

The NORM Report

Naturally Occurring Radioactive Material Contamination Summer 96

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Regulations for the Control of NORM - Update

The status of regulations for the control of NORM is summarized below for all 50 states. Since NORM contamination is not limited to the petroleum industry, some of the non-petroleum states are also drafting or preparing to draft NORM regulations to control NORM in other industries, e.g., mineral extraction and phosphorus. The status of NORM regulations in the federal government as well as in Canada is also summarized below. Each regulatory agency was contacted during the first two weeks of September 1996.

The last states to enact NORM regulations were New Mexico and South Carolina. Their regulations were summarized in the Summer 1995 issue of **The NORM Report**. Louisiana, Mississippi, Arkansas, Texas and Georgia have previously enacted regulations for the control of NORM. Oregon enacted regulations in January 1990. Although the Oregon regulations were specifically written for the control of NORM in zircon sands, the Oregon regulations do apply to all NORM contamination in the state. The Oregon regulations were summarized in the Winter 1996 issue of **The NORM Report**.

There currently are no federal regulations specifically for the control of NORM.

Enactment of regulations specifically for the control of NORM will require compliance by industries and companies with NORM contamination and NORM waste materials. Companies should also be in compliance with state general regulations for the control of radiation (see the letter to the editor on page 23 of this issue) and the OSHA radiation regulations.

Summaries of the status of NORM regulations in all 50 states, the federal government and Canada follow:

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ALABAMA

Alabama is still redrafting their proposed NORM regulations. There is no timetable for the regulations to be adopted. There has been some interest in plugging wells, but there have been no request for NORM regulations.

ALASKA

Alaska's Department of Environmental Conservation is attempting to get funding for the

development of NORM regulations. They are hoping to get support from the petroleum industry so that they can go to the legislature for backing to hire one new temporary person to draft the regulations. The regulations are expected to be self-supporting (from fees, etc.) once they are enacted. Although not limited to the large petroleum companies operating in the state, NORM contamination

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ALASKA (continued)

problems are primarily associated with the large companies -- there are not many smaller independents in Alaska. Also, the industry is comparatively new in Alaska and they don't expect to have as many unremediated sites as are common in the oil production states in the lower 48. The major oil companies operating in the state are expected to cooperate with the Department of Environmental Conservation so that the resulting regulations are in a form that can be complied with at a minimum of cost and business disruptions.

ARIZONA

All radioactive materials, which would include NORM, are addressed in Arizona's general radiation regulations. At present, NORM is not specifically addressed, but consideration is being given to enacting NORM regulations at a later date, possibly in 1997.

ARKANSAS

The revisions to the Arkansas NORM regulations are presently being printed after the state legislature approved them. The Governor and the Director of Health must still sign off before the revised rules can become effective. They should be effective in about two months.

The revised NORM regulations are expected to be similar to the Louisiana rules. The exempt radiation dose is being changed from 25 microrem per hour above background to 50 microrem per hour including background. An important difference with the Louisiana rules is that Arkansas will not require NORM surveys. If available, the revised regulations will be summarized in the next issue of **The NORM Report**.

CALIFORNIA

The consensus report detailing the results from the survey of petroleum facilities for NORM contamination in California still has not been released to the general public. In addition to gamma radiation surveys, wastes, brines, soil and other appropriate samples were taken for laboratory analysis. The Health Department has approved the report for release. The Department of Conservation has not yet approved the report for publication.

COLORADO

There is no change in the status of NORM regulations in Colorado. NORM regulations are not expected to be enacted in the foreseeable future. The litigation between Envirocare of Utah and the Environmental Protection Agency concerning the disposal of radioactive waste which had been sent to a landfill in Colorado (See the Spring 96 issue of **The NORM Report**) is still active. Envirocare is currently trying to reach an out-of-court settlement.

CONNECTICUT

The Connecticut Department of Environmental Protection (DEP) has prepared a proposal to have a contractor draft proposed regulations for the control of low level radioactive wastes, including NORM and NARM. The proposal is currently undergoing review within the DEP.

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 consid-

ered to be covered in Sections C and D, Radioactive Materials, in the regulations. 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 18 month study of phosphate NORM, funded by the Florida Institute of Phosphate Research at the state's request, began in July. The study's goal is to identify and evaluate the extent of occupational and public radiation exposure risks related to phosphate NORM. The Institute, located in Bartow and affiliated with the University of South Florida, selected the Polk County Public Health Unit and a private consulting firm to conduct the study as a joint project. Florida hopes the data provided by the study will provide guidance on the extent of regulatory intervention needed to address phosphate NORM in the state.

The Florida Advisory Council on Radiation Protection's NORM Committee, formed in response to the state's request for recommendations on regulatory approaches to NORM, will report to the Council in October.

In an on-going effort to improve the characterization of NORM in Florida, state personnel have been conducting informal site surveys of NORM generators. Surveys of oil fields located in the Panhandle and southwest part of the state remain in the planning stage.

GEORGIA

Georgia's regulations for the control of NORM became effective in October 1994. There have been no

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GEORGIA (continued)

changes in the rules since. Revisions to the general rules and regulations for the control of radiation have been drafted and are expected to be adopted by the Board in late 1996. However, there are no changes in the NORM rules in this revision.

HAWAII

Hawaii has no specific regulations for the control of NORM. The state has drafted revisions to their antiquated rules for the control of radiation. These rules which are expected to cover NORM are currently in the legal process. There is no timetable for finalization. They have been undergoing administrative review for over two years.

Hawaii doesn't have any particular problems with NORM at this time. 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 for the control of NORM and none are planned for the near future. There has been no indication from the state legislature or anybody else concerning interest in the regulations. There are provisions in the general regulations for the control of radiation that can be used for NORM problems if the need arises.

ILLINOIS

Illinois's approach to NORM regu-

lations is being reviewed to decide if general NORM regulations should be proposed. Or as an alternative, should rules be written to address the NORM problems in selected industries where the potential exists for NORM contamination. No decision as to the approach to be proposed has been made yet. The Department of Nuclear Safety may go with the approach of identifying known NORM problems and writing specific rules for those problems. As new NORM problem areas are identified, new rules will be written to cover them. This approach may be preferable to generic rules which cover the whole world of NORM and results in too much unnecessary regulations without much benefit. This approach to NORM rule making is the result of reviewing the in-depth comments made on the latest (1994) CRCPD draft. There is no time schedule for NORM rule making in Illinois.

INDIANA

No new regulations for the control of NORM have been enacted or proposed in Indiana. There have been a few incidents involving NORM-contaminated materials in scrap yards, etc.

IOWA

Iowa is reviewing the last Part N draft from the CRCPD. At the present time Iowa has not done anything on specifically regulating NORM and has no timetable for action on rules and regulations.

There is a situation in Iowa that originally goes back to the 1950's at Ames Laboratory. The Bureau of Radiological Health recently released some land for unrestricted use, specifically for a soccer complex. A medical doctor in the area complained about the hazards of radioactive dust from the land, even though the background levels of

radioactivity was essentially the same in the released land as the background radioactivity in the city itself. The 84-year old doctor is a pillar in the community, and has raised the concerns of some citizens. The State is unsure as to how to proceed.

KANSAS

Regulations for the separate and specific control of NORM have not been proposed. 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.

KENTUCKY

The Kentucky Department of Environmental Protection is in discussions with Ashland Exploration to find a satisfactory long term disposal site for the NORM that needs to be remediated from the Martha Oil Field.

An article on the World Wide Web provides a little history of this NORM problem in Kentucky. The article by Terence Hamilton-Smith, Brandon C. Nuttal, and James A. Drahovzal is reproduced below in its entirety.

This project was initiated as a result of reported radioactivity associated with oil production in the Martha oil field in eastern Kentucky. Such associated radioactivity is referred to as NORM (Naturally Occurring Radioactive Materials) contamination. An interdisciplinary technical group was formed including representatives of the Kentucky Geological Survey, the Kentucky Department for Environmental Protection, the Kentucky Division of Oil and Gas, and the Kentucky Department for Health Services.

(Continued on page 4)

KENTUCKY (continued)

This committee met often in 1993 to evaluate the potential NORM hazard in the oil and gas fields of Kentucky.

Available data suggest that NORM contamination results from petroleum production in Kentucky. It is specifically associated with radium-bearing scale deposited in pipes, facilities, and pits resulting from brine production associated with oil, including both primary water production and waterflood stimulation. Gas and oil production without associated water is not expected to result in a NORM hazard. Results of NORM investigations to date have been presented at meetings in Kentucky sponsored by the University of Kentucky Department of Geological Sciences, the Kentucky Oil and Gas Association, and the Kentucky Geological Survey. Future work will depend on the initiative of the Kentucky Department for Health Services.

LOUISIANA

A proposal was received recently from a petrochemical company looking for a disposal site for non-oilfield NORM. They wanted a rules change which would allow this kind of waste to go to a Class D landfill. The DEQ is studying the proposal. Other states that allow the disposal of these wastes in landfills are being contacted to determine their policies. One state contacted said they were using the Environmental Protection Agency's document on "Guidance for Disposal of Water Filtration Waste". Such wastes often contain radium-226. If a rule change is deemed necessary, it may be possible to change Section 1412 of the Louisiana regulations to allow industrial sources of wastes containing NORM less than some concentration to be disposed of into

some classes of landfills.

The DEQ also has an application from an oil company for permission to dispose of their own NORM in an injection well. This is the first proposal for injection received by the new administration in Louisiana and it is not known what the Secretary of the DEQ will do. The issues have been outlined for him but there has been no decision yet whether a general rule for injection will be enacted or if such requests will be decided on a case-by-case basis. If a company has a permit from the Department of Natural Resources and a license from the DEQ, the company could proceed with the injection of the NORM wastes.

MAINE

Maine has general regulations for the control of radiation, but does not have specific NORM rules. Maine does have NORM-contaminated water treatment wastes. Many water supplies in Maine contain significant concentrations of radium and radon. Ion exchange resins used in water treatment can become "hot" with radium. Carbon filters used to remove radon from water become contaminated with the radon decay products, lead-210, bismuth-210, and polonium-210.

MARYLAND

Maryland has no specific regulations for the control of NORM. NORM is handled under the general radiation regulations. These general regulations were recently 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 a subset of NARM and NARM is considered to be regulated in the Massachusetts general radiation regulations. The most recent revisions to the general radiation rules became effective in February 1996. NORM is not a major problem in the state.

MICHIGAN

Effective April 1, 1996, the Radioactive Materials Program formerly in the Michigan Department of Health was transferred to the Michigan Department of Environmental Quality. Although Michigan has guidelines and standards for NORM contamination, there has been no progress on the development of regulations for the control of NORM.

For the past two years, the Michigan Department of Radiological Health in the Department of Public Health has been dealing with luminous aircraft dials of World War II vintage. These dials contain radium-226 and many of the gauges are in deteriorated condition and show excessive radium leakage. There are tens of thousands of these leaking gauges in various parts of Michigan.

The decontamination of the two large warehouses (see the Winter and Spring 1996 issues of *The NORM Report*) is expected to take place this fall with the assistance of the EPA and Superfund funds. Following the first stage of decontamination, there will still be additional contamination that will have to be assessed and remediated at a later date.

Recently there were some incidents involving radiation alarms being triggered at scrap metal yards. The radiation was apparently due to

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MICHIGAN (continued)

radium-226 in pipe scale. The tubulars were of the type normally used for well waters rather than in oil and gas production. The level of contamination was about 100,000 picocuries per gram, typical of scale seen in oil production pipe in Michigan. A supplier of such pipe admitted that although designed for water usage, some oil and gas companies may have used them. The investigation is continuing.

MINNESOTA

There has been no legislative action with regard to the disposal of radium and other NORM-type materials. Minnesota has no regulations for the specific control on NORM. The general regulations for the control of radiation are currently being revised. Specifically the revisions cover the regulations dealing with x-ray and other devices that may use NORM as a source of radiation. These revisions may be effective by the end of 1996.

MISSISSIPPI

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

The Department of Health has asked the Attorney General for an opinion as to who will have jurisdiction for NORM in the future. This has been challenged in court by an attorney who has been very active in NORM litigation in the state. The Attorney General has stated he will not render his opinion until the court challenge is settled.

In the interim the Department of

Health continues to function as it has in regard to NORM. Licenses are still being processed for remediation contractors, etc. There have been no changes in the Department of Health NORM rules and none are expected unless the Attorney General "rules" that the Department of Health has no NORM jurisdiction. The Health Department's attorney believes that any commercial remediation, etc. will still have to be licensed by the Department of Health. Although the Department of Health appears to be doing less with NORM, complaints are still being received about health problems associated with NORM exposures.

Very little is being done about these complaints since the Department of Health has been told they have no jurisdiction according to state law. The legislature enacted legislation that the Oil and Gas Board has jurisdiction over all oil and gas wastes. The Oil and Gas Board's NORM rules which became effective July 1, 1995 assumes jurisdiction only over NORM at the wellsite. It is expected that the Attorney General's opinion will state that the Oil and Gas Board will have jurisdiction over all of the NORM associated with oil and gas production. The Department of Health remains in limbo until the Attorney General acts.

Copies of the NORM surveys submitted to the Oil and Gas Board have been made available to the Department of Health. Since many of the surveys appeared to be of questionable value, the NORM Report editor asked if Mississippi had a licensing or certification program for NORM surveyors. They do not. When the Health Department NORM regulations, Rule 68, were promulgated, a one-page guideline was made available to prospective surveyors. These

guidelines outlined a recommended 24-hour NORM survey course, mandated types of radiation survey instrumentation to be used, and methods of plotting data and units to be used. When potential surveyors submitted their resumes and were "approved", their names, addresses, etc. were added to a list which was made available to anyone needing a NORM survey. The Department added a disclaimer stating that they did not endorse any one on the list. The surveys coming from the Oil and Gas Board often contain the names of surveyors who are unknown to the Department of Health. (Editor's comment: It is obvious that any facility using an outside surveyor should check the surveyor's credentials carefully, especially since there is always the possibility of future litigation).

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 oilfield 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 operations within the State of Mississippi

A public hearing on Rule 69 was to have been held in January. This was postponed until March and at the request of attorneys on both sides of the issue, the hearing was again postponed until April 2-4, 1996. The changes made to the August draft were summarized in the Winter 96 issue of **The NORM Report**.

Following the three-day public hearing, Rule 69 was adopted by the Oil and Gas Board with only a

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MISSISSIPPI (continued)

few minor technical changes. The ruling has been appealed but the rule is expected to be upheld. Oil and Gas Board rulings have been overturned only one time in the history of the Board. It could be two years before the results of the appeal are known.

Additional background on Rule 69 follows:

(1) Rule 69 passed by the Oil and Gas Board allows oil companies to use on-site storage of NORM. Under the rule, NORM, a byproduct of the drilling process, may be stored on site for as long as the site remains open, with oil companies having the option to apply for permission to use alternative methods of disposal if they show good cause for doing so.

(2) Rule 69 dictated new NORM disposal guidelines that could make at least that aspect of NORM handling a little easier. Before Rule 69, Mississippi producers had to send their NORM wastes to licensed NORM landfill sites as far away as Utah. Now, companies could bury NORM in leak-proof underground containers in old wells or other approved disposal sites that were dug and sealed off according to stringent regulations.

Rule 69 was designed to work in tandem with Rule 68 to eliminate or reduce to acceptable levels the exposure of workers at Mississippi's oil and gas production facilities. The rules also are designed to protect the public and the environment from NORM radiation derived from production activities. Essentially, Rule 69 states that any oil field exploration and production sites must be operated and, when the time comes, released for general use in a way that ensures that workers and the public receive no more than 100

millirem of radiation per year.

Under Rule 69, wells permitted by the Board before the effective date of Rule 69 would have to make property surveys within one year. Wells permitted after the effective date would have to have surveys done before the start of their operations, with another survey conducted in two more years. If a site's last survey recorded a maximum exposure rate of over 50 microR per hour above normal background radiation, that site would be re-surveyed every five years, while others would be re-surveyed once every 10 years. The operator will be required to maintain survey and material transfer reports in his local office for 10 years after the property is released.

Next, the rule's criteria for site operations require that site personnel be trained regarding radiation hazards and stay at or near contaminated sites only for short periods of time. Sites with radiation over a certain level must have warning signs and, in some cases, fences must be constructed.

Coupled with Rule 68, Rule 69 allows operators to apply for approval for alternative means of disposal such as drilling a NORM well or transporting it to another storage facility. The only difference is that the operator must now survey to make sure there are no NORM hotspots.

Finally, the rule also spells out procedures that may be used to bring the radiation levels of equipment and property under certain levels so that it can be transferred to another producer.

Rule 69 has been a source of confusion for some at the Department of Health's Division of Radiological Health as to which

sites would be regulated by them and which by the Board under the rule.

However, a law passed by the Mississippi Legislature in 1995 gives the Oil and Gas Board express jurisdiction over all oilfield sites. Under Rule 69, the only sites governed by Department of Health regulations would be those with any operations or operating site conditions that may cause people to receive a dose of over 100 millirem of radiation per year.

MISSOURI

There are no specific NORM regulations in Missouri and none are planned at present. 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. NORM is not considered to be included in the 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. Nebraska believes that NORM is included in their general regulations for the control of radiation. There are no plans for specific NORM regulations.

NEVADA

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

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NEW HAMPSHIRE

New Hampshire considers NORM to be a subset of NARM and the state has always regulated NARM in the same manner as by-product, source, and special nuclear materials are regulated as an Agreement State. One area that may not presently be regulated and may have to be is water treatment systems. There are significant quantities of radon in New Hampshire water supplies. Some water treatment facilities actually become quite "hot". Another potential NORM problem area is the inadvertent exposure to the radiation hazards associated with construction involving granite ledge containing uranium and thorium. Future regulatory activities may consider the need to adopt regulations similar to the draft of Part N of the Conference of Radiation Control Program Directors, Inc. (CRCPD), and which have been adopted by such states as Louisiana, Texas and Arkansas.

NEW JERSEY

The Bureau of Environmental Radiation continues to address the comments received on the interested party draft of N.J.A.C. 7:28-12, *Remediation Standards for Radioactive Materials*. There is no estimated schedule set for publication of the rule proposal in the New Jersey Register.

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.

A task force from the Oil Conservation Commission proposed a rule for the disposal options that were addressed in the Part 14 NORM regulations. On March 14, 1996, the Final Report

of the Task Force's proposed NORM disposal rule was submitted to the Chairman of the Commission. A background discussion of the proposed rule accompanied the report. Topics covered in the latter report were the New Mexico Environmental Improvement Board NORM regulations, the Task Force process in developing the rule, the jurisdiction of the Oil Conservation Division over NORM disposal and the rationale for the major provisions of the rule.

A public hearing was held before the Oil Conservation Commission of New Mexico on April 11, 1996 and on June 20, 1996 the Commission adopted Rule 714 for the disposal of naturally occurring radioactive material (NORM) associated with the oil and gas industry. Rule 714 became effective July 15, 1996.

Some of the history of the NORM regulations, the content of Rule 714, and the rationale for the report follow.

In August 1995, after more than four years of effort by representatives of the OCD, the New Mexico Environment Department, the oil and gas industry and environmental groups, NORM regulations were adopted by the Environmental Improvement Board (EIB). Only "Regulated NORM" is subject to the EIB NORM regulations. "Regulated NORM" is defined as NORM at concentrations of greater than 30 picocuries per gram of radium-226 above background, or NORM with a maximum radiation exposure reading at any accessible point greater than 50 microrentgens per hour, including background levels.

The EIB NORM regulations apply to any person who engages in the

extraction, transfer, transport, storage or disposal of NORM.

The regulations also apply to sludges and scale deposits in tubulars and equipment and to NORM deposits in soil, water and the environment.

Section 1407 of these EIB regulations, "*Disposal and Transfer of Regulated NORM for Disposal*," provides the regulatory framework for the NORM disposal rule. Several of the NORM disposal options discussed in that section require that disposal be pursuant to "applicable Division (OCD) rules and regulations." The Task Force examined each NORM disposal option in Section 1407 requiring OCD approval and presented testimony which addressed each disposal option:

1. Disposal of Regulated NORM On or Near the Surface of the Ground.
2. Blending or Discing Regulated NORM Contaminated Soils in Place
3. Disposal in Non-retrieved Flowlines and Pipelines
4. Disposal at Commercial or Centralized Facilities
5. Disposal in Plugged and Abandoned Wells
6. Disposal by Injection
7. Alternative Disposal Methods

NORM is not a hazardous waste regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA). 42 U.S.C. B 6901, et. seq. This conclusion is based upon legal analysis by the Task Force and confirmed by conversations with representatives of the U.S. Environmental Protection Agency.

NORM, as oilfield waste, is excluded from the definition of

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NEW MEXICO (continued)

solid waste in the New Mexico Solid Waste Act, NMSA 1978 which is administered by NMED. Further, OCD has been granted jurisdiction by the New Mexico Oil and Gas Act NMSA 1978 to regulate the disposition of wastes from a variety of oilfield processes. The Commission concludes that the OCD has regulatory jurisdiction over these wastes, notwithstanding the presence of low-level radiation in these wastes.

Abandoning buried flowlines and pipelines in place is an occasional practice in the oil and gas industry. It tends to be more protective of the environment than removal, because removal involves substantial surface disturbance and increases the risk of spills or releases to the environment. Rule 714 allows abandonment of buried pipelines to minimize disturbance of the soil surface and to better control the release of potentially contaminated pipe. Abandonment of buried pipelines is not a method for disposing of any Regulated NORM other than that present in the pipeline at the time of proposed abandonment.

Commercial or centralized surface waste management facilities should not become operational for the disposal of Regulated NORM without, at least, (1) an order from the Division, (2) a Division Rule 711 permit, (3) appropriate licenses issued by the NMED, and (4) any other approvals required by law.

Existing Division rules on plugging and abandonment (Rule 701, et. seq.) provide the protection needed for disposal of NORM in wells to be plugged and abandoned except for the additional requirements listed in Rule 714.

Disposal of Regulated NORM by

injection is especially appropriate since injection is an established and regulated form of disposal of oilfield waste designed to be protective of the environment, public health, and fresh waters. Rule 714 imposes a number of requirements after the injection takes place, including provisions for adequate notice and a hearing to protect the environment, public health and fresh waters.

All testimony presented was in support of the Commission adopting the proposed rule as presented by the Task Force. There was no opposition to any parts of the proposed rule.

Rule 714 provides for cost effective procedures for disposal of oilfield related NORM while protecting fresh water supplies, human health and the environment and therefore was recommended for adoption.

With the exception of the adoption of Rule 714, there has been little change in agency NORM activities. There have been no new applications for specific licenses for storage or decontamination activities. Several companies licensed in Louisiana have asked for reciprocity in order to operate in New Mexico. Six oil companies have requested extensions to their general licenses allowing for continued storage of NORM wastes. This is required annually for up to ten years.

NEW YORK

New York has begun to analyze a wide range of samples from oil and gas wells in the state. Samples include brines, crude oils, tank bottoms, oily sludges, pipe scale, sediments and soils. Results of brine analysis reveal relatively low levels of NORM. Analysis of other media are on-going.

NORTH CAROLINA

Nothing presently is being proposed on NORM regulations for North Carolina. The state recognizes that NORM is an issue that may need attention, but there are many other priorities, not the least of which is the low level waste disposal facility. North Carolina is the host state for the Southeast Compact.

The state is aware of NORM contamination within the state, particularly in scrap metal yards. For the present, North Carolina is on the sidelines and is advocating a constructive relationship between the regulated community and the would-be regulations.

NORTH DAKOTA

Several boxcars of scrap iron were returned to a company in Williston because of a "high" radiation reading. The radiation identified as radium was found to be coming from some pipe. Since Williston is in the oil field area, it is assumed the pipe had been used in oil production and contained radioactive scale.

Another call received recently was from a company with a water-gas separator who reported elevated radiation readings along with heavy metal contamination. This indicates a possible hazardous waste problem mixed with NORM. A decision will have to be made as to how the waste material can be disposed. Can it be disposed of down hole with the heavy metals present? The heavy metals, e.g., barium, lead, cadmium, and silver, are in concentrations up to several thousand parts per million. Samples will be sent to an analytical laboratory to determine the exact concentrations of the radioactivity and the metals present. If the radium content is less than 5 picocuries per

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NORTH DAKOTA (cont'd)
gram, it will not be treated as a NORM issue. The surface radiation reading is approximately five times background. Although it may not be classified as NORM contaminated, the radioactivity may present problems if the wastes are taken to a commercial hazardous waste facility for disposal.

There are no plans at present for drafting specific regulations for the control of NORM.

OHIO

Ohio is presently revising their general regulations for the control of radiation. The proposed rules are currently undergoing review by the Radiation Control Advisory Council. The rules have one more stage to go through before becoming effective. NORM is included in the revised regulations as part of Ohio's preparation for Agreement State status.

OKLAHOMA

The next meeting of the Radiation Management Advisory Council is scheduled for September 26, 1996. It is expected that a new draft of proposed NORM regulations will be ready for discussion at this meeting.

OREGON

There are no new developments regarding NORM in Oregon. Ray Paris, Manager of Radiation Protection Services in the Oregon Department of Human Resources is also the Chairman of CRCPD's NORM Commission. Oregon is "waiting" for the CRCPD NORM Commission to complete its work before revising or writing new NORM rules for the state.

Oregon does have NORM regulations entitled *Regulation and Licensing of Naturally Occurring Radioactive Materials (NORM)*.

The rules which 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 NORM Report**.

PENNSYLVANIA

There has been no progress in the development of regulations for the control of NORM in Pennsylvania and nothing is planned at present.

In the past few years some of the Pennsylvania brine wells were checked for NORM contamination as were the roads where brine was used. Nothing of consequence was found.

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 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 regulation and none are proposed at the present time. 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 at this time.

TENNESSEE

NORM contamination in Tennessee is handled basically 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.

(See also the letter to the editor on page 23. The letter was written by Mike Mobley, Director of Radiological Health in the Tennessee Department of Environment and Conservation.)

TEXAS

The Texas Department of Health has jurisdiction for NORM except for the disposal of NORM. 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.

The Department of Health is still planning to make some modifications in their NORM rules. The revisions have been delayed because of other priority matters. The revisions should be completed during the next year. The changes will primarily be in classifications of NORM and adding some requirements for processing of NORM from other persons. These revisions will be coordinated with the Railroad Commission, particularly where they concern jurisdictional issues.

Statewide Rule 94: Disposal of Oil and Gas NORM Wastes took effect February 1, 1995. This rule sets forth requirements for the safe disposal of NORM that constitutes, is contained in, or has contaminated

(Continued on page 10)

TEXAS (continued)

oil and gas wastes. Rule 94 was summarized in the Winter 95 issue of *The NORM Report*. There are no plans at present to revise Rule 94.

The Texas Natural Resource Commission has not started drafting rules for the disposal of NORM wastes not associated with oil and gas exploration and production. Although there is no firm schedule yet, the drafting of specific NORM disposal rules could begin in the summer of 1997.

UTAH

NORM is considered to be included in Utah's comprehensive radiation control regulations. No specific NORM regulations have been proposed at the present time in Utah.

VERMONT

Some granites contain measureable higher concentrations of NORM than others. Consequently, if exempt limits for NORM, particularly radium, are set sufficiently low, many granites used for tombstones primarily, but also used in construction, would not be allowed in commerce. It appears to be the reds, the pinks, and some brown granites that are particularly high in NORM. If the NORM limits are too stringent, it will certainly affect some of the people in the stone trade. They will be restricted to certain types of stone containing limited NORM contaminations.

Concern has been expressed as to the radiation received by some workers in the granite plants due to radioactive materials 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 working 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.

Even though most stone cutting is done under wet conditions, exposure to radioactive dust is potentially possible. If the action of the process throws spray into the air, some of the finer spray will dry and the materials that were present in the water will be suspended in the air where they can be inhaled by the workers. Working under water may not be as efficient as it is thought to be.

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 in the process of being revised.

WASHINGTON

Washington has an interesting situation. A company wants to build a plant for processing zircon sands from Florida. There is a difference of opinion as how to classify the radioactivity in the sands -- is it NORM or is it source material? The sands contain uranium and thorium in equilibrium with their radioactive decay products. According to most regulations, including federal and state rules, ores are exempt from being classified as source material if they contain less than 0.05% uranium and thorium. Regardless of the concentration of the uranium and thorium, the Washington Department of Health has exempted the company from the state regulations for

radioactive materials. But the Zirconium Institute continues to argue that the material should properly be classified as NORM.

Rulemaking as to the quantity of NARM which will be allowed to be brought into Washington for disposal is continuing consistent with the requirements of Washington's Administrative Procedures Act. (See the Spring 96 issue of *The NORM Report*.)

WEST VIRGINIA

There are no specific regulations for the control of NORM in West Virginia. NORM is considered to be adequately covered by other regulations that require registration of facilities that own, possess, etc. radioactive materials. There are no plans at present for the specific regulation of NORM.

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 is looking at developing an enforcement standard for radioactive contaminants in ground water with the primary isotopes being radium-226 and radium-228. The main purpose is to establish a ground water enforcement standard for use in monitoring, controlling, and if necessary, limiting human exposure to radioactive materials introduced into ground water by regulated human activities.

WYOMING

Wyoming has no regulations for the control of NORM and none have been proposed at this time.

(Continued on page 11)

WYOMING (continued)

There is a restriction on produced water. 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**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)**

The EPA has begun finalizing the draft report *Diffuse NORM Wastes - Waste Characterization and Preliminary Risk Assessment* issued in April, 1993. The report has been reviewed by EPA's Radiation Advisory Committee (RAC). The RAC issued their report *A SAB Report: Review of Diffuse NORM Draft Scoping Document. Review of the Office of Radiation and Indoor Air Draft Document on Diffuse Naturally Occurring Radioactive Material (NORM): Waste Characterization and Preliminary Risk Assessment* in May 1994. The final draft of the EPA Report will respond to the comments detailed in the RAC Report.

NUCLEAR REGULATORY COMMISSION (NRC)

The NRC continues to monitor NORM developments but is doing nothing specific on NORM at this time.

MINERALS MANAGEMENT SERVICE (MMS)

The MMS released the document entitled *Issuance of Notice to Lessees and Operators of Federal Oil and Gas Leases on the Outer Continental Shelf Gulf of Mexico Region - Guidelines for the Offshore Storage and Subseabed*

Disposal of Wastes Resulting from the Development and Production of Oil and Gas on the Outer Continental Shelf on May 8, 1996. The document outlines specific guidelines for wastes which contain NORM above background concentrations. The guidelines were summarized in the Spring 96 issue of **The NORM Report**.

Copies of the report are available from:

Melanie Stright
U.S. Department of the Interior
Minerals Management Service
Offshore Environmental
Assessment Division
Branch of Environmental
Operation
(703) 787-1736

CANADA

The *Guidelines for the Handling of Naturally Occurring Radioactive Materials (NORM) in Western Canada* was released in August 1995. There are no plans to make the guidelines into regulations at the present time. It is expected that the oil and gas and the fertilizer industries will use the NORM guidelines to develop their own code of operating practices in order to give their front-line workers specific guidelines to enable them to work with NORM safely. Some of the rationale used in developing the guidelines was given in the Spring 96 issue of **The NORM Report**.

CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS (CRCPD)

The Conference of Radiation Control Program Directors, Inc. (CRCPD) was formed in 1968. The major purpose for its establishment was to serve as a common forum for state radiation control programs in the United States to

communicate with each other. A secondary purpose was to serve as a forum for the state radiation control programs to communicate in a uniform manner with the many federal agencies having radiation protection responsibilities. As stated in its Bylaws, the first objective of the CRCPD is to promote radiological health in all aspects and phases.

There was a summit meeting on September 3-6, 1996 of the CRCPD's Commission on NORM and their NORM Advisory Committee for the purpose of rewriting Part N. The CRCPD has been involved in the preparation of suggested regulations for the control of radiation hazards associated with NORM since the early 1980's. This suggested regulation is designated "Part N" and designed to become part of the Conference's Suggested State Regulations for the Control of Radiation (SSRCR). The SSRCR are model regulations designed as guidance for the development and amendment of state radiation control regulations. The SSRCR exists to encourage more uniform regulations among the states, to complement federal regulations, and to help states maintain regulations identical with, or as effective as federal regulations.

Unfortunately, the meeting was held in South Carolina and Hurricane Fran limited the time the NORM Commission could meet with its Advisory Committee to about six hours. The Commission did get some general direction from the Advisory Committee and was able over the next two and a half days to redraft a total rewrite of Part N. The consensus of the Commission was to propose a dose-based standard rather than a concentration standard. This should give the states greater flexi

(Continued on page 12)

CRCPD (continued)

bility to implement the standard. Also the Commission is proposing to redefine NORM as "Technically Enhanced NORM" rather than just NORM. The new Part N draft should be ready for public comment in early 1997.

Ray Paris (Oregon), the Chairman of the NORM Commission, felt it was a very productive meeting with good input from the oil and gas, zirconium and phosphate industries, as well as from attorneys on both sides of the issues, etc.. There was a good mix of people with excellent backgrounds. This is necessary to have the flexibility to write guidelines for industries with different NORM requirements.

The next task of the NORM Commission after Part N is completed is the development of an implementation guide. Since Part N will be a dose-based standard, the states and affected industries may need to know how to imple-

ment the proposed regulations. CRCPD's Commission on NORM is charged with (1) To develop suggested state regulations for the regulation of NORM. A draft of Suggested State Regulations on NORM shall be provided to the CRCPD Board of Directors within 18 months after the first meeting of the Commission. (2) To perform, or have performed, a risk-based assessment and supporting rationale and justification for NORM standards and a cost-benefit analysis on the degree of regulation needed. The results of the analysis shall be made available to the CRCPD Board of Directors within 18 months after the first meeting of the Commission.

The major issues in the regulations for which the assessment and justification are needed are:

- a. Contamination criteria
 - for unrestricted use
 - potential for restricted use (e.g., industrial uses, oil

field or land farming, disposal in sanitary land fills, etc.)

- b. Recycling
- c. Disposal options

The NORM Commission will consider recommendations of its NORM Advisory Committee in their development of a new draft of Part N. The charges to the Advisory Committee include (1) To provide recommendations to the Commission on NORM and (2) To solicit support and "buy-in" to recommendations of the CRCPD from non-regulatory sectors.

Visit CRCPD's World Wide Web site. It contains information about CRCPD, projects and activities, including working groups and their charges, membership information, upcoming meetings, the list of publications, positions and resolutions, information on how to contact CRCPD and how to join, and "What's new?" The address is <http://www.webpub.com/crcpd/> ■

The following is a Position Statement of the Health Physics Society.

LOW-LEVEL RADIOACTIVE WASTE

Low-level radioactive waste (LLRW) is an inevitable by-product of society's current use of radionuclides in medical research, diagnosis, and treatment of diseases, industrial process, and electric power generation -- activities vital to our national interests. Far less waste is produced today than a decade ago because of judicious use of radioactive materials, improved waste management practices, and reduction in nuclear defense activities. But LLRW will continue to be generated and disposal capacity required if society is to enjoy the benefits of these activities.

Consequently, the majority of LLRW being generated must now be temporarily stored at or near the source of generation at thousands of sites nationwide.

The goal of managing LLRW is to ensure the safety of workers and the public, and to protect the environment. To achieve this goal, disposal, not temporary storage, is the safest approach. Present knowledge and technology is sufficient to allow such disposal. Comprehensive regulations and practices are in place for the design, operation, and closure of LLRW disposal facilities.

The 1980 LLRW Policy Act, as amended in 1985, established a framework for the States to provide for safe disposal of low-level radioactive waste, encouraging the creation of regional compacts to develop an appropriate network of disposal facilities. The deadlines established for the development of new facilities and for the closure of existing facilities to out-of-region waste have passed with no new facilities devel-

The Health Physics Society strongly recommends prompt action to provide safe disposal access for all low-level radioactive waste. We urge timely completion of the facilities currently under development and accelerated cooperation among the state and regions where progress has been slower. Such actions are vital to the continued management of all radioactive materials, and the continued beneficial use of such materials. ■

NORM in the Journals

The following are titles (and summaries where available) of recent articles in the scientific literature. It is planned to make this a regular feature of The NORM Report

Health Physics. 69(4): 454-460; 1995

ICRP RECOMMENDATIONS APPLICABLE TO THE MINING AND MINERALS PROCESSING INDUSTRIES AND TO NATURAL SOURCES

Roger H. Clarke

Abstract--The current views of the International Commission on Radiological Protection on exposure to natural radiation are presented in the new recommendations (ICRP Publication 60) where the concepts of practice and intervention are both used to establish mechanisms of control. The history of the present recommendations is reviewed, and the latest guidance on the control of ^{222}Rn at home and at work (ICRP Publication 65) is outlined. The new model of the respiratory tract, which has been adopted by ICRP, is discussed in the context of its predictions of the doses from radon and from particulate natural radionuclides. Consideration is given finally to criteria for the restoration of sites previously contaminated by natural radionuclides.

Health Physics. 69(4):513-520; 1995

RADON EMANATION COEFFICIENTS FOR PHOSPHOGYPSUM

P.M. Rutherford, M.J. Dudas,
and J.M. Arocena

sAbstract--Phosphogypsum is a by-product of the phosphate fertilizer industry which is stockpiled in large quantities world-wide. Phosphogypsum consists mainly of dehydrate gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) but also contains elevated concentrations of ^{226}Ra and other inorganic species which originate from the processing of phosphate rock. ^{222}Rn has been identified as one of the major environmental concerns associated with phosphogypsum. This study was conducted to determine effects of particle size, weathering, and moisture content on the ^{222}Rn emanation coefficient (ϵ) for phosphogypsum. Average ϵ for air-dry, unfractionated phosphogypsums derived from Togo, Florida, or Idaho

rock was approximately 12%. Average ϵ for fine fraction phosphogypsum ($<20 \mu\text{m}$ diameter) was greater than for unfractionated phosphogypsum by a factor of 4.6, 1.4, and 4.4 for samples derived from Idaho rock, Togo rock, and Florida rock, respectively. Phosphogypsum samples subjected to an artificial weathering procedure lost 40% mass, with no change in ϵ . Increasing water content was found to first slightly decrease, then to increase ϵ compared to air-dry samples; ϵ for 100% saturated phosphogypsum was 1.9-fold greater than in air-dry phosphogypsum. Particle size sorting could account for variability of ^{222}Rn exhalation at repositories. Very high moisture contents could slightly increase ^{222}Rn emanation, but exhalation would likely be reduced due to slow diffusion through porosity of saturated phosphogypsum.

Health Physics. 71(2):225-234; 1996

OVERVIEW OF RADIATION SAFETY IN THE TIN BY-PRODUCT (AMANG) INDUSTRY OF SOUTH EAST ASIA

G. S. Hewson

Abstract--Processing of by-product heavy minerals (amang) from tin mining involves potential exposure to external and internal sources of radioactivity. The radioactivity arises through the presence of thorium and uranium series radionuclides in the various minerals. Monazite is the most radioactive mineral, containing 3% to 7% thorium by weight, while ilmenite is generally the least radioactive mineral containing typically less than 0.05% thorium. External exposure occurs when workers are in close proximity to accumulations or stockpiles of the radioactive minerals, whereas internal exposure occurs when workers are involved in dusty processes. This paper summarizes the nature of the amang industry in South East Asia and presents the results of preliminary measurements of external radiation and airborne radioactivity in twelve Malaysian and Thai plants. Although constrained by a paucity of exposure data, it is concluded that radiation doses to some amang plant workers may approach or exceed international standards and that

(Continued on page 14.)

NORM in the Journals

(Continued)

Overview of Radiation Safety (Continued)

appropriate control measures are required as a matter of priority. Radiation doses may approach or exceed 100 mSv in situations where workers are exposed to excessive levels of ambient dust and no protective measures are used. Observations and recommendations are made relating to monitoring and surveillance, instruction and training, and engineering and administrative protection measures.

Health Physics. 71(2):185-189; 1996

RADON AND LUNG CANCER IN FINLAND

Eeva Ruosteenoja, Ilona Makelainen, Tapio Rytomaa, Timo Hakulinen, and Matti Hakama

Abstract--A study with 291 cases and 495 controls on indoor radon and lung cancer incidence was conducted in a Finnish population residing in a high-exposure area. Relative risks of 1.8 and 1.5 for the incidence of lung cancer were observed for those exposed to concentrations of 95-185 Bq m⁻³ and 186 Bq m⁻³, respectively. The increase in risk was not statistically significant.

1994, 129 pp. (soft cover), \$55, Swedish Council for Building Research, Sv Byggtjanst, S-171 88 Solna, Sweden; ISBN 91-540-5649-7

The Radon Book: Measures Against Radon

Bertil Clavens and Gustav Akerblom

Sweden has been a leader in radon research and *The Radon Book* was written by two of Sweden's foremost radon experts. Akerblom is a geologist and has written extensively on the radon concentration and transport in the ground. He is also the principal author of a handbook concerning the investigation of the radon situation before building. *The Radon Book* provides detailed descriptions, in words and detailed illustrations, of how radon enters buildings and how to radon-proof buildings.

NCRP Report No. 123 I and NCRP Report No. 123 II, 294; 205 pp.; ISBN 0-929600-48-7 (v.1); 0-929600-49-5 (v. 2); 0-929600-17-9 (set).

Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground

This two-volume set of reports from the NCRP is designed to assist the user who is not familiar with environmental monitoring and transport modeling to assess in a conservative manner the impact from intermittent and continuous radionuclide releases for their operations. The NCRP's expressed intent is stated as follows: "The objective of this Report is to provide a series of simple screening techniques that can be employed to demonstrate compliance with environmental standards or other administratively-set reference levels for releases of radionuclides to the atmosphere, surface water, or ground." The technique is designed for the release of small quantities from point source releases on an intermittent or continuous basis. The methods are not designed for assessing the impact of accidental releases. This last statement is repeated in every section of the book for every pathway evaluated.

South Texas Law Review, March 1996, pp. 477-537.

Texas Landowners Strike Water--Surface Estate Remediation and Legislatively Enhanced Liability in the Oil Patch--A Proposal for Optimum Protection of Groundwater Resources from Oil and Gas Exploration and Production in Texas

Gary Linn Evans

The conclusions of the article states: "The relationship between the surface estate owner and the mineral estate owner developed throughout many years of common-law interaction. The estates were severed to combine the acumen and financial resources of the mineral developer with the property right of the surface owner, both of whom are motivated by financial

(Continued on page 15)

NORM in the Journals

(Continued)

Texas Landowners (continued)

benefit. The right, responsibilities, and remedies have been judicially interpreted and applied, generally recognizing that both estates must be afforded some latitude or the relationship would cease to exist.

Various states have legislatively modified the relationship, ostensibly to provide added protection to the surface estate owner. While an adjustment was made, these legislative measures are incomplete and common-law damage assessments are still relied upon. While evaluating the advisability of surface damage statutes, consideration must be given to the goal of the legislature and the results must be examined to determine whether this goal is being advanced or whether only economic results are being altered.

In contemplating a legislature modification of the surface and mineral estate relationship, Texas must view the probable outcome according to existing common-law damage assessments. Historically, Texas courts have adamantly refused to apply strict liability of oil and gas producing operations. This reluctance stems from the vast economic import of the industry and the appropriateness of the activity in most instances. An expansion of liability, especially as it pertains to groundwater contamination, must be carefully considered. Due to Texas courts' adherence to absolute ownership of percolating groundwater and the difficulties associated with remediating groundwater resources, damage assessments could take on mammoth proportions. While the surface estate owner should be compensated for economic loss, that recovery must be capped at diminution in value. Awards in excess of fair market value must be administratively controlled to ensure that funds are expended on the environmental contamination, and not merely to enrich the surface estate owner. The unfortunate occurrence of subsurface contamination must not be permitted to instigate vexatious litigation ultimately leading to economic waste and unjust enrichment. While the surface estate owner should be compensated for negligently inflicted damage, Texas courts should make it perfectly clear that they must look elsewhere for their pot of gold. Effective natural resource remediation demands more than merely "finding the deepest pocket and placing liability there."

Argonne National Laboratory
Programs and Capabilities Database
Document No. 607-003

RADIOLOGICAL DOSE ASSESSMENT RELATED TO MANAGEMENT OF NATURALLY OCCURRING RADIOACTIVE MATERIALS GENERATED BY THE PETROLEUM INDUSTRY

Radiological dose assessment was conducted for six naturally occurring radioactive materials (NORM) management and disposal activities associated with oil and gas production and processing wastes. The activities assessed included equipment decontamination, downhole encapsulation, underground injection, land-spreading, equipment smelting, and landfilling contaminated equipment. Maximum individual dose equivalents were estimated for workers and the general public, and were used as the basis for comparison between disposal options, as appropriate.

*For more information contact Industry Liaison,
Industrial Technology Development Center, Bldg. 900,
Argonne National Laboratory, 9700 S. Cass Ave.,
Argonne, IL 60439*

**The following are papers presented at the
Forty-first Annual Meeting of the Health
Physics Society, Seattle, WA, July 21-25, 1996**

**MODIFICATION OF THE U.S. DEPARTMENT
OF ENERGY'S (DOE) SYSTEM OF RADIA-
TION PROTECTION REQUIREMENTS AND
GUIDANCE.** P.V. O'Connell, J.L. Rabovsky, and
s.G. Zobel (U.S. Department of Energy EH-52,
270CC, Germantown, MD 20874-1290)

**ANSI/HPS NORM STANDARD--UPDATE OF
DEVELOPMENT ACTIVITIES.** J-C. Dehmel¹ and
S.Y. Chen² (¹S. Cohen & Associates, Inc., 1355
Beverly Road, McLean, VA 22101; Beverly Road,
McLean, VA 22101; ²Argonne National Laboratory,
9700 S. Cass Avenue, Argonne, IL 60439)

(Continued on page 16)

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NORM in the Journals, etc.

(Continued)

RADIATION PROTECTION OF RADIOSENSITIVE POPULATIONS. K.L. Mossman (Arizona State University, Tempe, AZ 85287-2701)

NATURAL RADIOACTIVITY CONCENTRATION IN DIFFERENT TYPES OF INORGANIC FERTILIZERS IMPORTED BY SAUDI ARABIA.

I.I. Kutbi, S. Abdul-Majid, and W.H. Abulfaraj (NE Department, KAAU, P.O. Box 9027, Jeddah 21413, Saudi Arabia)

RADIOLOGICAL CRITERIA FOR UNRESTRICTED USE OF SITES CONTAINING NORM. D.E. Bernhardt, V.C. Roger, and K.K. Nielson (Rogers & Associates Engineering Corporation, P.O. Box 330, Salt Lake City, UT 84110-0330)

MARSSIM: STATISTICAL DECISION METHODOLOGY. C.V. Gogolak (U.S. DOE Environmental Measurements Laboratory, 376 Hudson Street, New York, NY, 10014)

THE ORIGIN OF THE 50 MICROROENTGEN PER HOUR VALUE

L. Max Scott, Ph.D. CHP
Louisiana State University

In about 1988, the Assistant Secretary for Air Quality and Radiation of the Louisiana Department of Environmental Quality (DEQ) appointed a committee consisting of an independent radiation protection consultant, a member of the DEQ Radiation Protection Division, an employee of a major oil company and myself. The committee was charged with the task of providing guidance regarding Naturally Occurring Radioactive Material (NORM) as encountered in the production of petroleum.

The committee was probably as knowledgeable as anyone in the field. However, I believe it is safe to say that no one felt we knew enough to draft a regulation. From this point the committee decided that the first thing that needed to be done was to determine the extent and magnitude of NORM contamination in the petroleum production industry. We decided that the first step was to recommend that radiation surveys be required so that data could be gathered. A natural follow-on to this was to select a level above which additional action might be required.

It was decided that the committee would recommend that all operations involved with the production of petroleum be required to conduct a radiological survey using suitable instrumentation such as a micro-R meter. In cases where levels above a yet-to-be-determined value were observed the companies would have to so identify the site to DEQ. The central question then was what value do we select.

I believe that only three values were seriously considered; those being 25, 50 and 100 microentgen per hour. There was considerable feeling within the committee that levels were essentially at background or several times background; in other words they were either "low or high" and not a continuum of values. If this was the case then it didn't appear critical as to what level was selected. Deliberation from this point centered around what level to recommend such that DEQ management would accept. I don't recall why, but 100 microentgen per hour was ruled out early. The committee finally agreed on 50 microentgen per hour including background as a value that would pick-up those sites that should receive additional attention.

One thing that I definitely recall was making the statement to the Assistant Secretary that a level of 50 microentgen per hour would pickup all of those sites which might be of real concern. I think that the committee believed that the 50 microentgen per hour was a interim value; certainly that was my belief.

As you can see there was not a great deal of science involved in our recommendation and at least for myself the risk, neither acceptable nor unacceptable, was considered.

The Assistant Secretary or other members of the committee may recall thing differently, but the above is the way I remember it. ■

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Published Quarterly
Editor: Peter Gray, Ph.D.

Taxes: down through history

"When there is an income tax, the just man will pay more and the unjust less on the same amount of income." ---Plato, circa 390 B.C.

"The art of taxation consists in so plucking the goose so as to obtain the largest possible amount of feathers with the smallest possible amount of hissing." ---Jean Batiste Colbert, 1665

"If Patrick Henry thought that taxation without representation was bad, he should see how bad it is with representation." ---The Old Farmer's Almanac

(To be continued)

NEWPARK RESOURCES GRANTED NORM DIRECT INJECTION PERMIT

On May 22, 1996 Newpark Environmental was issued permits by the Texas Railroad Commission which, for the first time on a commercial basis, authorize the direct injection of processed oilfield waste contaminated with naturally occurring radioactive material (NORM) into disposal wells. Newpark's NORM disposal wells are located at its Big Hill, Texas facility.

The Company was originally permitted to process NORM at a plant in Port Arthur, Texas in September, 1994, utilizing proprietary methods which reduce the contamination level of the processed material below that regulated as NORM (below 30 picocuries). The waste was then transported to the Company's injection wells for disposal in environmentally secure geological structures.

In contrast, the amended permits provide for NORM injection without the need to reduce its contamination level. The amended permits maintain the ability to receive NORM containing Radium 226 up to 6000 picocuries and a total activity less than 30,000 picocuries. In the last two years, Newpark has learned much about the safe handling and processing of this material. These permits take the processing and disposal of NORM to a higher level by allowing the Company to process larger volumes efficiently and at reduced cost compared to its original process. "As operations under the amended permits confirm the anticipated cost reductions, the consumer with large volumes for disposal should benefit," stated James D. Cole, President and chief executive officer of Newpark Resources.

For further information contact Rick Carrigee with Newpark Environmental at 318/984-4445 or Joe Dupuis with SOLOCO at 318/981-5058.

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Lafayette, LA. (318) 984-4445
New Orleans, LA. (504) 561-5794
Houston, TX. (713) 240-9131

Transforming NORM into Safe Materials through Vitrification

Chris Chapman and Richard Peters
Vitrification International Technologies, Inc.

Vitrification is a method for converting inorganic materials such as sludges and soils, into stable glass. Vitrification of naturally occurring radioactive material (NORM) is an effective means to render the material almost harmless for many thousands (and possibly millions) of years.

The primary source of all natural radioactivity begins with uranium. This isotope slowly decays through a long series of isotopes (the decay chain) and as a result, radium-226 is formed. This isotope is found in drilling muds from petroleum production activities. The problem with radium and its daughters is due to the uncontrolled dispersion of radon and subsequent very small particulate aerosols of heavy metals (polonium, bismuth and lead) with radioactive emissions.

Vitrification locks the offending radium into glass. After the glass is formed, release of the radon gas or heavy metal particles is not possible. The radium and all the subsequent decay products are chemically bound and trapped in the silica matrix. This is true for a large piece of glass as well as glass that is crushed down to granules.

In nature, silica may be broken down through a process that is related to glass leaching or hydration by water. Since glass is so chemically resistant to leaching, the body of glass containing the NORM will not be altered significantly before the radium has decayed away to stable lead-206. Typical environmental alteration or corrosion rates for glass are less than 0.010 inches per million years! This is the thickness of about three sheets of paper every million years.

Alpha radiation is the emission of a helium nucleus and will not penetrate the glass so vitrification of NORM blocks alpha radiation from further concern. Beta radiation is the emission of an electron and is easily blocked by a modest thickness of glass. Gamma radiation is like x-rays. They penetrate almost anything to some extent. This is also true for glass. However, the gamma radiation from radium decay is primarily important during the bismuth-214 decay to polonium. Gamma radiation can be shielded with sufficient thickness of a dense or thick material such as lead, steel, concrete and soil. Glass provides modest

(Continued on page 19)

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1- (800) 797 - 9992

Transforming NORM into Safe Materials through Vitrification

(continued)

self-shielding of gamma radiation. Since glass is more dense than concrete, it is better than concrete for shielding humans from gamma radiation.

These characteristics of glass are the primary reasons the international waste management community and the U.S. EPA selected glass for retaining the most highly radioactive waste material on earth, HIGH-LEVEL RADIOACTIVE WASTE. These radioactive materials are millions of times more radioactive than is NORM.

Vitrification of NORM provides the significant benefit of essentially eliminating radon and daughter product emissions from the material. After vitrification, radium concentration is the same, but radon emanation becomes less than from many common construction

materials. When radium decays to radon, the radon gas can not escape from the silica matrix because its atomic radius is too large. This is also true for all gases with atomic radii larger than neon. Since a sheet of paper will shield against alpha radiation, just a few molecules thickness of glass will block alpha radiation from a glass made of NORM. Vitrification of NORM waste transforms the material into a chemically durable solid with essentially no radioactive characteristics. This characteristic is retained as long as the glass is unaltered. Since the glass is very chemically durable, radon retention will be maintained for millions of years for normal environmental conditions.

Vitrification of NORM thus provides the following

(Continued on page 20)

Selective Tools, Inc. (STI)

STI was incorporated under the laws of Texas in 1986. The primary activities of the company are oilfield related and over 100 oil and gas firms have been serviced during the past eight years. On August 20, 1993, STI received the first Specific License granted by the Bureau of Radiation Control, Texas Department of Health for the decontamination of NORM-contaminated equipment, facilities and land including the minimization of NORM wastes. Under their license, STI is authorized to handle NORM as defined in the Texas Regulations for the Control of Radiation, both liquids and solids of unlimited maximum activity. In addition to the petroleum industry, STI has serviced the phosphoric acid industry as well as tanker loading and offloading facilities. Relative to their Specific License, STI services include.

- Soil remediation
- Pipe and equipment decontamination
- Automated tank/enclosed vessel decontamination
- Pipeline descaling
- NORM slurrification and disposal operations
- NORM surveys
- Worker training and certification
- Project and implementation relating to unique NORM problems
- NORM surveys and core analysis

For additional information on these services, please contact our office:

Mike McClure
Selective Tools, Inc.
2401 Fountain, Suite 600
Houston, TX 77057
(713) 780-1944 or Fax (713) 780-1964

Transforming NORM into Safe Materials through Vitrification

(continued)

benefits:

lower cost landfills.

* **Reduction in hazard.** The conversion to glass causes radioactive elements to chemically bind to a matrix of silicon dioxide and other glass-forming compounds. This results in elimination of the spread of radioactive particles, prevention of leakage of radioactive elements by weathering, and altering the material properties so that the alpha, beta and gamma radioactive emissions are reduced.

VIT Inc. provides vitrification equipment and services based on its proprietary technology, Perma VIT. VIT utilizes the R&D investments made by the US DOE in the technology for high-level and mixed waste vitrification (over \$300 million). Because of design advancements, glass melters with lower-capital cost are available for NORMS vitrification.

* **Reduction in volume.** Sludges and soils are conglomerates of small particles with 25%-35% air or water-filled void space. When vitrified, all air and water is removed and the void space is closed in. As a result, the volume of material to manage is greatly reduced, sometimes by a factor of 2.

For further questions about:

NORM vitrification, please contact Chris Chapman at 509-943-1867.
 E-mail: vitglass@oneworld.owt.com.

* **Increased management options.** If the material is stabilized and if there is less of it to deal with, there are more options for managing the waste. This may include on-site storage and disposal at alternative or

Louisiana NORM and NOW vitrification processing plant project, please contact David E. Reed at 504-581-5495 or Bogdan Wojak at 604-541-0030
 E-mail: bwojak@direct.ca.

3,000 Line Mile Environmental Aerial Survey

Hyperspectral Imaging, Multispectral IR and Radiometric of the Los Angeles Basin

SeisPulse[®] Inc. is pleased to announce the undertaking of an extensive, proprietary, airborne environmental survey of the Los Angeles Basin. This unique 3,000 line mile high altitude and helicopter survey, represents the largest urban, environmental data gathering effort ever undertaken. The data will provide the Licensee with high resolution, multisensor information of site-specific (>2 meter) environmental conditions over a vast area of the Los Angeles Basin. The hyperspectral data is capable of identifying the molecular structure of environmental contaminants for soils as well as plants. The data will be available for licensing in the Fall of 1996. The information will be gathered digitally utilizing calibrated, state-of-the-art remote sensing instrumentation which will include:

Remote Sensing Instrumentation

- Hyperspectral Imaging (.4-2.5 μ m)
- Airborne Radiometrics (256 Channel)
- Multispectral Infra Red (256 Channel)

Environmental Detection Goals

Geobotanical Indicators, VOC Sources
Radionuclides - NORM & Source Material
Geobotanical & Surface Contamination

The survey will overfly at 1/8 mile flight lines some 5 million+ parcels of commercial, residential, municipal, state and federal properties - including landfills, municipal waste water treatment facilities, and industrial sites in the areas of the Alameda Corridor, Downtown Los Angeles, Long Beach, Port(s) Area; Huntington Beach, El Toro, Brea, Santa Fe Springs, El Segundo, Culver City; Santa Monica, Playa Del Rey, Burbank and the San Fernando Valley. A single property within the survey grid would have complete, contiguous coverage of environmental conditions *SeisPulse*[®] data within a one mile radius of the individual parcel.

The licensing of these data is both prudent and cost-effective application of environmental due diligence for property owners; lenders; fiduciaries and trustees; legal practitioners; insurance professionals; tax assessment specialists; appraisers; developers; environmental specialists; federal, state and municipal regulators; municipalities; corporations; transit authorities and the military.

For further inquiries or to receive a map of the survey area please contact:

Peter MacDowell, Seispulse[®], Inc., P.O. Box 911, Azusa, CA 91702
PHONE: (818) 969-0911 or FAX: (818) 969-4971 ■

Increased Scrutiny of International Shipments

The following letter was sent to the Zirconium Environmental Council by Kilpatrick and Cody. The letter is reprinted with the kind permission of Charles Simmons of Kilpatrick and Cody.

An article in the July 2, 1996 Wall Street Journal entitled *Nuclear Detection Gear is Being Tested By Customs Service at Some Entry Sites* describes the heightened level of effort that U.S. Customs will be directing towards detecting the unauthorized importation of *nuclear materials*. While Customs' efforts are directed towards illicit materials that could be used to

assemble nuclear weapons, the proliferation of sensitive radiation detectors at ports of entry may lead to an increased scrutiny of innocuous NORM-containing materials, similar to situations that have already arisen at many landfills equipped with radiation monitors.

Bulk or container shipments of NORM-containing materials (e.g., zircon, zirconia, baddeleyite, and refractories) could reasonably be expected to trigger sensitive radiation detectors at ports of entry. Absent a clear understanding by Customs of the types of NORM

(Continued on page 22)

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Radiation Monitor

The Inspector with its built-in GM detector is practical and convenient for the detection of NORM contamination.

ITS FEATURES INCLUDE:

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- Microprocessor based
- Adjustable timer
- External calibration controls
- Powered by one 9 volt battery
- Padded vinyl carrying case CE certified



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Tel: 615-964-3561 Fax: 615-964-3564 e-mail: seiinc@usit.net

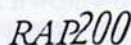
THE GAS INDUSTRY NEEDS THE RIGHT PROBE FOR DETECTION OF LEAD 210 & RADIUM 226. RADIATION ALERT® PROBES ARE THE ANSWER.

RAP Scintillation Probes

The CsI(Tl) crystal used in the RAP probes have a higher atomic number, are physically more rugged, and less hygroscopic than a typical NaI detector. The improved gamma ray absorption of CsI(Tl) allows a thinner crystal to be used, which effectively reduces the background count rate.



The RAP47 is optimized for high sensitivity to low energy gamma radiation. It is ideal for the detection of 47 keV gamma the typical energy of lead 210. Compared to the standard 2 inch GM pancake probe, the RAP47 is proven to be 135 times more efficient for the detection of lead 210.



The handheld RAP200 scintillation probe has high sensitivity to gamma radiation. The RAP200 is optimized for the detection of U-235 and Ra-226.

For complete product information, please contact us for a free catalog.

Increased Scrutiny of International Shipments

(Continued)

found in everyday commerce, unwarranted delays in shipping (and possibly adverse public attention) could result. Moreover, even if Customs concludes that a NORM shipment does not involve nuclear materials, Customs officials are duty bound to ensure that all applicable transportation regulations are complied with. Thus, shipments of NORM-containing materials will be subjected to increased regulatory inspections at ports equipped with sensitive radiation detectors. Customs has not disclosed the location of radiation detection devices, or its plans to expand the detection program.

In light of the potential for increased scrutiny of imported products, we recommend that Committee Members who are involved in international commerce through U.S. ports of entry consider the following:

- * Conducting a regulatory compliance review to confirm that all applicable U.S. DOT and international transportation standards are met (e.g., packaging, labeling, marking and shipping documentation requirements).
- * Alerting foreign suppliers to Customs' actions and the timeliness of reviewing regulatory compliance.

In addition, we should establish an informal dialogue with Customs officials and port authorities with the objective of educating them on zircon as an innocuous NORM-containing material in everyday commerce that could confuse and confound the antiproliferation security purposes of the heightened radiation scrutiny. ■

A LETTER TO THE EDITOR

Dear Mr. Gray:

As discussed with you on September 4, 1996, I am very concerned that many individuals misinterpret some of the information you provide in your publication. In fact, I recently read a draft federal government publication that indicated that only a few states regulated NORM. The authors believed (wrongly) that only states with specific NORM regulations regulate NORM.

My perspective is that those state regulations that address NORM specifically are largely exemptions for certain processes, concentrations, or activities. Attached is an analysis Tennessee did in December, 1995, on NORM regulation (using your report). We found 25 states handle NORM under their general radiation control regulations, eight have specific regulations in place, and five were developing specific regulations. **Once again, note that specific NORM regulations are usually specific exemptions, not added regulatory criteria.**

In Tennessee, all radioactive material is subject to the exact same standards. For example, the free release of equipment contaminated with NORM must meet Reg Guide 1.86 standards, just as Atomic Energy Act (AEA) regulated radioactive material must. It should be noted that a number of the specific exemptions mentioned above present much greater potential radiological risk than do other regulated radiation activities. In particular, free release of contaminated materials and disposal of contaminated fluids by underground injection appear highly questionable, especially for a radionuclide with a long-lived alpha emitter with a gaseous radioactive daughter. The risks are significant both in the absolute sense and especially in comparison with the risk levels to which regulated AEA radioactive material are held.

Michael H. Mobley, Director
Division of Radiological Health
Department of Environment and Conservation
State of Tennessee
615-532-0360

Editor's Note: Due to lack of space in this issue, the attachment Mike Mobley referred to in his 2nd paragraph will be printed in the Fall 96 issue of **The NORM Report**.

NORM DECONTAMINATION & WASTE MANAGEMENT SERVICES

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FIELD SERVICES

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MEETING CALENDAR

**International Conference on Deep Disposal of
Radioactive Wastes
Winnipeg, Manitoba, Canada
September 15-18, 1996**

For information: M.M. Ohio, Conf. Chair
Waste Management and Environmental Affairs Div.
Canadian Nuclear Society c/o AECL
Pinawa, Manitoba, Canada., ROE 1LO

**The 3rd International Petroleum Environmental
Conference**

**Albuquerque Hilton
Albuquerque, New Mexico
September 24-27, 1996**

A common objective of the conference and the Department of Energy is to seek solutions to environmental issues of a technical, legal, and regulatory nature.

In a recent study, the National Petroleum Council recommended that the Federal Government should use the most up-to-date scientific and technical information available in the legislative, regulatory, and judicial processes. The Council further observed that there is a lack of coordination among federal agencies in developing regulations. This may result in overlapping paperwork requirements on industry with no commensurate increase in environmental protection. The conference will focus primarily on promoting effective technologies which enhance industry's ability to prevent pollution and remediate existing conditions, while providing a sound scientific basis for environmental regulations and policy.

The Department of Energy will be conducting two interactive workshops to address potential solutions to **Overlapping Environmental Regulations and Alternatives to Litigation on Issues of Environmental Compliance**. These workshops will offer an opportunity for senior officials from the U.S. Environmental Protection Agency and State Regulatory Agencies to meet with you and discuss possible solutions to these national concerns. For information regarding conference context, contact:

Dr. Kerry Sublette:
The University of Tulsa
Department of Chemical Engineering
600 South College Avenue
Tulsa, OK 74101
Phone: (918) 631-3085
Fax: (918) 631-326

The American Industrial Hygiene Association
Presents:

**4th Annual International Hazard Communication
Symposium**

**Crystal Gateway Marriott
Arlington, Virginia
September 28-29, 1996**

The objective of this symposium is to provide technical training and education about existing hazard communication regulations in Europe, Mexico, Canada, Australia and Asia. Formal presentations will be supported by interactive break out sessions. Breakout sessions will afford greater opportunities to begin applying the information in a directly usable fashion.

American Industrial Hygiene Association
2700 Prosperity Avenue
Suite 250
Fairfax, Virginia 22031
Phone: (703) 849-8888
Fax: (703) 207-3561
Email: hstubblebine@aiha.org

**Society of Petroleum Engineers
Annual Technical Conference and Exhibition
Colorado Convention Center
Denver, Colorado, U.S.A.
October 6-9, 1996**

The SPE Annual Technical Conference and Exhibition (ATCE), will provide you three of the most valuable tools anyone in the petroleum industry can or should have: access to networking with the most complex or simplest problems; solutions to those problems through the sharing of information and experiences; and technology encompassed by more than 350 technical papers that deliver the very latest practical applications in drilling, formation evaluation, production, reservoir engineering, and many other related topics.

Providing you access to the best the industry has to offer is what makes ATCE the essential meeting of the year for all petroleum professionals. Hear industry leaders and government officials assess the present and future of the industry and its technology. Talk to colleagues whose work parallels or complement your own, and who can provide insight into workable, economic solutions.

Society of Petroleum Engineers
P.O. Box 833836

(Continued on page 25)

MEETING CALENDAR (Continued)

Richardson, TX 75083-3836, U.S.A
 Phone: (1) (214) 952-9393
 Fax: (1) (214) 952-9435
 Telex: 163245 (SPEUT)
 Email: <http://www.spe.org>

**Internationally Conference on Technologically
 Enhanced Natural Radioactivity Caused by
 Non-uranium Mining, Ustron⁷, Poling (70/1)
 Sponsored by PCSR, IAEA
 October 16-19, 1996**

Further Information: Mr. Jerzy Prus, Dept. of Int.
 Relations, Central Mining Inst., pl. 40-166 Katowice,
 POLAND

**The Fourth Annual Beneficial Reuse Conference
 BR'96**

University of Tennessee Conference Center
 Knoxville, Tennessee
 October 22-24, 1996

The focus of the fourth annual **Beneficial Reuse Conference**, BR'96, will continue to be on radioactivity in scrap metal, but sessions on Department of Energy (DOE) plans to reindustrialize certain facilities, and reuse of concrete are new this year. A tour of Oak Ridge Facilities is planned for the Monday preceding the conference. Another feature is that a one-day session will be devoted to Naturally Occurring Radioactive Materials (NORM). Other topics covered by this year's conference include radioactive scrap metal regulations and policy, business/environmental strategies, beneficial reuse initiatives in DOE facilities stakeholder involvement, risk communications and a session hosted by the Association of Radioactive Metal Recyclers (ARMR).

Early registration will result in a substantial discount. Before July 31, 1996, the registration fee is \$250; after that it is \$295. For more information, or to register, call (423) 974-4251 and for BR'96 information E-mail questions to Louis Allen, lallen1@utk.edu

**Second International Symposium on Extraction
 and Minimization of Waste
 Scottsdale, Arizona, USA
 October 27-30, 1996**

Eighteen different societies throughout the world, including the Health Physics Society, are sponsoring this four-day symposium. The international symposium will focus on issues and processing as applied to the treatment and minimization of wastes. The symposium is expected to bring together a diverse group

of researchers, policy makers, regulators, manufacturers and other interested groups to address common interest in waste treatment and minimization.

The following technical topics will be discussed.

- * Mining wastes
- * Iron and steel industry wastes
- * Titanium industry wastes
- * Radioactive wastes
- * Aqueous processing
- * Thermal processing
- * Biotreatment
- * Treatment of soils
- * Smelter and refinery wastes
- * Arsenic, selenium, & mercury wastes

For information:

V. Ramachandran
 ASARCO, Inc.
 (891)263-5224

or

Carl C. Nesbitt
 Michigan Technological University
 Tel: (906)487-2796
 Fax: (906)487-2934
 E-mail: cnesbitt@mtu.edu

**Energy Week
 Conference & Exhibition
 George R. Brown Convention Center
 Houston, Texas
 January 28-30, 1997**

The American Petroleum Institute and the American Society of Mechanical Engineers - Petroleum Division '97 Conference & Exhibition. As organizing sponsors of this 8th Annual International Event, both the API and the ASME are seeking papers related to the business, regulatory and technological changes affecting the oil, gas and petroleum industries.

For more information, please contact:
 Rebecca Sellers at (713) 963-6255

**Environmental Conference '97
 SPE/EPA Exploration & Production
 Dallas, Texas U.S.A
 3-5 March 1997**

The Society of Petroleum Engineers (SPE) and the Environmental Protection Agency will sponsor the third SPE/EPA Exploration and Production Environmental Conference in March 1997. Several

(Continued on page 26)

MEETING CALENDAR (Continued)

major engineering, scientific, oil and gas industry, and governmental organizations endorse this comprehensive conference focusing on U.S.A. exploration, drilling, and production areas. Emphasis will be on industry and government working together to address environmental issues and regulations affecting all oil and gas operations.

The program will feature keynote presentations on the conference theme of "Environmental Leadership Through Technology."

For more information, please call:
 Society of Petroleum Engineers
 Technology Transfer Department
 P.O. Box 833836
 Richardson, TX 75083-3856
 Phone: (214) 952-9393
 Fax: (214) 952-9435

**1997 International Conference on Radiation
 Dosimetry and Safety
 Taipei International Convention Center
 Taipei, Taiwan
 Republic of China
 March 31 - April 2, 1997
 (Short courses: Mar. 27-28)**

The purpose of this conference is to promote radiation protection and peaceful applications of radiation. Conference participants will share their radiation protection experiences in nuclear energy production, accelerators, industrial and medical applications of radiation, and research activities. The conference scientific program will consist of paper presentations, short courses and an instrumentation exhibition.

For more information:
 Prof. C. J. Tung
 1997 RDAS
 Department of Nuclear Science
 National Tsing Hua University
 Hsinchu, Taiwan 300
 Republic of China
 Tel: (886 35) 727300
 Fax: (886 35) 718649
 Email: cjtung@ins.nthu.edu.tw

**29th Annual National Conference on Radiation
 Control
 Tacoma, Washington
 April 27 - May 3, 1997**

This is the annual meeting of the Conference of Radiation Control Program Directors. If you are interested in presenting a paper, please submit an abstract to the CRCPD Office of Executive Director by September 30, 1996.

It should be noted that acceptance of a submitted paper does not necessarily mean that CRCPD will pay the travel expenses of the speaker to give the paper.

**American Industrial Hygiene
 Conference & Exposition
 Dallas Convention Center
 Dallas, Texas
 May 17-23, 1997**

The premier conference for occupational and environmental health and safety professionals

There are many industrial hygienists who have Radiation Safety Officer responsibilities in industries and medical centers across the country. Your willingness to share your health physics experience with this audience would be of value to these professionals, as witnessed by their enrollment in professional development courses for health physics that occur prior to the conference.

Abstracts for the 1997 conference are currently being accepted. Deadline for submittal is mid-September to allow time for review of the abstracts and preparation of the conference program in early December.

Abstract forms are available from:

American Industrial Hygiene Association
 2700 Prosperity Ave.
 Suite 250
 Fairfax, VA 22031
 Phone: (703) 849-8888
 Fax: (703) 207-3561

**1997 Rocky Mountain Symposium
 on Environmental Issues in Oil and Gas
 Operations
 Colorado School of Mines
 Golden, Colorado
 July 14-15, 1997**

The Colorado School of Mines and the U.S. Bureau of Land Management will sponsor the third symposium

(Continued on page 27)

Meeting Calendar (Continued)

on all aspects of environmental protection, remediation, and reclamation involved with oil and gas operations.

The Symposium will address a wide range of issues pertaining to oil and gas development and the environment. Papers or poster presentations on any of the following topics are invited. Papers and presentations on any other topic relevant to the theme of the Symposium will also be considered. Proceeding will be published and distributed at the Symposium.

For further information:

Petroleum Engineering Management
Colorado School of Mines
Golden, Colorado 80401
Phone: (303) 273-3746
Fax: (303) 273-3189
Email: rgraves@mines.edu

**Workshop on Intakes of
Radionuclides
Occupational and Public Exposure
Avignon, France
September 15 -18, 1997**

The workshop is cosponsored by the European

Community; USDOE; IPSN, France; NRPB, UK; BFS, Germany; and NIRS, Japan.

The Workshop will aim to bring together those involved in radiation protection research related to problems of incorporated radionuclides, and representatives of regulatory authorities and industry. The Workshop will consider the following topics:

- Practical applications of the new Human Respiratory Tract Model;
- Revised dosimetric model for the GI tract;
- Developments in physical dosimetry;
- Data for biokinetic model development;
- Monitoring of workers and assessment of exposure
- Dosimetry of the embryo and fetus;
- Decorporation of radionuclides; and
- Reliability of models and biokinetic data.

Information:

Scientific Secretariat, Dr. H. G. Menzel,
European Commission,
DG XII/F/6 - T61 1/31, 200 rue de la Loi,
B- 1049 Brussels, BELGIUM.
Fax: +32 2 296 6256
Tel: +32 2 295 9298
Email: h.menzel@mhsg.cec.be

EXCERPTS FROM THE FEDERAL REGISTER

61 FR 10812, March 15, 1996

Nuclear Regulatory Commission
Regulatory Guide; Availability

Revision 1 of Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," describes the information that should be provided to workers by licensees about health risks from occupational exposure.

61 FR 20775, May 8, 1996

Environmental Protection Agency
National Emission Standard for Radon Emissions From Phosphogypsum Stacks

Summary: On March 24, 1994, EPA announced its decision concerning a petition by The Fertilizer Institute (TFI) seeking reconsideration of a June 3, 1992 final rule revising the National Emission Standard for Radon Emissions from Phosphogypsum Stacks, 40 CFR Part 61, Subpart R. EPA partially granted and partially denied the TFI petition for reconsideration. Pursuant to that decision, EPA is convening a rulemaking to reconsider 40 CFR 61.205, the

provision of the final rule which governs distribution and use of phosphogypsum for research and development, and the average radium-226 concentration for phosphogypsum removed from a phosphogypsum stack. This document identifies proposed changes to be considered as part of this reconsideration and specific underlying issues on which EPA seeks further comment.

61 FR 20747, May 8, 1996

Department of Transportation
Hazardous Materials Transportation Regulations;
Compatibility with Regulations of the International Atomic Energy Agency

Summary: On September 28, 1995 RSPA published a final rule which amended the Hazardous Materials Regulations pertaining to the transportation of radioactive materials to harmonize them with those of the International Atomic Energy Agency (IAEA) and, thus, most major nuclear nations of the world. Several

(Continued on page 28)

SAFE NORM DISPOSAL

Envirocare



Of Utah, Inc.

- ♦ The Nation's First and Largest NORM Disposal Facility
- ♦ Selected by US EPA with Over 15 Million Cubic Feet of NORM Disposed to Date
- ♦ The Most Cost-Effective NORM Disposal Alternative Available
- ♦ Over 40 miles from Nearest Town in an Arid Desert Environment
- ♦ Accepted and Supported by Regulators and Local Public

Envirocare of Utah, Inc. operates the nation's first and largest diffuse NORM disposal facility. We have safely disposed of over 15 million cubic feet of NORM for EPA and DOD as well as major exploration and production companies. As EPA prepares to finalize federal NORM regulations, Envirocare presents the least liability concern of any licensed NORM facility in the country. For more information, please contact the Business Development Group at (801) 532-1330.

EXCERPTS FROM THE FEDERAL REGISTER (Continued)

substantial changes were made to provide a more uniform degree of safety for various types of shipments. These changes included requiring offerors and carriers to maintain written radiation protection programs, revising the definition of and packaging of low specific activity radioactive materials, and requiring use of the International System of Units for the measurement of activity in a package of radioactive material. This final rule makes editorial and technical corrections to that final rule and responds to a petition for reconsideration.

61 FR 30443, June 14, 1996
 Department of Transportation
 Action: Advisory Guidance
 Summary: Preliminary findings in the investigation of a recent passenger aircraft accident in Florida indicate

a possibility that hazardous materials carried as cargo aboard the aircraft may have caused or contributed to the severity of the accident. This is advisory guidance to remind persons involved in the transportation of hazardous materials of their responsibilities to ensure that hazardous materials are properly packaged, identified, authorized for transportation, handled, loaded, and transported in conformance with the Hazardous Materials Regulations.

61 FR 31169, June 19, 1996
 Nuclear Regulatory Commission
 Action: Conversion to the Metric System; Policy Statement
 SUMMARY: On September 27, 1995, The U.S. Nuclear Regulatory Commission (NRC) published a request for public comment on its existing metrication

(Continued on page 30)

The following is reprinted from the August 1996 Health Physics Society Newsletter. It is reprinted with the kind permission of the author, Lew Pitchford.

Let's Be Practical!

Lew Pitchford, CHP
Columbia, Missouri

The recent *Newsletter* articles have been interesting discussions of the HPS Position Paper "*Radiation Risk in Perspective*" and the linear hypothesis. Reading them made me think of the old question "How many angels can dance on the head of a pin?"

What is Not Known:

No one can prove or disprove the Linear Hypothesis at low doses and low-dose rates, as was correctly stated. Doses and dose rates can be accurately measured or calculated at low doses but biological effects cannot be measured. There are questions about the correct shape of the dose-response curve: linear, quadratic, or linear-quadratic. Possibly another more complex curve may be more appropriate. Each of these curves may or may not have a threshold below which there is no effect. There could be a region above zero where benefits occur, such as increased immune response, reduced cancer, etc. That portion of the curve would be negative for harmful effects produced by radiation until the curve intercepts the zero effect axis, which would be the threshold for damaging effects. The answers to these questions in the low-dose range remain unknown because the effects are too few to be measured.

What is Known:

There are many possibilities, including no effects at low doses. If there is an effect at low doses and low-dose rates, it is small, too small to measure. It is masked by the naturally occurring effects.

Biological response curves are generally sigmoidal. There is no place on earth or in space that is radiation free. Zero radiation dose is not possible. We breathe air with cosmogenic nuclides as well as gases released from the earth. We ingest natural nuclides in our food and water. We also receive direct radiation from the earth, space, and within our bodies. The amount varies greatly with geography, altitude, climactic conditions, buildings we occupy, and our habits. Total background radiation accounts for the greatest portion of radiation dose to the world's population. It is natural, it may be at an optimum level, and it could be essential for life. The chemical, electrical, and physical balances in nature are amazing. Background radiation is normally the largest component of the doses received by members of the public. It normally exceeds doses from

medical and industrial uses. The same is true for many individuals classified as occupational workers. After background, medical radiation is the major source. Little can be done to alter background radiation. It has always been present, slowly decreasing in activity. Chronic doses are less effective than the same acute doses, that is, doses delivered at a higher dose rate. Repair of radiation damage has been well documented, especially at low doses. The human body is exceedingly resilient following a radiation exposure or other insults. At higher doses, effects can be measured. Extrapolation of high-dose curves can be done; however, without measurements to prove the effects, the extrapolations are speculative.

What Considerations Apply:

Scientists consider all possibilities until each is proven wrong or one appears proven to be true. Background radiation and its variation in dose must be considered when evaluating low-dose effects. Caution must be exercised in setting limits for permissible radiation exposures since the effects of very low doses cannot be proven. To be realistic and practical, recommendations must consider these factors. There may be effects, either harmful or beneficial. Public welfare is not enhanced with undue fear, such as any dose is harmful, possibly lethal. Such phobias are too prevalent. They have drastically affected our electric power production, radioactive waste disposal, and the cost of operations involving radiation.

What Are Other Risk Factors:

Risk is accepted in other aspects of life, even activities involving significant radiation doses. Risks are accepted because the benefits outweigh the risks. Driving a car involves known and quantified risk, including risk of death (10s of thousands die each year in the U.S. alone). Innocent people are killed through no fault of their own. Risk is acceptable; the benefits lost by not driving would exceed the value of risk reduction. Compromise is necessary when considering cost of safety, including the cost of additional safety in automobiles and highways. The same rationale is true of many aspects of our lives.

Practical decisions are needed based on the benefits we expect to obtain vs. the cost an risk involved. Some

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Let's be Practical! (Continued)

benefits are so great that very high risk is accepted on the part of individuals, such as surgery. In science and engineering research, personal risks are taken to enhance knowledge or reduce future risks or costs. Test pilots know the risk statistics but continue to test new planes. High risk is significant in construction, certain sports, and many other common activities.

Money must be considered in reducing risks. Absolute risk-free activities in our lives are rare or nonexistent. Risk-free environments certainly do not exist in hospitals, transportation, farming, industrial practices, or in most of our daily lives. Practical, efficient, and acceptable decisions must be made to maximize benefit and reduce risk and cost.

These same factors should apply when considering radiation exposures to humans. The benefits and risks are known and accepted in medicine and heavy industries. Using the linear hypothesis to achieve absolute risk-free status in certain exposures is not practical or reasonable and should not be acceptable. Acceptable standards are generally compromised by the most knowledgeable, concerned individuals making the most appropriate decisions by balancing maximum benefit and least risk.

Benefits must be compared to the known risks; a bal-

ance that is acceptable to society must be the end point. To have an extremely low value may be cost prohibitive. Zero risk for radiation safety is no more practical than requiring zero risk for air travel, for highway travel, for our food, or for dangerous sports.

Action Needed:

A practical risk level for radiation safety must be established, comparable to other risks that we find acceptable. It must maximize benefits and minimize risks.

Radiation Risk in Perspective:

The Health Physics Society Position Paper "*Radiation Risk in Perspective*" appears to achieve that. It should provide excellent guidance to those in rules-making positions. The Paper will be useful in discussions with the public about the relative risks involved. The writers considered the important factors in their decision making and stated those factors. Position papers such as this may not be universally accepted, but it is hoped the general HPS membership will recognize the Position as responsible, reasonable, practical, and thus acceptable. It is fortunate that our Society now states important positions concerning the safe use of radiation. ■

EXCERPTS FROM THE FEDERAL REGISTER (Continued)

policy. This action was taken in accordance with the NRC's policy statement of October 7, 1992, in which the Commission was to assess the state of metric use by the licensed nuclear industry in the United States after 3 years to determine whether the policy should be modified. The purpose of this notice is to inform the public of the Commission's decision that its Statement of Policy on Conversion to the Metric System does not need to be modified, that it considers this policy final, and that its conversion to the metric system is complete.

61 FR 33053

ENVIRONMENTAL PROTECTION AGENCY
National Emission Standard for Radon Emissions
From Phosphogypsum Stacks

AGENCY: Environmental Protection Agency.

ACTION: Notice of public hearing.

SUMMARY: The Office of Radiation and Indoor Air, ,

Radiation Protection Division will hold a public hearing on the proposed rules for 40 CFR Part 61, Subpart R, (Subpart R) the National Emission Standard for Radon Emissions from Phosphogypsum Stacks-- Notice of Reconsideration. This proposed rules was in response to The Fertilizer Institute's Petition for Reconsideration of the National Emission Standard for Hazardous Air Pollutants regulating radon emissions from phosphogypsum stacks. EPA partially granted and partially denied the TFI petition for reconsideration. Pursuant to that decision, EPA is convening this rulemaking to reconsider 40 CFR 61.205, the provision of the final rule which governs distribution and use of phosphogypsum for research and development, and the methodology utilized under 40 CFR Section 61.207 to establish the average radium-226 concentration for phosphogypsum removed from a phosphogypsum stack. ■

Comparison of NORM Rules by State

<u>Radium Exemption Concentration</u>		<u>Radium Cleanup Standard</u>	
AR	5 pCi/g	AR	5/15 pCi/g ⁽³⁾
CO (proposed)	5 pCi/g	CO (proposed)	5 pCi/g
GA	5 pCi/g with high radon factor ⁽¹⁾ 30 pCi/g with low radon factor ⁽²⁾	GA	5/15 pCi/g with high radon factor 30/15 pCi/g ⁽⁴⁾ with low radon factor
LA	5 pCi/g above background	LA	5/15 pCi/g, or 30 pCi/g if the effective dose equivalent to members of the public does not exceed 100 millirem per year
MI (proposed)	5 pCi/g	MI (proposed)	5/15 pCi/g
MS	5 pCi/g with high radon factor 30 pCi/g with low radon factor	MS	5/15 pCi/g with high radon factor 30 pCi/g with low radon factor
NM	30 pCi/g	NM	30/15 pCi/g
ND	5 pCi/g.	ND	5 pCi/g
NJ	Variable- depending on concentrations and volumes- annual dose less than 15 mrem/yr.	NJ	Variable- depending on concentrations and volumes- annual dose less than 15 mrem/yr.
OK (proposed)	30 pCi/g	OK (proposed)	30/15 pCi/g
OR	5/15 pCi/g	OR	5 pCi/g
SC	5 pCi/g with high radon factor 30 pCi/g with low radon factor	SC	5/15 pCi/g with high radon factor 30/15 pCi/g with low radon factor
TX	5 pCi/g with high radon factor 30 pCi/g with low radon factor	TX	5/15 pCi/g with high radon factor 30/15 pCi/g with low radon factor
CRCPD (proposed)	5 pCi/g	CRCPD (proposed)	5/15 pCi/g

NOTES

- (1) High radon factory is a radon emanation rate greater than 20 pCi per square meter per second
- (2) Low radon factory is a radon emanation rate less than 20 pCi per square meter per second.
- (3) 5/15 pCi/g of radium of radium in soil, averaged over any 100 square meters and averaged over the first 15 centimeters of soil below the surface.

- (4) 30/15 pCi/g is 30 pCi/g of radium in soil, averaged over any 100 square meters and averaged over the first 15 centimeters of soil below the surface.

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NORM Training Course Offered by OGCI & Peter Gray

OGCI (Oil & Gas Consultants International, Inc.), a world leader in petroleum training, has scheduled 2-day training courses in NORM for 1996 and 1997. The course *NORM Contamination in the Petroleum Industry* covers all aspects of NORM contamination and its control, including:

- Fundamentals of Radiation
- Fundamentals of NORM
- Radium Contamination
- Radon Contamination
- State & Federal Regulations
- NORM Surveys including Hands-on Training
- Maintenance Procedures
- Disposal of NORM Wastes
- Decontaminations
- Release of Facilities
- Recommended Programs
- Liability and Litigation

This course builds a rigorous and complete foundation for the control of NORM contamination.

This in-depth course is taught by Peter Gray who has a background in nuclear and radiochemistry and 25 years experience in the petroleum industry. Dr. Gray has a Ph.D. in Nuclear Chemistry from the University of California at Berkeley. He took early retirement from Phillips Petroleum Company in 1985 after 25 years with the company. Since 1985, Dr. Gray has been a consultant in NORM. During his tenure with Phillips, Dr. Gray was in charge of the company's NORM control program from the discovery of NORM contamination in natural gas and natural gas liquids in 1971 until his early retirement in 1985. This background uniquely qualifies Dr. Gray as the instructor for the course-- an instructor who understands the origin of NORM and why it contaminates nearly all petroleum facilities, where the contamination is, how to set up programs that protect employees, company facilities, the environment and the public, how to survey for NORM contamination, the available options for the disposal of NORM wastes, and the Federal and state regulations for the control of NORM.

Peter Gray is the editor/publisher of **The NORM Report**, a newsletter reporting on developments in NORM, including summaries of regulatory activities on the state and Federal level as well as in Canada.

The 1996/97 schedule for the course **NORM Contamination in the Petroleum Industry** is:

Oct. 3-4, 1996 Houston
 March 18-19, 1997 Lafayette, LA

For further information about the course, contact Joseph Goetz, OGCI. 1-800-821-5933, or contact Peter Gray, 918-492-5250, for information about the course content. ■

Comparison of NORM Rules by State (Continued)

Exemption for Contaminated Equipment

AR	Concentration limit only (5 pCi/g)	OK	50 µR/hr including background
		OR	5 pCi/g
CO (Proposed)	Concentration limit only (5pCi/g)	SC	50 µR.hr including background
GA	50 µR/hr including background	TX	50 µR/hr including background
LA	50 µR/hr including background	CRCPD (Proposed)	Concentration in dpm
MS	25 µR/hr above background 100 cpm above background		
NM	50 µR/hr including background		

NOTES

Before release for unrestricted use, facilities or equipment contaminated with NORM should not exceed specified contamination limits in dpm/100 sq. centimeters. ■