REGULATORY CONTROLS FOR NORM CONTAMINATION: EMERGING ISSUES AND STRATEGIES

Linda Wennerberg, Ph.D.
Arthur D. Little, Inc.
Acorn Park
Cambridge, MA 02140-2390

ABSTRACT

Naturally occurring and accelerator-produced radioactive material (NORM) faces the increasing likelihood of federal or state regulatory control. Public concern and limited preliminary survey data fuel the debate over the necessity, approach, and jurisdiction of a NORM regulatory strategy. This debate requires the resolution of technical controversies and potentially competing state and federal agency interests. An additional facet of the debate is the impact of regulation upon traditionally non- nuclear industries, such as oil and gas production. Regulatory response has been initiated in several states, such as Louisiana's controls on equipment used in oil and gas production, to control specific industrial activities which generate NORM. A more comprehensive, generic federal strategy to control NORM contamination is also under review by the Environmental Protection Agency. This paper will detail the emerging technical issues, federal and state regulatory strategies under consideration, and evaluate the efficacy of selected regulatory approaches.

INTRODUCTION

The American public continues to press for increasingly stringent environmental and public health regulation. This sentiment is especially strong in the area of radioactive material and waste management. This paper addresses the issues forming the current debate on the regulatory options to control naturally occurring radioactive materials (NORM). The controversy has potentially significant impacts on the currently unregulated or minimally regulated industries, such as oil and natural gas production activities, and/or the regulating community. This paper outlines the existing regulatory framework, defines what is meant by the general term NORM, identifies specific issues facing the diverse range of impacted industries, and discusses the emerging regulatory strategies.

Currently, radioactive material use, treatment, storage, and disposal, and related radiation safety programs are regulated and monitored by federal agencies or by officials in authorized states. Primary federal control for the management of all aspects of use and disposal of radioactive materials resides with the Nuclear Regulatory Commission (NRC) under the authority of the Atomic Energy Act (AEA). The NRC controls and manages radioactive material through regulatory controls and a licensing mechanism for commercial operators who "receive, possess, use, transfer, own, or acquire radioactive material." Licensed radioactive material is defined as "source material, special nuclear material, or by-product material received, possessed, used, or transferred under a general or specific license issued by the Commission." Other federal agencies, such as the Department of Energy (DOE) and the Department of Defense (DoD), are self-regulating for radioactive materials and waste management through Orders, guidelines, or directives from the chief administrating official.

Specific aspects of radioactive material handling, packaging, shipment, radiation safety, or waste disposal are the responsibility of other authorized federal agencies. Packaging, labelling, and shipping of radioactive materials or wastes are under the authority of the Department of Transportation (DOT). Worker protection for employees in nuclear industries is addressed by federal officials including the Department of Labor (DOL). The Environmental Protection Agency (EPA) has a more limited regulatory responsibility for the management of radioactive material or waste primarily through the management of uranium mill tailings and radiation levels in drinking water. The imposition of dual regulation for the hazardous and radiological constituents in mixed waste has resulted in increased EPA and NRC collaboration and involvement. Further regulatory responsibilities are designated to individual states with the authority to apply AEA requirements to manage radioactive materials under specific conditions established by the NRC.

This complex regulatory framework for radioactive material and waste management is a continuing subject of public controversy. A significant issue that has emerged in this debate is the lack of specific defined controls for the use of naturally occurring radioactive materials (NORM) or the disposal of waste or contamination. In short, NORM management is perceived as a gap in the federal regulatory structure and is currently one of the complex, interdisciplinary regulatory issues emerging in the 1990s. Managing this subset of radioactive materials creates technical and regulatory controversies for health physics professionals, the commercial users or generators of NORM, and the regulatory community as a whole. The technical issues are introduced first through the definition of the broad category designated as NORM and the radionuclides of significant concern.

DEFINITION OF NATURALLY OCCURRING RADIOACTIVE MATERIALS

Naturally occurring radioactive materials occur as a result of natural processes that deposit the material in the Earth's crust. NORM is represented by radionuclides from three specific decay series, defined as uranium-238 (uranium series), uranium-235 (actinium series), and thorium-232 (thorium series). Natural processes deposit NORM isotopes into the geologic strata. The isotopic composition and activity of NORM in specific geologic strata may vary widely, even within a limited geographical area.

Individual radionuclides present in a specific occurrence of NORM represent varying risks to human health and the environment, depending on activity, exposure pathway, duration of exposure, calculated dose, and chemical form. The

radionuclides of greatest concern for NORM- related industries are radium and its daughter, radon. Radium is of concern because it has been documented at significant levels in NORM-contaminated equipment during natural resource extraction activities. Radon is of special concern: it has characteristics that enhance its availability for release to the environment, as well as documented high concentrations at many locations in the United States. Radon exhibits characteristics of an unreactive noble gas with a moderate level of solubility and mobility. Radon can move through such environmental media as groundwater, brines and the soil column as a gas or dissolved in solution. Both the geographic distribution of radon within the U.S. and its inherent characteristics increase the likelihood for contact and release of radon during the process of specific resource extraction or processing.

NORM and NORM contamination provide an emerging area of study and analysis for the health physicists, the regulatory community and technical experts in a range of industries. The potential for increased radiological exposure to workers, the general public, and the environment is under debate due to the lack of comprehensive radiological surveys for the industries utilizing or generating NORM or NORM contamination. Assessment of potential dose and related risk to humans or the environment are further hampered, since NORM contamination is derived from natural physical processes and therefore may exhibit highly varied isotopic composition or activity levels within a designated study area. The specific industrial practices that yield NORM as a by- product of extraction or processing also affect the volume, composition, or potential exposure pathways of available NORM. Both natural processes and induced man-made activities affect the type and risk related to localized NORM and are a concern in the on-going regulatory debate.

EMERGING REGULATORY ISSUES

NORM or NORM contamination is not expressly regulated either by the existing federal regulatory framework or through a comprehensive set of guidelines. Current federal regulations address the levels of radon in drinking water and emissions from uranium tailings deposition. State governments, generally under the authority to protect public health, have initiated radiation control programs. Several states, including Texas, Louisiana and Florida, have introduced or are finalizing regulatory controls directed at the management of NORM. These state NORM regulations often focus on specific facets of NORM management of most concern to the affected state population. Public concern and the acknowledgement by federal and state regulators that NORM is not comprehensively regulated are likely to precipitate the formalization of federal policy. Several controversial issues arise in the development of federal regulations. The first concern is the assignment of jurisdiction to a responsible federal agency. A second major issue will be the definition and imposition of liability for NORM contamination. The third significant controversy relates to the extension of radioactive regulations to commercial industries and firms that have not been traditionally regulated to manage radioactive material.

The issue of jurisdiction and the assignment of authority to a federal agency is increasingly controversial due to the impact upon public perception as well as the commitment of agency staff, resources, and specific regulatory philosophy. Both EPA and NRC have initiated discussions on potential regulatory strategies for NORM. The question of jurisdiction evaluated the differing levels of technical and administrative expertise in the management of radioactive materials, the regulatory approach, and the perceived level of public support for these two federal agencies. The regulatory missions for the two agencies underscored that NRC has more extensive experience and available expertise in the management of radioactive materials. Philosophically, the two agencies pursue different regulatory strategies, with EPA adopting a highly prescriptive process and NRC utilizing performance objectives as the basis of regulations. Public perception of the merits and specific strengths of these differing regulatory philosophies are part of the debate as to the most effective means to regulate NORM.

Formal authorization of federal agency jurisdiction for NORM regulation will answer some of the uncertainty in current NORM debate. The establishment of agency jurisdiction will also define the basic regulatory philosophy and approach. Regardless of the outcome of this debate, the role of sound technical information becomes vital to both the regulatory community and those industries slated to be regulated for NORM.

Regulation of NORM also establishes the definition, scope, and penalties associated with related legal liability. Due to the nature and variety of release mechanisms, NORM or NORM contamination has the potential to generate liabilities related to environmental damage and human exposure. The potential for radiological exposure to the general public in addition to individuals in an occupational capacity adds further complexity to the assessment of calculated dose, related health risks, and scope of regulatory responsibilities. An additional concern relates to the extension of current operating standards and the assignment of liability to past activities.

Evaluation and determination of liability related to environmental degradation, human health effects, and historic and current practices create a substantial potential for controversy. Regulation of NORM is likely to establish accepted standards that will require technical review, interpretation, and industrial compliance activities. Litigation addressing damage to the environment or human health represents the most extreme forum for liability concerns. Regulation, once formalized, establishes the decision framework which will be refined through the courts, negotiations, and actual applications.

The third area of controversy centers on the imposition of regulations controlling radioactive materials in previously unregulated industries. Enactment of new federal or state regulations for NORM places additional regulatory burdens on a diverse set of industrial sectors. Industries that are likely to be affected include uranium mining, metal or mineral extraction, geothermal power generation, water purification processes, and oil and natural gas production. The presence of NORM or NORM contamination may expand the range of affected industries to those companies processing the extracted natural resources, maintaining equipment, or providing waste management services.

As a group, many of these industrial sectors and their specialized service industries lack experience with the management, regulatory compliance, record keeping, disposal, and special technical constraints currently imposed on the users of radioactive materials. The role of technical information is critical in the support of the regulators and the

impacted industries developing and implementing technically sound regulatory procedures and industrial responses.

These technical, legal, and economic aspects under consideration for federal NORM regulations also impact upon state government efforts. State regulators also must evaluate the issues of limited technical information, agency jurisdiction, regulatory approach, and the implications of assigning liabilities associated with NORM contamination. These issues and the impacts on regulating previously unregulated industries weigh heavily on state regulators who often operate with limited staff and fiscal resources. The complexity of NORM management, especially as it affects diverse industries, is unlikely to result in comprehensive NORM management at the state level.

Several regulatory strategies are being considered and evaluated at this time. It is important to briefly review these options since they indicate the emerging regulatory trend to address NORM contamination in oil and natural gas production as well as other extractive, processing, and environmental industries.

POSSIBLE STRATEGIES FOR NORM REGULATION

The debate over the regulation of NORM is likely to result in a comprehensive federal policy with supporting regulation. Federal policy provides the opportunity to address compliance issues for a diverse group of industries and strengthen the more localized approach taken by the states enacting their own regulations in the current federal policy vacuum. Several different regulatory strategies have emerged in this debate, however, current agency action and review has focused on use of an existing regulatory framework, most likely under the authority of EPA.

The first option calls for the development of a new federal agency or new legislation to specifically address the management of NORM. Such a new agency or extensive new law-making has had its proponents, but is judged to be infeasible. No concerted support for this regulatory strategy has emerged. The debate has shifted to existing agencies and regulatory frameworks already in place.

The second regulatory option is to expand the NRC's licensing mechanism to include the users, transporters, and disposers of NORM or NORM contamination. This option assigns the responsibility for NORM to the regulators of the commercial nuclear industry. There is no doubt that NRC has the most extensive experience with the regulation of radioactive materials. However, NRC has not asserted authority over NORM through the licensing of users.

A third option revolves around applying EPA's existing authority under the Resource Conservation and Recovery Act (RCRA). The established RCRA process has extensive monitoring, training, recordkeeping, storage, and disposal requirements which could be modified to address issues of NORM management. The primary weakness of using the existing RCRA process rests on the regulations emphasis on the management of waste. NORM is not always a waste based on the characteristics of contamination, the activity of the radionuclides, the availability for human or environmental exposure and where NORM contamination occurs or the production or processing activities. Therefore, the mission of RCRA is not intended to address the non-waste aspects of NORM management.

A final proposed regulatory strategy is managing NORM under the general guidelines established in Section 6 of the Toxic Substances Control Act (TSCA). TSCA is structured to regulate hazardous materials to minimize the potential for release to the environment. The language in Section 6 expressly grants EPA broad, general powers to control materials representing an unreasonable risk. TSCA was proposed in the draft report entitled, "Diffuse NORM Wastes- Waste Characterization and Preliminary Risk Assessment" and released for public comment. TSCA has, historically, not been applied to the control of radioactive materials. Section 6 of TSCA does provide for the recordkeeping, tracking, storage, use, and disposal mechanisms needed to better regulate the types of NORM contamination found in the affected industries such as oil and natural gas production, mineral or metals extraction, related processing activities or water pollution management systems. The broad powers of Section 6 and its emphasis on control of materials causing an unreasonable risk addresses many of the diverse characteristics of NORM contamination without limiting EPA's ability to regulate materials prior to designation as a waste.

TSCA and the other three regulatory options remain under discussion and it is premature to predict which of these strategies (or what new concepts) will be applied to the regulation of NORM. NORM management requires broad based legislative authority and a flexible, focused regulatory framework to best address the complex, highly variable nature of the contamination and the non- made processes which enhance and potentially release radioactive contamination. Currently, federal and state regulators struggle with limited survey information as well as the variable legal and economic parameters in attempts to regulate NORM. The level and extent of risk to humans or the environment has not been quantified. Regulation of NORM by federal or state regulators requires assessment of these risks, the most feasible and effective regulatory approach, and an understanding of the impacts of regulation on a diverse group of industries. Piecemeal regulation of NORM does not contribute to effective management of the contamination. Further regulation of NORM is highly likely at the federal and state levels of government. Such regulation will require a comprehensive understanding of the technical, legal and economic aspects to be effective.

REFERENCES

1. Atomic Energy Act (as amended)
2. Resource Conservation Recovery Act
3. Toxic Substances Control Act
4. Environmental Protection Agency, "*Diffuse NORM Wastes - Waste Characterization and Preliminary Risk Assessment*" Draft Report (1991).
5. GESELL, T.F., "*Occupational Radiation Exposures Due to Radon-222 in Natural Gas and Natural Gas Products*", Health Physics, Vol. 29 (5), pp. 681-687. (1975).
6. GRAY, P., "*Radioactive Materials Could Pose Problems for the Gas Industry*", Oil and Gas Journal, pp. 45-48 (June 25, 1990).