

The NORM Report

Na

ing Radioactive Material Contamination
Volume VII, Number 4

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Regulations for the Control of Naturally Occurring Radioactive Materials - An Update

The status of regulations for the control of NORM contamination is summarized for all 50 states, the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the Minerals Management Service (MMS), Canada, and the Conference of Radiation Control Program Directors (CRCPD) beginning on page 2. NORM contamination is not limited to the petroleum industry, and several non-petroleum states are drafting rules for the control of NORM in other industries. Each regulatory agency was contacted during December 2001 and January 2002.

During 2001 two more states have enacted regulations for the control of NORM. Maine adopted the CRCPD Part N regulations effective August 1 and West Virginia extensively revised their general regulations for the control of radiation and have included NORM regulations. The revised regulations became effective July 1.

Several other states have enacted regulations for some aspects of NORM control. e.g., remediation and cleanup of contaminated areas and the disposal of contaminated material. Many states consider NORM to be regulated by their general rules on radiation.

The states, besides Maine and West Virginia, which have specific regulations for the control of NORM are Arkansas, Georgia, Louisiana, Mississippi, New Mexico, Ohio, Oregon, South Carolina, and Texas.

There currently are no federal regulations specifically for the control of NORM, although the Environmental Protection Agency appears to be moving in that direction. Two multi-agency groups are looking into better and more efficient ways to regulate low-activity materials and harmonize radiation standards and risk management among the various federal member agencies. See details in the NRC section (Page 21).

Canada now has published their *Guidelines for the Management of Naturally Occurring Radioactive Materials*. Some of the features of the Guidelines were summarized in the Volume VII, No.3 issue of *The NORM Report*.

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Summaries of State and Federal Regulations for the Control of NORM

ALABAMA

Alabama is waiting for the CRCPD recommendations for the control of NORM before finalizing their redraft of the state's proposed NORM regulations. There is no time table for the regulations to be adopted. There has been some interest in plugging and abandoning wells, but there have been no requests from industry for NORM regulations.

ALASKA

There is no NORM regulatory activity in Alaska at the present time. Although the price of oil has risen significantly, the budget is still very tight. Nothing will probably be done until the federal government (e.g. the EPA) mandates the Alaskan legislature to do something about NORM, similarly to what is currently happening about radium/radon in drinking water. There is some concern as to how radium removed from drinking water will be treated.

There have been no current problems with NORM contamination that have been referred to the State for action. The oil companies take care of their own NORM problems. Contaminated wastes are either being sent to Washington State for disposal or to the EPA-permitted injection well on the North Slope.

The Arctic Monitoring Assessment Program which is a consortium of all the Arctic countries, is starting to take an interest in NORM-type material. It is not known how this will translate into the U.S.

Committee's action on the issue.

ARIZONA

A proposed rule relating to NORM was to be published in the State Register around the first of the year. Public comments on the proposed rule will be accepted through at least February 24, 2002. For the present, all radioactive materials, including NORM, are addressed in Arizona's general radiation regulations.

ARKANSAS

The Arkansas NORM regulations constitute Section 7 of the *Arkansas Rules and Regulations for Control of Sources of Ionizing Radiation*. The revised regulations were summarized in the Fall 96 issue of this newsletter. There are no plans to revise the NORM regulations in the near future.

CALIFORNIA

The California Division of Oil, Gas and Geothermal Resources has indicated they would like to make a NORM survey of geothermal facilities in the state, but nothing has been done yet.

In 1993, California underwent a peer review of its oil and gas exploration and production waste management regulatory programs. The review was conducted by the Interstate Oil and Gas Compact Commission (IOGCC), in cooperation with the U.S. Environmental Protection Agency and other interested groups. One recommendation of the review team was for a thorough evaluation of the industry

NORM survey data by the appropriate state agencies to verify the extent of oil and gas field NORM in California.

Subsequent to the IOGCC peer review, and following increased public and governmental interest in NORM issues, the California Department of Conservation, Division of Oil, Gas and Geothermal Resources and the California Department of Health Services, Radiological Health Branch conducted a more comprehensive survey of selected sites. This effort was in cooperation with the oil and gas industry. The sites chosen for the study were selected because they were points where NORM was expected to occur; the sites were not selected randomly. All six oil and gas districts in the state were sampled in this study. Four hundred seventy-five radiation measurements were taken in 70 oil and gas fields. Besides gamma radiation meter readings, 124 samples of pipe scale, produced water, tank bottoms and soil were collected and analyzed by the Sanitation and Radiation Laboratory of the Department of Health Services to assess the actual concentrations and radionuclides present.

The results of the study indicate that NORM is not a serious problem in California oil and gas production facilities - confirming the findings found in an earlier survey (1987). In the 1987 survey, seventy-eight percent of the measure-

(Continued on page 3)

CALIFORNIA (continued)

ments were at background levels. A few sites had elevated levels of NORM. Further, studies of those sites should be considered. Routine protective measures may be all that is necessary to minimize exposure to radiation in these particular areas. The survey results and laboratory analyses are reported in: *A Study of NORM Associated with Oil and Gas Production Operations in California*. The report was issued by:

Department of Health Services
Radiological Health Branch
and
Department of Conservation
Division of Oil, Gas and
Geothermal Resources

Elevated levels of NORM were found in material from some of the production facilities. The NORM was found in water filters and softeners, gas processing equipment, pipe scale, and tank bottoms. However, these elevated levels are not high enough to be of immediate health concern.

Copies of the report are available from:

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Radiological Health Branch
601 N 7th Street
P.O. Box 942732, MS 178
Sacramento, CA 94234-7320
E-mail: shsu@dhs.ca.gov
Telephone: (916) 322-4797

A summary of the report recommendations was in the Fall 96 issue of *The NORM Report*.

Promulgation of NORM regulations in California is a low priority at present. However, it is expected that California will enact NORM regulations sometime later.

COLORADO

There are no specific rules for the disposal of NORM in Colorado. NORM is treated like any other radioactive material. Part 18 of the Colorado Rules and Regulations Pertaining to Radiation Control (milling of uranium and thorium) has been updated to conform to Criteria 6(6) of 10 CFR 40, Appendix A (benchmark dose criteria). A specific provision has been added that prohibits any material being disposed in a tailing impoundment that would prevent the transfer of that impoundment to DOE upon termination of the license.

Colorado does have a solid waste regulation that says sewage sludge must be below 40 picocuries per gram gross alpha activity before it can be sent to a landfill or otherwise "free released." The state is working on guidance for water treatment facilities that must extract radionuclides to comply with the CWA.

There is no specific NORM regulatory activity in Colorado at this time.

CONNECTICUT

Connecticut now has an approved radiation limit for decommissioned facilities of 19 millirem per year above background. Although specifically addressed to decommissioned facilities, by inference it

applies to any radioactive material, by-product or NORM.

The 19 mrem/yr is based on Connecticut's specific adjustments to standard EPA/NRC modeling and to current technology for making radiation measurements in the field.

Starting with the 19 annual millirem limit, one can calculate back to determine exempt count rates for specific isotopes and field conditions using field survey equipment.

Using *Guidelines for Disposal of Drinking Water Wastes Containing Radioactivity* (U.S. Environmental Protection Agency draft, June 1994) and Nuclear Regulatory Commission limits for the release of licensed material, the Connecticut Department of Environmental Protection put together its first guidelines for an actual water treatment facility. The 19 millirem/yr limit will also be used in developing guidelines for water treatment and other facilities, giving case-by-case guidance. Simply put, the guidance will be to apply NRC discharge limits above background radioactivity. EPA Region 1 has given preliminary concurrence on this interpretation of EPA's Draft guidance. The thinking on this — "If it came from the ground and nothing was done to enhance it, it can go back into the ground."

Although an EPA Region 1 health physicist agreed with the proposed scenario that if "there is no radiological concern if it came from the

(Continued on page 4)

CONNECTICUT (continued)

ground, it could be returned to the ground if there had been no technical enhancement." However, an EPA expert on Underground Injection Controls (UIC) stated that the Clean Water Act amendments in its later revision, allows the injection of only water that meets federal drinking water standards. This would seem to exclude the return to the environment of any water treatment residue (salts from water softeners, filter backflush, etc.).

DELAWARE

There are no specific regulations for NORM in Delaware. NORM, NARM and other radioactive materials are considered to be covered in the general regulations for the control of radiation enacted in 1993. A revision of the general regulations became effective September 1, 1995. The revision tightened the compliance aspect of the regulations. NORM is considered to be covered in Sections C and D, Radioactive Materials, in the regulations.

The Radiation Control Regulations are being considered for further revision, particularly Parts H and K. The revisions are at least six months to a year away.

NORM contamination appears to be minimal in the state. Occasionally a call is received from a salvage yard or steel mill reporting that their gate radiation monitors had detected gamma radiation above background on a load of scrap metal.

FLORIDA

The Florida Department of Health, Bureau of Radiation Control continues to devote staff resources to research the scope of the state's TENORM issues to support its evaluation of appropriate regulatory approaches. Its recent focus has been on the state's heavy mineral sands industry. Two facilities located in the northeast part of the state generate source material as a result of their separation of economic minerals from ancient beach sand deposits. The state is working with the industry to improve their radiation protection programs to address the radiological hazards associated with both the source material and the TENORM progeny present at the sites.

Florida does regulate gyp stacks requiring stacks to be lined with geomembrane liners and capped with a soil cover. The idea is to mitigate leachate release into the underlying Floridian Aquifer emanating from the stack.

GEORGIA

Georgia's regulations for the control of NORM became effective in October 1994. There have been no changes in the rules since. Revisions to the general rules and regulations for the control of radiation became effective May 6, 1997.

Georgia is in the process of again revising several of their radiation rules. It is planned to take the revisions to the Board for approval at their February 2002 meeting. No substantive changes are proposed for the Georgia's NORM rule (391-3-17-.08 REGULATION AND

LICENSING OF NATURALLY-OCCURRING RADIOACTIVE MATERIALS (NORM).

The following describes the "clean-up" revisions. The Rule is amended as follows: typographical errors are corrected in .08(7)(c)l. and 2. correcting the abbreviation for the word "gram" from "gm" to "g"; and correcting the typographical error in .08(15)(a)5.(i) from Title "II" to Title "11".

HAWAII

Hawaii has revised their general radiation regulations but the CRCPD Part N was withdrawn for now. Part N will probably be incorporated in the regulations during the next revision, probably in 2002. NORM problems that do arise meanwhile can be handled on a case-by-case basis under the general regulations.

Hawaii does not now have any particular problems with NORM. Although Hawaii does not have petroleum production, it does have geothermal wells on the big island. Possible NORM contamination in these geothermal wells has not been addressed.

There is also some concern about radioactivity and radiation contamination in the state's military posts and bases, including old radium gauges and instruments. Additionally, there may be some NORM associated with the dry dock activities in the state.

IDAHO

Idaho has no regulations specific to

(Continued on page 5)

IDAHO (continued)

the control of NORM. There are general statutory and regulatory provisions in the existing Idaho law giving the Department of Environmental Quality authority to address problems with NORM should they arise.

The Department of Environmental Quality has drafted regulations with respect to the **DISPOSAL** of rad wastes not regulated by the NRC, such as **NORM/TENORM**. These rules have gone out for public comment and are currently before germane committees of the Idaho Legislature. Currently, the rules are in effect as a temporary rule. As well, the states commercial haz waste disposal facility, US Ecology, has a Part B HWMA permit that has been modified to provide for additional permit conditions regarding the acceptance of FUSRAP and NORM wastes.

ILLINOIS

In June 2001 a newly revised draft of the Illinois TENORM regulations was sent to the Illinois Department of Nuclear Safety (IDNS) staff for comment.

This draft incorporated most of the changes recently made to the Conference of Radiation Control Program Directors, Inc. (CRCPD) model rule (SSRCR Part N TENORM) by the CRCPD's SR-5 Working Group. The SR-5 submitted its revised draft Part N, Rationale for the revisions, Matters for Future Consideration, revised Implementation Guidance, and replies to Peer Reviewer comments on the earlier draft Part N and

Implementation Guidance to the CRCPD Board of Directors during September 2001 for evaluation and approval.

The Illinois TENORM regulations will be summarized in **The NORM Report** when available.

INDIANA

No new regulations for the control of NORM have been enacted or proposed in Indiana. There have been incidents involving NORM — contaminated materials in scrap yards, etc. It is expected there may be a need for NORM regulations sometime later.

IOWA

Iowa does not have specific regulations for the control of NORM. The Iowa general regulations for radiation control are assumed to cover NORM and are used when NORM problems arise. Most of the NORM problems in Iowa involve NORM contaminated metal sent to scrap recyclers.

KANSAS

Regulations for the separate and specific control of NORM have not been proposed in Kansas. Regulations for the control of all radioactive materials in Kansas implicitly include NORM. NORM problems that do arise are handled on a case-by-case basis, taking into consideration radiation exposures to the public and workers.

Kansas regulators have been working closely with the scrap industry, but there is no indication of probable legislation concerning NORM issues.

KENTUCKY

The Kentucky Department of Environmental Protection continues to work on a satisfactory long term disposal site for NORM. Meanwhile, remediation activities in the Martha Oilfield are proceeding gradually and continually towards the final phases of the cleanup of the field. Remediated materials are being stored in a temporary site pending the resolution of discussions on long term storage.

When the public clamor over the contamination of the Martha Oilfield dies down, consideration will be given to promulgating NORM regulations.

LOUISIANA

Following the adoption of the first state regulations for the control of NORM, Louisiana's revised NORM regulations became effective January 20, 1995. A draft of an *Implementation Manual for Management of NORM in Louisiana* was released in September, 1995. The Table of Contents of this manual was given in the Fall 95 issue of *The NORM Report*.

The introduction to the Implementation Manual states "On January 20, 1995, the revised NORM regulations (LAC 33:XV. Chapter 14) became effective. This revised Implementation Manual reflects the changes and revisions which were made. It also includes the Radiation Protection Division's position on certain NORM issues that are not specifically addressed

(Continued on page 6)

LOUISIANA (continued in the NORM regulations.”

There have been no changes or revisions in the Louisiana NORM regulations since 1995 and none are planned.

Chem Waste has received approval for the disposal of NORM wastes containing up to 150 pCi/gm.

US Liquid sites in Louisiana can receive wastes containing less than 50 pCi/gm.

The number of P&A disposal wells has increased in Louisiana probably due to the high costs of NORM waste disposal.

There is one commercial facility operated by Phillips Services. It is allowed to operate as a commercial facility because during the incineration process used the NORM is diluted. It is required that the incinerator wastes be disposed as incinerator RCRA waste. As long as the NORM wastes contain less than 5 pCi/gm the Department is not concerned about it from a regulatory point.

Chevron has a NORM injection well for their own wastes from a specific cleaning area (that is, a non-commercial facility.) Chevron was refused permission to bring NORM wastes from Chevron facilities in Mississippi for disposal in their Louisiana injection well.

Meetings have been held with the Hazardous Waste Division to discuss the disposal of NORM contaminated mixed wastes in a haz-

ardous waste landfill. One problem is that the hazardous waste disposal regulations in Louisiana prohibit the disposal of RCRA hazardous wastes containing NORM in a hazardous waste landfill.

The Louisiana regulations are based upon federal regulations. There has been some contact with the EPA in an attempt to determine the intent of the federal regulations. Knowing the intent of the federal regulations may suggest some options which can be used for the disposal of the hazardous wastes containing small concentrations of NORM. The federal regulations do allow some radioactivity, e.g., cesium-137, in the wastes to be disposed of in a hazardous waste landfill. Up to 100 picocuries cesium per gram can be disposed of this way.

MAINE

The CRCPD Part N (1999) Suggested State Regulations for the Control of NORM have been adopted with an effective date of August 1, 2001.

Maine now has proposed a rule revising their adopted Part N to bring it into agreement with the current CRCPD Part N which is before the CRCPD Board of Directors for approval. The public comment period for the Maine proposed rule ends in mid-February.

Maine does have NORM - contaminated water treatment wastes. Many water supplies in Maine contain significant concentrations of radium, radon and uranium. Ion exchange resins used in water treat-

ment can become “hot” with radium and uranium. Carbon filters used to remove radon from water become contaminated with the radon decay products, i.e., radioactive lead, bismuth and polonium.

The recent National Academy of Science report (*Risk Assessment of Exposure of Radon in Drinking Water, 1998*) and EPA’s imminent adoption of radon in water MCL will mandate the state adopt water treatment wastes regulations.

MARYLAND

Maryland has no specific regulations for the control of NORM. NORM is handled under the general radiation regulations. These general regulations were revised to bring the rules into line with 10 CFR 20 as well as making other changes deemed advisable. The revisions became effective October 9, 1995.

MASSACHUSETTS

Massachusetts does not have specific regulations for the control of NORM. NORM is considered to be a subset of NARM and NARM is considered to be regulated by the Massachusetts general radiation regulations.

The amended general radiation regulations became effective July 9, 1999.

MICHIGAN

There have been no significant changes in the Michigan guidance documents for the control of NORM and although none are planned for the immediate future,

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MICHIGAN (continued)

the CRCPD's Part N is being closely followed to determine if it should be the basis for future NORM regulations in Michigan.

The cleanup and disposal guidelines that are being used in Michigan have been updated with respect to references to applicable state laws and improved ties to federal MARSSIM guides. That is, some regulatory and technical updates have been made, but there have been no really substantial changes to the present guidelines.

There have been some successful remediations at several oil and gas facilities that had slightly contaminated soils. The contaminated soils were sent to solid waste landfills in Michigan. The Michigan guidelines for disposal in type 2 municipal solid waste landfill allow up to 50 pCi/gm radium-226 to be disposed. This can be a large cost saving. Analysis has shown that this level shows an insignificant risk to the public.

Michigan is resurveying many sites for NORM contamination. The original surveys had been made in the early 90s. The resurveys show that, generally, oil and gas sites which showed NORM contamination in the earlier surveys showed even greater contamination in the present study. For example, radiation readings of 18 milliroentgens per hour (18,000 microroentgens per hour) were seen at a gas separator and radioactivity levels of radium-226 as high as 150,000 to 200,000 pCi/g are seen in oil and gas facilities.

NORM levels in paper mills in Michigan have been reported at concentrations at just over 800 pCi/g.

MINNESOTA

Minnesota has no regulations for the specific control of NORM; it has regulations for devices that use discrete NARM (e.g. radium-226) as a source of radiation.

One landfill in Minnesota has been permitted to receive NORM wastes. The level of NORM which will be accepted at the landfills has not been determined.

Concern about NORM is increasing as more people learn about NORM contamination. One problem that has arisen is the zircon sands left when foundries go out of business. Allowing these NORM wastes to be disposed in a landfill will make the disposal easier.

In 1998, the Minnesota Department of Health began the process to become an Agreement State with the U.S. Nuclear Regulatory Commission. Minnesota hopes to become an Agreement State in August 2003.

MISSISSIPPI

Responsibility for NORM in Mississippi is currently divided between the Department of Health and the Oil and Gas Board. The Oil and Gas Board was to have authority for NORM at the wellsite (effective July 1, 1995). After the petroleum leaves the wellsite the Department of Health was to have jurisdiction for any NORM contamination.

However, the Mississippi legislature enacted legislation that gave the Oil and Gas Board jurisdiction over all oil and gas wastes. However, the *Mississippi State Board of Health Regulations for Control of Radiation, Section 801.N* is still in effect. The Division of Radiological Health continues to process licenses from contractors for NORM decontamination at industrial facilities. The attorney for the Department of Health believes that any commercial remediation, etc. will still have to be licensed by the Department.

Although the jurisdictional conflict involving the Department of Health and the Oil and Gas Board has not been completely resolved, it has been smoothed out to a degree. If the NORM wastes are generated by E & P activities, it is assumed to be under the jurisdiction of the Oil and Gas Board. If the dosage from the NORM reaches a certain level, the Department of Health assumes jurisdiction. The Department of Health does not appear to be disputing this. The Oil and Gas Board has assumed jurisdiction for about 99% of NORM associated with oil and gas.

On August 11, 1995, the Oil and Gas Board issued a proposed *Rule 69: Control of Oil Field NORM*. The rule provides the regulations for the control of oil field NORM to ensure that radiation exposures of workers and members of the general public are negligible. The rule applies to NORM that has been derived from the exploration and production activities of oil and gas

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MISSISSIPPI (continued)
operations within Mississippi.

Revisions made to Rule 69 at the public hearing in August 1995 were summarized in the Winter 96 issue of **The NORM Report**.

Rule 69 was appealed to the Mississippi State Supreme Court where it was decided in favor of the Oil and Gas Board.

Rule 69 has been implemented. Oil and gas operators have conducted NORM surveys on all their properties. Over 1,500 survey data have been entered in a computer. The data will be analyzed to determine how many sites are over a selected concentration level of NORM contamination.

The Oil and Gas Board received a petition to amend statewide Rule 68. **Rule 68, Disposal of Naturally Occurring Radioactive Materials (NORM) Associated with the Exploration and Production of Oil and Gas** became effective in September 1994. The petition which was received from the US Oil & Gas Association, Alabama/Mississippi Division asks the Oil and Gas Board to authorize the surface and subsurface land-spreading of Naturally Occurring Radioactive Materials (NORM) associated with the exploration and production of oil and gas. The original Rule 68 did not authorize landspreading as a method of NORM disposal.

Special hearings were held before the Oil and Gas Board commencing on August 18, 1999. At a hear-

ing held September 15, 1999 arguments and closing statements were heard.

(Editor's Note: Some of the Oil and Gas Board's thinking on the revisions to Rule 68 to allow land-spreading were discussed in the Volume VII, No. 2 issue of **The NORM Report**.)

The Board found that the maximum radiation levels in the proposed amendments which would authorize the surface and sub-surface landspreading of NORM E&P oilfield wastes, are significantly more restrictive than the radiation levels contained in **Statewide Rule 69: Control of Oil Field NORM** which was approved by the Mississippi State Oil and Gas Board and became effective June 1, 1996, and which has recently been upheld on appeal by the Chancery Court of the First Judicial District of Hinds County, Mississippi. The Board found that existing Statewide Rule 69, among other things, prescribes standards for the cleanup or remediation of property containing NORM E&P oilfield wastes. The Board noted that property for unrestricted use could have a maximum ambient exposure rate of 50 microrem per hour which is equivalent to concentrations of thirty (30) picocuries per gram. The Board's own expert, Dr. Vern Rogers, previously testified during the hearing on Statewide Rule 69, that this maximum soil concentration would result in no demonstrable health and safety impact on the residents of the State of Mississippi. The Board found that the proposed amendments to

Statewide Rule 68, which were before the Board would allow the surface and subsurface landspreading of NORM E&P oilfield wastes only where the maximum NORM concentrations do not exceed five (5) picocuries per gram. The Board found that the proposed land-spreading amendments to Statewide Rule 68 contain maximum NORM concentrations which are six (6) times more conservative than the NORM concentrations prescribed in existing Statewide Rule 69. In addition, the Board found that the maximum radiation exposure rate of 40 millirem per year, as proposed is fully supported by the overwhelming weight of the credible scientific testimony as being safe and fully protective of both human health and the environment.

The Board stated that in developing the landspreading rules, it had been the objective of the Board to develop rules which are sufficiently protective of oilfield workers, the general public and the environment, which do not conflict with existing state or federal regulations, which are technically sound, and which are implementable by those subject to their provisions. The Board was of the opinion and found that the landspreading rules being adopted fully meet all these objectives.

The Board found however, after careful evaluation, that a number of additional revisions should be incorporated into the proposed landspreading amendments to Statewide Rule 68 which differ significantly from the rule as original-

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MISSISSIPPI (continued)

ly proposed. These additional revisions were also summarized in the Volume VII, No.2 issue of **The NORM Report**.

The effective date of the amended Rule 68 was January 19, 2000.

Subsequently, an appeal of Rule 68 was filed in Lincoln County but was dismissed by the courts.

MISSOURI

There are no specific NORM regulations in Missouri and none are planned. Occurrences of NORM problems are handled under the state's general regulations for the control of radiation.

MONTANA

There have been no new developments applicable to NORM regulations in Montana. The regulations for the control of radiation have not been revised since 1980 and NORM is not considered to be included in these general radiation regulations. The Montana Department of Health and Environmental Sciences does have the statutory authority for NORM regulations, but there is no funded program for their development.

NEBRASKA

There has been no change in the status of NORM regulations in Nebraska. The state believes NORM is included in their general rules for the control of radiation. There are no plans for specific NORM rules.

Like many other states, Nebraska receives comments and questions

from recyclers. Some of these recyclers have "requested" NORM rules so they can use NORM limits, e.g., 50 microrem/hr, to know when they can refuse or accept contaminated scrap.

NEVADA

Nevada has no specific NORM regulations and none have been proposed. Comprehensive statutes for the control of radiation address NORM and NARM similarly.

NEW HAMPSHIRE

New Hampshire considers NORM to be a subset of NARM and the state has always regulated NARM in the same manner as the Agreement State materials (e.g. by-product, source, and special nuclear material). New Hampshire is currently reviewing the Part N Suggested State Regulations for the Control of NORM as published by the Conference of Radiation Control Program Directors, Inc. (CRCPD), for additional rulemaking necessary for regulation of TENORM (Technically Enhanced NORM) sources.

New Hampshire has significant quantities of radionuclides in drinking water. Treatment of the New Hampshire water supplies often results in resins and filters containing high concentrations of radium, uranium and radon decay products. Regulation and disposal of these water treatment wastes are issues currently being discussed by the Health Department and the Department of Environmental Services.

NEW JERSEY

Soil Remediation Standards for Radioactive Materials, N.J.A.C. 7:28-12, was adopted on August 7, 2000. The response to the comment document, final rule, guidance manual on characterization and final status surveys, and the spreadsheet used to implement the standards are all available on the Radiation Protection Program's website:

<http://www.state.nj.us/dep/rpp/index.html>

New Jersey has about 10 sites that are in some stage of cleanup. Most are using all or part of the rule for the cleanup levels and MARSSIM to implement final status surveys.

NEW MEXICO

The New Mexico NORM regulations, *Subpart 14: Naturally Occurring Radioactive Materials (NORM) in the Oil and Gas Industry* became effective August 3, 1995.

Rule 714, Disposal and Transfer of Regulated NORM for Disposal provides the regulatory framework for the disposal options addressed in the Part 14 NORM regulations. Rule 714 became effective July 15, 1996. Rule 714 was summarized in the Summer 96 issue of **The NORM Report**.

The guideline document draft for use with the NORM regulations (Appendix A of the regulations) is also available. The guide is entitled *Appendix A: Regulation Guidelines for the Management of NORM in the Oil and Gas Industry in New Mexico*.

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NEW MEXICO (continued)

The purpose of the document is to provide guidance to persons involved with facilities or equipment associated with the production of oil and gas and how to conduct screening surveys with portable radiation detectors to identify NORM and to initiate determination of needed radiation protection controls. The guide is intended for individuals licensed by the New Mexico Environment Department and permitted by the New Mexico Soil Conservation Division. The document is intended to assist general and specific licensees in the proper use, transfer, transport, storage and disposal of regulated NORM.

The guide describes the type and extent of information needed by the New Mexico Radiation Licensing and Registration Section staff to evaluate an application for a specific license for authorization to perform commercial services involving NORM contamination.

The guide is for general guidance in preparation of the license application and should not be considered as all the information that may be required for a particular application. Nor is it a substitute for the applicant's safety evaluation of the proposed activity. The applicant must ensure that the application correctly and adequately describes the commercial services offered, and the radiation safety measures and procedures to be followed to provide adequate protection. For this guide, decontamination means deliberate operations to reduce or remove residual NORM contami-

nation from equipment, facilities or land.

Copies of the New Mexico NORM guide are available from:

William M. Floyd
Program Manager
Radiation Licensing &
Registration Program
P.O. Box 26110
Santa Fe, NM 87502
Telephone: (505) 476-3236
FAX: (505) 476-3232

Copies of the State of New Mexico Radiation Protection Regulations (including the NORM rules), can be downloaded from the Department's website at

www.nmenv.state.nm.us

The official title of the regulations is 20 NMAC 3.1.

NEW YORK

On July 31, 2000, the New York State Department of Environmental Conservation amended the Department's **Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials** (6 NYCRR Part 380), which control the disposal of radioactive materials and radioactive wastes in this State. The amendment was promulgated as an emergency rule (effective July 31, 2000) and added a new category of radioactive waste to those radioactive wastes that are regulated under Part 380. These radioactive wastes may not be accepted for disposal at a facility regulated under the provisions of the State's solid waste management regulation, 6 NYCRR Part 360 (Part 360). The full text of the amended Part 380 is available

on the Department's website at www.dec.state.ny.us/website/regs/380.htm.

Type of Radioactive Wastes Affected

This regulation affects radioactive wastes that were produced when ores were processed to extract uranium and thorium before November 11, 1978. (Similar wastes produced after that date are regulated by the US Nuclear Regulatory Commission.) Uranium and thorium are both naturally occurring radioactive materials, and the ores in which they are found contain other radioactive elements that are produced by the radioactive decay of the uranium and thorium. When the ores are processed to remove the uranium and thorium, the resulting waste products can contain high concentrations of these radioactive materials. These wastes have been considered by some to be NORM wastes that were heretofore unregulated. Often, the buildings and lands where the ores were processed became contaminated with these radioactive wastes.

Typical Waste Forms Excluded from Landfills by this Amendment

Cleanup of these sites usually involves removing contaminated soil. In addition, buildings and other structures often must be demolished. These result in waste soils and demolition debris. Some of these wastes are not contaminated with radioactive material and their disposal is regulated as solid waste under Part 360. However, some wastes will contain radioactive uranium, thorium, and their decay products at concentrations greater than what normally is found

(Continued on page 11)

NEW YORK (continued)

in those wastes due to naturally occurring radioactive materials. Under this amendment, those wastes are radioactive wastes and cannot be accepted at landfills in New York State.

Upcoming Rulemaking Process

The Department is still under emergency rulemaking and is in the process of advancing the final rule. (The Part 380 amendment is expected to be finalized in the near future). The Department has received some negative responses from several corporations but has also received positive responses from other groups.

New York continues to have problems with radiation alarms being set off at landfills.

NORTH CAROLINA

Nothing presently is being proposed for NORM regulations for North Carolina. The state recognizes that NORM is an issue that may need further attention, particularly in scrap metal yards. The state is also aware that there are North Carolina industries that generate NORM wastes, such as the phosphate industry, waste water treatment sludge, and metal mining and processing wastes. For the present, North Carolina remains committed to interacting with industry, Federal and state agencies and providing assistance in resolving disposition of NORM wastes.

North Carolina is considering ways to standardize its methods of responding to incidents involving NORM/TENORM. Examples of

such incidents include scrapyards/landfill portal monitor trips and mine refuse/industrial waste disposal. It can take an excessive amount of time to investigate each portal monitor trip and similar incidents at landfills and scrapyards. The state cannot afford to send a health physicist or other technical staff to each facility requesting assistance. At one end an agency could act as a free health physics consultant and guide them through every step in disposing of the NORM, or at the other extreme, fax the facility a list of available qualified consultants and coordinate things from the office.

NORTH DAKOTA

North Dakota does not have specific regulations for the control of NORM. The state is currently revising their Radiation Control Regulations, but no changes are expected with respect to NORM.

OHIO

The revised Ohio regulations for the control of radiation, including NORM and NARM, were summarized in the Spring 97 issue of The NORM Report. The regulations were revised to agree with the federal regulations as an initial step in Ohio's application to become an Agreement State. The Agreement State status became effective August 31, 1999.

It is probable that more specific NORM regulations will be necessary within the next 12 to 18 months.

OKLAHOMA

Oklahoma has no specific regula-

tions for the control of NORM contamination. The draft of NORM regulations prepared by the Department of Environmental Quality's Radiation Management Advisory Council was tabled indefinitely at the request of the state legislature.

Oklahoma became an Agreement State effective September 29, 2000.

OREGON

There are no new developments regarding NORM regulations in Oregon.

Oregon has NORM regulations entitled *Regulation and Licensing of Naturally Occurring Radioactive Materials (NORM)*. The rules that became effective in January 1990 are found in the Oregon Administration Rules, Chapter 333, Division 117 - Health Division. The Oregon NORM rules were summarized in the Winter 96 issue of *The NORM Report*.

A few comments may be helpful in evaluating the impact of NORM regulations in Oregon: "NORM is regulated in Oregon in order to lower the risk to the public by properly using and disposing of NORM from large quantity users. Typically, disposal is to Oregon Department of Environmental Quality (DEQ) permitted landfills and less than ten large foundries or rare mineral extraction NORM/TENORM licenses are active in any year in Oregon." (This includes two large Broad Scope A - Industrial licensees.)

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PENNSYLVANIA

All radioactive materials including NORM are addressed in Pennsylvania's general radiation regulations. At present there are no specific NORM regulations.

A draft of solid waste regulations has been prepared by the Bureau of Radiation Protection and the Bureau of Land Recycling and Waste Management. This started as guidance about five years ago and has evolved to codify the essential elements so that now all the 300 landfills, transfer stations and resource recovery facilities (e.g. incinerators) will be required to monitor for radiation.

Maximum performance standards (alarm set points, etc.) and best management practices were set out in the regulations and guidance. That is, what can and what can't be accepted in a solid waste facility. Some 95% of the radioactive materials being disposed of in the landfills are short-lived nuclides, e.g. from nuclear medicine facilities. But, occasionally the landfills do receive some NORM waste, and it is expected that when the northwest counties of the state, where there is an oil and gas industry, start installing monitors many more instances of NORM will be seen.

Particularly noteworthy in these regulations and guidance is that if an alarm goes off because of cover materials taken from an undisturbed environment are being taken to a landfill, the materials are exempt from the regulations. That is, if there is no enhancement of the radioactivity, the materials are

exempt.

If there is TENORM, i.e., technically enhanced NORM, a small quantity can be accepted by the landfills if certain conditions are met. One cubic meter of material can be accepted without further approvals if the material contains less than 5 picocuries radium per gram, and the dose rate is less than 50 microrem/hour. Approval to accept other materials in the landfills will be handled on a case-by-case basis. The set point for the gate radiation monitors is 10 microRem/hour above background.

The title of Document Number:250-3100-001 is: *Final Guidance Document on Radioactivity Monitoring at Solid Waste Processing and Disposal Facilities*. Effective date: Sept. 16, 2000.

Now over the next two years, the 300 landfills must submit action plans, install radiation monitoring equipment, developing procedures, training staffs, etc.

Nine out of ten radioactive wastes sent to landfills in Pennsylvania are short-lived radioactivities from medical wastes. The landfills will either need multichannel analyzers and the expertise to interpret the results or hire a consultant to separate the TENORM from the medical wastes. The medical wastes will be allowed to be disposed of in the landfill while the TENORM must meet the requirements above to be accepted by the landfill.

Pennsylvania is a major state for

the disposal of solid wastes from most of the states bordering Pennsylvania.

The Comment/Response Document entitled *Report to the Environmental Quality Board on the Proposed Guidance Document on Radioactivity Monitoring at Municipal and Residual Waste Processing and Disposal Facilities* can be downloaded from: http://www.dep.state.pa.us/dep/subject/Rec_Final_Technical_guidance/Rec_Final_Technical_guidance.htm (The document is at the bottom of the table.).

A copy of the document may also be available from:

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At a recent meeting of ISCORS (see the NRC section later in this newsletter), Dave Allard addressed the question of why the regulations and guidance were needed. He said one reason was because landfill alarms were being tripped by radioactively contaminated waste from medical treatments, even though such disposal was legal. Staff has to respond to these alarms, which expends resources. The issue is complicated by the fact that those landfills which have installed radiation monitors have different alarm set points and sensitivities. On a national basis, different regulations exist related to the

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PENNSYLVANIA (continued)

deregulated and exempt radioactive materials that may trip an alarm. It appears that solid waste facilities have been installing monitors (without mandate) for the following reasons: to protect their image and legal interests; because current state permit conditions prohibit acceptance of "radioactivity"; to avoid cleanup cost if contamination is discovered; to reassure citizens; and concern for illegal disposal of low level radioactive waste.

He went on to say that the expected result of these new regulations and guidance is that: all Pennsylvania solid waste facilities will have to install radiation detection equipment, develop site-specific action plans, and respond to alarms. Sources of radioactivity commonly encountered by landfills were described, most of which originate from nuclear medicine procedures and consumer products. Naturally occurring radioactive material (NORM) or technologically enhanced NORM (TENORM) is also detected, as well as lost radium byproduct material sealed sources.

As to the objectives of regulations and guidance, the state's motivation is to protect the public, workers, and the environment from unnecessary radiological impact. Also, solid waste facilities would be protected from contamination and subsequent costly remediation (e.g., incineration). Other benefits would be to prevent unlawful low level radionuclide waste disposal; to assist facilities in complying with regulations; and conserve state

resources by reducing unnecessary response activity. A set of basic regulatory limitations pertaining to the processing of prohibited radioactive materials such as specifically licensed naturally occurring or accelerator produced material (NRRM), low level waste, and byproduct, source, special nuclear, and transuranic materials was outlined. There are also limitations on radioactive materials which cannot be processed unless approved by the state, such as short-lived materials from medical treatment, TENORM, and consumer products.

The actual regulations with alarm set points and general guidance is available, as well as a consumer Fact Sheet. Contained in the guidance is information on developing action plans, detection and initial response, monitoring equipment, characterization, determining origin, disposition, disposal options, and records and notification. This information is available on the Department of Environmental Protection web site.

RHODE ISLAND

Rhode Island has no specific regulations for the control of NORM and none are in the planning stage. NORM is considered to be covered under the state's general radiation control regulations.

SOUTH CAROLINA

Part IX -- Licensing of Naturally Occurring Radioactive Material (NORM) became effective June 30, 1995 in South Carolina. There have been no changes in the regulations and none are proposed. Part

IX was summarized in the Summer 95 issue of **The NORM Report**.

SOUTH DAKOTA

South Dakota has regulations for the control of radiation, but nothing specific to NORM. No legislation has been proposed to regulate NORM.

TENNESSEE

NORM contamination in Tennessee is handled like any other radioactive material. If it is enhanced above background levels, an assessment is made to determine if it constitutes a problem. If it does, it is dealt with similarly to any other radioactive material, i.e., by using the general radiation regulations. There are no specific regulations for the control of NORM and none are planned. It appears that as more people learn about NORM, more instances of NORM contamination are being reported.

TEXAS

The Texas Department of Health has jurisdiction for NORM except for the disposal of NORM contaminated wastes. The Railroad Commission has jurisdiction for the disposal of oil and gas industry NORM wastes, while the Texas Natural Resource Conservation Commission has responsibility for the disposal of NORM wastes not associated with oil and gas exploration and production.

In April, 1999, the Texas Department of Health (TDH) finalized revisions to 25 Texas Administrative Code, §289.259, *Licensing of Naturally Occurring*

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TEXAS (continued)**Radioactive Material (NORM).**

The revisions included new definitions that support the changes in the rule. Exemptions for oil and gas NORM waste are redefined and exemptions for pipe (tubulars) and other downhole or surface equipment contaminated with NORM are clarified. Specific licensing requirements for spinning pipe gauge operations that perform NORM decontamination and for persons receiving NORM waste from other persons for processing or storage are added. Other minor grammatical changes are made to the section for clarification.

Over the last several years, industry has indicated that they consider "routine maintenance" to be the repair and maintenance of equipment for restoring it to its intended use or efficiency, despite the presence of oil and gas NORM. Decontamination of equipment contaminated with NORM above the exempt limits may occur incidental to the routine maintenance.

The TDH acknowledges that not all routine maintenance activities result in a significant increase in radiation exposure risk. Simple routine maintenance tasks such as replacing or repairing a valve, changing filters, or "pigging" a pipe are such activities.

The wording in the revised rule, "Maintenance that provides a different pathway for exposure than is found in daily operations and that increases the potential for additional exposure is not considered routine," was proposed to define the risk the department is concerned

about. In discussions with the industry, the TDH determined that the activity that presents the most concern is vessel entry. The industry considers this to be routine maintenance. However, this is the type of operation that the TDH believes presents a significantly increased risk from an enclosed environment where an inhalation risk (a different pathway for exposure than is found in daily operations) from NORM can be present.

The TDH acknowledges that unlike the employees of a company specifically licensed to perform decontamination, the employees or contractors of a general licensee would be performing vessel entry on an infrequent basis and thus, the radiation exposure risk is lowered due to the time factor.

The TDH drafted language that will outline radiation safety precautions that must be followed when vessel entry is conducted during routine maintenance, but wishes to seek further input from the industry on that draft language. However, in order for several of the other revisions of this section supported by comments to become effective and for the section to be reformatted in **Texas Register** format, no change to the wording about routine maintenance was made prior to the rule revisions being finalized.

In July, 1999, the TDH held a workshop to explain the revisions to the rule and to get stakeholder input on the draft language about routine maintenance. Over 75 people attended the workshop and the TDH received a good amount of

input on the draft language. The staff will be reviewing the input received during the workshop and will develop new draft revisions to 25 TAC §289.259. TDH hoped to have the revisions before the end of 2000, but legislative priorities for other regulatory actions pushed this back to at least the spring of 2002. The TDH is in the process of putting together a working paper (which is an internal document). After the document is "approved" internally it will be sent out to interested parties for comment.

The three agencies are considering some additional changes to the NORM rules, particularly concerning exemptions.

The Texas Railroad Commission's **Statewide Rule 94: Disposal of Oil and Gas NORM Wastes** took effect February 11, 1995. This rule sets forth requirements for the safe disposal of NORM that constitutes, is in, or has contaminated oil and gas wastes. Rule 94 was summarized in the Winter 95 issue of **The NORM Report**.

In 2000 the Railroad Commission conducted a survey of 612 randomly selected oil and gas sites throughout the State to determine the radioactivity level of various types of oil and gas equipment, including tanks, flow lines, valves, pumps, and well tubulars relative to background levels. NORM radioactivity above the regulatory level of 50 $\mu\text{R/hr}$ was detected at 59 sites. Of a total of 5,916 readings of oil and gas equipment, 203 were higher than 50

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TEXAS (continued)

microrem/hr. To augment the study, the Texas Department of Health surveyed 24 pipe yards around the State. Pipe at four yards had levels of NORM radioactivity above 50 microrem/hr. The survey results and other pertinent data were used to evaluate the effectiveness of the current regulations for the detection, control, and disposal of oil and gas NORM. The study was completed by December, 2000.

Legislation signed into law on May 2, 2001 authorizes the Railroad Commission to require the owner/operator of oil and gas equipment used in exploration, production, or disposal to determine whether the equipment is contaminated or contains oil and gas NORM waste, and identify any equipment so determined.

The Railroad Commission is drafting revisions to Statewide Rule 94 that address the legislative intent.

There has been no change to the Texas Natural Resource Conservation Commission (TNRCC) non-oil and gas NORM requirements. However, since the issuance of the 40 CFR 141, *National Primary Drinking Water Regulations for Radionuclides (Radium-226, Radium-228, and Natural Uranium)*, the TNRCC is in the process of implementing rules mirroring the EPA standards. Options for achieving compliance under these new rules for drinking water are limited to either finding an alternate source or treating the water to lower the radionuclide concentration to acceptable levels.

The TNRCC is currently investigating the potential need for new or amended NORM rules addressing the management of drinking water treatment residuals.

A drinking water advisory group with representatives from Texas water utilities and the public has been established. Meetings with this stakeholder group are being held to obtain input. Two questionnaires are being sent out to obtain more specific information from water utilities. The first questionnaire was sent to 125 drinking water utilities with NORM concentrations in their drinking water that may exceed the EPA standards. This questionnaire was designed to determine how many of the utilities would be able to find an alternate source of drinking water. The TNRCC is currently compiling this information and hopes to obtain results by the end of February 2002.

The second questionnaire will be sent only to those utilities who may have to treat their water and manage the residuals. This questionnaire is scheduled to be distributed in early March 2002. The information gathered will be used to determine the most environmentally conscious and cost effective management method for each of the utilities. The current rules will be evaluated, and rule changes may be implemented if significant need exists. If required, they will be completed in late 2003 - 2004.

UTAH

NORM is considered to be in Utah's comprehensive radiation

control regulations. No specific NORM regulations have been proposed in Utah.

On July 9, 2001, a license was issued to Envirocare of Utah to receive and dispose of containerized Class A, B, and C low-level radioactive waste in a new cell. The license does not become effective until the legislature and the Governor authorize the new facility and no construction or receipt of waste can occur as well. If either the legislature or Governor disapprove the facility, the license (effective until July 9, 2006) is immediately terminated.

The license decision was appealed to the Utah Radiation Control Board who are now going through pre-hearing phases of the appeal. The next major step is a decision regarding standing of the parties who have filed hearing requests.

At the January 4, 2002 meeting of the Utah Radiation Control Board, the Board considered intervention (standing) requests from the Sierra Club, Families Against Incinerator Risk (FAIR), et al (which included Utah Legislative Watch (ULW), Citizens Against Radioactive Waste (CAR), and several individual petitioners). After providing the opportunity for input from all impacted parties, the Board decided by a 6-4 vote to grant intervention to FAIR, ULW, and CAR. The Sierra Club announced that it would withdraw from the proceeding prior to the intervention determination. All parties will now meet to determine a schedule for the hearing. If the par

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UTAH (continued)

ties are unable to come to agreement upon a schedule, the Board will set the hearing schedule. The Board also acted upon a joint motion for a partial stay of proceedings to allow additional time for the U.S. Air Force, a petitioner for intervention, to continue to work on a resolution with the Rocky Mountain Compact and others on joint issues. The partial stay would reserve the right for the U.S. Air Force to request intervention (standing) if a resolution failed. The Board acted upon a motion to disqualify a Board member raised by FAIR, et. al. from the proceeding. Parties may request that Board members be removed from a proceeding for such reasons that a member's prejudice or bias could interfere with such member making a fair and objective judgment on the issues of the proceeding. The Board, after hearing arguments from all parties, concluded by unanimous vote that Board member Teryl Hunsaker would be able to be objective and represent the State of Utah as a whole in any decision regarding the appeals of the license application. Teryl Hunsaker fulfills the county elected official position on the Board and is a Tooele County Commissioner.

On October 19, 2001, an approval was issued regarding a major amendment request from Envirocare to receive and dispose of containerized Class A waste in the existing Class A cell. This licensing decision has also been appealed to the Utah Radiation Control Board. In contrast to the B/C license, Envirocare can receive

containerized Class A radioactive waste in the existing cell as the appeals process moves forward.

At the January 4, 2002 meeting of the Utah Radiation Control Board, the Board approved a Notice of Further Proceeding regarding the appeal of the containerized A amendment request in the existing cell. The Executive Secretary and Envirocare were allowed until January 18, 2002 to submit any response to the intervention request by Families Against Incinerator Risk (FAIR). Any reply by FAIR was to be filed by February 18, 2002. The Executive Secretary must compile the pre-hearing administrative record by March 15, 2002. Parties have until April 15, 2002 to supplement the record. The determination for standing in the proceeding will likely occur at the March 1, 2002 Board meeting.

VERMONT

Vermont has no direct regulations for the specific control of NORM and none are planned.

Concern has been expressed as to the radiation received by some workers in granite plants due to radioactive materials (NORM) in dust and the air. An excess of lung cancers has been reported in employees who have worked for a long time in the stone industry. Silicosis used to be the primary result of working with stone, but now lung cancer is reported to be a serious hazard as well. Some persons have expressed a desire to investigate this in more detail, but limited time and testing capability permit only so much activity. The

bottom line is that the regulators are being watched to see what they decide appropriate concentrations of NORM (radium) should be.

Vermont has become concerned with the levels of radioactivity in the drinking water in some areas of the state. Some individual wells have very high levels and need immediate treatment to protect the health of the residents. Some of the treatment systems if used would create filters that need to be regulated under the hazardous materials regulations. With others the backwash violates the Vermont Groundwater Standards and is at a level that is defined as radioactive in the federal UIC regulation as well. Vermont is also concerned that the radioactivity in many cases is being drawn out of a deep aquifer and disposed of in an aquifer close to the surface.

In getting involved in the issue, it became apparent that there is little information about the fate of radionuclides when they are sent to a septic tank and leach field. Vermont has associated itself with the New England Interstate Water Pollution Control Commission (NEIWPC) and several other New England states to do a study of this matter. So far the EPA has given Vermont a grant of nearly \$80,000 for this purpose. A work plan is due to the EPA March 11, 2002. The workgroup has established the sampling points to be used when evaluating sites of interest. At present the states are looking for suitable sites to be put on a pooled list from which to draw can

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VERMONT (continued)

didates for the actual study.

Denise Springborg at NEIWPC has been extremely helpful in coordinating the project with the other northeastern states and the EPA.

There is a possibility that the Water Treatment Technical Assistance Center at UNH will be able to participate with us and provide additional funding for the project.

a coordinated effort with this work, Vermont has been doing an evaluation of the availability of information on areas with a high likelihood or possibility of radioactive groundwater in Vermont. We are trying to develop a map of such areas with the data and its "accuracy" level. Some of the data was accumulated in the 60s from "flyovers" by people looking for possible uranium mining sites, and other data are obtained from actual monitoring of wells.

VIRGINIA

Virginia has no specific regulations for the control of NORM. NORM is considered to be covered in the general regulations for the control of radiation. These general regulations are being revised.

WASHINGTON

Washington has no specific regulations for the control of NORM and none are being planned.

In August 2000 the draft Environmental Impact Statement (EIS) for the Commercial Low-Level Radioactive Waste Disposal Site was jointly issued by the

Washington State Department of Health and Washington State Department of Ecology. The draft EIS evaluated alternatives for renewal of the US Ecology, Inc. license to operate the site, limits for disposal of diffuse Naturally Occurring or Accelerator Produced Radioactive Material (NARM), and closure of the site. Public comments were received on the draft EIS through November 2000.

The agencies original intent was to publish a final EIS in March 2001. Based on the volume and substance of the comments received, it became apparent that there was a lot more work to do before a final EIS can be completed. The new schedule is to issue a final EIS no later than December 2002.

There are many tasks the agencies will continue to work on in preparation of the final EIS. Some of these tasks are:

1. Individually answering all comments received during the comment period,
2. Integrating the data from the site investigation into the Chemical Risk Assessment, Ground Water Modeling, and Radioactive Risk Assessment,
3. Evaluating an alternative of zero volume for NARM disposal,
4. Evaluating impacts for air transportation of waste,
5. Evaluating transportation impacts for construction of the closure cover,
6. Researching and evaluating more operational enhancements including the use of trench liners,
7. Clarifying the role of the Model Toxics Control Act in closing the

commercial site,

8. Planning Phase III of the site investigation, including hiring a consultant to facilitate public participation in the Data Quality Objective (DQO) Process.

The agencies appreciate all the comments received on the draft EIS. Many of the tasks listed above reflect recommendations made during the comment period. Although the time and effort required to respond to the comments requires an extended schedule, the agencies believe this additional effort will result in a Final EIS that better answers the public's questions and concerns.

The responses to the comments received have been completed and the final EIS is being prepared. The final EIS is due before December 2002.

For more information, please contact Nancy Darling, Washington Department of Health, (360) 236-3244, Nancy.Darling@doh.wa.gov or Larry Goldstein, Washington Department of Ecology, (360) 407-6573, lgol461@ecy.wa.gov.

US Ecology has always met state regulations. The Environmental Impact Statement will evaluate the effects of the three actions to show that the site will be safe for at least 1,000 years.

WEST VIRGINIA

The general regulations for the control of radiation have been extensively revised and have been approved by the state legislature.

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WEST VIRGINIA (continued)

The revised regulations which now include NORM rules became effective July 1, 2001.

In addition to the inclusion of NORM rules, the revisions to the radiation regulations were very extensive, going from a 75 page document to a 450 page document. The NORM rules are largely based on the CRCPD Part N Suggested State Regulations for the Control of Naturally Occurring Radioactive Materials.

WISCONSIN

Wisconsin has no specific regulations for the control of NORM, except those imposed by the Department of Natural Resources for the disposal of materials containing radium-226. The state does have general regulations for the control of radiation.

Wisconsin's general radiation regulations are being revised as part of becoming an Agreement State. A draft of the revised general regulations is almost ready for legislative review. The revised regulations are significantly longer than the previous rules. Specific NORM regulations are not in the revision. NORM rules will be addressed later -- NORM is an issue onto itself. The current revision focuses on the Atomic Energy Act and NARM.

The public review and comment period ended November 30, 2001. The Department is now in the process of summarizing the public comments received and the Department's responses to them.

The proposed rule is being modified to reflect those comments. The proposed rule should be submitted for legislative review shortly.

WYOMING

Wyoming has no regulations for the control of NORM and none have been proposed. But, the issue has been discussed at a SERC meeting and the committee has inquired what surrounding states and the federal agencies (EPA/NRC) are doing and what regulations are in place. Wyoming is currently reviewing options using Wyoming's neighbors information as a basis for the next action.

At the current time, there is no plan to initiate any NORM regulations besides those currently in place (environmental rules/regulations).

Wyoming relies on voluntary cooperation for the control of NORM. For example, scrap yards and other recyclers have installed gate radiation monitors, etc.

Considerable scale is found in the Wyoming oil and gas industry but there appears to be no support for NORM regulations. The problem with that scenario is that there are no controls on NORM/TENORM within the state for the most part -- only some restrictions on produced water and ground water. For example, produced water cannot be discharged if it contains more than 60 picocuries radium per liter.

Wyoming no longer has regulations that require the registration of radioactive materials.

FEDERAL ACTIONS**ENVIRONMENTAL PROTECTION AGENCY (EPA)**

In July 2000, EPA sent a report to Congress stating the Agency's views on the need to revise its guidelines for TENORM because of the 1999 National Academy of Sciences evaluation (see **The NORM Report** - Fall 1999/Winter 2000 issue). EPA explained the technical and policy basis for its views and submitted the NAS report along with the EPA report. The EPA report is available to be read or downloaded electronically on EPA's TENORM Internet web site at: http://www.epa.gov/radiation/tenorm/docs/nas_resp.pdf

The Agency's current approach to TENORM is to :

- Study and issue individual technical reports on TENORM-producing industries to determine what's in the wastes and products from each industry and how much risk they pose. The Agency will focus on TENORM materials from specific sources in a series of separate reports.
- Identify and study existing TENORM sites to assemble a nation-wide view of the problem. This consists of a variety of field projects that will give EPA more information on the sources, characteristics and risks of TENORM.

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EPA (continued)

- EPA will seek to partner with other organizations to enhance data sharing and avoid duplication of efforts. Meetings and partnerships with stakeholders will help to review technical reports plus identify appropriate courses of study and action for each TENORM product or waste.

Ultimately develop and provide education and guidance for radiation protection, and for safely and economically handling, cleaning up and disposing of TENORM.

Accordingly, with this approach, EPA will not be developing a revision of the draft report *Diffuse NORM Wastes: Waste Characterization and Preliminary Risk Assessment* originally issued in April 1993. Instead, it plans to use some materials in that report plus new information and revised analyses in each of its technical reports. The first of those reports will be on TENORM from uranium mining and is currently in preparation.

The U.S. Environmental Protection Agency (EPA) has recently published a report titled *Radiation Protection at EPA - The First Thirty Years*. The report describes the radiation protection responsibilities transferred to EPA when it was established in 1970 and the statutes that have been enacted over the past 30 years that provide the Agency additional radiation protection responsibilities. The sec-

ond part of the report provides information on key EPA implementation activities and highlights the significant radiation protection precedents established by these activities.

As a companion to this report, EPA has developed a one-page timeline identifying, by decade, the EPA administrators, radiation protection statutes and authorities, implementation activities, and external factors. This report is currently available on the Web at

www.epa.gov/radiation/rpdpubs.htm.

The Multi-Agency Radiological Laboratory Analytical Protocols (MARLAP) Manual is currently available for public review. This follows the review by federal and state agencies which generated more than 2,000 comments. The manual was revised based on these comments and it is now available for public review and for peer review by the Environmental Protection Agency's (EPA) Science Advisory Board.

The MARLAP Manual is a document which provides guidance for the planning, implementation, and assessment phases of those projects which require the laboratory analysis of radionuclides. MARLAP's basic goal is to provide guidance and a framework for project planners, managers, and laboratory personnel to ensure that radioanalytical laboratory data will meet a project's or program's data requirements and needs. To attain this goal, the manual seeks to provide the necessary guidance for national consistency in radioanalytical work in the form of a performance-based

approach for meeting a project's data requirements. The guidance in MARLAP is designed to help ensure the generation of radioanalytical data of known quality appropriate for its intended use.

MARLAP was developed by a working group which included representatives from the EPA, the Department of Energy, the Department of Defense, the Nuclear Regulatory Commission, the National Institute of Standards and Technology, the U.S. Geological Survey, the U.S. Food and Drug Administration, the Commonwealth of Kentucky, and the State of California. Since MARLAP employs a performance-based approach to laboratory measurements, the guidance contained in the manual is applicable to a wide range of programs, projects, and activities which require radioanalytical laboratory measurements.

Examples of data collection activities that MARLAP supports include site characterization, site cleanup and compliance demonstration, decommissioning of nuclear facilities, remedial and removal actions, effluent monitoring of licensed facilities, environmental site monitoring, background studies, and waste management activities.

MARLAP is divided into two main parts. Part I is aimed primarily at project planners and managers and provides guidance on project planning with emphasis on analytical planning issues and analytical data

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EPA (continued)

requirements. Part I also provides guidance on developing project-specific analytical requirements, selecting analytical methods, preparing project plan documents and radioanalytical statements of work, obtaining and evaluating radio-analytical laboratory services, data verification, data validation, and data quality assessment.

Part II of MARLAP is aimed primarily at laboratory personnel and provides guidance in the relevant areas of radioanalytical laboratory work. The chapters in Part II are intended to serve as a resource base of information on the laboratory, analysis of radionuclides and provide guidance on a variety of activities performed at radioanalytical laboratories, including sample preparation, sample dissolution, chemical separations, instrument measurements, data reduction, etc. Part II also has chapters on measurement statistics, laboratory quality assurance and quality control, and waste management for radio-analytical laboratories. While the chapters in Part II do not contain detailed step-by-step instructions on how to perform certain laboratory tasks, the chapters do provide information on many of the options available for these tasks and discuss advantages and disadvantages of each.

Everyone is invited and encouraged to review and provide comments on the manual through the following Web site: <http://www.eml.doe.gov/marlap/>. From the Web site, the manual can be reviewed and printed and the

Web site has instructions on how to submit comments on the manual. All comments received by 15 December 2001 will be reviewed and considered by the MARLAP Workgroup. Comments received after that date will be considered if it is possible to do so.

EPA Related Web Pages**Radiation Protection Division (RPD)**

A division of the EPA, the RPD web page provides detailed information and links to the various programs associated with radiation protection activities.

www.epa.gov/radiation/index.html

Radioactive Waste Disposal: "Disposal of Naturally Occurring and Accelerator-Produced Radioactive Materials"

This EPA produced page discusses the various sources, uses, and disposal methods for accelerator-produced and naturally occurring radioactive materials. This site can be reviewed at:

www.epa.gov/rpdweb00/radwaste/narm.htm.

National Emissions Standards: "National Emissions Standards for Hazardous Air Pollutants (NESHAPs): Radionuclides"

This web page provides information and links to NESHAPs exposure limits from specific sources of air pollutants that are known or suspected to cause serious health problems:

www.epa.gov/radiation/neshaps/index.html

Human Health and**Environmental Damages**

This site provides supporting documentation that illustrates the human health and environmental damages that can be caused by poor management of mining and mineral processing wastes.

www.epa.gov/epaoswer/other/mining/minedock/damage.htm

TENORM Program:

Technologically-Enhanced Naturally-Occurring Radioactive Materials Homepage. The

TENORM Program was coordinated to condense the information from a variety of organizations that have identified an array of materials that present a radiation hazard to people and the environment.

www.epa.gov/rpdweb00/tenom/index.html

Federal Guidance for Radiation Protection:

EPA web page which provides information and links to Federal guidance documents for protecting the public from the harmful effects of radiation.

www.epa.gov/rpdweb00/federal/index.html

NUCLEAR REGULATORY COMMISSION (NRC)

The Commission has instructed the NRC staff to look into better and more efficient ways to regulate low-activity materials (unimportant quantities of source materials, i.e., less than 0.05% thorium and uranium which are basically similar to NORM and TENORM). The staff was instructed to form a working group with other federal agencies.

(Continued on page 21)

NRC (continued)**This working group is formally named the INTERAGENCY JURISDICTIONAL WORKING GROUP EVALUATING THE REGULATION OF LOW CONCENTRATIONS OF URANIUM AND THORIUM.**

The Working Group has identified several steps necessary for developing "best approaches" recommendations for regulatory responsibilities. The Working Group needs to: (a) better understand the uses and quantities of source material which are being used/processed that would fit into the scope of the Working Group's review; (b) identify concentration ranges and their potential doses; (c) determine where there are any potential issues or risks related to public health and safety regarding public or occupational doses, or environmental impacts; and (d) evaluate current regulatory controls of these materials.

The Working Group believes it must also develop criteria for making decisions and recommendations regarding the issues. It has already begun gathering information on the materials that are being used/processed that fall within the scope of its evaluation. Once this is complete, the Working Group will focus on the issues and, in light of current regulatory controls, develop options and recommendations for the future regulation of these materials.

As the Working Group progresses in this endeavor, it will consider how the options and recommenda-

tions address the Agency's performance goals: (1) maintain safety; (2) increase public confidence; (3) increase effectiveness, efficiency, and realism; and (4) reduce unnecessary regulatory burden.

The agencies on this working group are the Nuclear Regulatory Commission, the Environmental Protection Agency, the Department of Energy, OSHA and the Army Corps of Engineers. The Group is looking at ways to better regulate low-end materials, which include TENORM. They are exploring options where one option might be for the Commission to defer regulations of unimportant quantities of source materials. The Group, which last met December 13, 2001 is still exploring options and has nothing firm to offer yet. They are preparing a paper for the Commission which should be out this spring.

Estimates of possible doses from uranium and thorium suggest that the concentration limit of 0.05 % (500 ppm) may not be adequately protective of public health and safety and the environment. However, lowering the concentration limit below this level could lead NRC to regulate many activities (including almost all mineral processing and product manufacturing) unrelated to the nuclear fuel cycle. This was not intended in the 1946 and 1954 Acts.

Additionally, many naturally-occurring materials containing uranium and thorium also contain radium at elevated concentrations that could pose health and safety impacts that may be more signifi-

cant than the uranium and thorium that are present in the materials. The Jurisdictional Working Group will review and evaluate potentially relevant and applicable regulations and explore ways to regulate those materials containing uranium and/or thorium which could pose a risk to humans and the environment. The Jurisdictional Working Group will also consider possible regulatory approaches, including shared roles among Federal and State agencies, to address such concerns and minimize the associated risks.

At the April 11-12, 2001 meeting of the Working Group, James Kennedy, NRC/DWM, provided an update on the status of a grant with the National Academy of Sciences (NAS), entitled *Improving Practices for Regulating and Managing Low-Activity Radioactive Waste*. NAS will essentially be evaluating everything except high level waste, including FUSRAPS, NORM, TENORM, and 11.e.2. byproduct material. NAS will be evaluating ways to improve the management and oversight of such materials, possibly including safety improvements. The study will take approximately 20 months, once work on the study begins.

The Working Group discussed the current revision of Part N, *Regulation and Licensing of Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM)*, which is part of the Suggested State Regulations issued through the

(Continued on page 22)

NRC (continued)

CRCPD. It will be submitted to the CRCPD Board for approval and then to Federal agencies for official concurrence.

Loren Setlow, EPA, informed the group that the IAEA is working on a technical document on TENORM/NORM. The IAEA committee will develop a description of the existing situation for NORM/TENORM occurrences, including radiation levels measured, sites contaminated, regulatory frameworks in place, etc. This should be a two-year effort, with a working draft to be completed first,

Loren Setlow, EPA, provided a summary of the National Academy of Sciences (NAS) Report, *Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials*, which was completed in 1999, as well as a summary of the EPA's response to Congress (June 2000). The NAS was tasked with determining whether the differences in the guidelines for TENORM developed by the EPA and other organizations are based upon scientific and technical information or on policy decisions related to risk management. If the guidelines developed by the EPA and other organizations differ in their scientific and technical bases, the NAS was to look at what the relative merits of these assumptions are. Additionally, the NAS was to determine whether there is relevant and appropriate scientific information that has not been used in the development of TENORM guide-

lines.

The NAS determined that the differences are based essentially on differences in policy judgments for risk management, and that the differences are not based on technical issues. All current scientific information on TENORM is reflected in current guidelines.

The NAS made several recommendations for EPA's consideration. The EPA has several activities related to TENORM. It is studying individual TENORM sources and looking at existing sites. Based on these studies, EPA may develop education and guidance for safe and economical handling, clean-up and disposal of TENORM. The EPA is also work(ing with other organizations in developing TENORM solutions, such as the ISCORs-NORM Subcommittee, and the Sewage Sludge and Ash Subcommittee.

At the September 26, 2001 meeting there was a discussion of the EPA comments on Part N (CRCPD). EPA submitted two sets of comments on Part N, from the Office of Radiation and Indoor Air (ORIA) and from the Office of Emergency and Remedial Response (OERR / Superfund). There are two comments specific to the Working Group's work: 1) the definition of TENORM does not appear to cover everything that could be considered TENORM, and 2) the exemption for zircon should be eliminated.

At the December 13, 2001 meeting James Kennedy, NRC/DWM, discussed NRC's comments, dated

August 10, 2001, on Part N. Mr. Kennedy provided a description of NRC's perspective in commenting on the document:

- (1) NRC has no authority over TENORM.
- (2) NRC wants to promote consistency in regulation of nuclear materials and risk management standards and approaches.
- (3) TENORM is both similar to and different from AEA materials.
- (4) The states and CRCPD have authority to set policy over how TENORM is to be handled.
- (5) NRC acknowledges NAS recommendations.

The NRC comments to the CRCPD that are specific to the work of the Working Group are (a) strengthen the justification for the zircon exemption, and (b) explain in the Rationale what consideration has been given to setting a concentration standard for other radionuclides.

The group was provided information from the *Part N Rationale and Implementation Guidance*, specifically related to the proposed exemption. These documents discuss in more detail the proposed exemption and the data the Part N working group reviewed. Steve Collins, with the State of Illinois Radiation Control Program, and Chairman of the CRCPD Part N Working Group, discussed this information. In addition to information received from Charlie Simmons, the Part N working group reviewed data from Australia and South Africa on the mining and processing of zirconium. Where

(Continued on page 23)

NRC (continued)

possible, the Part N working group looked at real data instead of relying on default values.

Ms. Taylor (NRC) provided a summary of key points for the Commission paper, developed from prior Working Group meetings and discussions. Mr. Setlow indicated that a point that needs to be made is the number of waste sites that would be affected by TFNORM regulations.

The next meeting was not scheduled at this time, but will probably be in March 2002.

Another committee, the Interagency Steering Committee on Radiation Standards (ISCORS), is charged with harmonizing radiation standards and risk management practices among the various federal agencies. The agencies on the Steering Committee include the Nuclear Regulatory Commission, the Environmental Protection Agency, the Department of Energy, Health and Human Services, Department of Transportation, Department of Defense, Department of Labor/OSHA, and the Department of State.

The Steering Committee has several subcommittees, including a NORM Subcommittee. The members of this subcommittee include all the members of the parent committee except the Department of State. Representatives from various states attend meetings as observers.

The mission of the ISCORS NORM Subcommittee is to ensure

effective communication and coordination among member agencies involved with regulatory, oversight, and disposal issues for NORM wastes, and products containing NORM. At the direction of the full ISCORS Committee, the Subcommittee may take on responsibility for issues on other types of radioactive waste and materials.

The most recent meeting of the ISCORS Committee was January 8, 2002, but no information on that meeting is available yet. At the October 1, 2001 meeting, Loren Setlow reported that the NORM Subcommittee had been scheduled to meet July 26 for the purpose of continuing the drafting of a white paper on agency responsibilities for NORM/TENOIRM. That meeting was postponed and the drafting was rescheduled for October or November. No other information on the drafting of the white paper is available.

Bob Meck of NRC, reported that finalization of the agency's draft *NUREIG-1640 Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities* was peer reviewed by the Center for Nuclear Waste Regulatory Analysis. Resolution of peer review and public comments has been initiated, and the final version is expected to be published by Summer 2002.

Follow-on technical information on inventory, collective dose, and costs is under development. Inventory data on "clean," "likely clean," and "nearly clean" materials and equipment is needed, as

these categories are the most likely candidates for clearance.

Information on ISCORS, including the NORM Subcommittee can be found on the ISCORS Web page at <http://www.iscors.org>

It is my understanding that the ISCORS Annual Report for 2000 has been released, but it is not yet available on their Web page.

According to the Atomic Energy Act of 1954 the NRC cannot regulate NORM, but is very interested in the subject since NORM is very similar to what the NRC does regulate.

MINERALS MANAGEMENT SERVICE (MMS)

The Minerals Management Service Gulf of Mexico OCS Region has released a *NOTICE TO LESSEES AND OPERATORS OF FEDERAL OIL, GAS, AND SULFUR LEASES AND PIPELINE RIGHT-OF-WAY HOLDERS IN THE OUTER CONTINENTAL SHELF, GULF OF MEXICO OCS REGION: Guidelines for the Sub-Seabed Disposal and Offshore Disposal Storage of Solid Wastes*. This Notice to Lessees and Operators (NTL) supercedes NTL No. 96-03, dated May 8, 1996, on this subject.

It updates regulatory citations, makes minor technical amendments, and includes a statement on the Paperwork Reduction Act of 1995. The Guidelines became effective September 24, 1999. The background section of the

(Continued on page 24)

MMS (continued)

Guidelines is reproduced below.

NTL No. 99-G22**BACKGROUND**

This Notice to Lessees (NTL) provides standardized guidelines and instructions for the sub-seabed disposal and offshore storage of solid wastes generated from oil and gas development on the Outer Continental Shelf (OCS) in the Gulf of Mexico OCS Region (GOMR). This NTL applies only to such solid wastes that are classified as exempt exploration and production (E&P) wastes under the Resource and Conservation and Recovery Act (RCRA) (see 40 CFR 261.4(b)(5)). These exempt E&P wastes include drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of oil, gas, or sulfur on the OCS.

According to 30 CFR 250.300(b)(2), you must obtain approval from the Minerals Management Service (MMS) of the methods you will use to dispose of drill cuttings, sand, and other well solids. Under this authority, the MMS GOMR requires that you must obtain approval for the sub-seabed disposal of all wastes, and for the offshore storage of E&P wastes that contain naturally occurring radioactive materials (NORM) above background levels. You must obtain these approvals before you may proceed with such disposal or storage operations.

This NTL provides guidance and

instructions on the disposal of these E&P wastes, worker safety when handling these wastes, and the contents of application to dispose of or store these wastes. The procedures regarding waste disposal outlined in this NTL do not supercede, but are supplemental to, those procedures for abandonment of wells as specified in Subpart G of 30 CFR 250.

This Notice to Lessees (NTL No. 99-G22 is available on the Internet at the following URL:

http://www.gomr.mms.gov/homepg/regulate/regs/ntls/ntl_lst.html

CANADA

**CANADIAN GUIDELINES
FOR THE MANAGEMENT
OF NATURALLY OCCUR-
RING RADIOACTIVE
MATERIALS (NORM)**

June 2000

Prepared by the Canadian
NORM Working Group of the
Federal Provincial Territorial
Radiation Protection
Committee

Editor's note: The Canadian NORM Guidelines are now published. They can be downloaded from the web by accessing the Saskatchewan Labour website: <http://www.labour.gov.sk.ca/safety/publications/publications.htm> and selecting, under brochures, the **Canadian Guidelines for NORM.**

Or they can be directly accessed

from the Health Canada Website: http://www.hcsc.gc.ca/ehp/ehd/catalogue/rpb_pubs/00ehd245.pdf.

The Table of Contents of the Canadian Guidelines as well as the Preface, Introduction, Purpose, etc. were included in the Canada report in the Volume VII, No. 3 issue of **The NORM Report**. It is recommended that those interested obtain a copy of the Guidelines.

Guideline Basis

The Guidelines are based on the most recent international standards recommended by the International Commission on Radiological Protection (ICRP) and CNSC regulations. The recommendations of the ICRP represent an international consensus on radiation protection standards and provide the basis for regulatory control of radioactive materials in virtually all countries of the world. As these regulations and standards are subject to periodic amendment, the Guidelines may also be updated to reflect amendments to accepted national and international radiation protection practices. The ICRP and International Atomic Energy Agency (IAEA) radiation protection philosophy and recommendations of significance for NORM in Canada are contained in ICRP reports 60, 65, 68, 72 and 77 and IAEA Safety Series 115.

There is some talk that one of the Canadian provinces may adopt the Canadian Document as regulations. Most of the provinces are planning to use it only as a guide. ■

CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS (CRCPD)

CRCPD's SR-5 Working Group submitted its latest revised draft Part N with its Rationale, Matters for Future Consideration, and revised Implementation Guidance to the CRCPD Board of Directors in September 2001 for evaluation and approval.

Information regarding the SR-5 Working Group and its revisions to Part N (May 2001 draft) was included in the Volume VII, Number 3 issue of **The NORM Report**. This information was provided by Steve Collins (IL), Chair of SR-5.

Before submitting the latest Part N

draft to the Board for approval, editing, revision, and formatting of the Part N, the Rationale, Matters for Future Consideration, the Implementation Guidance documents, and replies to peer reviewer's comments were completed.

See the NRC section in this issue of **The NORM Report** beginning on page 21 for information on the EPA and NRC responses to the latest draft of Part N.

As of February 15, 2002, the Board has not approved the Part N documents, but instead have asked Collins to research a couple of items the Board wants more infor-

mation on before they consider approval.

The final approved Part N will be summarized in **The NORM Report** as soon as it is available.

The *Directory of State and Federal Agencies Involved with the Transportation of Radioactive Material* with notes on their statutory authority and regulations as of October 2001. (CRCPD Publication 01-8), is available from:

CRCPD
205 Capital Avenue
Frankfort, KY 40601 ■

Making It Safe, Making It Legal, and Creating Peace of Mind

SUMMARY

The job of a radiation safety officer has three parts: keeping it safe, keeping it legal, and helping people feel that they are safe. Absence of peace-of-mind about radiation protection matters can create very real health effects, even when there is little or no radiation exposure involved.

From a public health perspective, I have come to believe that creating peace of mind is part of the job of a radiation safety officer. Creating peace of mind -- that is, helping people to feel safe -- was the most challenging and difficult task. The only *real* health effects that most radiation safety officers ever see are from fear of radiation effects, not from those effects themselves.

Frightened people may make decisions such as changing jobs (and losing health insurance), terminating a pregnancy, or moving, all of which impact health. Furthermore, frightened people who choose to stick with it may suffer from anxiety, stress, insomnia, and weight loss or even weight gain. Genuinely listening

to the concerns of those who benefit from radiation safety services can help to provide peace-of-mind and minimize decisions that are risky to health.

Public health professionals will tell you that the worst thing for an employee's health is to terminate employment when it results in loss of health insurance. Few on-the-job dangers are bigger than the risk of having no health insurance.

Peace - of - mind cannot be imposed on anyone. The process of creating peace - of - mind requires the creation of trust, which must be granted by the recipient. Realize that many people are not swayed by a discussion of numbers or quantitative concepts. Rather, just having their concerns genuinely heard will make them feel better. Deal with their fear up-front, proactively, and explicitly.

Daniel J. Strom

Operational Radiation Safety,

Vol. 81, No. 5, November, 2001. Pages S46-S47 ■

The Radium Dial Painters

Editor's Note: The following was submitted to the Radsafe mailing list on November 9, 2001 by Mark Sasser. The radium dial painters' experience has been used to help understand the biological effects of NORM (radium).

The year was 1923, a giddy time for a small-town teenager who had no money for college but found herself able to buy silk dresses and high-heeled shoes. Margaret Looney, a soft-spoken redhead known as Peg, was fresh out of high school when she and dozens of other young women were hired to paint glow-in-the-dark watch dials at the newly arrived Radium Dial Co.

It was no easy task to trace the tiny numbers on the watches, made popular by their use in World War I. So the women were encouraged to make a fine point on their brushes by rolling the tips on their tongues before dipping them in the radium-laced paint. "Not to worry," their bosses told them. "If you swallow any radium, it'll make your cheeks rosy."

Discovered in 1898 by Marie Curie, the naturally occurring radioactive element was the wonder substance of the new century, thought to cure everything from arthritis to cancer. The women at Radium Dial sometimes painted their teeth and faces and then turned off the lights for a laugh. What they didn't know was that the substance was killing some of them.

Radium Dial and its successor, Luminous Processes, are gone. But the radium scattered when their buildings were destroyed in 1969 and 1984 remains in Ottawa, a sleepy river town in north-central Illinois. "The tragedy really still lives there," said Ross Muliner, an associate professor of health policy at the University of Illinois-Chicago.

That tragedy, he says, began with the dial painters, who worked in studios in Ottawa; Orange, N.J.; Waterbury, Conn.; and on Long Island. Peg Looney was one of an estimated 4,000 workers nationwide. A 1922 yearbook from her all-girl Catholic high school describes the senior as a bookworm, with "a voice ever so soft, gentle and low" prone to the occasional giggling fit.

At Radium Dial, Miss Looney would make about \$18 a week, compared with the \$5 she could make elsewhere. The company prospered as the glow-in-the-dark concept expanded for use on military aircraft controls and the hugely popular Westclox "Big Ben" alarm clock.

All the while, staff doctors routinely checked the dial painters for radioactivity, though the women didn't know it at the time. Miss Looney's family later learned that she tested positive for radioactivity in 1925 and again in 1928 -- the year before she died. "I'm angry because they knew years before she died that she was full of radium," her sister said. "And then they lied."

Results of the tests would become public in a Chicago courtroom in 1938 after one worker, Catherine Wolfe Donahue, sued Radium Dial. She testified that she and a co-worker asked supervisor Rufus Reed why the company didn't post the results of the physical exams.

"My dear girls, if we were to give a medical report to you girls, there would be a riot in the place," Reed said, according to testimony in court records.

Ms. Donahue, who was so ill she had to be carried into the courtroom, died that same year, shortly after the company agreed to pay her a few thousand dollars. Earlier lawsuits filed by five Radium Dial workers in New Jersey also ended in settlement.

But most women who got sick never sued. "Let's just say they didn't have a whole lot of social authority. They couldn't just bang on doors and get noticed," said Claudia Clark, an assistant professor of history at Central Michigan University in Mount Pleasant, Mich., and author of the new book "Radium Girls."

Deaths were often attributed to other causes, anemia one of the most common. But experts, including scientists at Argonne National Laboratories, now affirm that radium did kill some of the women. There is still disagreement about how many. Some say a few; others believe radium caused hundreds to die or suffer bad

(Continued on page 27)

The Radium Dial Painters (continued)

health for years. "There are a bunch of cases where people know there's something wrong," Clark said.

Some women had tumors bulging from their jaws or leg bones, where radium was said to settle. Declining health forced Miss Looney to leave Radium Dial on Aug. 6, 1929. Eight days later, age 24, she was dead.

An autopsy by a Radium Dial doctor listed diphtheria as cause of death. But her family has never believed that, in part because the company asked them to rush the funeral. "They wanted the whole thing done with - it gone," said Miss Looney's niece, Darlene Halm of Ottawa, recounting the story her mother told her. "It was like a big cover-up."

A 1997 study at Northern Illinois University in DeKalb documented an above-average cancer rate near the factory. But no follow-up search for a direct link has begun, in part due to lack of money and staff. "And, frankly, the community is not screaming," said Ruth Anne Tobias, the researcher who oversaw the 1997 study.

Besides Illinois, at least two other states have radium hot spots. Cleanup on a radium-laced landfill in Glen Ridge, N.J. -- the last of four towns in that state -- is beginning this month, according to EPA spokesman John Cahill. In all, the EPA expects to spend more than \$144 million for radium cleanup in New Jersey and New York, with detoxification begun in West Orange and Orange, site of the defunct U.S. Radium Co. A site in Montclair, N.J., is now free of radium, said Cahill,

as is the site of the former Radium Chemical Co. in New York's borough of Queens.

Officials at the Connecticut Department of Environmental Protection have found contamination - including in apartment buildings that are former dial painting studios -- in Waterbury, Bristol, New Haven and other cities. With a report due early next year, state officials say they are asking the EPA to help with federal funds.

Scientists at Argonne do know, at least in part, what happened to Peg Looney. Twenty years ago, they exhumed her body and those of about 100 others nationwide. Using a tiny measurement named for Madame Curie, they found 19,500 microcuries of radium in Miss Looney's bones, more than 1,000 times the amount scientists consider safe.

Robert Rowland, the Batavia, Ill., scientist who oversaw the Argonne study, calls this "an awful lot of radium ... one of the highest we found." The results were used, in part, to develop safety standards for plutonium workers.

"I guess you could look at this story and say, 'it's the canary in the coal mine,'" said Katie Troccoli, a real estate agent and outspoken environmental activist in Ottawa.

"It was a terrible thing to happen," she said. "Somehow, we have to get the word out."

Mark S. Sasser

Partners or Adversaries?

How can we call ourselves scientists if we are not willing to "question"? Knowledge and understanding are not stagnant. We should break with historical traditions of health physics and radiation safety. They no longer serve us well as a society or as scientists who wish to serve humankind. They cause agencies to argue about whether cleanup standards should be 15 or 25 millirem per year. They cause exposure scenarios to be projected thousands or tens of thousands of years into the

future. They compromise beneficial use with no known reduction in risk.

This is not for me! Our relationship to the radiation industries should be that of "partners in safe use," not that of "policemen." Health physics should support and expand the safe beneficial use of our wonderful tools -- radiation and radioactive materials!

Waste Management and other Bulletins

A new, monthly, online bulletin, *Waste Management*, is now available from the DOE Remedial Action Program Information Center (RAPIC). The January 2002 issue of this bulletin is available at: <http://www.hsrdo.org/rapic/7cabwm.html>

This bulletin contains citations to technical documents on the management of radioactive and selected hazardous material. Links to full-text copies are provided for many of the documents cited.

The other five bulletins which RAPIC has been preparing monthly include:

Decontamination/Decommissioning & Tank Remediation

<http://www.hsrdo.org/rapic/7cabdd.html>

Soil and Groundwater Studies

<http://www.hsrdo.org/rapic/7cabsg.html>

Site Remediation

<http://www.hsrdo.org/rapic/7cabsr.html>

EM Program Management and Research

<http://www.hsrdo.org/rapic/7cabem.html>

Event Calendar

<http://www.hsrdo.org/rapic/8cabev.html>

The complete *Event Calendar* can be accessed at: <http://www.hsrdo.org/rapic/8event.html>

Links to the three most recent issues of the five bul-

letins listed above are available at:

<http://www.hsrdo.org/rapic/index.html>

Please share this announcement with others who have an interest in waste management or the subjects of the other bulletins.

Bulletin content through September 2001 has been added to RAPIC's ERDIS Database. Access the database at:

<http://128.219.128.87/default.asp>

A search guide and description of the ERDIS database are available at:

<http://www.em.doe.gov/rapic/6erdis.html>

A description of other services offered by RAPIC is available at:

<http://www.em.doe.gov/rapic/2service.html>

RAPIC is sponsored by the U.S. Department of Energy's Office of Environmental Management.

For more information, please contact:

Park T. Owen
Remedial Action Program Information Center
1060 Commerce Park Drive
Oak Ridge, TN 37830-6480

Phone: 865/576-0568 or -6500

FAX: 865/576-0004

E-mail: rapic@ornl.gov

Web: <http://www.em.doe.gov/rapic> ■

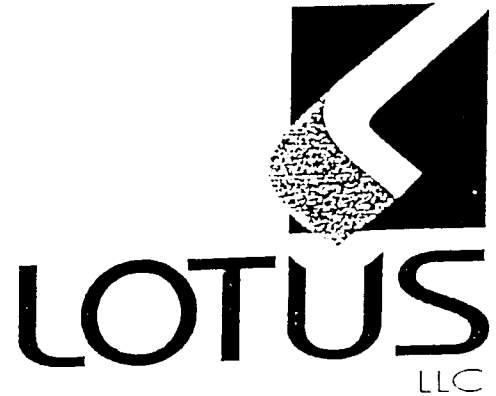
NCRP Report No. 136: Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation

NCRP Report No. 136 on **Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation** is 263 pages long with 12 sections and references. It begins with 1. Executive Summary followed by 2. Introduction, 3. a Biophysical section, and 4. Deoxyribonucleic Acid Repair and Processing after Low Doses and Low-Dose Rates of Ionizing Radiation. These are followed by 5. a section on

Mutagenesis, 6. a section on Chromosome Aberrations Induced by Low Doses and Low-Dose Rates of Ionizing Radiation, 7. Oncogenic Transformation In Vitro and Genomic Instability, 8. Carcinogenic Effects in Laboratory Animals, 9. Carcinogenic Effects in Human Populations, Epidemiological Data, 10. Adaptive Responses, 11. Research Needs, and concluding with 12. Discussion and Conclusions. ■

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Meetings Calendar

Natural Radiation and NORM IBCs Second International Conference 22/23 April 2002 London

This conference will be of interest to those in industry dealing with problems associated with NORM or natural radiation, particularly when industrial operations or other factors lead to enhancement of radioactivity in materials being handled and/or increased exposure to ionizing radiation by workers most significantly and the general public.

Information on the conference can be found at:

<http://www.ibcenergy.com> and click on the safety and nuclear button.

Seventh International Symposium Natural Radiation Environment (NRE-VII) 20-24 May 2002 Island of Rhodes, Greece

The primary objective of the NRE-VII Symposium is to provide a forum for the presentation of the results of scientific research and the discussion of issues concerning the Natural Radiation Environment. The symposium series "Natural Radiation Environment" (NRE) has a long standing tradition, dating back to 1963. Since then, it has become the primary scientific meeting addressing levels and effects due to man's exposure to natural and technologically-enhanced natural radiation sources on a global scale.

Information on the conference can be found at:

<http://nrevii.nuclear.ntua.gr>

The 2002 Annual Conference and Meeting of the CRPA-ACRP 6-9 May 2002 Vancouver, Canada

The scientific program of the Canadian Radiation Protection Association will focus on carrying the theme "from theory to practice" throughout the conference. There will be a number of hands on workshops dealing with subjects ranging from teaching decontamination procedures to dealing with the press during emergencies. There will be two sessions on NORM, as well as sessions on high activity wastes and other ionizing radiation.

More information on the conference can be found at:
<http://www.carpa-acrp.ca/english/conference.shtml>.

34th National Conference on Radiation Control 5-8 May 2002 Middleton, Wisconsin

Information on this annual Conference of Radiation Control Program Directors, Inc, can be found at:
<http://www.crcpd.org/>.

The 2002 American Radiation Safety Conference and Exposition 16-20 June 2002 Tampa, Florida

This 47th Annual Meeting of the Health Physics Society will have several special sessions including a plenary session on medical health physics and technical sessions ranging from biokinetics to waste management. In addition, the Health Physics Society Sections and other interested parties are expected to sponsor another dozen technical sessions on topics such as depleted uranium, instrumentation, environmental remediation, radon, and operational topics.

Further information can be found at:

<http://www.hps.org>. ■

Which Is Safer -- Nuclear or Coal?

If we consider total deaths, coal burning is dominated by air pollution which is generally estimated to cause at least 10,000 deaths per year in the United States. Annual U.S. deaths from 100 nuclear power plants are: reactor accidents (treated probabilistically) - 2; routine emissions - 2; all others - less than 2. On a per GWe-year basis, these numbers should be divided by 100., or

about 0.06 deaths from all causes per GWe-year from nuclear power.

For coal burning, a treatment similar to the one used for long-term deaths from radiation doses gives about 30 deaths per GWe-year from chemical carcinogens released in coal burning. ■

NORM in the Literature

Some More Radiation Litigation Articles

PRE-LITIGATION STRATEGIES - GATHERING AND PRESERVING DOCUMENTARY EVIDENCE

by

G. D. Richmond, P. Robinson, and S. Trubatch

Abstract -- Radiation injury claims may arise under various legal theories. In addition, plaintiffs may advance such claims within different jurisdictional venues, such as federal and state courts and workers' compensation boards. Irrespective of the jurisdiction the legal theory underlying the claim, one element remains common to these claims - the quality and quantity of the evidence. While many different pieces of evidence may be needed to litigate a radiation injury claim, the most important evidence for the investigating health physicist is that which establishes the nature and extent of radiation exposure. Most radiation injury claims are associated with late radiation injury, often an allegation of radiation-induced cancer. Because radiation-induced cancers often have a long latency period, claims may not arise for years, or even decades, after exposure. Therefore, the immediate challenge to the health physicist who investigates an exposure, is to avoid the temptation of a "wait and see" approach to gathering evidence. Not only may evidence be short-lived in nature, but with the passage of time memories grow dim and witnesses may become unavailable. Prompt and thorough gathering of pertinent evidence likely will be a determining factor in the outcome of any radiation injury claim. Although ensuring the availability of all pertinent evidence is the key role of the investigating health physicist, he or she also can help to ensure that the evidence does not inadvertently become inadmissible in a court of law, for example, under the hearsay rule. To ensure that the necessary evidence is available in admissible form, the task of gathering evidence should be systematically approached using a pre-established process that reflects a basic understanding of the rules of evidence. Such a process is discussed here.

Health Phys. 81(6):683-690: 2001

ADMISSIBILITY OF SCIENTIFIC EVIDENCE POST-DAUBERT

by

Jeff Masten and Jadwiga "Jodi" Strzelczyk

Abstract -- Proof of medical causation is the key element in cases involving alleged radiation injury. Until 1993, the use of scientific testimony in the courtroom was governed by the Frye doctrine requiring that a theory be "generally accepted" before it can be the basis of an expert's opinion. Applying that rule trial courts adopted a "let it all in" approach resulting in a near overdose of pseudoscience presented to juries. With its decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S. Ct. 2786 (1993), the U.S. Supreme Court announced a new five-factor, non-exclusive test for federal district courts to consider when assessing the opinion of scientific experts. The Court further directed that the trial courts, acting as a gatekeeper for expert evidence, must evaluate whether there is an adequate "fit" between the expert's data and the opinion offered. This article examines how the Daubert standard has been implemented in federal court to combat junk science. Examples from recent case law dealing with operational health physics issues are presented as an illustration of the use of the five-factor test to challenge questionable testimony on causation. Guidance is offered to prospective expert witnesses in radiation-related litigation to insure that proposed testimony will be admissible in district court.

Health Phys. 81(6):678-682: 2001

APPLICATION OF THE SUPREME COURT'S DAUBERT CRITERIA IN RADIATION LITIGATION

by

Steven E. Merwin, Dade W. Moeller, William E. Kennedy, Jr., and Matthew P. Moeller

Abstract -- In 1993, the U.S. Supreme Court set forth the standard for determining the admissibility of expert scientific evidence in litigation. This standard is known as the Daubert criteria, named after the pertinent case, *Daubert v. Merrell Dow Pharmaceuticals, Inc.* The Daubert criteria require the courts to deter-

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mine whether an expert's testimony reflects scientific knowledge, whether his/her findings are derived by the scientific method, and whether the work product is based on good science. The Daubert criteria are especially important in radiation litigation because issues involving radiation doses and effects are often complex and thus a jury will typically rely heavily on the analysis and opinions of experts. According to the Daubert criteria, scientific opinions must be based on a methodology that has a valid testable hypothesis; has been subject to peer review; and is generally accepted in the scientific community. Additionally, the expert must be qualified to present opinions based on the methodology. Although the application of the Daubert criteria in radiation litigation is highly dependent on the specific court and judge presiding over the case. There have been recent high-profile cases in which application of the criteria has resulted in the dismissal of analysis and opinions offered by scientific experts. Reasons for the dismissals have included basic scientific errors such as failure of the expert to consider all possible explanations for in observed phenomenon, the selective use of data by the expert, and the failure to acknowledge and resolve inconsistencies between the expert's results and those of other investigators. This paper reviews the Daubert criteria as they apply to radiation litigation and provides examples of the application of the criteria from recent judgments involving the Three Mile Island and Hanford Downwinders cases.

Health Phys. 81(6):670-677: 2001

THE ROLE OF THE RADIATION SAFETY SPECIALIST AS WITNESS: RISK COMMUNICATION WITH ATTORNEYS, JUDGES, AND JURORS

by
Raymond H. Johnson, Jr.

Abstract -- As nuclear workers and members of the public continue to fear radiation in this litigious society, specialists in radiation safety will often be called upon as experts to explain the significance of radiation exposures or as fact witnesses to explain radiation safety practices. Radiation risk communication with attorneys, judges, and jurors presents special chal-

lenges to the communication skills of health physicists. Your role as the radiation specialist is to present testimony, either in the form of a deposition or as a trial witness in a way that a judge or jury can understand. As a specialist in radiation safety. You will also need to educate The attorney that you work with so that he or she can ask the right questions and defend challenges in the case. The way that you communicate to attorneys, judges, and jurors could have a great impact on the case's outcome. As a radiation specialist, your testimony is not only to present the scientific basis for radiation health risks, but also to persuade the judge or jurors in the direction of the desired outcome of the case. Insights from the Myers-Briggs Type Indicator show that judges and jurors are most likely persuaded by "Sensing" language that is specific, detailed, measurable, and verifiable with their five senses. Thus, the conceptual, abstract, and theoretical "Intuitive" language often favored by radiation experts may not be understood or appreciated by a judge or jurors. They may also prefer the more personal, empathetic, and caring "Feeling" language rather than the impersonal, logical, and analytical "Thinking" language favored by health physicists. People's feelings about radiation risks are a big factor in radiation cases and providing testimony to address feeling-based conclusions requires a very different communication approach than normally used by health physicists. An understanding of language preferences can be crucial for effective communication with attorneys, judges, and jurors. These insights are derived from the author's experience as a communication specialist and as a radiation expert for the plaintiffs in two radon cases. This paper also provides insights into the qualifications for serving as an expert or fact witness, preparation for a trial, presenting testimony, the courtroom as drama, and the best language modes for persuasive communications with judges and jurors.

Health Phys. 81(6):661-669: 2001

SPREAD OF ⁶⁰CO CONTAMINATED STEEL AND ITS LEGAL CONSEQUENCES IN TAIWAN

by
Jau-Yuan Hwang, Joseph Chang, and Wushou Chang

(Continued on page 33)

NORM in the Literature (continued)

Abstract -- Since 1992, over 200 civilian residential and school buildings in Taiwan have been identified to have contained ^{60}Co contaminated steel rebar emitting excessive gamma radioactivity in living environments. These buildings were mostly constructed in early 1983 and 1984 by employing steels from one steel mill, which had recycled unknown ^{60}Co orphan sources in northern Taiwan. In 1994, a group of residents who once stayed for a protracted period up to 10 years in the contaminated Ming-Sheng Villa filed a civil action against Taiwan's nuclear regulators office, the Atomic Energy Council, for state tort compensation of 3.4 M U.S. dollars in equivalent. After three years of court processes, the Taipei District Court handed down a decision in partial favor of the exposed residents. Both parties soon appealed against this judgment to the Taiwan Appellate Court. This article analyzes the main legal issues involved, including government's obligations to prevent and eliminate contamination, to take preventive measures, and to take necessary remedial measures; and plaintiffs' assertion on any legal right against governmental offices. Moreover, discussion issues contain the scope of damage and compensation, causation analysis, absence of effective and efficient regulation over radioactive contamination, limit of tort compensation law and compensation amount, weight of medical evidence as well as role of expert witnesses, and related comparative legal studies.

Health Phys. 81(6):655-660: 2001

RADIATION LITIGATION AND THE NUCLEAR INDUSTRY -- THE EXPERIENCE IN THE UK

by
William J. Leigh and Richard Wakeford

Abstract -- In the United Kingdom, the Nuclear Installations Act 1965 places a "strict" statutory duty on the operators of nuclear facilities to ensure that any exposure to radiation resulting from operations does not cause injury or damage. A claimant does not have to prove fault to receive compensation under the Act, only causation. The 1965 Act has been fundamental in shaping litigation involving the nuclear industry, in the UK. Civil law cases brought under the Act will be heard before a single judge (with no jury or technical assessor) who must present his or her decision in a rea-

soned judgment. This process leads to a considerable volume of expert evidence being presented to the court and extensive cross-examination of witnesses. The expense and uncertain outcome of cases involving claims by nuclear workers that occupational exposure to radiation had caused the development of cancer has led to employers and trade unions setting up the voluntary Compensation Scheme for Radiation-linked Diseases as an alternative to litigation. This Scheme has worked well and is held up as a model of alternative dispute resolution. However, a few cases concerning personal injury or damage to property have come before the courts when the defendant nuclear operator considered that the claims were technically unjustified and where settlement was not a policy option. As anticipated, these cases were lengthy, complex, and expensive. The radiation doses assessed to have been received by the individuals were the subject of claims, whether workers or members of the public, have been crucial to the outcome. The technical expertise of health physicists and allied specialists has been vital in establishing defensible estimates of dose, and this contribution can be expected to remain of high importance in radiation litigation in the UK.

Health Phys. 81(6):646-654: 2001

THE WHISTLEBLOWER IMPLICATIONS OF RADIATION INJURY LAWSUITS: LESSONS LEARNED FROM *IN RE McCAFFERTY*

by
Charles F. Rysavy and J. Wylie Donald

Abstract-- While it is widely known that strict regulations protect nuclear workers who raise safety-related concerns, few are aware that the filing of a claim for radiation-related injuries has been interpreted to constitute a "protected activity" under the Energy Reorganization Act, which endows the claimant with "whistleblower" status. This means that negative employment-related actions taken against a radiation injury claimant can result in detrimental, even draconian, consequences for the employer involved. The case of *In re McCafferty* illustrates this vividly. The claimants in *McCafferty* were six contract insulators who filed lawsuits for emotional distress they claimed

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NORM in the Literature (continued)

to have suffered due to exposures they received at Centerior Energy's Davis-Besse nuclear plant. Because of the pending lawsuit and claim for emotional distress, Centerior denied all six claimants access to Centerior's plants, which resulted in their being terminated by their employer. The claimants brought an action with the Department of Labor, succeeded in convincing the Administrative Review Board that Centerior's actions constituted retaliation under the ERA "whistleblower" provision, and were afforded nearly full relief on their claims. This article explains how Centerior's actions ran afoul of the Energy Reorganization Act's "whistleblower" provision. It also describes what licensee and their subcontractors can do if faced with similar circumstances.
Health Phys. 81(6):640-645: 2001

Alberta and Oilpatch Scrambling to Address Radioactive Contamination Threat

by
Darcy Henton

Canadian Press, Sunday, January 20, 2002

The web link of this article is:

<http://www.canada.com/search/site/story.asp?id=DFC7F91B-2716-4E98-94D5-IC421E5C7325>

RADON EXHALATION RATES AND GAMMA DOSES FROM CERAMIC TILES

by
R. S. O'Brien, H. Aral, and J. R. Peggie

Abstract-This study was carried out to assess the possible radiological hazard resulting from the use of zircon in glaze applied to tiles used in buildings. The ^{226}Ra content of various stains and glazing compounds was measured using gamma spectroscopy and the ^{222}Rn exhalation rates for these materials were measured using adsorption on activated charcoal. The radon exhalation rates were found to be close to or less than the minimum detectable values for the equipment used. This limit was much lower than the estimated exhalation rates, which were calculated assuming that the parameters controlling the emanation and diffusion of ^{222}Rn in the materials studied were similar to those

of soil. This implied that the ^{222}Rn emanation coefficients and/or diffusion coefficients for most of the materials studied were very much lower than expected. Measurements on zircon powders showed that the ^{222}Rn emanation coefficient for zircon was much lower than that for soil, indicating that only a small fraction of the ^{222}Rn produced by the decay of ^{226}Ra was able to escape from the zircon grains. The estimated increase in radon concentration in room air and the estimated external gamma radiation dose resulting from the use of zircon glaze are both much lower than the relevant action level and dose limit.

Health Phys. 75(6):630-639: 1998

CALCULATIONS OF BACKGROUND BETA-GAMMA RADIATION DOSE THROUGH GEOLOGIC TIME

by
P. Andrew Karam and Stephen A. Leslie

Abstract -- Life on earth is exposed to a background level of ionizing radiation from a number of sources, including beta and gamma radiation from geologic and biologic materials. Radiation dose from geologic emitters has changed because of the chemical evolution of the continental crust, changes in the relative abundances of ^{235}U and ^{238}U , and the radioactive decay of uranium, thorium, and ^{40}K with time. The radiation dose from internal ^{40}K has decreased by a factor of about eight because of changes in the activity concentration of ^{40}K in potassium over the past 4 billion years. Radiation exposure from geologic materials has decreased from about 160 mrad/yr to 66 mrad/yr over the past 4 billion years, and radiation exposure to an organism with a potassium concentration of 250 mmol per liter has decreased from about 550 to about 70 mrad/yr. Accordingly, background radiation exposure from these two sources has dropped from about 700 to 135 mrad/yr during the time life has existed on Earth. The conservative nature of mutation repair mechanisms suggest that these mechanisms may have evolved in the past and that organisms may retain some of the capability of efficiently repairing damage from higher radiation levels than exist at present.

Health Phys. 77(6):662-667: 1999 ■

Regulatory References

Title 10 CFR Part 20 ---- Standards for Protection Against Radiation	U.S. AEC 1974 ----	Termination of Operating Licenses for Nuclear Reactors, NUREG 1.86 U.S. Atomic Energy Commission, Washington, D.C. June 1974
Title 10 CFR Part 61 ---- National Emission Standards for Radionuclide		
Title 29 CFR Part 1910.96 ---- Ionizing Radiation	ARKANSAS	Rules and Regulations for Control of Sources of Ionizing Radiation. Section 7 NORM
Title 33 U.S.C. 466, et seq. ---- Federal Water Pollution Control Act as amended		
Title 40 CFR Part 141 ---- National Primary Drinking Control Program; Criteria and Standards	GEORGIA	Rules and Regulations for Radioactive Materials, Chapter 391-3-17, Section 08-Regulation and Licensing of NORM
Title 40 CFR Part 190 ---- Environmental Radiation Protection Standards for Protection Power Operations	LOUISIANA Radiation	Title 33: Environmental Quality Part XV: Protection. Chapter 14: Regulation and Licensing of NORM
Title 40 CFR Part 192 ---- Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	MISSISSIPPI	Part 801 Section N Licensing of NORM Oil and Gas Board, Rule 69, Control of Oil field NORM
Title 40 CFR Part 440 ---- Ore Mining and Dressing Point Source Category	NEW MEXICO	Subject 14: NORM in the Oil and Gas Industry
Title 42 U.S.C. 300, et seq. ---- Safe Drinking Water Act, as amended	OREGON	Regulations and Licensing of NORM Oregon Administrative Rules, Chapter 333, Division 117 -- Health Division
Title 42 U.S.C 2011, et seq. ---- Atomic Energy Act of 1954, as amended		
Title 42 U.S.C 4321, et seq. ---- Toxic Substances Control Act (TSCA)	SOUTH CAROLINA	Part IX, Licensing of NORM
Title 42 U.S.C. 4341, et seq. ---- Conservation and Recovery Act of 1976 (RCRA)	TEXAS	Texas Department of Health-- Texas Regulations for Control of Radiation (TRCR) Part 46, Licensing of NORM Railroad Commission of Texas-- Rule 94, Disposal of Oil and Gas NORM Wastes
Title 42 U.S.C 7401, et seq. ---- Clean Air Act; as amended		
Title 42 U.S.C. 7901, et seq. ---- The Uranium Mill Tailings Radiation Control Act of 1978		

NORM Manuals Available

The manual which I use in teaching my 2-day course ***NORM Contamination - An Emerging Environmental Problem*** is available. The manual contains over 800 copies of the slides used in the course. Although designed originally for the oil and gas industry, the manual is updated regularly and contains material about NORM contamination in other industries.

In addition to being an inclusive text on NORM, the manual can be easily used to structure in-house information or training courses on NORM.

The Table of Contents shown below indicates the range of topics in the manual.

1. Fundamentals of Radiation Protection
2. Radiation / Radioactivity Units
3. Biological Effects of Radiation
4. Radiological Protection
5. Introduction to NORM Contamination
6. NORM Contamination - Radium
7. NORM Contamination - Radon
8. NORM in Oil & Gas & Other Industries
9. Fundamentals of Radiation Detection
10. NORM Surveys

11. Disposal of NORM Wastes
12. Federal Regulations
13. State Regulations
14. Canadian Guidelines
15. Recommended Industrial Hygiene
16. Program Suggestions for NORM Control
17. Radiation Litigation & Minimization
18. Conclusions
19. Glossary

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In addition to the manual for the 2-day NORM course the manual from my 1-day course is also available. The two manuals are similar in content—but the 2-day course manual is more detailed. The 1-day course manual contains about 400 slides.

The cost of the 2-day course manual is \$195 (US) and the cost of the 1-day course manual is \$125. ■

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