

EVOLUTION OF EPA/DOE TECHNICAL COOPERATION IN REMEDIATION OF RADIATION/MIXED WASTE CONTAMINATED SITES

Robert S. Dyer, Beverly Garcia-Frias, and Anthony B. Wolbarst
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, DC

Larry J. Coe
Sanford Cohen and Associates, Inc.
McLean, VA

ABSTRACT

The EPA Office of Radiation Programs (ORP) and the DOE Office of Environmental Restoration and Waste Management (EM) are cooperating in efforts related to restoration of radioactive and mixed waste sites. The impetus for these efforts derived from DOE's need to perform restoration activities according to CERCLA/RCRA requirements, and from ORP's role as a supplier of radiation expertise to federal agencies. These activities include: assessing remediation technology; developing radioanalytical protocols; matching cleanup technologies to soil characteristics; developing a process for the evaluation, selection, and appropriate use of groundwater models; reviewing incinerator practices; and addressing technical issues associated with the WIPP. Cooperative projects planned for the future include: evaluation of methodologies for streamlining the restoration process; assessment of the applicability of process knowledge for waste characterization; evaluation of recycling of radioactive metals; and expansion of selected environmental protection initiatives at the International Atomic Energy Agency (IAEA).

Public acceptance is a crucial component of the remediation process. An underlying objective of these cooperative initiatives is to address issues of concern to the public in an open and honest fashion.

BACKGROUND

Three important objectives of DOE's EM program are: development and assessment of remedial technology, implementation of restoration and waste management activities that meet regulatory requirements, and enhancement of public trust. These three needs are linked. Technologies that produce "faster, better, cheaper" results must be found, and the public and the regulators must be made aware of their effectiveness. Regulatory agencies must ensure the public that regulations protect human health and the environment, and demonstrate that implementation of those regulations is practical. As DOE changes its focus from weapons production to environmental restoration, it must effectively demonstrate its intentions to the public.

ORP provides technical assistance to EPA's Superfund program in the remediation of sites contaminated with radioactive and mixed wastes, and many of the problems confronting DOE's environmental restoration program are similar. Areas of assistance include estimating radiation risk, exposure, and health effects; development of the Hazard Ranking System of the National Contingency Plan (40 CFR 300) for radioactive substances; remedial technology assessment; radiation monitoring and surveying; and environmental pathway modeling. Many of ORP's projects directly or indirectly include interaction with government officials and the public. Recent examples include the evaluation of risk to the public from the Maxey Flats Disposal Site; review and assessment of environmental monitoring and remediation plans at sites including Paducah Gaseous Diffusion Plant, Hanford, Savannah River Site, Oak Ridge Reservation, and Norton Air Force Base; risk assessment of natural radioactivity such as at Pocatello and Soda Springs, ID and Lansdowne, NJ; removal actions such as Radium Chemical Company in Queens, NY,

and Bluewater Uranium Mines, NM; and the cleanup of radium contaminated soils at Montclair and Glen Ridge, NJ.

ONGOING COOPERATIVE EFFORTS

WIPP Program Support

ORP and EM began cooperating on radioactive and mixed waste issues at the outset of the EM Program. The first initiative was a joint determination of the effectiveness of air monitoring equipment proposed by DOE for use in the Waste Isolation Pilot Plant (WIPP). DOE was required to demonstrate that salt aerosol present in the WIPP would not interfere with routine air sampling and measurement. Since both EPA and DOE required quality assured data, it was jointly decided that EPA would assist DOE in performing the demonstration of the air monitoring equipment. The ORP collected air samples in the WIPP, analyzed the samples to meet requirements of the quality assurance project plan, and evaluated the data. From the data, it was concluded that the sampling equipment functioned normally under WIPP conditions. The demonstration was completed in time, and the EPA's Office of Solid Waste decision on DOE's No Migration Petition was published on schedule in the Federal Register. The WIPP sampling project represented an ability to cooperate to meet externally imposed deadlines. The study was technically oriented with no regulatory or enforcement components.

The two offices have subsequently cooperated in a number of additional areas associated with the WIPP, including review and comment on the WIPP Quality Assurance Program Plan, review of procedures for headspace sampling and analysis, coordination of the inter-laboratory performance demonstration program, participation in operational readiness reviews of DOE laboratories scheduled to send waste to the WIPP, and review and comment on Quality Assurance Project Plans prepared by these facilities.

Evaluation of Incineration of Radioactive/Mixed Waste

The next joint program involved the review and evaluation of current U.S. radioactive/mixed waste incinerators, off-gas monitoring technologies, and data from trial burns. Incineration is a proven volume reduction technique that has been widely used for hazardous wastes, but experience with incineration of radioactive and mixed wastes is limited. In response to a request from the State of New Mexico, ORP and the EPA Control Technology Center prepared, in 1990, a two volume background information document on technology and radiological risks for the incineration of radioactive and mixed wastes. It became apparent that one thing the State of New Mexico really wanted was monitoring data collected during trial burns at the Las Alamos National Laboratory (LANL) incinerator. But the political and social climate around Santa Fe and LANL made it difficult for the State to request this information and LANL to respond. The perception of both the State and local citizens was that LANL was withholding information. ORP staff worked with both the State and LANL staffs on the issue of the data. As it turned out, LANL willingly supplied the data to ORP for the express purpose of transmitting it to the State and, in fact, supplied this data at a public hearing in Santa Fe. When told that the State staff had never seen the LANL incinerator facility, ORP arranged a tour and the LANL and State staffs began a dialogue on the issues surrounding incineration as a remedial technology.

On the public issue, ORP staff attended a public meeting in Santa Fe at which very vocal citizens strongly criticized DOE's use of incineration. The key issue seemed to be the use of HEPA filters on the off-gas system. The filters were perceived to be inadequate and no amount of assurance or performance data from DOE would change the public's mind. It seemed that the only plausible solution to the impasse was to get more information to the public; information that would result in better understanding by the public that the filters are adequate, and that it is also possible to improve the state of the art of filter media to provide an extra margin of safety. Part of the solution to this kind of problem will be to learn from the successes of operators in both Europe and Japan.

Preparation of the incineration background information document was hindered by the general absence of operational data acquired in a consistent, methodical fashion that would allow direct correlations between incinerated waste characteristics and stack radionuclide emissions. ORP and EM are evaluating the incineration of radioactive and mixed wastes. This project will focus on technology needs for DOE incinerators, determination of the public perception of incineration at DOE locations, and determination of the technical and public opinion requirements for addressing any negative perceptions at DOE locations. The project is based on a study of the operating practices of, and operational data produced by, US and foreign governmental and commercial incinerators that are currently incinerating or have incinerated radioactive or mixed wastes.

Development of Selection Process for Groundwater Models

In a cooperative agreement that also includes EPA's Superfund Office and the Nuclear Regulatory Commission (NRC), EM and ORP are addressing common groundwater modeling needs. The purposes of this project are to: coordinate interagency efforts in modeling; identify models in use at

EPA, DOE and NRC sites; evaluate the technical capability and applicability of selected models for site characterization and remediation efforts; develop a systematic approach from which a Remedial Project Manager (RPM) would know how to obtain the information necessary to evaluate the appropriateness of a particular model for a specific application, determine if a proposed model has acceptable documentation and has been adequately tested; and supplement developing EPA guidance to address groundwater modeling needs at radioactivity contaminated sites. Lessons learned are intended for use by RPMs, OSCs, and contractors in the selection of groundwater models for use at radioactively contaminated sites. A model selection process that can support remedial decision-making under CERCLA and RCRA is being developed as a function of the phase in the remedial process (i.e., Site Assessment, RI/RFI, FS/CMA), the types and quantities of specific radionuclides, and the critical geohydrologic features of the site. The project also includes a detailed review of selected one, two, and three dimensional models in order to demonstrate this process. The model selection process developed will address and conform to NRC guidance on performance assessment for low level radioactive waste disposal facilities (10 CFR 61) and the high level waste program (10 CFR 60), DOE modeling guidance in support of the EM program and the high level waste program, and the EPA codes and guidelines developed in support of its low level radioactive waste rulemaking (40 CFR 193).

COOPERATIVE EFFORTS FOR FY92 AND BEYOND

Recycling of Metals Contaminated with Radioactivity

The EM program has large quantities of radioactively contaminated metals that will require appropriate disposition. Disposal by land burial is not favored because it would be environmentally unsound, be costly, remove natural resource-based finished products from the economy, and require an economic expense to replace those finished products. A viable recycling program for lightly contaminated metals is a critical environmental and economic need.

Beginning in FY92, ORP and EM will jointly evaluate the potential for recycling metals contaminated with radioactivity. A metals recycling program can be viable if it removes/separates radionuclide contaminants from contaminated materials and the "cleaned" metals can then be used either by the commercial recycling industry or by DOE, and if the cost/benefit of the recycling system compares favorably to the cost to dispose by burial. Metals inventories and contaminants, current and projected, will be identified. Domestic and international recycling options and processes will be researched and described in the context of their potential applicability to the EM program. Alternative strategies based on decontamination for unrestricted use and for controlled re-use will be identified, and preliminary cost/benefit analyses will be performed, including a consideration of different ways of preparation, handling, packaging, transportation, and disposal of EM metals. Radiological risk models will be developed, and risks and environmental impacts will be estimated. The impact of EM metals recycling on the recycling industry, on the steel industry, on radiation sensitive industries (solid state microelectronics, photographic, nuclear counting), and the implications for DOE will be evaluated. The best available processes for recycling each of the classes of metals will be

selected, and research and development needs will be identified.

Evaluation of the CERCLA/RCRA Process

For sites contaminated with radioactive or mixed wastes, compliance with CERCLA/SARA, RCRA, associated implementing regulations and guidance documents, and ARARs found in other environmental laws is a complex process. In some respects, the CERCLA remedial and RCRA corrective actions underway at DOE's nuclear weapons complex is the first large scale implementation of this process, and there are areas of uncertainty related to regulations, compliance, and enforcement. This is exacerbated by the fact that mixed waste is regulated jointly under RCRA and AEA.

Beginning in FY92, ORP and EM will conduct a collaborative program to facilitate the interagency exchange of technical information, evaluate the implementability of regulatory requirements against real-world radioactive/mixed waste problems, identify areas where the structure of the process can be made more efficient and effective, and recommend to DOE and EPA possible improvements. The program will apply CERCLA and RCRA requirements to a prototype site in EPA Region 4. From a review of the remedial projects already underway in this region, all technical and regulatory issues will be identified and screened to further identify those that are of generic concern. An EPA/DOE working group will evaluate each issue and prepare issue resolution papers. These may be used by remedial project managers and reviewers to help expedite on-going remediation efforts. These issue resolution papers will also serve as input to preparation of remedial guidance documents. In phase two of the project, a prototype site will be selected, and a program initiated to test and refine the issue resolution papers. This will involve preparation of a RI/FS work plan and other necessary documentation. In phase three, this work plan will be implemented, and the success of the planning process and the issue resolution papers in streamlining the remedial process will be evaluated.

Remediation of Soils Contaminated with Radioactivity

Since 1988, ORP has conducted a program to develop techniques for removing radioactive particles from soil by various physical and chemical means. Laboratory studies conducted at ORP's National Air and Radiation Environmental Laboratory include the development and application of procedures for characterizing the particle size distribution, mineral composition, and radionuclide distribution of soils. Based on characterization data, bench scale particle liberation and separation tests have been designed and conducted. These laboratory and bench scale tests, conducted on soils contaminated with radium and thorium, have demonstrated that soil washing can reduce the volume of radioactive soil that must be disposed of by burial, which is very costly.

In 1991, ORP conducted limited laboratory tests on soils from two FUSRAP sites, located at Maywood and Wayne, N.J. (W.R. Grace). These tests show that the soil washing techniques are applicable to these FUSRAP soils. The next step will be to characterize soils and conduct initial bench scale soil washing tests. As the results of this work continue to demonstrate the applicability of soil washing to FUSRAP, it is anticipated that ORP and EPA Regional staffs will work with DOE in communicating risk, cost savings, and technology application information to the public.

Protocol for Characterization of Radioactive Soils

Through a current interagency agreement with DOE, ORP is developing a soil characterization protocol based on its laboratory experience with radioactive soils from Superfund sites. This experience includes site radiological surveys, radioactive soil sampling, radioanalysis of soil samples, mineral and particle size analyses of radioactive soil, laboratory and bench scale testing of soil cleanup techniques, and determination of applicable cleanup technologies for specific soils. The protocol will be published as a Superfund guidance document, and will thus become directly applicable to the remediation of contaminated soils at DOE facilities listed on the National Priorities List (NPL). The DOE also has a number of sites with soil contaminated with radioactivity that are not currently listed on the NPL but are included in the EM program. DOE has already begun sampling radioactive sites in preparation for conducting soil cleanup studies. In 1992, the ORP characterization protocol will be tested by applying it to soils from approximately five DOE sites, representing a range of site conditions.

Standardization of Radioanalytical Procedures

Since data collected during site investigations are used in Hazard Ranking System (HRS) scoring, enforcement actions, general site characterization, and preliminary risk assessment, they must be of known quality and legally defensible. Standardization of analytical protocols and the availability of quality assured radioanalytical capacity are issues of great concern to both DOE and EPA. ORP and EM have discussed participation of the National Air and Radiation Environmental Laboratory under the Future Analytical Support Team concept, and the two offices are cooperating on a radioanalytical protocol program. This calls for ORP to assist DOE laboratories in evaluating current protocols, and to recommend standardized protocols for radionuclides or groups of radionuclides. The ORP assistance will ensure that protocols are consistent with EPA quality assurance/quality control requirements.

Process Knowledge

Due to the hazards associated with sampling radioactive mixed waste, DOE facilities would like to characterize the waste by using process knowledge. ORP will review waste generator documentation and recommend quality related improvements, sample and analyze waste streams with questionable documentation, and compare the analytical data with data prepared using only process knowledge. ORP and EM will find methods to improve the process knowledge documentation or waste management procedures. Where the data do not allow such an approach, the two Agencies will consider alternate methods for characterizing the waste.

Site Cleanup Criteria

The cost/benefit for recycling, and for every other restoration activity, will be driven by residual radioactivity criteria. Everybody -- EM, NRC, DoD, States, and the public -- is clamoring for cleanup criteria. Everybody thinks establishment of cleanup criteria is EPA's job but, in fact, Congress has not assigned that responsibility to any one agency.

The Conference Report on HR 4739, National Defense Authorization Act for FY91, did include a recommendation that DOE and EPA enter into a memorandum of

understanding (MOU) for the development and implementation of criteria and guidance for the cleanup of transuranic and other radionuclides at federal facilities. EPA and DOE are working together to finalize a policy MOU that outlines the broad structure for establishing guidance and criteria. The MOU will be limited to cleanup of transuranics and other radionuclides at federal facilities, and will not address waste disposal or mixed waste.

Technically, cleanup criteria might be based on currently accepted human exposure standards. But from a public perception standpoint, one only has to be reminded of the fate of NRC's proposed Below Regulatory Concern policy to realize that the public will be intensively concerned about the establishment of any residual radioactivity criteria. The public perceives a risk associated with any residual activity. There must be clearer assessment of the risk, and better communication of the meaning of that risk relative to all other risks. Further, development of cleanup criteria should take fully into account, but not be driven by, achievable technology.

International Environmental Protection

In 1991, ORP began to develop an environmental protection initiative at the International Atomic Energy Agency (IAEA). This has been coordinated with DOE, NRC, and the Department of State. The benefits would include access to international radiation expertise, international cooperation on technical assistance, an international presence for EPA and DOE in the areas of remediation of radioactive sites, and an opportunity for U.S. industry involvement in foreign cleanup projects. The proposed organization would consist of an Environmental Protection Section within IAEA's Division of Nuclear Safety. The Section would address the following program elements: site remediation and cleanup; technology development, demonstration, and transfer; post-Chernobyl environmental contamination assessment; emergency response; and risk management.

ORP is conducting several projects, approved by the U.S. - U.S.S.R. Committee for Cooperation in Environmental Protection, related to the Chernobyl nuclear accident. The projects focus on: methodologies and technologies for assessment of the contamination zone; study of transport, partitioning, and effects of radioactivity in an aquatic ecosystem; and remediation of water contaminated with radionuclides. Assessment of the contamination zone includes the use of aerial radiation surveys and Geographic Information Systems (GIS). Preliminary discussions have explored the use of the DOE aerial survey capability. Post-Chernobyl monitoring data will be obtained from Ukraine scientists later this year and formatted for GIS input. The procedures used to obtain the data will be evaluated for comparison with standard

radioanalytical techniques. For the aquatic studies, Black Sea samples have been collected and analyzed by ORP, Woods Hole Oceanographic Institute, and the Institute of Biology of the South Seas in Sevastopol, Ukraine. Application of the data to transport models is being evaluated. For water remediation, we have begun an information exchange with Ukrainian scientists and have begun the collection of water and sediment samples at the Kiev Reservoir, and are jointly investigating technologies for removal of strontium and cesium.

Possible benefits to both EM and ORP include: evaluation of transport models to determine health and environmental effects, and for use in emergency response scenarios; improvement of risk assessment capabilities; and promotion of international cooperation in technology transfer.

NEED FOR PUBLIC INVOLVEMENT

The national psyche reflects some lack of confidence in the government's ability to provide sufficient protection of public health and the environment. It is therefore difficult to convince people that the potential risk of an action, or lack of action, is acceptably small or of no consequence. Likewise, when the public develops a mistrust of a specific organization, that lack of faith translates into almost total disallowance of all actions by that organization, no matter how well intended or how positive. The best approach is to be proactive and work hard to discern and answer the public's concerns openly and honestly before public perception becomes a deterrent to effective and timely remediation.

CONCLUSION

The number of federal sites on the NPL that are contaminated with radioactivity has increased during the past few years, and will undoubtedly continue to grow as additional sites are evaluated. The development of Federal Facilities Agreements between EPA, DOE, and the impacted State to clean up large sites such as Hanford and Fernald requires close coordination between DOE and EPA and involvement by the public. Public concerns about radioactive and mixed waste requires a pro-active approach to all restoration and operational activities.

The underlying theme in all of the EM/ORP cooperative efforts is the development of technical solutions that will meet regulatory requirements and, at the same time, be acceptable to the public. The template developed by EM and ORP for jointly pursuing solutions to radioactive/mixed waste problems of mutual interest has proven to be both workable and beneficial. The bottom line objective is to work together on the technical level, to implement cleanup of DOE facilities in a manner that builds confidence in the cleanup process because it is protective of public health and the environment.