear Regulatory Commission (NRC) published in the Federal Register an "Issues Paper" concerning regulations covering releases of solid material containing very low levels of radioactive material from nuclear facilities. The paper noted that unlike liquid and gaseous material there were no specific criteria in the NRC regulations in Title 10, Code of Federal Regulations, Part 20, governing the releases of solid material from licensed facilities. The notice solicited comments on the issues raised in the paper and announced a series of public meetings on the issues raised in the paper. After holding these and other meetings and receiving comments from stakeholders NRC directed the staff on August 18, 2000, to defer rulemaking, to request the National Academy of Sciences (NAS) to study the issues involved, establish a technical base for future action, and to stay informed of international efforts in this area.

In 2002, NAS published the results of its study in *The Disposal Dilemma, Controlling the Release of Solid Materials from Nuclear Regulatory Commission-Licensed Facilities*. The staff published a number of research reports supporting the technical bases for potential rulemaking. NUREG-1640, *Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities*, was published in four volumes presenting scenarios and doses from the release of specific solid material from licensed facilities. NUREG-1725, *Human Interaction with Soil: An Information Search*, discussed scenarios for the potential interaction of people with soil that might possibly be released from a nuclear facility. NUREG-1761, *Radiological Survey for Controlling Releases of Materials*, identifies survey practices needed to analyze solid material to quantify potential radioactivity. In addition, the staff issued several reports summarizing comments from stakeholders. In 2004, the International Atomic Energy Agency approved Safety Guide No. RS-G-1.7, *Application of the Concepts*

of Exclusion, Exemption, and Clearance. This safety guide establishes international clearance concentration guidance for solid material at doses comparable to those suggested by the NAS report.

Currently, NRC staff is continuing to analyze rulemaking approaches with regard to alternatives that result in (1) retaining the current process by allowing unrestricted use through measurement guidelines, or (2) modifying NRC regulations to: (a) restrict release to only certain authorized paths such as restricting material to EPA regulated landfills, conditional use (*e.g.*, roadbeds, reuse of tools), and allowing case-by-case requests; (b) at only licensed low-level waste disposal facilities; or (c) allow release with no limitation on pathways if a radiation survey verifies that levels are acceptable ("clearance"). The current status of activities, including all NRC documents and stakeholder comments, can be found at the NRC web site (www.nrc.gov).

10:20 a.m. **Implementation of U.S. Department of Energy Policies, Directives and Guidance for Radiological Control and Release of Property**

Andrew Wallo, III
Stephen Domotor
Gustavo Vazquez
U.S. Department of Energy

This presentation will describe U.S. Department of Energy (DOE) directives, recent policies, and guidance relating to the management of property containing or potentially containing residual radioactive material. Although DOE general property management requirements will be addressed, the focus of the presentation will be on personal property which includes waste, scrap and equipment. Examples of authorized limits approved and implemented for disposal of waste containing residual radioactive material will be presented. The status of and plans for future directives or changes will be discussed in the context of intra- and interagency activities.

10:30 a.m. **Role of State Regulatory Agencies in the Disposition of Low-Activity Radioactive Materials**

Edgar D. Bailey
Conference of Radiation Control Program Directors, Inc.

Since the opening of the first disposal site for commercially generated low-level radioactive waste (LLRW) at Beatty, Nevada, in September 1962, the states have been

explicably involved in the process. The states have been involved as landowners, regulators, environmental monitors, and sometimes promoters of the sites and the persons operating the sites. Although some of the LLRW disposal sites were originally licensed by the U.S. Atomic Energy Commission and U.S. Nuclear Regulatory Commission (NRC), we have now evolved to the point where all of the operating and all of the closed sites are located in NRC Agreement States and are under the regulation of the Agreement States.

In recent years due to the ever-increasing costs of LLRW disposal and the availability of LLRW disposal sites there has been a continued effort to establish national criteria for radioactively contaminated wastes that do not need to be sent to a LLRW disposal site in order to adequately protect the health of the public and the environment. NRC has unsuccessfully tried to establish *de minimus* levels of radioactive materials and levels that were "below regulatory concern." The adoption of either of these proposed regulations would have gone a long way in addressing this need. Both of these proposals failed because of concerns from the general public, Congress, and the states.

NRC did adopt a decontamination and decommissioning rule (D&D) which provides a site-specific dose-based standard for the levels of radioactive contamination that may be left in place when a site/facility is released for unrestricted use. Many felt that this would establish radioactivity levels that did not have to be disposed of as LLRW. However, the D&D regulation did not set national standards for the radioactivity levels because it was site specific (and therefore the actual concentrations could vary from site to site), and because the states were permitted to establish regulations that required a lower calculated dose than the NRC regulations.

Concerns have arisen in some states over the contaminated soil and other materials left behind once a site or facility is released for unrestricted use. In California, for example, a Governor's Executive Order has prohibited the disposal of these so-called "decommissioned wastes" at municipal landfills.

Both the NRC and the U.S. Environmental Protection Agency (EPA) have rulemaking processes underway in an attempt to address these issues, NRC through a

rulemaking effort on “clearance” levels and EPA through an Advanced Notice of Proposed Rulemaking.

For either of these efforts to have a significant positive impact on the disposal of very-low-activity wastes, there will have to be acceptance and implementation by the states. Since both LLRW and solid waste disposal sites are in large part regulated by the states as Agreement States and as states with delegated authority from EPA to regulate solid waste, state involvement in the processes will be crucial and ultimately decide whether or not these efforts will be successful.

10:40 a.m. **Questions and Discussion**
(all participants)

11:35 a.m. **Summary**
John F. Ahearne, *Rapporteur*
Sigma Xi

12:15 p.m. **Closing Remarks**
Thomas S. Tenforde, *President*
National Council on Radiation Protection and Measurements

The Program Committee

S.Y. Chen, *Chair*
Argonne National Laboratory

William P. Dornsife
Waste Control Specialists

Susan M. Langhorst
Washington University, St. Louis

Jill A. Lipoti
New Jersey Department of Environmental Protection

Joel O. Lubenau

Ruth E. McBurney
Texas Department of Health

Dade W. Moeller
Dade Moeller and Associates, Inc.

Carl J. Paperiello
U.S. Nuclear Regulatory Commission

Michael T. Ryan
Charleston Southern University

Susan D. Wiltshire
JK Research Associates, Inc.

Registration

Wednesday, March 30, 2005
7:30 a.m. – 5:00 p.m.

Thursday, March 31, 2005
7:30 a.m. – 12:00 noon

There is no registration fee.

2006 Annual Meeting

April 2–4, 2006 in Arlington, Virginia

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