

AGENDA

**Formerly Utilized Sites Remedial Action Program Committee
of the
Environmental Management Advisory Board**

**Monday, June 19 - Wednesday, June 21, 1995
St. Louis, Missouri**

Monday June 19, 1995

Meet in lobby of Henry the VIII Hotel

1:00 p.m. Tour of St. Louis Sites

Tuesday, June 20, 1995

Main Ballroom

8:30 a.m. Chairman Opens Public Meeting

- ▶ **Introductions/Opening Remarks**
- ▶ **Overview of Findings from May 2-3 National Stakeholders Meeting**
- ▶ **Potential Issues for Discussion**

9:30 a.m. Briefing on Effective Department of Energy Technologies/discussions

10:30 a.m. Break

10:45 a.m. Environmental Protection Agency Briefing and Discussion

12:00 p.m. Lunch

1:00 p.m. Presentation Issue Papers

3:00 p.m. Break

3:15 p.m. Committee/Public Discussion of Issues

5:00 p.m. Break for Dinner

7:00 p.m. Public Comment Session

8:00 p.m. Meeting Adjourns

Wednesday, June 21, 1995**Main Ballroom****8:30 a.m. Chairman Reconvenes Public Meeting****8:35 a.m. National Stakeholder Forum Issues**

- ▶ **Values In Common**
- ▶ **Equity Issues**
- ▶ **Protection of Health and the Environment**
- ▶ **Community Involvement in the Decision Making Process**

10:00 a.m. Break**10:15 a.m. Continued Discussion of Issues and Public Recommendations****12:00 p.m. Lunch****1:00 p.m. Discussion/outline of Potential Guiding Principles**

- ▶ **Performance Based/Numerical Concepts**
- ▶ **Clean-Up Goals**
- ▶ **Waste Management Alternatives**
- ▶ **Institutional Issues**

2:30 p.m. Break**2:45 p.m. Committee Business**

- ▶ **Next meeting/Conference Calls**
- ▶ **Assignments/time frames**
- ▶ **Second National Stakeholders Forum**

3:15 p.m. Public Comment Session**4:00 p.m. Meeting Adjourns**

FORMERLY UTILIZED SITES REMEDIAL ACTION PLAN (FUSRAP) COMMITTEE

Committee Members & Affiliations

Mr. John Applegate*
University of Cincinnati
College of Law

Ms. Eva Crim
Dow ELANCO

Dr. Robert English
Consumer Power Company

Dr. Tom Gesell
Idaho State University
Department of Physics

Mr. Harlan Keaton
Environmental Radiation Control

Dr. James E. Martin**
University of Michigan
Department of EIH-EHS

Mr. Robert H. Neill
Environmental Evaluation Group

Ms. Sally Price
St. Louis Task Force

Mr. Ron Ross*
Western Governors' Association

Dr. Frank Parker*
Vanderbilt University

Ms. Joan Sowinski
Colorado Department of
Public Health and Environment

AGENDA

Tuesday, June 20, 1995

- 8:30 a.m. Chair Opens the Meeting
- Overview of Findings from the May 2-3, 1995 National Stakeholders Meeting in Washington
- 9:30 a.m. Briefing on effective Department of Energy Technologies/discussion
- 10:45 a.m. Environmental Protection Agency Briefing and Discussion
- 1:00 p.m. Presentation of Issue Papers
- 3:15 p.m. Committee/ Public Discussion of Issues
- 5:00 p.m. Dinner Break
- 7:00 p.m. Public Comment Session
- 8:00 p.m. Meeting Adjourns

Wednesday, June 21, 1995

- 8:30 a.m. Chair Reconvenes Public Meeting
- 8:35 a.m. National Stakeholder Forum Issues
- 10:15 a.m. Continued Discussion of Issues and Public Recommendations
- 1:00 p.m. Discussion/ Outline of Potential Guiding Principles
- 2:45 p.m. Committee Business

* Member of the Environmental Management Advisory Board

** Committee Chair

**U.S. Department of Energy
ENVIRONMENTAL MANAGEMENT ADVISORY BOARD**

June 1995

FORMERLY UTILIZED SITES REMEDIAL ACTION PLAN (FUSRAP) COMMITTEE

► **About the Committee**

The Committee, working with the National FUSRAP Stakeholders Forum, will propose a set of general principles for guiding the implementation of the Department's FUSRAP efforts. The principles will promote consistent and cost effective remedies across the FUSRAP projects.

► **Who?**

The U.S. Department of Energy Environmental Management Advisory Board Formerly Utilized Sites Remediation Action Plan Committee

► **Where?**

Henry VIII Hotel
4690 North Lindbergh
St. Louis, Missouri 63044
(314) 731-3040, extension 6186

► **When?**

Tuesday, June 20, 1995
8:30 a.m. to 8:00 p.m.

Wednesday, June 21, 1995
8:30 a.m. to 4:00 p.m.

For Further Information?

Contact James T. Melillo
Executive Director
Environmental Management
Advisory Board, EM-5
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Washington, D.C. 20585
(202) 586-4400

Internet address is:
James.Melillo@em.doe.gov

Please, phone 1-800-832-0885
to register to speak at the Public
Comment session to be held at
7:00 p.m. on Tuesday, June 20,
1995

**FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM COMMITTEE
MEMBERS & AFFILIATIONS**

Mr. John Applegate
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College of Law

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Dow ELANCO

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Ms. Joan Sowinski
Colorado Department of Public Health and Environment

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Members of the Environmental Management Advisory Board

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Mr. Bradley Sant

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Mr. Ben Smith

Consultant

Dr. Jay Sorenson

Vice Chairperson
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Sierra Club

Mr. Robert Wages

Oil, Chemical & Atomic Workers (OCAW)
International Union, AFL-CIO

Mr. Thomas Winston

Coordinator
Solid and Waste Management Activities
Ohio Environmental Protection Agency

*Co-Chairs

EMAB Update

April 1995

Environmental Management Advisory Board



- In January 1992, the U.S. Department of Energy established the Environmental Restoration and Waste Management Advisory Committee.
- It was established in accordance with the Federal Advisory Committee Act (FACA) and charged with providing advice and recommendations to the Assistant Secretary for Environmental Restoration and Waste Management on the Programmatic Environmental Impact Statement (PEIS), as well as other Environmental Restoration and Waste Management issues as requested by the Assistant Secretary.
- The Committee was rechartered in January 1994, as the Environmental Management Advisory Board (EMAB).
- The Board currently operates as a "board of directors" to the Assistant Secretary for Environmental Management (EM) providing advice and recommendations on a broad range of issues confronting the program, including the PEIS.
- The Board is comprised of representatives from Tribal, state and local governments, environmental and citizen activist groups, labor organizations, other federal agencies, and scientific and academic communities.
- The Board has established the following Committees to address key issues affecting both the department and EM. The findings, recommendations and/or work products of each Committee will be forwarded to the Board for consideration. Recommendations approved by the Board will be forwarded to the Assistant Secretary for Environmental Management.

Committees

Cost Effective Cleanup:



The Committee will help develop criteria for cost effective cleanup priority setting, and will review ongoing cost savings studies and downsizing efforts by EM. Three subcommittees have been formed to address lessons learned from past cost analyses, criteria for priority setting, and EM costs.

Technology Development and Transfer:



The Committee will develop implementable recommendations that can facilitate the development and commercialization of environmental technologies capable of addressing the Department's environmental problems.

Risk Management:



The Committee will provide advice to the Department regarding its June Report to Congress and on general risk management issues. Two subcommittees have been formed: one subcommittee to address the peer review strategy and stakeholder process for the June Report, and a second to comment on the Risk Principles and to develop a white paper on risk. Both subcommittees are following the risk legislation before the Congress.

Programmatic Environmental Impact Statement (PEIS):



The Committee provided substantive written comments on issues impacting the PEIS, which would consider how to manage subject wastes and analyze alternative sites at which the wastes could be managed in the future. The Committee will continue to provide advice and recommendations on the scope and process for the PEIS.

National Environmental Policy Act (NEPA):



The Committee is reviewing the Department of Energy's NEPA policy and the status of its implementation. The Committee expects to review the NEPA guidance and procedures for the Environmental Management program, and to review the role of public participation in the NEPA process.

Worker Health and Safety:



The Committee is in the process of reviewing a comprehensive safety and health strategy for EM and issues associated with managerial accountability and institutionalizing worker health and safety programs/policies.

Formerly Utilized Sites Remediation Action Plan (FUSRAP):



The Committee, working with the National FUSRAP Stakeholders Forum, will propose a set of general principles for guiding the implementation of the Department's FUSRAP efforts. The principles will promote consistent and cost effective remedies across the FUSRAP projects.



Did You Know?

The total gross area, in acreage and square footage of buildings, for which the Environmental Management program is responsible is equal to the total area of the States of Rhode Island and Delaware and the District of Columbia.

For Further Information Contact:

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Final Draft

WORKING DOCUMENT

and

ISSUE PAPERS

Resource Materials

for

FUSRAP Committee Meeting

Environmental Management Advisory Board

St. Louis, MO

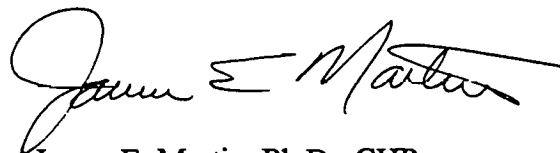
June 20-21, 1995

PROLOGUE

The FUSRAP Committee of the Environmental Management Advisory Board (EMAB) offers this working document and set of issue papers to persons interested in resolving the legacy of FUSRAP sites relative to national and local interests. Readers should remember that it is a working document on issues and was prepared to elicit focussed discussion; thus, the language and concepts are presented for this purpose and will surely change as the process of developing guiding principles proceeds.

Comments can be made at the public meeting in St. Louis, Missouri on June 20-21, 1995, to any committee member during and subsequent to the meeting, or in writing to Mr. James Melillo, Executive Director, EMAB, U.S. Department of Energy, 1000 Independence Avenue, Washington, D.C. 20585; or by Fax at (202) 586-0590.

The FUSRAP Committee seeks input and looks forward to productive interaction with those who want to participate.

A handwritten signature in dark ink, appearing to read "James E. Martin", is written in a cursive style.

James E. Martin, Ph.D., CHP
Chair

BACKGROUND AND PURPOSE

The St. Louis, MO meeting of June 20-21 is the third session involving members of the committee formed to address guiding principles for the formerly utilized Sites Remedial Action Project (FUSRAP) formed by the Environmental Management Advisory Board (EMAB). The FUSRAP committee, through EMAB, advises the Assistant Secretary for Environmental Management (EM) of the U.S. Department of Energy (DOE).

The first FUSRAP Committee meeting was held April 2-3, 1995 in Washington, D.C. to get organized, set directions, and establish a process for broad public involvement in developing guiding principles for remediation of FUSRAP sites (see Appendix A - Meeting Minutes). There was clear consensus that interests of the affected public and other stakeholders was of major importance to the process; thus, several FUSRAP committee members and support staff, in a second session, attended the National Stakeholders Conference on FUSRAP held May 2-3, 1995 in Washington, D.C. to define related issues. Both of these earlier meetings provided guidance for issues to be addressed by the FUSRAP Committee.

The purpose of this document is to provide working materials that will be considered by the FUSRAP Committee as it begins to address the issues that are fundamental to assuring that actions taken at FUSRAP sites are protective of public health and the environment and are sensitive to other values held by stakeholders.

Issues Papers for the St. Louis meeting are included herein. They address the major issues related to guiding principles defined by National Stakeholders Conference and other matters discussed in the first FUSRAP Committee meeting. The issue papers were developed for

FUSRAP wastes and materials only since that was a consensus of the stakeholders conference and the FUSRAP Committee. The issue papers summarized in later sections of this document are:

1. For FUSRAP materials, what are the radioactive constituents, levels, and mobility; and what are likely radiation exposures?
 - *2. Cleanup Criteria: agencies; how expressed; applicability to FUSRAP; precedents.
 - *3. Remedy Selection/Effectiveness
 - Treatment options; effectiveness; costs
 - *4. Community involvement/acceptance for remediation
 - Cleanup Priorities
 - Dialogue
 - Community Information
 5. How long for institutional controls, risk assessments.
 6. Health Risks and Costs
 7. How to Formulate Principles
- *From National Stakeholders Conference

Current Status

The majority of the FUSRAP sites are the result of national defense in wartime. Others, primarily rare earth processing from U and Th, were added by the Congress to assure that a national focus was available to assure their restoration. Under these circumstances, both the government and the public are to be commended in attempting to resolve environmental and public issues for these sites that would be otherwise abandoned as many other industrial and developmental activities have been, e.g. old radium industry sites.

Progress to date in remediation of FUSRAP sites has, in general, accomplished cleanup and removal at the less complicated sites, but has a ways to go at the larger, more complex sites. In the absence of basic guides/principles that specifically address remediation requirements, the majority of the sites have been and continue to be cleaned up using a variety of criteria. The lack of specific principles for FUSRAP sites has led to confusion and public concern, increased costs with marginal increases in protection levels, and delays in accomplishing necessary cleanups. In general, FUSRAP sites are not presently occupied by the public but some sites contain industrial or commercial activities where some awareness of controls could be assured.

EMAB Activities

Within the framework of issues identified to date the EMAB FUSRAP Committee appears to have a charge not only from EMAB and DOE but from involved stakeholders. Consequently, the Committee will use the issues and information from the National Stakeholders Conference as it begins its deliberations in St. Louis on guiding principles. This meeting is held in a local area to gain input from involved citizens in order that the principles address such concerns. A future meeting(s) will be held in another local area(s) before a final draft is developed. When draft principles are developed, these will be reviewed in a national forum similar to the National Stakeholders Conference with ample opportunity to influence the final recommendations to DOE. This document thus begins the process of defining the issues that need to be addressed as FUSRAP principles are developed. We should note that this process is for developing principles. It may not provide all the process necessary to carry through to selection of remedies and community acceptance of them; thus, it may be necessary to develop further activities to ensure that such dialogue occurs.

ISSUES FROM NATIONAL STAKEHOLDERS CONFERENCE

The conference used a consensus process to develop the various values, expectations, and key issues of the participants. The 60 or so attendees represented various local, governmental, and industry interests with particular emphasis on representation from Missouri, New York, and New Jersey. Five FUSRAP committee members and four support staff attended the conference to gain perspective on the issues discussed and the defining issues selected by the conference. Most of these issues are appropriate for consideration in developing guiding principles. Some, such as the funding initiative, are best addressed in other ways as suggested by the conference.

Expectations and Values

Expectations of conference participants were solicited and although the list of specifics was long, expectations appeared to center on the following concepts:

- Get on with it; make commitments and get something done.
- Step back and look where we're going.
- Consistency and a national perspective.
- Understand and address differing standards and regulations; involve necessary groups to do so.
- Solutions - DOE and local roles.
- Public process/dialogue with local communities; consensus from bottom up.

Values in Common among all working groups were recognized by the Conference as follows:

- Stakeholder teamwork/honest and open communication.
- Protection of human health and environment for current and future generations.

- Optimal use of resources
- Community acceptance
- Fairness/equity across community
- Implementable in a timely fashion

The Missouri Group values reflected this broader set of values; the New York and New Jersey values were also similar. The values identified by the Missouri group are:

- Protect human health and safety for present and future.
- Community sustainability: consider socio-economic impact on involved community.
- Investment of resources for greatest benefit to public welfare.
- Inclusion of community - open dialogue across all stakeholders.

Defined Issues

Issues in Common were developed by the conference attendees from a more detailed list.

Those issues of most importance were determined to be:

- Funding
- Clean-up criteria
- Clean-up priorities
- Remedy selection/effectiveness
- Community acceptance

The values, expectations, and issues in common defined by the conference trend toward broader community values such as land values, image related to having radioactive materials in the community, interests in actions to remove these impacts. Although a defined value related to

radiation risks is "protection of health and safety for present and future" concerns about risks did not appear to be dominant. This perspective is perhaps due to several decades of experience with the FUSRAP sites; in any case setting a direction, establishing priorities, and getting progress made were obviously of considerably more interest to representatives from the various communities. Because of this interest, it is important that guiding principles for FUSRAP be broad enough to be responsive to these other aspects rather than just traditional radiation safety considerations.

The specific issues, values, and expectations defined by the Missouri Group reflect this perspective of local interests. The Missouri Group's specific issues are:

- Concern that alternatives would not protect nearby residents and environment; uncertainty regarding risks.
- Lack of sufficient funding
 - national total
 - site specific allocations
- Disagreement over cleanup levels/objectives
- Availability/consequences/viability/acceptability of technologies
- Concern for permanence of alternative: that "Interim" becomes permanent
- Unwillingness to compromise/negotiate

Also related to the desire for early and effective progress, the stakeholder conference identified major actions for the EMAB FUSRAP Committee to undertake to move forward on the issues identified. The most important function that the committee can play, obviously, is to create the national framework for decisions by making some of the difficult decisions that simply cannot be made at the site level. It is essential that the Committee and DOE have a logical and fair

framework for decision making that establishes which materials need to be removed and conditions to allow certain circumstances to exist for local management without compromising health and safety or other community values. There should be some cut-off level of contamination; below which soils should be managed locally and above which soils can be disposed remotely. This cutoff should be tied to a particular land use, residential or industrial, and a number of incentives could be created for communities which choose to manage higher level materials locally or regionally resulting in cost savings to the program. Such a program would have to be worked from the ground up in conjunction with stakeholders if their expressed requirement of community acceptance is to be met.

ISSUE PAPER #1

FUSRAP MATERIALS

Issue: What are constituents of FUSRAP materials, concentrations, and potential exposures.

Significance: Guiding principles for assuring proper management of any radioactive material rests on an evaluation of actual and/or potential risks and since these are related to radioactivity content, development of FUSRAP principles requires consideration of the nature of the materials at the various sites.

Analysis: (to be supplied by Oak Ridge program office).

ISSUE PAPER #2

CLEANUP CRITERIA

Issue: Need to address cleanup criteria for FUSRAP materials specifically, considering precedents, national and international agencies involved, and alternative forms.

Stakeholder Conference Recommendation: Develop a consistent methodology to establish uniform cleanup criteria based on current and future land use. The conference determined that the EMAB FUSRAP Committee should take the lead on developing cleanup criteria according to the Action Plan shown in Figure 1.

Background and Precedent

Few radiation protection standards developed under current federal statutes expressly apply to the cleanup of radioactively contaminated sites. The principal exception is EPA's uranium mill tailings standards at 40 CFR part 192. Sites that are listed on the National Priorities List (NPL) and removal actions are cleaned up following the procedures in CERCLA's National Oil and Hazardous Substances Contingency Plan (NCP) in 40 CFR part 300.

Several federal regulations and guides (see Fig. 2) control radiation exposure of the general public, primarily from facility operations. Some of these apply to all pathways; others address waste management or limited pathways, i.e. air, water, groundwater. The major regulations, guidance documents, and advisories are consistent with recommendations of the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection (NCRP), the U.S. counterpart to the ICRP. The International Commission on Radiological Protection (ICRP) is an international organization dating back to 1927, first established by the International College of Radiology to provide radiological measurement and protection recommendations for uses of x rays and radium. In its Publication 26 (1977) the ICRP

Fig 1: Action Plan

(Sub-Team Name/Issue Area: Cleanup Criteria)

Action	Responsibility	Due By	Remarks
Develop FUSRAP - Specific standards & this conference recommend agency responsibility	EMAB	2/97	Identify individuals with policy-making authority & technical expertise
a) EMAB to asses feasibility of FUSRAP - specific standards		9/95	
b) EMAB to secure commitment from all agencies to fully participate/support	DOE, EPA, States, NRC, Health, ATSDR, Others?	12/95	
c) Convene (source list as b) above)	DOE, EPA, States, NRC, Health, ATSDR, Others?	2/96	
d) EMAB to report status at next FUSRAP conference	EMAB	FUSRAP Conference	

Fig. 2

Summary of Major Radiation Standards, Orders, and Guidance

Agency/ Type of Standard	EPA	DOE (For Facilities Not Licensed by NRC)	NRC (For NRC Licensees)	Other Standards and Guidance
Standards that Apply to Radiation Cleanups	<ul style="list-style-type: none"> • Health and Environmental Standards for Uranium and Thorium Mill Tailings (40 CFR part 192) • National Oil and Hazardous Substances contingency Plan (NCP—40 CFR 300) (applies to sites on Superfund's national priorities List (NPL) or sites being cleaned up under Superfund's emergency response provisions) 	<ul style="list-style-type: none"> • DOE 5400.4, "Comprehensive Environmental Response, Compensation, and Liability Act Requirements" (establishes DOE policy for compliance with CERCLA) 	<ul style="list-style-type: none"> • NRC is planning to publish proposed decommissioning standards shortly 	
Standards that Apply to Radiation Exposure During Facility Operations	<p><u>Multiple Pathways</u></p> <ul style="list-style-type: none"> • EPA Radiation Protection Guidelines for General Population Exposure (applies to all Federal facilities) <p><u>Single Media</u></p> <ul style="list-style-type: none"> • National Emission Standards for Hazardous Air Pollutants (NESHAPS, 40 CFR part 61) (applies to NRC and DOE facilities) • National Interim Primary Drinking Water Regulations (40 CFR part 141, subpart D) 	<p><u>Multiple Pathways</u></p> <ul style="list-style-type: none"> • DOE 5400.5, "Radiation Protection of the Public and the Environment" • Proposed Radiation Protection Standards (10 CFR part 834, 58 FR 16268, March 25, 1993) 	<p><u>Multiple Pathways</u></p> <ul style="list-style-type: none"> • Radiation Protection Standards (10 CFR part 20) 	<p><u>Multiple Pathways</u></p> <ul style="list-style-type: none"> • Standards recommended by the International Commission on Radiological Protection (ICRP) • Standards recommended by the National Council on Radiation Protection and Measurements (NCRP) • Standards recommended by the International Atomic Energy Agency (IAEA)
Standards that Apply to Radioactive Waste Management	<ul style="list-style-type: none"> • Health and Environmental Standards for Uranium and Thorium Mill Tailings (40 CFR part 192) (applies to active NRC licensees and inactive DOE sites) • High-Level Waste Rule (40 CFR part 191) 	<ul style="list-style-type: none"> • DOE 5820.2A— Management of Byproduct Material and NARM Waste 	<ul style="list-style-type: none"> • Low Level Waste Standards (10 CFR part 61) 	

*Proposed 40 CFR part 141—EPA Drinking Water Standards for Radionuclides also set standards to control concentrations of radiation levels in the environment. The standards apply to drinking water sources.

provided radiation dose limits for routine and planned special exposure of workers, which was the first explicit attempt to justify radiation exposure guides with quantitative levels of acceptable risk.

EPA regulatory programs are carried out under authority granted in the Atomic Energy Act; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Safe Drinking Water Act; Toxic Substances Control Act; Clean Air Act; Uranium Mill Tailings Radiation Control Act (UMTRCA); and other statutes.

In 1994, EPA proposed Radiation Protection Guidance (RPG) for protecting the general public under the EPA Administrator's authority to "advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States." The guidance, which applies to all pathways and Federal agency programs, limits exposure to members of the public to an annual effective dose equivalent of 100 millirems from all sources; this guide is provided in the context of the following recommendations:

1. There should be no exposure of the general public to ionizing radiation unless it is justified by the expectation of an overall benefit from the activity causing the exposure.
2. Individual doses should be maintained As Low As is Reasonably Achievable (ALARA). In other words, exposure to ionizing radiation and releases of radioactive materials should be reduced as far below regulatory limits as is reasonably achievable considering economic, technical, and social factors.

3. Federal agencies should implement the risk-weighted dose limitation system developed by the International Commission on Radiological Protection (ICRP) in 1977. This risk-weighted dose limitation system takes into account the individual contribution of each exposed part of the body to total risk. The risk limit is expressed in the sum of weighted dose equivalent to all parts of the body, called effective dose equivalent, and distributes the dose among various organs and tissues and their assumed relative sensitivity and hereditary effects.
4. Authorized limits for sources should be established to ensure that individual and collective doses in populations satisfy the objectives of the guidance. Also, the sources of radon at facilities should conform to authorized limits.
5. Members of the public should become constructively involved in the decision-making process and in influencing the public policy issues that affect them.
6. Control of exposure of the public should normally be ensured through knowledge of releases from sources and modeling of environmental transport.
7. Exceptions to planned exposures of radiation should be made only for highly unusual circumstances. Federal agencies should carefully consider the balance of the guidance, and make a public record of any authorized exception of Recommendation 3.

Site Cleanup Regulations

Cleanup of many sites has used the standards under Title I of UMTRCA (40 CFR part 192) as applicable, relevant, and appropriate requirements (ARARs). These standards apply to

inactive uranium milling sites and vicinity properties, and they limit the concentration of radium-226, and 228 within 15 cm of the surface to no more than 5 pCi/g above background levels; below 15 cm the limit is 15 pCi/g of radium. Radon decay product concentrations of 0.02 Working Levels (WLs) are required for remediation designs with an upper limit of 0.03 WL. Gamma radiation cannot exceed the background level by more than 20 microroentgens per hour. The regulations also require controls that are designed to be effective for between 200 and 1,000 years and which provide assurance that releases of radon-222 to the atmosphere from residual radioactive material will not exceed an average release rate of 20 pCi/m²/s, or increase the annual average concentration of radon-222 in the air at or above any location outside the disposal site by more than 0.5 pCi/l (40 CFR 192.02). Computational models, theories, and prevalent expert judgment may be used to determine whether a control system design will satisfy the standard.

Currently, the National Priorities List contains 48 facilities contaminated with radioactive material, 16 of which are owned or operated by DOE. Although UMTRCA and, in some circumstances CERCLA, has been used for the cleanup of DOE facilities, several DOE regulations and orders set radiation protection standards for activities at DOE facilities. Under Order 5400.5 "Radiation Protection of the Public and the Environment", DOE limits exposures of the general public to 100 mrem/yr and sets an agency-wide policy to limit radiation exposure to ALARA levels. DOE has proposed standards under 10 CFR 834 which incorporate ALARA principles and prescribe pathway dose limits of 10 mrem/yr for air, 4 mrem/yr for drinking water, and 25 mrem/yr for waste management.

The Nuclear Regulatory Commission (NRC) at 10 CFR 20 limits doses to a member of the public to 100 mrem/yr plus ALARA and has proposed a decommissioning of 15 millirem/yr _____ ALARA. Implementing ALARA at NRC sites may be difficult, because no specific

guidance has been established for residual contamination criteria. Different levels of "clean" are specified in NRC regulations for various pathways: groundwater, soil, and buildings. In the past, licensees have been required to reduce doses to levels below the regulatory requirements, as long as it was cost-effective to do so, i.e. ALARA.

CERCLA Cleanup Levels

In selecting a remedy at an NPL site, the NCP requires that two "threshold criteria" be met: 1) cleanup must be protective of human health and the environment, and 2) cleanup must meet applicable or relevant and appropriate requirements (ARARs), or justify a waiver. EPA has generally considered cleanup to be protective if it results in a lifetime excess cancer incidence risk range of between 10^{-4} and 10^{-6} (for carcinogens) and a hazard index of less than 1 for noncarcinogens. Since there is no single set of regulations and guidelines prescribing the cleanup of sites containing radioactive material, ARARs are likely to vary from site to site. The selection of ARARs involves site-specific analysis.

Superfund's NCP has no specific standards for radionuclides or other contaminants, but uses nine criteria for remedy selection and determining cleanup levels, including ARARs. Some 50 percent of Superfund cleanups are not based on an ARAR but are established on a site-by-site basis. The UMTRCA cleanup standard is typically used as an ARAR; others have used a State regulation. Since most site Superfund cleanups used ARARs, the rationales for the risk levels were not discussed in the records of decision (RODs); however, most sites achieved a risk range of 10^{-2} to 10^{-4} and these were deemed acceptable.

EPA has proposed that remediation of a site ensure that water that is a current or potential source of drinking water not exceed maximum concentration limits (MCLs) i.e. 4 mrem/yr for

beta particles, 15 pCi/l for gross alpha, 5 pCi/l for Radium-228, and 5 pCi/l for Radium-226. In July 1991, EPA proposed to revise the MCLs for Radium-228 and Radium-226 to 20 pCi/liter.

Restricted v. Unrestricted Use

The NCP allows EPA to consider institutional controls, such as water use and deed restrictions, in assessing risks posed by the site and in investigating appropriate remedies. Superfund-financed remedial actions cannot begin without assurances from the State that it will ensure that institutional controls implemented as part of the remedial action are in place and reliable and will remain in place for at least _____ years after initiation of a remedy.

The NCP provides limited guidance to EPA on when to restrict the use of a Superfund site. However, the NCP directs EPA not to use institutional controls as a substitute for active response measures; institutional controls are to be used as the site remedy only if more active measures are not feasible.

For DOE sites on the Superfund National Priorities List (NPL), DOE assumes lead authority for cleaning up the site, but follows CERCLA procedures. EPA sets the cleanup level and oversees sight assessment and cleanup. EPA must approve DOE procedures and cleanup. To comply with the CERCLA requirements, DOE enters into Interagency Agreements (IAGs) and/or Federal Facility Agreements (FFAs) with federal, state, and local entities for the execution of remedial investigation/feasibility studies (RI/FSs) and remedial actions to ensure that corrective actions are consistent with the NCP and, therefore, satisfy CERCLA requirements.

For facilities that are not on the NPL and that require a cleanup action, DOE must conduct a corrective action pursuant to RCRA (at facilities with RCRA permitted units) or other applicable authorities. Both RCRA and CERCLA programs provide a remedial investigation/feasibility study (RI/FS) of cleanup options under CERCLA or a corrective

measures study (CMS) under RCRA. Both provide for formal selection of a remedy after these analyses are completed.

The DOE Environmental Restoration Program also carries out remedial actions under the Formerly Utilized Sites Remedial Action Program (FUSRAP) and the Uranium Mill Tailings Remedial Action (UMTRA) Project. FUSRAP was established to identify, characterize, and remediate contamination at sites formerly used by the Manhattan Engineering District and the Atomic Energy Commission. The UMTRA project is dedicated to cleanup of uranium mill tailings at uranium processing sites.

With the exception of UMTRCA sites, radioactive material clean-up levels at DOE sites are determined on a case-by-case basis. These cleanup levels are generally negotiated with EPA and appropriate state agencies as part of the Federal Facility Agreement (FFA) for a site. All sites are subject to an agency-wide policy of reducing exposure to radiation to ALARA levels. If a site will be released for unrestricted use, the intent of the ALARA policy is to reduce residual contamination to a level that is as far below the specified guidelines as reasonable. If a site cannot be released for unrestricted use, institutional controls must be established to restrict site access so that exposure is reduced to an ALARA level. For DOE sites managed under FUSRAP and the Surplus Facilities Management Program, DOE's general procedure is to begin with the dose limits and generic guidelines developed for these programs and to then determine if more strict ALARA site-specific cleanup levels are feasible.

The EPA Cleanup Standard

EPA is developing a cleanup standard which is expected to be proposed at an annual committed dose of 15 mrem above background radiation levels for at least 1,000 years following

the completion of cleanup activities. The proposed standard corresponds to an excess lifetime cancer incidence risk of 3×10^{-4} . It focuses on exposures to human-generated concentrations of radioactive materials at sites that pose excess risk above levels that would normally be found in the environment.

EPA is also proposing that in the absence of active or effective institutional controls that members of the public be limited to 75 mrem/yr even if all the controls at a site fail. EPA fully expects implemented controls to be effective; thus, the 75 mrem/yr value becomes an additional requirement to assure that for long-lived radionuclides the effectiveness of controls is projected well into the future. A committed effective dose of 75 mrem/yr corresponds to a lifetime excess cancer risk of 1.4×10^{-3} , but is still consistent with the ICRP recommendations. EPA derived the 75 mrem figure by subtracting from 100 mrem the 25 mrem allowed for uranium fuel cycle facilities because it is extremely unlikely that there would be several sources of man-made radiation within the vicinity of a single site. Without this provision, a site would be required to either be cleaned up to a level that allowed it be released for residential use or not to be released at all.

Release of a site for industrial/commercial use may allow leaving a higher radionuclide concentration than required for unrestricted residential use so the 75 mrem/yr dose is intended to assure that a level of protection is provided even if such uses change in the future. The requirement represents an appropriate balance between protecting the public should institutional controls fail and imposing additional standards in those cases when institutional controls have been determined to be appropriate at a given site.

EPA believes that the cleanup standard is consistent with its other standards and is a small fraction of the 100 mrem guideline for exposures of the public from all sources. What is equally

apparent is the degree to which all its regulations attempt to achieve a lifetime risk level of 10^{-4} or less for the maximum exposed individual.

Relation to Background Radiation and Other Standards

By limiting exposure levels to 15 mrem/yr above natural background, EPA is acknowledging that natural background concentrations of radionuclides vary among sites. As a result, radionuclide measurement methods must be adequate to distinguish contamination from natural background radiation levels. Where possible, the same measurement techniques should be used for the same radionuclide at both background and contaminated sites. EPA believes that radioactive contamination can be measured independently of background radiation sources using generally available procedures.

General sources of natural background radiation and their average annual effective dose equivalents are cosmic (26 mrem), cosmogenic (1 mrem), terrestrial/soil (28 mrem), inhaled radionuclides (200 mrem), and radionuclides in the body (39 mrem). Primordial radionuclides are potassium-40, rubidium-87, and the radionuclides comprising the uranium-238 and thorium-232 decay series; these exist in the earth's crust and its underlying mantle at about 15 picocuries per gram (pCi/g) in the U.S. Radium-226 in soil averages about 1 pCi/g, with a range of from 0.23 to 4.2 pCi/g. The resulting average gamma exposure to humans from soil is about 28 millirem (mrem) per year, excluding exposure to radon gas. Assuming unrestricted residential use of a site, this dose is equivalent to a risk level of about 1.2×10^{-3} for a 70-year exposure or 5.3×10^{-4} for a 30-year exposure from these background sources in soil.

Typical concentrations of radium-226 in groundwater and surface water used for drinking water range from 0.3 to 0.8 picocuries per liter (pCi/l), although concentrations as high as 200 pCi/l have been measured. Dissolved radon-222 concentrations in groundwater typically range

from 50 to 300 pCi/l, although concentrations as high as 500,000 pCi/l have been measured. Surface water concentrations are generally below 10 pCi/l. The most common sources of these dissolved radionuclides are igneous rocks, sandstones, shales, and uranium-containing minerals.

The NESHAP standard of 10 mrem/yr for all radionuclide emissions to ambient air corresponds to a lifetime excess cancer risk of approximately 2×10^{-4} . In the preamble, EPA stated that more stringent standards would produce only marginal risk reductions, although costs associated with those standards would have been high and may not have been feasible using available technology. Its recommended action level of 4 pCi/l for radon corresponds to a lifetime (varies for smokers and non-smokers) cancer risk of 1.3×10^{-2} to members of the general population, necessitated because of cost considerations for the application of best available technological controls. EPA has also developed a 25 mrem/yr standard for public protection from the activities associated with the uranium fuel cycle (e.g., nuclear power plants).

Though standards for radionuclides are not specified within the RCRA Corrective Action standards (58 FR 8658), cleanup levels should be determined on a site-by-site basis, using other promulgated standards where appropriate. RCRA Corrective Action regulations are generally consistent with Superfund and are based on site-specific risk assessments.

Travis, et al. reviewed the risk levels associated with 132 decisions and determined 10^{-4} to be the *de facto* level of acceptable risk in a statistically significant number of federal regulatory decisions. However, cleanup levels that are based on an ARAR that is outside that risk range are generally considered protective.

Recent Updates in Recommendations

Recently, in Publication 60 (1991) the ICRP updated its recommendations and included guides for the general public as follows:

- Annual effective doses for individual members of the public shall be limited to 100 mrem, with higher doses allowed in a single year if annual effective dose averaged over 5 years does not exceed 100 mrem.
- Doses for specific practices (i.e., sources) should be less, i.e. ALARA.
- The risk factor for uniform whole-body irradiation is increased to about 7×10^{-4} per rem and should include weighted non-fatal cancer incidence.

The National Council on Radiation Protection and Measurements (NCRP), the U.S. counterpart to the ICRP, in NCRP Report No. 91 (1987) recommended annual effective dose limits of 100 mrem for continuous or repeated exposures and 500 mrem for infrequent exposures, exclusive of natural background and medical radiation.

NCRP Report No. 91 also recommends levels of public exposures for remedial actions. these should be undertaken when:

- The average annual effective dose equivalent from external exposure from all sources (including background but excluding naturally occurring sources) continuously exceeds 500 mrem. The report indicates that significant internal exposures from sources other than radon should be included in the exposure assessment.
- The average exposure to radon and its decay products exceeds 2 working levels per month.

NCRP Report No. 116 (1992) adopted the recommendations in ICRP 60, or an effective dose equivalent of 100 mrem/yr for the general public.

Summary

- No specific cleanup criteria exist for FUSRAP sites, although EPA and NRC have initiatives related to cleanup levels underway.

- FUSRAP sites have been cleaned up on a site-by-site basis generally using UMTRA standards or if on the Superfund NPL, by ARARs which are commonly UMTRA standards.
- Neither CERCLA nor RCRA specify site cleanup standards for radioactivity; cleanup and corrective actions have been and currently are based on a site specific risk analysis and feasible remedy selection.
- A broad consensus appears to exist among national and international groups that exposure of the general public should be limited to an effective dose equivalent of 100 millirems/yr; that no single source should use the entire guide; and that exposures for specific sources by ALARA below the 100 mrem/yr guide.
- Current and proposed guides, ARARs, and regulations provide little if any guidance on what constitutes ALARA or a cost effectiveness remedy.
- EPA is developing a proposed cleanup standard that considers a site that meets 15 millicuries per year from all pathways releaseable for unrestricted use; that drinking water MCLs must be met; allows use of active controls for restricted use; and requires protection of 75 millirem/yr for further conditions if controls fail.
- EPA is dedicated to a 10^{-4} lifetime risk range for its cleanup standard and its other regulations and programs, although some CERCLA site cleanups have been in a range of 10^{-2} - 10^{-4} .
- FUSRAP cleanup criteria will need to consider how these criteria apply.

ISSUE PAPER #3

REMEDY SELECTION AND EFFECTIVENESS

Issue: Improve remedy selection and effectiveness.

National Stakeholder Recommendation: Explore technology that expedites removal of radioactive material from the community. The conference determined that the actions necessary to accomplish this objective are to begin now to educate stakeholders (to be done by DOE, EPA, and knowledgeable stakeholders) and perform technology assessment (by DOE); to plan for a national meeting (perhaps another stakeholders conference) that would address effectiveness of remedies; and continue to secure funds. The FUSRAP Committee should provide the guiding principles necessary for decisions for selection of site-specific remedies.

Analysis: Three aspects appear to govern the approach to remedy selection and determining its effectiveness: 1) what the remedy must meet, i.e. the guiding principles; 2) community understanding of remedy options is essential to acceptance, and 3) how effective are various technology options.

The Guiding Principle that a remedy must meet appears to assume that it can be set without any knowledge of what various remedies can achieve. In most cases, guiding principles (in this case, cleanup criteria) usually reflect a balancing of potential exposures and applications of technologies to change them. If it is cheap and easy to obtain cleanup to background, most decision makers would opt to do so. Perhaps, the best focus of the issue is what increase in protection is gained by investing in various remedy options and then a selection based on value gained. When a guiding principle is chosen without regard to effective and feasible remedies, it is difficult to defend if attendant risks are low. Likewise, it can be equally inappropriate to apply a

principle derived for some other circumstance where a cost-effective and readily available remedy allowed a conservative principle to be set, but which is not available for the situation at hand.

Community Understanding of remedy options is closely linked to Issue 4, Community Involvement. Clearly, public information needs to be provided so that stakeholders can either participate in selection of the remedy or at least understand the choice made from available options. This information process could be addressed by one of several options, for example:

- community information workshops for several evenings over several months
- adult education general courses
- vendor presentations
- DOE/EPA/knowledgeable stakeholder presentations
- computer tutorials

In any case, a deliberate effort would be required to organize presentations, lead discussions and coordinate the process to assure consistent and continued progression of information content to address participants' interests and needs for information.

Effectiveness of Technologies is generally complex and needs to build upon a base of general understanding. Several technologies are under development and their elements can be discussed by DOE. Key issues are: 1) how to provide the knowledge base for understanding the technologies (i.e. community information, and 2) whether some technologies may be so promising it would be wise to await their full demonstration before a remedy is selected.

Active control measures that rely on institutional and engineering controls may allow sites which are not released for unrestricted residential use to be considered remediated. These active control measures should assure that exposed individuals at sites released under restrictions receive no more of a dose than for sites released without restrictions and should also protect individual

pathways such as groundwater. It is necessary to determine the type of active control measures to be used; the existence of an authoritative entity (e.g., governmental organization) to assure implementation of the active control measure; and the appropriate entity's resolve to assure site integrity over time of the active control measure.

One active control measure for returning a site not expected to be used for residential purposes to productive use could be land use restrictions that limit the remediated site to industrial or commercial uses. Such a site may continue to be owned by a governmental unit but leased to businesses, or land use restrictions may be maintained by deed restrictions, deed notices, and deed records which either prohibit certain kinds of site uses or, at a minimum, notify potential owners or land users of the presence of the substances remaining on site at levels that are not protective for all uses. A site may be remediated to a level that is protective for industrial/commercial land use, but would not be protective for residential or other less restrictive purposes unless active controls exist and/or mechanisms exist to alert potential buyers of the property to any remaining radioactive material.

It appears appropriate to also conduct reviews at least every X years for those sites where radionuclide concentrations at the site are above levels that will not allow unrestricted use. Such review should include: a summary of site conditions; summary of remedial action selected; summary of remedial action performed; description of post-remedial action activities; scope and nature of X-year review; summary of results of the review; summary of actions taken or proposed on the basis of the review, and; expectation for the scope and nature of future reviews. Before commencing a X-year review, the public should be informed of any determination that a X-year review is required, the planned scope of such reviews, actions taken based on any review, and any location where the X-Year Review Report will be accessible to the public.

The intent of X-year reviews should be to evaluate whether the remedial action remains protective of public health and the environment. The focus of the X-year review will depend on the original goal of the remedial action. For example, if protectiveness is being assured through engineering controls (e.g., containment with a cap) and institutional controls, the review should focus on whether the cap remains effective and the institutional controls remain in place and are being satisfied. If the X-year review determines that the remedial action is not remaining protective of public health and the environment, public disclosure is warranted and necessary. A related issue for X-year reviews is when to stop performing them, i.e. to establish circumstances or performance goals that once achieved would be a basis for discontinuing X-year reviews. For example, the effectiveness of a remedial technology results in a site that was previously released with land use restrictions to assure its performance, but followup confirms a level of performance that allows unrestricted residential use, then X-year reviews for that site would no longer be necessary.

ISSUE PAPER #4

COMMUNITY INVOLVEMENT

Issue: Need to enhance community acceptance.

Stakeholder Conference Recommendations addressed five areas to enhance community involvement/acceptance of FUSRAP activities as follows:

- Develop a local community communication strategy.
- Investigate a host community benefit incentive strategy.
- Develop a plan for educating the community.
- Investigate a National FUSRAP Roundtable for high-level political figures.
- Involve local stakeholders.

The actions recommended by the Conference include a site communication plan, a host community benefit/incentive program, a community-based environmental action plan, a plan for community education, and consideration of a national political round table. The main focus of these actions appears to be to get information to local people so they can actively participate in remediation decisions.

Analysis

A general desire to remediate all sites to levels allowing unrestricted use, coupled with limited federal funds to accomplish this goal, has caused many of the larger remediation efforts to extend several decades in time. In some instances, completion is projected to be still decades ahead. The lack of timeliness contributes significantly to community concerns, including questions of whether temporary solutions such as onsite storage will become permanent and when, if ever, the site may become available for beneficial use.

While various efforts have been made in the past by DOE to conduct operations more openly, the current Secretary and Assistant Secretary for Environmental Management have instituted a formal program to have people affected by the Department's actions participate in an exchange of substantive information relevant to public health and the environment. These participants have been defined as "Stakeholders" and include oversight organizations and sometimes contractors. The term does not apply to all parties affected, such as other federal agencies or even employees of DOE. Regulatory agencies prefer to be categorized as regulators and not as stakeholders.

Method of Operation

A logical system is to invite stakeholders to participate in meetings to discuss actions of DOE that can have an impact on the values and interests of individuals and organizations as well as public health and the environment. The work being done is desirable as are the reasons for the work. The purpose should be to make it possible for stakeholders to be directly involved in both policy and technical deliberations. By doing so they should become more knowledgeable about the issues, add their perspective to efforts to solve those problems, and become more confident not only in the dedication and commitment of those struggling to resolve decades old problems, but more importantly that the solutions are rational, intelligent, and protective of the public health and the environment.

Considerable effort and expense is required to prepare for stakeholder meetings and considerable effort to address recommendations and admonitions specified by stakeholders. Management can be a reluctant participant in compulsory attendance at a forum at times seemingly dedicated to reviewing sins, past and present, real and imaginary, major and minor, and fair and unfair of the past.

Stakeholders may have unrealistic expectations that expressing a concern should automatically result in an action item on the part of DOE. It does not. Stakeholders are not required to appear before Congressional committees to defend or justify the expenditures of public funds. DOE management is required to do so. Conversely, responsible concerns by stakeholders are not always fully addressed by DOE and feedback may appear to come from the public relations offices rather than scientific and managerial deliberations.

The ultimate objective should be to achieve a level where the public is comfortable that all adverse views are being considered, that the decision-making process is open and structured and the objective of doing what is best for the overall good of the country transcends the interests of vested interest groups. This requires considerable effort to make the subject agenda understandable and address basic issues rather than to go into unnecessary details.

Land Use Considerations and Community Incentives for FUSRAP Materials

Contamination levels which are not of health concern under current or planned land uses are logical candidates for what commonly is termed "release for restricted use". However, because the connotation is that the federal agency (DOE) would be restricting land use, even to the extent of creating a fenced "no-man's" land, the concept gathers little acceptance.

Were the community allowed to designate its own land use, compatible with its own long range planning goals which could meet "restricted use" criteria (appropriate dose levels to the public), a viable solution might be reached with assistance by DOE. Such assistance might include (but not be limited to):

- Dose evaluation and community information relative to the proposed use
- Application of technology to reduce residual activity or dose

- Monetary grants to assist site development
- Monies in trust for future land use changes (covering the "what-ifs" for things such as rehandling materials when an airport, highway or rail line, etc. which has covered the material eventually is removed)

Monies for technology application, grants and trusts would be some portion of that saved by not having to transport all radioactive material to a distant site.

Restricted Release Option

As levels of radioactivity rise above levels defined for unrestricted use, relatively few land uses are affected, although some important uses such as single family residences, schools and day-care facilities normally would be excluded. Allowed and conditional land uses normally acceptable for higher activity areas may include (to be confirmed by site specific dose calculations):

- Industrial facilities
- Commercial facilities
- Utility, Highway, Rail or Airport facilities and easements
- Landfills
- Cemeteries (minimal dose hazard and only minor chance of subsequent change in use)
- Open spaces (arboretums, ecological research areas, parks, nature trails)
- Monuments, museums
- Parking lots, parking structures

Range of Options

In addition to the above uses at the site itself, materials from the site could be moved to areas planned for or currently utilized for such uses. Consideration also should be given to selective removal of higher activity materials, or technologically concentrated radioactivity, to a licensed waste disposal facility to the extent necessary to achieve the community's desired use of the site.

The community should define the appropriate land use of the site in accordance with its normal land use planning procedures. The level of federal assistance for restricted use release of the site would become an important consideration in such planning, but the community should retain the right to opt for unrestricted release. In any event, information and assistance from DOE should be made readily available such that implementation time, costs and risks of failure to achieve the desired outcome may be assessed adequately by the community.

Land use planning by the local community should be a major determinant of FUSRAP site release criteria. Federal assistance and direct funding should be considered for those communities willing to utilize a site, or portions thereof, under restricted release criteria which would save taxpayer dollars in terms of site remediation to unrestricted release levels. Such funding could take the form of grants for land utilization development, and trust funds for potential future actions necessary to assure health protection as future changes evolve.

The benefits of funding for restricted release of the site would be considered by the community in balancing restricted against unrestricted release. Without such benefits, there is little if any incentive for communities to find any option acceptable except unrestricted release for the entire site.

Public notice and comment is important to community involvement. It should commence when intent is known to clean up a site and does not end until the site has been cleaned up to a generally agreed upon goal. Opportunities for earlier, direct and regular community involvement should enhance the community's participation throughout the cleanup process. EPA has reported that for cleanups under CERCLA, many communities near Superfund sites, including low income, minority and Indian communities, feel that they are not provided with the opportunity to fully participate in the cleanup process. These and other communities believe that the program does not address local concerns adequately when addressing risk or determining the method and level of cleanup, particularly with respect to future use of land. The public is often skeptical of the government's willingness to give serious consideration to community concerns. Affected stakeholders sometimes voice concern that opportunities for their involvement in site activities come too late in the process and that their input has little impact on cleanup decisions.

A community group should be established at sites to advise in the selection of a remedy that is considered appropriate by that community. These community groups should be formed after issuing a public notice of intention to remediate. If a community group is able to reach a consensus on a significant remedy selection issue, particularly on future land use of the site, their recommendations should be given substantial weight. As a matter of policy implementing agencies should prepare a written explanation when they make decisions that are inconsistent with community group's recommendations on a significant issue, such as land use.

No more than one community group per site should be established; however, because such groups should be used to complement, not duplicate or supplant, broader site-level public involvement initiatives. Community groups should only be established as needed when no advisory committee is in place (e.g., Community Work Groups for CERCLA actions) and an

affected local, state, tribal, or federal government entity requests the establishment of a community group, or a significant number of residents near a site sign a petition so requesting a group.

Under circumstances where the site remediation would be governed by local use conditions rather than immediate release for unrestricted use a Site Specific Advisory Board (SSAB) should be convened for the purpose of obtaining advice from affected parties regarding the proposed remediation. The purpose of the SSAB should be to provide advice, as appropriate, on:

- (1) whether there are ways to reduce residual radioactivity for unrestricted or limited uses which are technically achievable, would not be prohibitively expensive, and would not result in net public or environmental harm;
- (2) whether proposed land uses are such that there is reasonable assurance that exposures from residual radioactivity distinguishable from background to the average member of the critical group will not exceed _____ mrem per year, and can be assured without undue burdens on the local community or other affected parties.

Membership of the SSAB should reflect the full range of interests in the affected community and region, and be composed of individuals who could be directly affected by residual radioactivity at the remediated site.

ISSUE PAPER #5

HOW LONG?

Issue: Since FUSRAP materials are long-lived, for how long should risks be assessed and reliance on various institution controls be considered.

Significance: Since guiding principles for FUSRAP materials will need to address institutional controls such as land use and how risks should be considered over time, it is important to consider both the technical and societal aspects of various options for time frames for each.

Analysis: Most waste control systems depend on some combination of institutional means and technical systems to assure control of risks for some assessed period. Striking the balance may be difficult when long-lived radionuclides exist in the waste in significant amounts. Some constituents last so long that society has not yet developed the perspectives for determining to what level they need to be controlled, i.e. we don't exactly know what we owe the future.

The Institutional Controls Period is the time for which it is reasonable to depend on some social order to prevent humans from coming in contact with wastes by controlling site boundaries, guarding a structure, land use policies, record-keeping, monitoring, etc. In general, long-term isolation using stable natural barriers is desirable when feasible. Institutional mechanisms are short-term processes because of practical limitations, and they can be very effective in isolating radioactive wastes from humans if they can be maintained. Since society's basic structure and concern about waste may change, it is reasonable to rely on such controls for only limited periods.

The choice of a time period for relying on institutional controls is completely a matter of judgment, but is basic to a determination of when use of such controls is proper. A time period of 100 years has been adopted by several agencies as the maximum time for such controls to be

depended upon with any degree of assurance. This value appears to be a compromise between opposing views that one generation (30 years) could be relied upon and another view that 300 years (10 half lives of Cs-137 and Sr-90) could be appropriate.

RCRA corrective action and post-closure monitoring requirements are for 30 years and many Superfund cleanups are consistent with this value.

Disposal decisions should recognize that institutional controls are only of limited use. In general, makers should not rely on restrictions on customary uses of land and of ground or surface waters for wastes whose hazards extend beyond 100 years. This does not mean that institutional controls are required for 100 years, or that they must stop at that point if society can still maintain them; only that people making the initial disposal decision should not plan on their use to maintain protection beyond about 100 years.

Risk assessment time frames and control considerations are necessarily interrelated because each influences the other. Risks will be increased or decreased depending on the effectiveness of the control imposed, and controls to some extent will be chosen depending on the severity of the risk.

Risk determinations rest on a number of factors, especially the total amount of waste material at a particular location, its persistence due to form and concentration, its potential to enter the biosphere and produce adverse effects on individuals and populations, the effectiveness of various controls, and the inherent uncertainties of many of the parameters. It is especially important that the period of time for which particular radioactive wastes remain hazardous be considered from two basic standpoints: how well the control alternatives will perform in reducing the risks over time and the probability of any containment being breached. These factors have

been generally recognized and accepted as essential to risk assessments, and there is some agreement about how to take them into account.

A Risk Assessment time frame is problematic because of the reliability of the results. Projections of population size, land use, and human factors beyond a few hundred years are suspect, but the physical parameters of source terms, environmental transport models, and geological conditions may be reasonably predictable for a few thousand years.

Because of the long duration of FUSRAP wastes, it is appropriate to use a relatively long time period for estimation of health effects. Many agencies perform such estimates for periods up to about 1,000 years. Such a time period would provide consideration of both short-term exposure risks and long-term chronic exposure risks from FUSRAP materials. A shorter time period, though less subject to speculation, may have the result of focusing control only on short-term risks that may soon change if controls for long-lived components change. In this case, it is desirable to have some means of comparing the potential impact on public health and the environment in order to choose the best control alternative. This can be done by physical parameters related to risk potential such as the quantity of various radionuclides entering environmental exposure pathways, their physical distribution, or the doses they may produce. Such comparisons can also be made with health effects estimates based on very general assumptions beyond 1,000 years. Although health effects estimates are desirable for these very long time periods, reasonable comparison of control alternatives can be made by other parameters such as activity present, doses to assumed individuals, etc.

Lifetime Exposure of an Individual is an important risk determination used by regulatory agencies, in particular EPA. While a lifetime can be assumed to average 70 years, it is rare that exposure at a remediated site would occur that long even for unrestricted residential use.

Consequently, EPA has justified 30 years as a reasonable period for determining lifetime exposure due to residual radioactivity.

The stakeholder conference participants generally addressed need for risk assessments and that assessments should be made available to stakeholders. A relationship between time and risk assessment was not really addressed except in the context of providing current and future protection.

Proposed Principle for Risk Assessment: FUSRAP waste decisions should be based primarily on an assessment of risk to individuals and populations; such assessments should be based on predetermined models and should examine at least the following factors:

- a. The amount and concentration of radioactive waste in a location and its physical, chemical, and radiological properties;
- b. The projected effectiveness of alternative methods of controls;
- c. The potential adverse health risk to individuals for a 30-year lifetime exposure and for a reasonable range of future population sizes and distributions, and of uses of land, air, water, and mineral resources for 1,000 years;
- d. The probabilities of releases of radioactive materials to the general environment due to failures of natural or engineered barriers, loss of institutional controls, or intrusion; and
- e. The uncertainties in the risk assessments and the models used for determining them.

ISSUE PAPER #6

HEALTH RISKS AND COSTS

Issue: Health risks are of obvious concern; costs are important but should be considered after a "safe" level has been achieved to provide a cost-effective margin of safety, i.e. ALARA.

Analysis

Health risks should be considered for low-level radiation exposure for past FUSRAP activities; however, it should be recognized that the uncertainty over health risk models will never be resolved to everyone's satisfaction given the present state of science. It appears that most national and international bodies generally consider such risks on the basis of about 0.0005 effects per rem (recommended by SAB and the ICRP).

Costs of actions are also important in site remediation; these could be incorporated on the basis of \$_____ per statistical effect avoided below a safe level. Such a cost criterion fully recognizes and is driven by the nature of past activities and recognizes future benefits that could accrue. Although one can cite various costs incurred or recommended for avoidance of statistical health effects, most of these are for prospective regulatory actions for which regulated persons are given time to adjust to market conditions and incorporate attendant costs. For the most part, cited costs are estimates for the effect of a regulatory program after they have been decided, many times on the basis of other factors - i.e. the costs per effect have not been established as an a priori criterion to be achieved and justified as such. Such costs range from \$0.1 to \$8.5 million, and probably higher, but for prospective activities and without a clear basis or a priori justification that those are the costs that should be incurred.

Cost criteria for actions related to past events are less available; however, two examples involving naturally occurring radioactive materials offer some guidance: EPA's radon remediation

guides, and the Surgeon General's guidelines for uranium mill tailings, primarily in Grand Junction, CO. Radon remediation is recommended by EPA for homes containing radon above 4 pCi/L which usually can be reduced to about 1 pCi/L. The risk avoidance would then be about 10^{-2} for each individual in such a home (i.e. 4 pCi/L to 1 pCi/L) at an average cost of \$1,500.00 per home and perhaps another \$1,500.00 for maintenance of a system. Such actions thus return a reduced radon lung cancer risk level at a rate of about \$300,000 per statistical effect. The Surgeon General's earlier guidelines dealt with a localized problem, federal funds, and generally higher costs per potential effect since these generally required removal of uranium mill tailings from around structures. These costs are estimated to be on the order of ?\$ per statistical effect avoided.

Both the radon guides and the uranium tailings guides indicate a public perspective on willingness to spend money to preclude statistical effects, primarily based on whose money is to be spent. Radon remediation, though relatively inexpensive, is not being pursued actively by the public except for perhaps real estate transactions, which is an indication of their willingness to spend personal funds. Uranium mill tailings, with government funding, has been an interesting contrast.

Within this context of past expenditures, a responsible expenditure for avoiding statistical effects due to past site activities would be for those actions that would yield a reduction in health risk at a cost up to \$_____ per effect potentially avoided; more costly actions do not appear justified.

ISSUE PAPER #7

HOW TO FORMULATE PRINCIPLES

The ICRP in its recent Report No. 60, recommended a dose limit for long-term exposure of members of the general public of 100 mrem/yr over background radiation dose, but took care to emphasize that this guide should apply only to future radiation activities, not past or existing activities where the value of intervention may be inordinately costly with respect to potential reductions in risk. The cautions raised with respect to past and future activities appear important to assure that benefits accrue to offset costs of proposed actions.

The EPA Science Advisory Board addressed an issue similar to FUSRAP materials for past uses of phosphate slag in and around Soda Springs and Pocatello, Idaho. The SAB determined that such uses in those communities likely produced situations where persons could be exposed to whole body gamma radiation well above the widely accepted guide of 100 mrem/yr for the general population, and that it was important to determine those persons and consider graded actions based on risk/cost tradeoffs. Slag is a by-product of elemental phosphorus production, and has been used as an aggregate in highway construction, as railroad ballast, and in some residential construction. The SAB made a distinction, as recommended by ICRP 60, between actions for past uses of slag and current and future uses, which are more amenable to cost effective control at the source.

Other aspects need to be considered in establishing and applying action principles for FUSRAP sites, for example:

- **Graded Decision Guidelines.** Graded decision guidelines should be used as a means by which exposure to low-level radiation can be evaluated and remediation alternatives can be identified and considered in the context of net benefits.

- **Exposures.** Application of graded-decision guidelines should be based on measured (vs. estimated) individual exposures applied to actual and realistic (vs. hypothetical or worst-case) exposure scenarios. Exposure scenarios describe circumstances of 30-50 years in duration, and are non-occupational in nature.
- **Uncertainty.** The application of graded decision guidelines should be based on quantified uncertainties in exposure and risk. This will provide a quantified estimate of the likelihood that a dose or risk exceeds specific decision criteria.
- **Defining the Average Annual Level of Background Exposure.** Background radiation exposure for graded decisions includes external gamma radiation due to cosmic rays and terrestrial radiation. Other sources of background radiation exposure are radon in buildings, internally deposited naturally occurring radionuclides, and other radiations present in the environment.
- **Past and Future Activities Warrant Different Considerations.** Both ICRP 60 and the SAB's review of the Idaho Radionuclide Study determined that actions to achieve acceptable exposure levels should consider past practices and future practices separately to assure that actions are "optimized so as to maximize the net benefit". The ICRP intended that its recommended dose limits be used for the control of future practices in recognition that use of a predetermined dose limit of this magnitude ...

"might involve measures that would be out of all proportion to the benefits obtained and would thus conflict with the principle of justification".

Alternative Exposure Guides - FUSRAP Sites

Actions related to exposure control for remediation of FUSRAP sites could focus on one or all of the following alternative forms:

1. Action Guide: Above 100 mrem/yr of additional whole body exposure due to FUSRAP site contamination, sites should be remediated and DOE should pay costs of all means of reducing exposures that would lower exposures below 100 mrem/yr and would implement other steps that could remove risks to families of young adults and adults at a cost/benefit rate of \$_____ per potential estimated effect potentially avoided.

Basis: Such exposures, even though attendant risks are low, are above the widely accepted standard for public exposure of 100 mrem/yr. DOE accepts responsibility for action, but is not asked to spend money at inordinate rates for changing potential risks after the site is below 100 mrem/yr (a prudent option may be to purchase and control site use, including stabilization, rather than try to fix).

2. Protection: Below _____ mrem/yr additional exposures due to residual radioactivity, remediation would not be recommended.

Basis: Two groups are generally at risk, young people up to age 25, who would be expected to move to their own home and adults who probably occupy a house in their 20s

and live there less than 50 years. At 25-50 mrem/yr the risk to either (using SAB's value of 0.0005/rem) would be 3×10^{-4} up to 1.3×10^{-3} . (These would be slightly higher if a 70-yr lifetime exposure were to be assumed; therefore, the exposure scenario is an important factor in a chosen dose level). These are no greater risks than those a person could receive by random choice of lifestyles in the area due to national variations; they thus represent acceptable risks for past activities. The lower value is essentially EPA's lifetime risk criterion of 10^{-4} ; the upper value is not out of the ordinary in other decisions (radon remediation, for example) that have been made which could disrupt lives and produce uncertain benefits.

3. Cost Effective Action Guide: Between _____ and 100 mrem/yr, remediation would be pursued using those actions that would reduce risk to a critical exposure group collectively at a cost of less than \$_____ per potentially serious health effect. (Cost sharing could be considered on a ?? percent basis between property owners and DOE, respectively).

Basis: Using SAB's risk factor and a residential scenario, potential risks to young adults and adult homeowners (see above) could be on the order of 3×10^{-3} ; expenditures of \$_____ per effect could eliminate some of this risk; however, land use may be a better option.

4. Land Use Guide: Site areas that could potentially cause exposures between _____-100 mrem/yr could be held for limited use and noted on city records such that future use

would be precluded unless the property user is prepared to undertake the remediation necessary.

Basis: Acknowledges potential for exposure, but takes a reasonable approach to deal with the areas. Challenges are: i) to identify and keep up with the areas so they receive attention if used in the future, and ii) to provide a means of paying for removal and disposal .

APPENDICES

Formerly Utilized Site Remedial Action Program Committee
of the
Environmental Management Advisory Board
April 3 - 4, 1995
Washington, D.C.

Committee Members Present:

Dr. James Martin, Committee Chair, University of Michigan
Mr. John Applegate, University of Cincinnati
Ms. Eva Crim, Dow Elanco
Dr. Robert English, Consumers Power Company
Dr. Tom Gesell, Idaho State University
Mr. Harlan Keaton, Environmental Radiation Control
Mr. Robert Neill, Environmental Evaluation Group
Ms. Joan Sowinski, Colorado Department of Public Health and Environment

Department of Energy Officials Present:

Mr. David Adler, Oak Ridge Operations Office
Mr. Florence Blair, Headquarters Office of the Principle Deputy
Mr. Sal Golub, Headquarters Office of Environmental Restoration
Mr. Albert Johnson, Headquarters Office of Environmental Restoration
Mr. James Melillo, Headquarters Office of Public Accountability
Mr. Les Price, DOE Oak Ridge Operations Office
Mr. Jim Wagoner, Headquarters Office of Environmental Restoration

Other Participants:

Mr. Jeffrey Bartlett, Stepan Company
Mr. David Bennett, U.S. Environmental Protection Agency
Ms. Nancy Page Cooper, Quality Leadership Consulting
Mr. David Kramer, *Inside Energy*
Mr. David Levenstein, U.S. Environmental Protection Agency
Mr. Sean Murphy, International Association of Environmental Testing Laboratories
Ms. Kelly Rippetto, Coleman Research Corporation
Mr. Doug Sarno, Phoenix Environmental
Mr. John Waddell, Science Applications International Corporation

April 3, 1995, Session

Dr. James Martin, Chair of the Formerly Utilized Site Remedial Action Program (FUSRAP) Committee, opened the first meeting at 10:30 a.m. and reviewed the meeting agenda (Attachment 1). Dr. Martin then invited the meeting participants to introduce themselves and asked for recommendations for any additional Committee member that would bring the perspective of local citizens to the Committee.

Next, Dr. Martin discussed the purpose and establishment of the FUSRAP Committee and the purpose of the meeting. Mr. Jim Wagoner added that FUSRAP is a national issue and the development of guiding principles by the Committee will be an important step in addressing the issue.

Mr. Les Price then gave a FUSRAP overview (Attachment 2). He reiterated that FUSRAP is a national problem and discussed the Department's National FUSRAP Stakeholder Forum scheduled for May 2-3, 1995, in Washington, D.C., and invited Committee members to attend the meeting. Dr. Martin then asked Committee members to think about their views as to the role of the Committee at this upcoming meeting.

Mr. Les Price then discussed the mission and goals of the FUSRAP. He stated that the mission is to identify and clean up contaminated sites that were used in the early years of the nation's atomic energy program or were added by specific congressional regulation. The six goals established by the Environmental Management program are to:

- ▶ eliminate and manage any urgent risks;
- ▶ emphasize health and safety for workers and the public;
- ▶ maintain and improve management and financial control;
- ▶ demonstrate tangible results;
- ▶ apply results from the technology development program to accomplish our mission more cost-effectively; and
- ▶ develop stronger partnerships between the Department and stakeholders.

Mr. Price stated that the 46 FUSRAP sites in 14 states vary in size and are generally very low risk, given the current land use. He also stated that the FUSRAP sites are different than the Department's reservation sites, as many are privately owned. Further, while the sites are located in residential, commercial, industrial, and recreational communities, there is a lack of institutional controls on these sites. Additionally, the sites do not provide economic benefits to the community. The community concerns at the large sites include health risks, property values, economic development, the pace of cleanup and the desire for the

work to be rapidly completed. Mr. Price reviewed the FUSRAP management structure, budget history and major accomplishments. He then presented the current program, stakeholder involvement activities, the baseline forecast and related planning studies.

Mr. David Adler then gave a description and history of the major FUSRAP sites. These sites include the St. Louis, Missouri site, the Maywood, New Jersey site, the Wayne, New Jersey site, and the Tonawanda, New York site.

Next, Mr. Les Price continued with a discussion of remedy selection issues and their status. He reviewed sensitivities associated with remedy selection, the cost of remedy options at the four major FUSRAP sites, and the remedy selection process. Mr Price identified major issues associated with the remedy selection process as well the current status of the process. He discussed several alternatives including deferral of remedial action; consolidation and onsite control; treatment and offsite disposal; excavation and offsite disposal; and initiation of action on key community concerns/consensus building.

Mr. Price presented the current working strategy which entails initiating action on key community concerns/consensus building, followed by moving the final record of decision and then trying to determine the "national will" with respect to FUSRAP decisions.

Dr. David Bennett then gave a presentation (Attachment 3) on the Environmental Protection Agency's Superfund selection of remedy. He gave an overview of the statutory framework, the remedial process and investigation, and feasibility studies. He presented nine remedy selection criteria, the final remedy selection process, expectations, treatment, containment and institutional controls.

Dr. Martin distributed a document for the Committee's review that proposes FUSRAP site remediation principles (Attachment 4).

Dr. Martin called for a period of public comment. There were no public comments, and the meeting adjourned at 5:30 p.m.

April 4, 1995, Session

Dr. Martin opened the second day of the FUSRAP Committee meeting at 8:30 a.m. He asked the Committee members for their views as to the Committee's decision making process. After a period of discussion, the Committee determined that consensus decisions will be developed. The Committee also discussed its role for the National Stakeholders Forum. After a period of discussion, it was determined that members of the Committee will attend the

meeting as "outside observers."

The Committee then developed a list of FUSRAP issues including:

- ▶ Cleanup Issues
- ▶ Waste Management Issues
 - ▶ treatment
 - ▶ transportation
 - ▶ consolidation
 - ▶ buy-out
 - ▶ no-action
- ▶ Institutional Issues
 - ▶ land use
 - ▶ length of time
 - ▶ funding level
 - ▶ Department commitments

The Committee also developed a process and timeline for its effort which includes:

- ▶ developing of ideas on guiding principles
- ▶ attending the May 1995 National Stakeholders meeting
- ▶ holding a Committee meeting in June 1995 to develop FUSRAP guiding principles for presentation at a future stakeholder meeting;
- ▶ revising the guiding principles after stakeholder review
- ▶ finalizing the guiding principles by December 1995.

It was suggested that representatives from the Office of Management and Budget, the National Taxpayers Union and Congress be invited to the next Committee meeting. The next Committee meeting was tentatively scheduled for June 15-16, 1995, at St. Louis, Missouri. The purpose of the meeting is to discuss the May 1995 Stakeholders Forum, tour the St. Louis site and draft guiding principles.

Dr. Martin called for a public comment period. There were no public comments, and the meeting adjourned at 3:00 p.m.

**FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM COMMITTEE
MEMBERS & AFFILIATIONS**

Mr. John Applegate
University of Cincinnati
College of Law

Ms. Eva Crim
Dow ELANCO

Dr. Robert English
Consumers Power Company

Dr. Tom Gesell
Idaho State University Department of Physics

Mr. Harlan Keaton
Environmental Radiation Control

Dr James E. Martin
University of Michigan

Mr. Robert H. Neill
Environmental Evaluation Group

Mr. Ron Ross
Western Governors' Association

Dr. Frank Parker
Vanderbilt University

Ms. Sally Price
St. Louis Task Force

Ms. Joan Sowinski
Colorado Department of Public Health and Environment

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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri



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