

The NORM Report

Naturally Occurring Radioactive Material Contamination
SPRING 1995

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Comments on the EPA's Proposed Radiation Protection Guidance for Exposure to the General Public

Comments of the American Petroleum Institute on EPA's Proposed Radiation Protection Guidelines for Exposure of the General Public are attached to this issue of **The NORM Report**. As the Introduction to the Report states: "These comments are in response to the EPA's proposed revised Federal Radiation Protection Guidance for Exposure of the General Public, 59 Fed. Reg. 66414 (December 23, 1994) ("Proposed Guidance"). API is interested in this matter because the Proposed Guidance covers "most terrestrial sources of exposure arising from human activities" for the first time. These terrestrial sources include technologically-enhanced exposure to natural radiation such as "scale in oil- and gas-field piping" and "wastes and/or emissions from the burning of coal oil and natural gas. The proposed Radiation Protection Guides would reduce the limit for the effective dose equivalent for radiation exposure to the public from 500 millirem per year to 100 millirem per year $= 1 \text{ mSv}$."

API believes that based on legal, policy and scientific grounds, EPA should reconsider the efforts to make sweeping changes to the current provisions of the Federal Radiation Council, Radiation Protection Guidance for Federal Agencies, promulgated in 1960 and 1961, including the proposed increase in the stringency of the Radiation Protection Guides. Moreover, because of the general applicability to and substantive impact on industry, the Proposed Guidance constitutes a rule."

If the EPA "Guidance" becomes effective, it could have a significant impact on industries with NORM contamination problems.

One of the authors of the report, Dr. David Gooden, is a nationally recognized authority on radiological physics. Dr. Gooden is the Chairman of the Radiation Management Advisory Council for Oklahoma. This council provides guidance and recommendations to the Department of Environmental Quality in matters regarding radiation safety in Oklahoma. The Council is currently developing NORM regulations for the State of Oklahoma.

I particularly thank Mike Loudermilk of API's Dallas office for making the report available for distribution with **The NORM Report**.

HELP!

Do you have an idea for an article? Do you have a news release? Do you have a case history of interest? Any suggestions, comments, or complaints? Call or fax me.

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Regulations for the Control of NORM - Update

The status of regulations for the control of NORM is summarized on the following pages for 14 states, the EPA, and Canada. These 14 states are those that have regulations in effect, are proposing regulations, or are expected to have regulations within one to two years. The status of NORM regulations in all 50 states will be summarized in the Summer 95 issue of *The NORM Report*. Each regulatory agency in the states summarized below was contacted during the first half of May, 1995.

The last state to enact NORM regulations was Georgia. The Georgia regulations became effective in March, 1994. Louisiana, Mississippi, Arkansas and Texas also have specific regulations for the control of NORM. New Mexico, Connecticut, South Carolina and Illinois will probably have NORM regulations before the end of 1995. Other states are in various stages of drafting NORM regulations or guidelines.

A summary of the status of NORM regulations in 14 states, the Federal government and Canada follows:

ARKANSAS

There have been no changes in the Arkansas NORM rules and regulations. However, one change under consideration is to change the NORM exemption from 25 microR/hr above background to 50 microR/hr including background. This will make the Arkansas regulations similar to the Texas and Louisiana NORM regulations in this respect.

CALIFORNIA

As a preliminary to drafting NORM regulations, California has made surveys of petroleum facilities for NORM contamination and collected samples for laboratory analyses. Water, brine, soil and other appropriate samples have been collected. A draft report of the surveys has been prepared but is still under review and not ready to be released. Meetings are being held which include representatives from the petroleum companies to review the report and make comments and suggestions. There is no timetable for the report's release, but hopefully, it will be sometime this summer.

CONNECTICUT

The Connecticut Department of Environmental Protection is currently reviewing a prepared draft of NORM regulations. It is slowly working its way through the approval process. After the DEP

has approved the draft, the proposed regulations will be sent to Legal and then to the State Legislature for enactment. There is no timetable for final enactment of the NORM regulations.

GEORGIA

Georgia's regulations for the control of NORM became effective in October, 1994. Since then only very minor changes have been made, e.g., correction of typos, etc. No revisions of the regulations are planned in the near future.

ILLINOIS

The Division of Radioactive Materials in the Illinois Department of Nuclear Safety is preparing a draft of proposed NORM regulations. It had earlier been thought that a final proposal might be ready by March or April of this year, but now it appears it will be delayed. The delay is due to a review of the voluminous comments made to the latest draft of CRCPD's Part N. A review of the Part N comments indicated that many might be applicable to the Illinois proposed regulations. There is no timetable for final approval of the proposed Illinois regulations.

KENTUCKY

Kentucky is sampling and verifying the Martha Oil Field contamination, especially the areas

that have been reported as not being contaminated. The cleanup of the contaminated areas has begun.

As far as the NORM regulations are concerned, they will not be promulgated until the Martha Oil Field agreements are complete. Kentucky had the option of promulgating the regulations now which could confuse the Martha Oil Field negotiations but would have the benefit of having regulations for other NORM contaminated sites, or waiting for the Martha Oil Field agreements to be completed. Kentucky has chosen the latter option at this time. There is no timetable for NORM regulations.

LOUISIANA

The latest revisions to the Louisiana NORM regulations became effective January 20, 1995 when they were published in the Louisiana Register. Many of the revisions were significant. Details were given in the Spring, 1994 issue of *The NORM Report*. Although it is expected there will be further revisions at some time in the future, nothing is being planned at present.

MICHIGAN

The status quo is being maintained in Michigan as far as the draft of

(Continued on page 3)

MICHIGAN (Continued)

NORM standards and guidelines is concerned. A decision is still being awaited as to whether to proceed with regulations.

Michigan's Department of Public Health has been very busy of late dealing with radium from other kinds of environmental sources, mainly military aircraft gauges containing radium. There are some very significant environmental problems in this area in Michigan at present. The extent of the problem is greater than previously thought. These are primarily gauges from World War II aircraft and continuing in use in aircraft through the 1950s and 60s. The so-called gauges have been setting off radiation gate monitors at smelters and scrap yards.

MISSISSIPPI

The Mississippi Legislature recently passed legislation giving the state Oil and Gas Board authority for NORM at the wellsite effective July 1, 1995. Once the petroleum leaves the wellsite, the Mississippi Department of Health has continued authority for NORM contamination.

Richard Lewis of the Mississippi State Oil and Gas Board says the Board will probably be writing new regulations at some point in the future. At the present time all that they have is Rule 68 - Disposal of NORM Associated with the Exploration and Production of Oil and Gas. Since this is a very new assignment, the Board has no guidelines or what is expected in regulations. The Board will get together with the Department of Health to determine the best approach to regulations. Field surveys, etc. will probably be contracted out to the Department of Health as the Board does not have qualified people to make these radiation surveys. A memorandum of agreement and some guidelines for action are the

next step necessary for the Board to take authority for NORM contamination at the wellsite. Rule 68 referred to above, was summarized in the Winter 95 issue of The NORM Report.

NEW MEXICO

Subpart 14: Naturally Occurring Radioactive Materials (NORM) in the Oil and Gas Industry continues to work its way through the approval process. After the December, 1994 hearing before the New Mexico Environmental Board the revised Subpart 14 was sent back to the Radiation Advisory Council and then in the beginning of May the proposed regulations were sent to the Environmental Improvement Board who approved them as amended. The Board had requested that "if diking was done under any contaminated soil that permission had to be obtained from the land owner". The Council did not go along with this because the Oil Conservation Division said it would give members of the public regulatory authority over the state. So the Board's request was changed from having to get the land owner's permission to only notifying the land owner. The Board approved this and these revised proposed regulations went before the Council May 24. It was expected that the Council would concur with the Board's approval. Then the regulations will be filed with the State Records Center and the regulations will become effective 30 days later, probably in late June or July. The proposed regulations discussed at the December meeting are essentially the same as the final proposed regulations.

Subpart 14 establishes radiation protection standards for the possession, use, transfer, transport, storage and disposal of NORM associated with the oil and gas industry, and which are not subject to regulation under the Atomic Energy Act of 1954, as amended. The provisions of Subpart 14 were

discussed in the Winter 95 issue of The NORM Report. One of the more important changes in the proposed New Mexico regulations when compared with other states with NORM regulations is that the radium exempt level in soil is 30 pCi/g.

OKLAHOMA

The Oklahoma Radiation Management Advisory Council continues to revise the May 1993 draft of proposed NORM regulations. The regulations will be Subchapter 19, Licensing of Naturally Occurring Radioactive Materials (NORM). Subchapter 19 will be part of the Title 252, Oklahoma Administrative Code, Chapter 400. Radiation Management. The last revision to Chapter 400 became effective May 26, 1994.

There is still some controversy as to who should have jurisdiction over NORM -- The Department of Environmental Quality or the Oklahoma Corporation Commission. Currently, the Corporation Commission has declined jurisdiction, but the independent petroleum producers want the Commission to have the jurisdiction. The cost of enforcing the regulations is a major factor.

The Radiation Management Advisory Council is preparing a "polished draft" which will be used to address specific items within the draft. Essentially this draft will be a working draft for future discussions. The next meeting of the Council will be June 22, 1995 at which the main topic will be the proposed NORM regulations.

SOUTH CAROLINA

The proposed NORM regulations continues to work through the administrative/legislative approval process in South Carolina. Enactment of the regulations by the

(Continued on page 4)

SOUTH CAROLINA (Cont'd)
end of June, 1995 continues to be a possibility. NORM is not a major issue in South Carolina as it is in some of the other states, particularly the petroleum states.

TEXAS

The Texas Department of Health is planning draft changes to their current NORM regulations. The revisions may be proposed in late 1995. The Department of Health has licensed a NORM processing facility in Port Arthur (Soloco). The license is now in a hearing mode.

The status quo is being maintained by the Texas Railroad Commission. Statewide Rule 94-*Disposal of Oil and Gas NORM Waste* was adopted by the Railroad Commission on December 12, 1994 and took effect February 1, 1995. There are no plans to revise Rule 94 at the present time.

Rule 94 sets forth requirements for the safe disposal of NORM that constitutes, is contained in, or has contaminated oil and gas waste. The rule was developed in consultation with the Texas Department of Health and the Texas Natural Resource Conservation Commission regarding protection of public health and the environment. Rule 94 was summarized in the Winter 95 issue of *The NORM Report*.

WASHINGTON

New regulations have been proposed which will put a ceiling on how much NORM can be brought into Washington for disposal. It has been proposed that an annual limit of NORM wastes be 8,600 cubic feet with 1,000 cubic feet as an annual limit from any one generator. When the annual limit is reached, according to the proposed regulation, no additional NORM wastes could come into the State, either in-

region or out-of-region. The site would be closed for any more NORM disposal that year. Public hearings were held on the proposal in March, 1995 and written comments were accepted before March 8.

No decision on the proposed regulation have been made. The Department of Health is still trying to answer the many comments that were received. Most of the comments were in opposition to the proposed regulation. Because of the dearth of NORM disposal options available, people want the site to remain open for the disposal of NORM wastes. When all the comments have been reviewed, the comments will be given to the Secretary of the Department of Health and he will either rethink the proposed regulation or decide to enact the regulation. A final decision is expected in July.

During 1994, the volume of diffuse NORM accepted at the site was 51,000 cubic feet, six times the proposed limit. According to the site manager, the associated loss of revenue would require a compensating increase in the fee for burial of waste, both LLRW and NARM.

The Richland LLRW facility has been the only burial site that accepts radium sources since the Beatty site closed. Currently, hundreds of discrete radium sources from the entire United States are disposed of annually.

U.S. ENVIRONMENTAL PROTECTION AGENCY

The EPA is considering how to handle the cleanup rule. In theory, the site cleanup is generally applicable to federal facilities and NRC licensees. EPA hopes to reach an agreement with the NRC so that the cleanup rules will be suspended as far as its applicability to the NRC licensees is concerned. In this case the NRC

decommissioning rule would pertain to the NRC licensees assuming EPA makes the determination that the decommissioning rule is sufficiently protective. In this case the primary application of the site cleanup rules will pertain only to federal facilities. NORM is involved only to the extent that it is comingled with Atomic Energy Act type wastes.

Although it is not planned at present to extend the cleanup regulations to private facilities, it is always possible that EPA's Office of Solid Waste and Emergency Response would use the regulation at a superfund site. In which case, if a site were a superfund site, the site cleanup provisions might apply.

Very little has been done on the *Draft Document on Diffuse Naturally Occurring Radioactive Material (NORM): Waste Characterization and Preliminary Risk Assessment* since the Science Advisory Board issued its report in May, 1994. The basic intent of the NORM draft report was to summarize the issue, in part to satisfy the Science Advisory Board's interest. The EPA had never had a program to develop regulations from the NORM draft report. The EPA is much more preoccupied with the site cleanup rule and deciding what to do about low level waste. The EPA has literally not focused on any followup to the NORM draft report.

A Science Advisory Board report: *Review of Draft Document on Radionuclide Cleanup Levels for Soil* was issued on April 26, 1995. A review meeting for closure on the technical aspects of the cleanup standards was held on May 23 and 24, 1995. This draft SAB report in review of the technical basis of EPA's Office of Radiation and

(Continued on page 5)

U.S. ENVIRONMENTAL PROTECTION AGENCY

(Continued)

Indoor Air's technical support document for the development of radionuclide cleanup levels for soil is a draft report which has not received concurrence of the SAB's Radionuclide Cleanup Standards Subcommittee (RCSS) or its parent committee, the Radiation Advisory Committee (RAC). Once approved by the RCSS and the RAC, the revised review draft will be forwarded to the SAB's Executive Committee (EC) and their vettors for final review and approval. If all the SAB's reviewers approve the report, it will become final and transmitted to the EPA Administrator. Following transmission of the final approved report to the Administrator, the SAB will release copies to the Agency and the interested public.

In January, 1995, EPA's Science Advisory Board released *Beyond the Horizon: Using Foresight to Protect the Environmental Future*. This report, produced at the request of EPA Administrator Carol Browner, addresses three principal questions:

1. Can the Agency and the country do a better job of anticipating environmental problems, rather than reacting to them?
2. If so, what methodologies are available that would help us better anticipate such problems?
3. If those methodologies are used, what potential problems does the SAB see "beyond the horizon"?

This overview report (EPA-SAB-EC-95-007) is supported by reports for various SAB committees, including the Radiation Advisory Committee. The RAC's report

(EPA-SAB-RAC-95-006) entitled *Future Issues in Environmental Radiation* is a report on future issues and challenges in the study of environmental radiation with a focus toward future institutional readiness by the Environmental Protection Agency.

The report analyzes the present-day situation on many significant technical issues in environmental radiation, and defines those which the Subcommittee felt would be most likely to require the attention of the Agency to plan, prepare and manage for the future. Among the issues related to NORM are Low-Level Radioactive Waste, including those "not currently managed" by EPA (e.g., NORM); Cleanup of Contaminated Sites; Mixed Hazardous/Radioactive Waste; Radon in Indoor Air; Terrestrial Radiation: Occupational Exposures, etc.

EPA has developed a plan to address Congressional criticism that the existing radiation protection program is inconsistent, duplicative and incomplete. In a January 27 memo to Senator Glenn (D-OH), the assistant administrator for Air and Radiation recognized the need for "more coherent, complete and consistent radiation standards" and outlined a plan to achieve that purpose. EPA will continue the effort to build an interagency consensus on Federal Radiation Protection Guidance and on development of acceptable radiation risk standards and dose limits.

NUCLEAR REGULATORY COMMISSION

On January 8, 1994 a petition was filed with the NRC requesting that the NRC reduce the limit for radiation dose to members of the public from the current 100 mrem per year to 1 mrem per year. The NRC has denied the petition for rulemaking on the basis that the

proposed action is not necessary because current public dose limits adequately protect the health and safety of the public; the requirement that doses are as low as is reasonably achievable (ALARA) provides an ample margin of safety and the proposed 1 mrem per year limit is not supported by the recommendations of ICRP, NCRP or Presidential guidance.

On January 13, 1995 NRC issued a draft of proposed Revision 1 to Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure." The guide is being revised to provide guidance on the instructions and information that should be provided to workers by licensees. Comments were due March 15, 1995.

CANADA: ALBERTA, BRITISH COLUMBIA AND SASKATCHEWAN

These three western provinces of Canada have jointly formed a committee of government and industrial representatives to develop guidelines for the control of NORM. The committee has representatives from the petroleum and fertilizer industries. The first two parts of the three-part proposed guidelines are generic and Part 3 will be industry specific. The proposed guidelines are undergoing final review and should be available this summer, for distribution. ■

FINAL CUT

The most discouraging of business news,
It should hardly be surprising,
Is having a one-man consulting firm ---
And finding that it needs downsizing.

Ed. Dempsey, The Wall St. J. ■

CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS (CRCPD)

The CRCPD has set up a new NORM Commission which will take over the responsibilities of the Part N and E-4 Committees. E-4 is the Committee on Natural Radioactivity Contamination. Greta Dicus of Arkansas has been appointed Chair of the new Commission and Ray Paris of Oregon is Vice-chair. Edd Kray, the present Chair of the Part N Committee will remain as Chair of Part N and will be a member of the Commission.

In addition to the new Commission, an Advisory Committee is being established to give advice to the Commission. The Advisory Committee will be composed of a variety of people interested in NORM, including representatives from industry. The gas and oil industry as well as other industries impacted by NORM will be asked to have a representative on the Advisory Committee. It is anticipated that the Advisory Committee will meet with the NORM Commission at least once or twice a year.

The Commission will ultimately develop NORM regulations to be used by the separate states in enacting their own regulations. The belief is that it will be necessary to have more than one NORM standard. The standards may have to be related to a specific region of the country or for different industries.

If the CRCPD Board of Directors (Ruth McBurney of Texas is the current Chairperson) accepts and approves the Part N suggested NORM regulations being drafted by the Part N Committee chaired by Edd Kray, the "regulation" will be put out as a suggested regulation. However, some members of the Board are concerned as to whether or not the current NORM draft has the total support of industry. If that total support isn't there the Board may feel they don't want to go with something that is not going to be applicable, accessible and workable. So it is possible that the Board will not approve the current draft of Part N, but wait for more input from industry and possibly develop separate standards as described above.

Other groups with interest in developing NORM regulations will be encouraged to work with the Commission. Organizations with active NORM groups include the Health Physics Society, the Interstate Oil and Gas Compact Commission, the API and a NCRP Committee that is evaluating NORM.

The CRCPD and Part N have been important components in the development of regulations for the control of NORM for many years, long before Louisiana became the first state to have NORM regulations. The following is a brief history of Part N as prepared by Edd Kray, Colorado Department of Health, and present Chair of CRCPD SR-5 Committee, the Committee responsible for the development of Part N.

The CRCPD has been involved in the preparation of a suggested regulation for the control of radiation hazards associated with NORM since the early 1980s. This suggested regulation is designated "Part N" and designed to become part of the Conferences' 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 compatible with, identical with, or as effective as Federal regulations.

The SSRCR were initially published in 1962 by the Council of State Governments with the advice and assistance of the U.S. Atomic Energy Commission and the U.S. Public Health Service. In November, 1990 the CRCPD assumed responsibility for coordination and publication of the SSRCR. Much of the SSRCR is composed of regulations compatible with, if not identical, to regulations of the Nuclear Regulatory Commission (NRC) as written in Volume 10 of the Code of Federal Regulations (CFR) and pursuant to the Atomic Energy Act (AEA). The AEA does not address NORM or its associated hazards. The need for regulations to cover the hazards associated with NORM was realized in the early 1980's. This came about through numerous requests to State Radiation Control Programs for authorization to use NORM contaminated materials. Speculation that other large-scale projects utilizing NORM materials would develop, coupled with inadequate coverage of these situations by the SSRCR prompted several state and Federal regulatory personnel to meet and discuss this issue.

This led to the formation of the CRCPD "Part N Committee" (now the SR-5 Committee). This CRCPD Committee released the first draft of Part N in July of 1984.

From 1984 to 1991 Part N went through 6 drafts leading to a "Proposed Part N" submitted to the CRCPD in April, 1991. These

(Continued on page 7)

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CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS (Continued)

variable drafts were subject to comment by the regulatory community, the public and industry, resulting in numerous improvements as time progressed.

In 1992 it was determined that the proposed Part N was in need of further refinement prior to adoption. In April of 1993 The Proposed Part N was mailed to all the states and appropriate regulatory agencies (NRC and EPA) for an additional round of comment. These comments were addressed and incorporated into a June 1994 revision of Part N which was submitted to the CRCPD.

This submission was concurrent with a CRCPD revision to the policies and procedures for preparation and publication of the SSRCR and prompted a look at the overall historical process for development of Part N. The Part N Committee and the CRCPD agreed that although the public and industry had provided comment which was incorporated into the various drafts of Part N, this public and industry review was not sufficiently current. Significant practical experience has been gained on NORM regulation

during the past few years, particularly within the oil and gas producing states which have adopted their own regulations based on earlier drafts of Part N.

For this reason the Part N Committee is, at this time, reviewing comments received from representatives of the public, industry and environmental groups. The Committee believes they will be able to present a draft for review which had been through comprehensive review earlier by the regulatory community. ■

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CHALLENGES IN RADIATION SAFETY

In a recent issue of the Newsbrief, Roland Fletcher of Maryland and the past Chairperson of CRCPD's Board of Directors, pointed out some of the challenges in radiation safety as he sees them.

There is still so much to do in radiation safety, and yet too frequently our major efforts are spent on perceived rather than actual problems. "Fact is fact, but perception is reality." Some of the continuing challenges I see are:

- Lack of positive press on radiation accomplishments (e.g., how many lives are saved, made longer, made better, etc., due to radiation?)
- WHY IS THERE STILL NO NATIONAL, CONSISTENTLY APPLIED REGULATION OF NORM?
- Licensing state certification: is this an idea whose time has come -- and gone?
- What do we do about disparity between x-ray and radioactive material regulatory programs? How do you spell relief?
A-F-F-O-R-D-A-B-L-E T-R-A-I-N-I-N-G
- Status of radon programs -- there is a growing list of nay sayers

I am sure there are many others, but these came to mind. ■

LNT MODEL IMPACTS NORM (Continued from page 8)

commercial or industrial use, well within the normal background range of 1-5 pCi per gram in soil. The HPS should lead public understanding and acceptance of low-level radiation as part of life. Regulators should propose radiation regulations that are easily distinguished from background levels to alleviate public fear and misunderstanding of radiation. HPS can help EPA to avoid betrayal of public trust and backlash at over-regulation which is costly to society without benefit to public health.

References

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Petrochemical Services, Inc.

In a recent project for a major international oil corporation, Petrochemical Services, Inc. (PSI) repaired a large bulk treater on an offshore production platform in the Gulf of Mexico. In cleaning the vessel, 650 barrels of waste was collected. This waste material had a NORM reading of 850 microR per hour. PSI utilized its solid reduction unit to reduce the volume of waste. The PSI solids reduction unit used in conjunction with the PSI decontamination agent, segregates remaining solids into NOW and NORM waste streams.

Working 24-hour days, PSI cleaned the vessel for hotwork and had the platform back online in a timely fashion. The 650 barrels of waste removed from the vessel was reduced to 350 barrels, made up of 75 barrels of NOW waste and 275 barrels of NORM waste. PSI saved the customer \$192,500 (based upon \$550 per barrel) in downhole disposal costs for NORM waste.

For further information contact:

James Broadwell
Petrochemical Services, Inc.
2121 Chartres Street
New Orleans, LA 70116
(504) 947-7825
1-800-800-2291
Fax (504) 944-8549

DISCRETE AND DIFFUSE NORM

Discrete NORM is typically small volume, high specific activity sources which include items such as radium sealed sources, certain water treatment ion exchange resins, etc.

Diffuse NORM is typically very large volume, low specific activity sources which have been created by the processing or technological enhancement of materials originally found in nature with small concentrations of naturally occurring radioactive isotopes.

Examples are oil and gas extraction byproducts (scales, sludges and films), mineral extraction byproducts and tailings, certain coal flyash and bottom ash, phosphate mining and production wastes, and water treatment wastes.

HOW DANGEROUS IS RADIATION?

In the April, 1995 issue of the HPS Newsletter, John Cameron, professor emeritus of medical physics at the University of Wisconsin-Madison and currently a visiting professor at the University of Florida discussed radiation fears.

The fear of radiation is costing U.S. taxpayers billions of dollars each year. Estimates of future costs are about \$500 billion to protect the public from low-level radiation at old atomic-bomb facilities. This great waste of taxpayers' money, will not save even one life.

Large amounts of radiation -- above about 10 percent of the lethal dose -- will increase the chance of cancer, but not by much. Among the 100,000 atomic-bomb survivors, there was only a one percent increase in deaths in the last fifty years due to radiation-induced cancer. The health of some survivors appears to be better. Overall, atomic-bomb survivors are living longer on average than similar Japanese who did not receive any radiation from the bombs.

The beneficial effect of moderate amounts of radiation is well-known from studies of plants and animals during the last 90 years -- it is called radiation hormesis. Many common toxic substances also exhibit hormesis. They are beneficial and even necessary for health at low doses, but lethal at high doses. Examples are the 17 essential trace elements we need in our diet.

Radiation is part of our natural environment. Each hour we each have

about 20 million radioactive disintegrations in our body -- they irradiate billions of our cells. It is hard to believe that a very small amount of similar radiation can be dangerous to our health.

Cameron mentioned health effects on the people living downwind from the Nevada nuclear test site. They have been described as "cancer victims who became a tragic legacy of atmospheric testing." There is no evidence to suggest that downwinders had an increase in cancer. It would be very surprising if they had.

Finally, Cameron says that anyone who wants to learn more about radiation should read "The Good News About Radiation," by John Lenihan.

AMBAR, INC. - A NEW NORM PROCESSING COMPANY

REGULATION BY EXCEPTION

AMBAR, INC. has developed a process for the dissolution of barium sulfate scale using a proprietary solvent called AmBaSol. The radium contamination is solubilized with the barium sulfate leaving solids (sands, etc.) with a radionuclide content sufficiently low that the solids can be disposed of at a NOW waste facility. The AmBaSol solution containing the solubilized barium sulfate and radium has been classified by the Louisiana Department of Natural Resources as a fluid that can be disposed of in commercial class II injection wells.

A simple summary of AMBAR's dissolution process using AmBaSol follows:

AMBAR METHODOLOGY

1. Receive NORM containers from petroleum facility. Segregate all NORM extraneous solids and decon.
2. NORM material pumped into the dissolution tank containing heated AmBaSol transferred from AMBAR's heater tank.
3. Product mixture is then agitated for a prescribed amount of time until barium sulfate is scrubbed from solids (sand, etc.).
4. Mixed product is then pumped to a holding tank. Solids are then allowed to fall out and settle.
5. Samples drawn and meter readings taken. Solids will now be at acceptable levels for NOW waste disposal.
6. NOW waste solids returned for disposal at a NOW waste facility.
7. AmBaSol solution containing barium sulfate (and radium) are classified as fluids capable of being disposed of in a Class II injection well.
8. AmBaSol solution sent to originating petroleum facility for disposal in an injection well.
9. End of process. End of paper trail. End of NORM.

For further information, contact:

John Sturtevant
Preston Vincent or David Baudoin
AMBAR, INC.
2417 W. Pinhook Road
Lafayette, LA 70505
(318) 237-5300

The structure of existing regulations is largely "regulation by exception". Those industries that are successful in getting exceptions or exclusions written into law or regulation will suffer fewer economic consequences. For the oil and gas industry, an absence of involvement at the legislative or regulatory level increases the potential for becoming subject to the same regulations that govern other industries that generate NORM materials and wastes through different processes that are not exempted or excluded. These materials and wastes are likely to each have a different health risk, and in turn have very different storage, handling, treatment and disposal requirements and attendant costs. Given the regulatory trend towards regulation by exception, this is not an area where the legislation and regulatory drafting can be left to someone else with the hope that the resulting law or statute will protect the oil and gas industry's interest. Further, the regulation of NORM is at a very early stage of development at both the state and federal level. As can be seen from the successful efforts of other affected industries, contributing to the development of the regulation at the preliminary stage can be an effective means of heading off future compliance costs. ■

NORM AND THE AGING OIL FIELD

NORM contamination is a non-linear event. As an oil field ages, the production of water usually increases. Since radium is a "constituent" of the water, as the production of water increases, the formation of NORM may increase also. ■

MEETINGS CALENDAR

The following is a listing of meetings that may be of interest. These meetings either contain sessions or papers dealing with NORM, or they are of a related subject matter. It is intended to make the Meeting Calendar a regular feature of The NORM Report. I would very much appreciate receiving notices of upcoming meetings.

July 23-27, 1995

Health Physics Society 40th Annual Meeting

Location: Boston, Massachusetts

This is the Joint Annual Meeting of the Health Physics Society and the American Association of Physicists in Medicine. There will also be special events associated with the joint X-ray Centennial celebration.

Additional information can be obtained from:

Health Physics Society

1313 Dolley Madison Boulevard,

Suite 402

McLean, VA 22101

(703) 790-1745

FAX: (703) 790-2672

July 31--August 3, 1995

Beneficial Reuse, '95

Third Annual Conference on the Recycle and Reuse of Radioactive Scrap Metal

Hosted by The Energy, Environment, and Resources Center at the University of Tennessee and the Oak Ridge National Laboratory's Center for Risk Management

Location: University of Tennessee Conference Center, Knoxville, Tennessee

The technical topics scheduled in the meeting include Naturally Occurring Radioactive Material: Inventories, Generation, and Treatment

There will also be a workshop on Naturally Occurring Radioactive Materials. This will be a workshop designed to provide information on state and federal regulations, decontamination industries, research initiatives, segregation and storage activities, and recycling opportunities. This will be a "hands-on" workshop that emphasizes problem solving. Active participation is encouraged.

For further information contact:

Tad McGalliard or Bruce Clemens

(615) 974-4251

Fax: (615) 974-1838

September 25-27, 1995

International Petroleum Environmental Conference - Issues and Solutions in Exploration, Production and Refining

Location: New Orleans, Louisiana

The South-Central Environmental Resource Alliance

(SERA), The University of Tulsa Division of Continuing Education, PennWell Books, and the U.S. Department of Energy is sponsoring this conference. Papers are being solicited on NORM as well as other timely petroleum-related environmental problems to be explored in some depth.

For further information contact:

Dr. Kerry Sublette

Director of the Center for Environmental Research and Technology

The University of Tulsa, or

The University of Tulsa

Division of Continuing Education

600 South College Avenue

Tulsa, OK 74104-3189

(918) 631-3088 or (918) 631-2347

Fax: (918) 631-2154

January 7-10, 1996

The 29th Midyear Topical Meeting of the Health Physics Society, Naturally Occurring and Accelerator-Produced Radioactive Material (NARM): Regulation and Risk Assessment

Location: Scottsdale, Arizona

The following technical sessions are currently planned:

NARM: What is it and where is it? This session will provide an overview of NARM sources and applications.

NARM: Should it be a federal responsibility? This session will address the issue of potential federal intervention due to the ubiquitous nature of the material.

State regulatory measures. This session will highlight the progress that states have made in developing regulations applicable to NARM-related activities.

Challenges associated with discrete sources. This session will review the radiation protection challenges associated with the generation, use and disposal of discrete sources of NARM.

(Continued on page 13)

MEETINGS CALENDAR (Continued)

Challenges associated with diffuse sources. This session will review the radiation protection challenges associated with the generation, use and disposal of diffuse sources of naturally occurring radioactive materials (NORM).

Decontamination and decommissioning. This session will focus on the issues surrounding the decontamination and decommissioning of NARM facilities and sites, including risk assessment.

Occupational Radiation Protection. This session will consider the factors that influence occupational exposure and methods to monitor and reduce that exposure at NARM facilities.

Any Health Physics Society member may submit an abstract. Nonmember submittals are welcome but require member sponsorship. If a nonmember wishes to submit an abstract, I will be happy to serve as sponsor, or a member of the Symposia Committee would serve as sponsor. One problem -- abstracts must be received by June 15, 1995. I suggest if someone wants to submit an abstract and can't meet the deadline, contact Glenn Sturchio at (908) 504-6267 to see if an exception can be made. Further information can be obtained by contacting Sturchio at the above number.

January 29-February 2, 1996

ENERGY WEEK Conference & Exhibition.

The Conference will focus on the future of the oil, gas and petrochemical industries, featuring 7 information conferences, including PETRO-SAFE.

Location: Houston, Texas

The American Society of Mechanical Engineers International-Petroleum Division and the American Petroleum Institute are issuing a call for participation at the ENERGY WEEK Conference & Exhibition organizing sponsors of this 7th annual international event, both the ASME and the API are seeking papers relating to business, regulatory and technological changes effecting the oil, gas and petrochemical industries.

For further information contact:
Michelle Chappell
(713) 963-6215

May, 1996

American Industrial Hygiene Conference

Location: Washington, DC

The Ionizing Radiation Committee of the American Industrial Hygiene Association is soliciting papers, round table discussion topics, and training seminars (Professional Development Courses) to be presented at the Conference.

Ionizing radiation has traditionally been the domain of health physicists; however, now many industrial hygienists are being asked to be radiation safety officers or to become involved with radioactive materials in their assignments.

Deadline of submittal of abstracts is October 18, 1995 with notification of acceptance in early December. Additional information is available from Tom Roundtree at (904) 771-4711, or Norris Johnson at (803) 725-3018. Fax: (803) 725-7012.

RADIOACTIVE MATERIALS IN RECYCLED METALS

The number of incidences of radioactive materials getting into recycled metals is increasing and may require corrective actions to safeguard the public health and the environment. A recent paper in the *Journal of the Health Physics Society*, *Radioactive Materials in Recycled Metals* by Joel O. Lubenau and James G. Yusko (Health Physics, April 1995, Volume 68, Number 4, 440-451) does an excellent job of reviewing the incidence, probable causes, and consequences associated with radioactive sources that have made their way into recycled metals. Lubenau and Yusko estimate that for the period ending December 31, 1993 there have been hundreds of

instances in which radioactive material was discovered in recycled metal; and that might be a gross underestimate of the real situation. Radioactive material appearing in metal scrap includes sources subject to licensing under the Atomic Energy Act and also naturally occurring radioactive material (NORM).

Improvements in regulatory oversight by the government could stimulate improved accounting and control of radioactive sources. However, additional government effort in this area must be reconciled with competing priorities in radiation safety and budgetary constraints.

**ROUNDTABLE FOR REINVENTION -- SPONSORED BY THE NATIONAL ENVIRONMENTAL
POLICY INSTITUTE**

Roland Fletcher, past Chairman of CRCPD recently represented CRCPD at the "Roundtable for Reinvention." The conference involved many members of Congress and high-level government decision makers. Speaker of the House Newt Gingrich was a principal speaker and EPA Administrator Carol Browner was the luncheon speaker.

Fletcher expected to be overwhelmed with questions about what is being done in radiation control. However, the largest confrontation he had was to convince the nametag makers that the R in CRCPD did not translate to the Conference of RADON Control Program Directors. It appeared that there was so much focus on evaluating EPA regulations that the only radiation issues mentioned were radon (air and water), site cleanup standards, waste disposal guidance, and a little about radionuclide emissions.

In the Speaker's address, it was obvious that he sought to generate a different approach to environmental issues, as evidenced by the following statements:

- Superfund projects cost millions, but clean little

- For 29 years, environmental protection has meant bureaucracy, litigation and overregulation
- Environmental policy must fit into world policy; reassert civic responsibility

There were other similar statements made, but the direction was clear -- reduce, and in some cases eliminate, environmental regulations.

The Speaker was followed by many who were on both sides of the moratorium/federal regulations issue. A number of subsequent presenters pointed out the need for continued vigilance in environmental regulation, but also encouraged a thorough reconsideration of the old adage, "How clean is clean?" It is often easy to lose sight of a good solution, while searching for a perfect one.

Carol Browner made it clear that environmental policies have been largely successful and the administration is not willing to overlook past accomplishments and begin again. She acknowledged the need for a reevaluation, and perhaps redirection or revision, but assured the audience that wholesale abandonment would not occur. ■

Lionhead Engineering and Consulting Ltd.

Naturally Occurring Radioactive Barium Sulfate Scales present major environmental and health hazard problems in parts of Western Canada. Lionhead Engineering and Consulting Ltd. specializes in the SAFE HANDLING, REMOVAL AND DISPOSAL OF RADIOACTIVE BARIUM SULFATE SCALES.

Lionhead Engineering and Consulting Ltd. specializes in the removal of LSA radioactive scales from both surface and sub-surface equipment. Operations are conducted in a totally controlled environment where the radioactive scale and dust are collected in dry, wet and air filtration systems. After collection, the material is loaded in specially designed canisters for sub-surface disposal in specifically designated oil and gas wells that have been scheduled for abandonment.

In addition to removal, collection and disposal of radioactive scales, Lionhead Engineering and Consulting Ltd. specializes in the design of well bore abandonment programs including regulatory clearance for sub-surface disposal.

For more information or to discuss your needs, call or write:

Lionhead Engineering and Consulting Ltd.
203, 622-5th Avenue S.W.
Calgary, Alberta T2P 0M6
Tel: (403) 262-2694; FAX: (403) 237-7111

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 containerization 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 design and implementation relating to unique NORM problems

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

Mike McClure
 Selective Tools, Inc.
 11 Greenway Plaza, Suite 1712
 Houston, TX 77046
 (713) 626-0091 or FAX (713) 960-0832

REGULATIONS --- A TECHNICAL BASIS?

More is known about the potentially harmful effects of radiation than about almost any other toxic substance. Industry is now quite skilled at controlling these effects so that society can benefit from radiation's use. We trust that regulations promulgated to control these activities will be reasonable and -- at a minimum -- have a sound technical footing.

Some recent regulatory actions have caused us to question whether this expectation is being met. Two examples are the various existing and proposed state regulations for licensing and control of naturally-occurring radioactive materials (NORM) at oil field exploration/production sites, and the proposed "Environmental Protection Agency Radiation Site Cleanup Regulation." Are the technical bases for these regulatory positions sound? Do they draw appropriately from our current knowledge base? Are they applicable to the radiological conditions they purport to regulate? Or is it possible that standards without a defensible technical foundation have been or are about to be promulgated?

Carol Berger ---AAHP President ■

REMEDIED TANK BATTERY SITES

A recent article in the Journal of Health Physics discusses a radiological study of remediated sites in the Martha oil field in Kentucky. This article is entitled *Radiological Characterization of Remediated Tank Battery Sites* by M. B. Hebert, L. M. Scott and J. J. Zrake (Health Physics 68 (3):406-410; 1995). The remediation of the sludge pits associated with the tank battery sites consisted of the removal of soil and sludge from the pits with controlled land spreading to achieve biodegradation of the hydrocarbons. Radium soil concentrations were determined as a function of depth and external gamma exposure rates were determined at one meter above the surface. Radon flux measurements were made as well as radon emanation coefficients.

One of the conclusions of the study was that field radon flux emanation coefficient determinations were significantly lower than those which have been assumed as default values in computer models. Based on these data, the radon flux for petroleum production NORM at the Martha, Kentucky location does not contribute significantly to dose. ■

MATERIALS AND SOURCES ASSOCIATED WITH ELEVATED NORM LEVELS

The following is a listing of materials and sources associated with elevated NORM levels. The list is from the NORM-3 Report (1994) from the CRCPD E-4 Committee on NORM Contamination and Decontamination/Decommissioning whose charge includes preparation of reports and documents regarding technical NORM issues.

bauxite red mud	rear earth processing
niobium - tantalum	rock wool
copper	thorium
ion exchange	thorium contaminants
lignite	tin
monazite	titanium
oil production	uranium milling
-natural gas	uranium mining
-pipe scale	uranium recovery
-in pipe	waste water treatment
-released from rework	water treatment
-polyvinylchloride pipe	-alum
-produced waters	-granular activated charcoal
phosphate	-ion exchange media
-overburden waste rock	zircon
-phosphogypsum	-beach sands
-phosphate slag	-foundry casting
pumice and scoria	
radon	
radium and radon	
discrete radium	
-lightning rods	
-static eliminators	

PRIORITIES FOR NORM GUIDANCE

CRCPD's E-4 Committee also prioritized NORM materials and industries in its NORM-3 Report.

The prioritization of the hazards is made based on population exposure, typical activities and volumes of material. This resulted in the following list:

pipe scale
foundries
thorium
zirconium
sewage sludge
water treatment sludges, resins, activated charcoal filters
mineral extraction industries
fertilizer
phosphogypsum
phosphate slag
coal ash
red mud
other zircon
uranium and overburden
produced waters

NORM -- LEGAL LIABILITIES

Regulation of NORM establishes the definition, scope, and penalties associated with related legal liability. Due to the nature and variety of release mechanisms, NORM or NORM contamination has the potential to generate liabilities related to environmental damage and human exposure.

The potential for radiological exposure to the general public as well as to individuals in an occupational capacity adds further complexity to the

assessment of calculated dose, related health risks, and levels of responsibilities. An additional concern relates to the extension of current operating standards and the assignment of liability to past activities.

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THE PROBABILITY THAT A PARTICULAR MALIGNANCY MAY HAVE BEEN CAUSED BY A SPECIFIED IRRADIATION

Maintaining excellent

worker protection and

health and safety

standards in industrial

facilities where NORM

contamination exists or

will exist is not a serious

technical problem

Ionizing radiation is not generally known to leave a characteristic marker in those cells that are malignantly transformed and ultimately destined to become an overt malignancy. Thus, the most comprehensive medical examination, and accompanying laboratory tests done on a patient with a malignancy, however valuable they may be in determining the type and extent of the malignancy as well as its optimal treatment and prognosis, rarely provide definite information as to its causation.

As a result, it is not possible, on the basis of medical evaluation, to unequivocally prove or disprove a claim that a specific malignancy was caused by a specified radiation exposure. Therefore, another basis for judgement as to causation of the malignancy must be sought, despite the fact that new developments in molecular biology may ultimately link specific cancers with specific radiation exposures.

From *National Council on Radiation Protection and Measurements*,
Statement Number 7, Issued September 30, 1992. ■

EMPLOYEE NORM TRAINING

All employees whose work involves radiation and radioactive materials should be provided with initial training about the potential for exposure, the risks associated with exposure and the work practices and procedures to be followed to prevent or minimize exposure. The training should include topics such as these from NCRP Report No. 71 (NCRP, 1983):

- Characteristics of ionizing radiation
- Types of radiation that could be encountered and under what conditions
- How exposure might occur, internal and external
- Basic effects associated with radiation exposure, acute and chronic
- Basic protective procedures and practices, e.g., time, distance, shielding, work practices, protective clothing
- Radiation monitoring programs, surveys, effective dose, allowable limits
- Employee and organization responsibilities

- Emergency procedures

Written materials covering these topics can be valuable for distribution to the employees and testing can serve to document the employee's knowledge of the various topics. Periodic retraining is necessary, usually on an annual basis and provides an opportunity for employees to ask questions, offer suggestions and express any concerns about the radiation aspects of their work.

The extent and breadth of employee training will vary with job requirements and responsibilities. For an individual whose duties do not require presence in the radiation environment, a simple description of the working environment, protective measures to be taken and assurance of personal safety may be sufficient.

The supervisor should be responsible for ensuring that radiation workers receive any additional information required in the form of specific training on the proper procedures for their jobs. The material regarding radiation safety that is discussed in the general training program should be reviewed at these specific training sessions. The discussion should include the potential radiation hazards, the radiation control devices and the procedures particular to the employee's work, including monitoring techniques. ■

RADIATION SAFETY OFFICER

Employing a Radiation Safety Officer (RSO) is warranted for those industries where NORM contamination is a possibility, and where radiation exposure pathways are complex and difficult to control. At these facilities, the RSO should supervise the radiation safety program, providing technical advice as needed. To be fully effective, the RSO should report to senior management and have the authority to enforce radiation safety regulations and administrative policies at all levels of the organization. In addition, the RSO should be provided with adequate resources and not be assigned duties which may lead to a conflict of interest where radiation safety is concerned.

This level of authority does not, however, imply total responsibility. A radiation safety program is most effective only when everyone involved in operating the facility is committed to the same objective of

reducing risk to a level which is ALARA. The RSO's responsibilities, therefore, also include guiding the operations groups so that they consider measuring, evaluating and controlling radiological conditions whenever they are performing either their ongoing activities or planned changes. To be effective, the RSO may need to develop safety rules that are specific to that facility or organization.

The RSO should possess a combination of education, radiation protection experience and appropriate training consistent with the magnitude of potential radiation risk and the complexities of the specific program. In some facilities, one person may appropriately perform all the RSO and industrial hygiene or safety functions. Other facilities, particularly those which must deal with more varied sources of radiation, may require at least one professional with more specialized experience. ■

Stan A. Huber Consultants, Inc. (SAHCI)

Stan A. Huber Consultants, Inc. (SAHCI) has specialized for 25 years in providing full health physics support services to industrial facilities that use or may be contaminated with radioactive materials or NORM. We offer a full range of professional services including, but not limited to:

1. Providing professionally recognized radiological surveys of materials, equipment and facilities to define the true scope of any NORM contamination that may exist.
2. Preparing or assisting with licensing, permits, and regulatory compliance needs and documentation.
3. Providing health physics services, such as:
 - a. Decontamination/decommissioning projects. Termination of licensed facilities require that a close-out radiation survey be made to ensure that the facility is free of NORM contamination and can be released for unrestricted use.
 - b. Certified calibration of NORM survey meters (required by regulations to be done every 6 or 12 months).
- c. Soil and water analyses.
- d. Routine radiation surveys.
- e. Radiation safety programs.
4. Drum or container packaging and transport arrangements (including manifesting, labeling, load preparation, etc.) can be done for each shipment of NORM wastes.
5. Providing on-the-job training for your personnel to assume the radiation survey requirements and the shipping functions for continuing NORM disposal projects.
6. Coordinating decontamination projects and acting as liaison between waste removal personnel, facility management, and regulatory agencies.

We can provide references of previous projects.

If any of these services are of interest, or if you would like a no-obligation discussion or additional information, please contact our office by phone (815/485-6161), FAX (815/485-4433), or by letter to:

Stan A. Huber Consultants, Inc.
 200 North Cedar Road
 New Lenox, IL 60451-1751

RADIATION SAFETY COMMITTEE

In some cases, management should establish a radiation safety committee to help define program scope and enhance their ability to review a program's effectiveness. This committee may be set up for any facility but is especially useful in those cases where potential radiation exposures approach the dose limits. The Radiation Safety Officer may work with and be an *ex-officio* member of this committee, normally composed of several people aware of the facility's radiation protection programs and needs. For example,

the committee might include supervisors of maintenance, production and engineering. It should review radiation safety analyses of operations and facility operating procedures, assessing the need for increased management attention to the radiation safety program. It may also review specific radiation safety issues, providing advice on how to reduce radiation exposure, and work on improving communications between employees and facility management. ■

**THERE IS NO QUESTION THAT AFFECTED INDUSTRIES ARE CAPABLE OF THE
 SAFE MANAGEMENT, CONTROL, REMEDIATION AND DISPOSAL OF NORM.**

Campbell Wells Corporation

Campbell Wells Corporation, a wholly owned subsidiary of Sanifill Inc. began receiving NORM wastes for treatment and disposal in May 1994 at its facility located near Lacassine, Louisiana. The Lacassine facility is designed to treat non-hazardous oilfield waste (NOW) contaminated with naturally occurring radioactive material (NORM). This commercial facility, the first of its kind in the United States, is permitted to receive NOW-NORM generated throughout Louisiana, other states, and the Outer Continental Shelf.

The permits issued to the Lacassine facility by the Louisiana Department of Natural Resources and the Louisiana Department of Environmental Quality (LADEQ) specify that the facility may receive NOW-NORM that contains not more than 200 picocuries of radium per gram (pCi/gm). The waste material will be treated at the Lacassine facility to (i) bring the NOW element of the wastes to the "reusable material" standards as specified in Order 29-B and monitored by the LADEQ, and (ii) reduce the radium content of the NORM wastes to levels that do not exceed 5 pCi/gm above radium background concentrations in the vicinity. This will qualify the treated waste materials for "unrestricted transfer" as defined in the LADEQ's regulations for the control of NORM.

NOW-NORM waste materials containing radium in excess of 200 pCi/gm, other NORM-contaminated oilfield wastes, and NORM-contaminated materials not associated with oilfield wastes may be managed through Campbell Well's Sunrise Supply Limited facility. Sunrise Supply is the only LADEQ licensed commercial storage facility in Louisiana. Through the combination of the new Lacassine NORM facility and the Sunrise Supply storage facility, Campbell Wells provides the oil and gas industry with a comprehensive program for compliance with NORM regulations.

For additional information on the NORM services provided by Campbell Wells, contact:

Sammy Cooper or Jerry Brazzel at (318) 981-4004

STUDY LINKS RADON GAS TO LUNG CANCER

Up to one-tenth of U.S. lung cancer deaths may be caused by radon gas in homes, according to an analysis of how the radioactive radon affects miners.

A study in the *Journal of the National Cancer Institute* (as reported in the June 6, 1995 issue of the *Tulsa World*) said radon, seeping into homes from the ground, may cause about 14,400 lung cancer deaths in the United States, and may be responsible for up to 30 percent of lung cancers among nonsmokers.

The conclusions are based upon an analysis of 11 studies of lung cancer among hard-rock miners who were exposed to radon while at work. By relating the rate of exposure to radon among miners and their rate of lung cancer, the researchers were able to estimate the number of lung cancers that may be caused by residential radon exposure.

But the authors of the report added that the estimates

"should be interpreted with caution" because miners are also exposed to other chemicals, such as diesel exhaust, that could affect their lung cancer rates.

Jay Lubin, a National Cancer Institute researcher said the new study confirms an earlier, smaller study that first suggested the hazard of radon in the home. He said the earlier study was based on 360 lung cancer deaths among miners.

The new study analyzes 2,700 lung cancer deaths among miners and examines the underground radon risks of about 65,000 workers.

Based on the miners' experience and the estimated radon levels in American homes, Lubin said, the radioactive gas in residences causes about 4,700 lung cancer deaths among nonsmokers and about 9,700 among smokers.

(Continued on page 22)

**STUDY LINKS RADON GAS TO LUNG
CANCER (Continued)**

Over 149,000 Americans died of lung cancer in 1993, about 85 percent of those deaths were attributed to smoking.

The study suggested strongly that residents who live in homes with more than 4 picocuries radon per liter of air to have a sharply increased risk of lung cancer. The risk is particularly increased for nonsmokers, he said.

Dr. Samet of Johns Hopkins University, an expert on radon, said the new study strengthens the evidence that underlies the EPA recommendations about radon.

The report supports the idea that everybody should test for radon, he said.

He said radon levels should be measured over several months because the level of radon can change season to season.

Dr. Samet's note: The conclusions of the above study are in contrast with several other studies, for example, with the research of Professor Bernard Cohen of the University of Pittsburgh. One of Professor Cohen's major conclusions was that radon concentrations above and below about 8 picocuries per liter of air did not lead to an increase in the lung cancer rate. ■

LOW-LEVEL RADIATION -- RISK OF CANCER

The abundant recent evidence that biological defense mechanisms are stimulated by low-level radiation. Several studies have shown that the number of chromosome aberrations induced by a high dose of radiation is substantially reduced by pre-exposure to a low dose.

For example, the number of chromatid aberrations in marrow cells in mice induced by 65 rad of X-rays was reduced roughly in half by pre-exposure three hours prior to 0.2 rad of X-rays. ■

**NORM and NORM
contamination are to be
respected, but not feared**

 **NORM SERVICES**

- Complete NORM Radiological and Environmental Services
- Safe & Effective Solutions from Identification through Disposal
- Surveys & Site Assessments
- Specifically Licensed Permanent Facility & Offsite Activities
- Tubular Cleaning
- Vessel Decontamination
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- NORM/NOW Remediation & Pit Closures
- Certified Radiological Laboratory
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- Consulting Engineering
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The NORM Report

The NORM Report is published four times a year by Peter Gray & Associates. It is available by subscription for \$95 a year or \$49 a year for government and non-profit organizations. Single copies are available for \$35 an issue.

Peter Gray & Associates
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Tulsa, OK 74147

(918) 492-5250 or FAX (918) 492-4959

Comparison of NORM Rules by State

Radium Exemption Concentration

AR	5 pCi/g
GA	5 pCi/g with high radon factor ⁽¹⁾ 30 pCi/g with low radon factor ⁽²⁾
LA	5 pCi/g above background
MS	5 pCi/g with high radon factor 30 pCi/g with low radon factor
TX	5 pCi/g with high radon factor 30 pCi/g with low radon factor
CO (proposed)	5 pCi/g
MI (proposed)	5 pCi/g
NM (proposed)	30 pCi/g
OK (proposed)	30 pCi/g
SC (proposed)	5 pCi/g with high radon factor 30 pCi/g with low radon factor
CRCPD (proposed)	5 pCi/g

(1) High radon factor is a radon emanation rate greater than 20 pCi per square meter per second.

(2) Low radon factor is a radon emanation rate less than 20 pCi per square meter per second.

Radium Cleanup Standard

AR	5/15 pCi/g ⁽³⁾
GA	5/15 pCi/g with high radon factor 30/15 pCi/g ⁽⁴⁾ with low radon factor
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
MS	5/15 pCi/g with high radon factor 30/15 pCi/g with low radon factor
TX	5/15 pCi/g with high radon factor 30/15 pCi/g with low radon factor
CO (proposed)	5 pCi/g
MI (proposed)	5/15 pCi/g
NM (proposed)	30/15 pCi/g
OK (proposed)	30/15 pCi/g
SC (proposed)	5/15 pCi/g with high radon factor 30/15 pCi/g with low radon factor
CRCPD (Proposed)	5/15 pCi/g

(3) 5/15 pCi/g is 5 pCi/g 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.

(Continued on page 25)

REGULATORY EFFORTS

The unwarranted fears of radiation expressed by many people and the good intentions of government agencies to accommodate such public concerns is recognized.

Hover, it is in the public's best interest to follow nationally recommended limits based on scientific recommendations developed through an impartial consensus process.

It is essential for our credibility that we do not become so narrowly focused that we cannot deal responsibly with total risk. ■

NORM Training Course Offered by OGCI & Peter Gray

OGCI (Oil & Gas Consultants International, Inc.), a world leader in petroleum training, has scheduled training courses in NORM control for 1995. The course *NORM Contamination in the Petroleum Industry* will cover all aspects of NORM contamination and its control, including:

- Fundamentals of Radiation
- Fundamentals of NORM
- NORM (Radium) Contamination
- NORM (Radon) Contamination
- State and Federal Regulations
- NORM Surveys including hands-on practice
- Maintenance Procedures
- Disposal of NORM Wastes
- Decontaminations
- Release of Facilities
- Recommended Programs

This course builds a rigorous and complete foundation for the control of NORM contamination. The 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 contamination in the petroleum industry. 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 retirement in 1985. This background uniquely qualifies Dr. Gray as an instructor of the course -- an instructor who understands the origins of NORM, why it contaminates nearly every oil and gas facility, where the contamination occurs, how to set up programs which protect employees, company facilities, the environment and the public, how to survey for NORM contamination, the available options for the disposal of NORM contaminated wastes, and the federal and state regulations for the control of NORM. The course meets all requirements for Radiation Safety Officer training as outlined by Louisiana's DEQ.

Peter Gray is the editor/publisher of *The NORM Report*.

The 1995 schedule for the course *NORM Contamination in the Petroleum Industry* is:

Oct. 17-20	Calgary
Nov. 7-10	Houston

For further information about the course, contact Joseph Goetz, Vice President, OGCI, 1-800-821-5933. Or contact Peter Gray at 918-250-6042 for additional information about the course content. ■

Comparison of NORM Rules by State (Continued)

Exemption for Contaminated Equipment

AR	Concentration limit only (5 pCi/g)		disintegrations per minute ⁽⁵⁾
GA	50 µR/hr including background	NM (proposed)	50 µR/hr including background
LA	50 µR/hr including background	OK (Proposed)	50 µR/hr including background
MS	25 µR/hr above background	SC (Proposed)	50 µR/hr including background
TX	50 µR/hr including background	CRCPD (Proposed)	Concentration in dpm
CO (Proposed)	Concentration limit only (5 pCi/g)		(5) Before release for unrestricted use, facilities or equipment contaminated with NORM should not exceed specified contamination limits in dpm/100 sq. centimeters.
MI (Proposed)	Concentration limit only in		