PUBLIC PARTICIPATION IN THE EVALUATION OF INNOVATIVE ENVIRONMENTAL CLEANUP TECHNOLOGY

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ABSTRACT

Now that the mission of the United States Department of Energy (DOE) at sites across the country has turned from weapons production to environmental cleanup, innovative technologies for remediation of contamination are urgently needed. DOE is managing a national program to develop, demonstrate, and deploy new technologies with promise to expedite this cleanup. The Integrated Demonstration for Cleanup of Volatile Organic Compounds at Arid Sites (VOC-Arid ID) is one such effort. Time and resources, however, are too limited to be invested in methods of remediation that will never be deployed because they have not been rigorously evaluated or because they face the withering opposition of stakeholders. Therefore, the VOC-Arid ID is assessing technology both in terms of its technical effectiveness and its stakeholder acceptability. Only if a technology performs as required and is acceptable to regulators, users of technology, and the public will the VOC-Arid ID recommend its deployment. What distinguishes public involvement in the VOC-Arid is the direct influence stakeholders have on the design of technology demonstrations. Stakeholders participated in defining the criteria with which innovative environmental cleanup technology will be evaluated. A guiding principle of the VOC-Arid ID is that stakeholder participation will improve the quality of the technologies being developed, enhance the acceptance of the technologies, and lead to the broad and timely deployment of appropriate and effective innovative methods of environmental remediation.

INTRODUCTION

The VOC-Arid ID is one of several U.S. Department of Energy (DOE) demonstrations designed to expedite the development and deployment of innovative cleanup technology. Innovative technologies are needed now because of the extent and severity of environmental contamination at DOE sites and because the technologies currently in use are, in some cases, incapable of effective and timely remediation. A guiding principle of the VOC-Arid ID is to devote limited resources to testing and developing only those technologies most likely to be deployed. A technology's performance and its acceptance by regulators, users of technology, and the public determine its ability to be deployed. The ultimate goal of the VOC-Arid ID, whose demonstration is at the Hanford Site, Richland, Washington, is the timely, widespread use of effective, accepted technologies at arid DOE sites throughout the western United States.

The Integrated Demonstration's public involvement program is being carried out in three phases. Phase I, now complete, involved Hanford stakeholders in defining the criteria with which innovative technology is evaluated. Phase I involved extensive interviews with individual stakeholders and workshops to consolidate and refine stakeholders' definitions of evaluation criteria.

Phase II, which this paper describes in detail, applied the criteria to four technologies comprising a groundwater remediation system that is part of the VOC-Arid ID. Technologies were evaluated through a series of focus group discussions with Hanford regulators, representatives of public interest groups, and technologists. A highlight of Phase II was the opportunity, in an integrated workshop, for this broad range of stakeholders to consider each other's concerns and consult directly with the VOC-Arid ID's technical staff to further guide the design of the technology demonstrations.

In Phase III of the public involvement program, the methods of technology evaluation and public participation developed in Phases I and II will be brought to bear on the challenge of involving stakeholders at other arid sites. An immediate benefit of this involvement is that the Hanford demonstrations, by addressing the interests and concerns of stakeholders from other arid sites, will make the VOC-Arid ID's technologies more quickly and more broadly deployable. The purpose here is to lessen the need to redemonstrate technologies before deploying them.

APPROACH TO STAKEHOLDER PARTICIPATION

Two attributes distinguish the VOC-Arid ID's approach to stakeholder participation. The first is the degree to which stakeholders are involved in technical evaluation, and the second is the responsiveness of the technology development process to stakeholders' contributions. In focus groups, stakeholders analyzed in detail the qualities and capabilities they see as required in order for a technology to be both effective and appropriate. Stakeholders can see concrete results of their involvement at distinct points throughout the process. For example, stakeholders contributed directly to defining criteria with which innovative technology is being evaluated. Developers of the VOC-Arid ID's technologies used these criteria in designing plans for testing new technology.

Phase I: Defining Criteria through Interviews and Workshops

The goal of Phase I of the public involvement program was to determine what stakeholders believe to be the characteristics of effective, trustworthy technology. Three hundred individuals who had shown interest in the cleanup of the Hanford Site were invited by mail to participate in a process of public consultation. In addition to those who responded to the initial invitation of interest, the VOC-Arid ID public involvement team sought the participation of other key stakeholders with the result that a group of 40 was finally identified. These individuals represented the following interests:

- Regulatory agencies
- Federal, state and local governments
- Native American tribes
- Interest groups
- Business and labor groups
- Agriculture
- Education
- Commercial users of technology
- DOE site contractors

The group was comprised of stakeholders knowledgeable about the issues, activities and goals of the Hanford cleanup. In many ways, however, they represented the general public in that their recommendations reflected their personal, value-influenced perspectives on cleanup technologies. Between July and September 1992, the VOC-Arid ID public involvement team conducted interviews with stakeholders at locations convenient to them to determine what was important to them if they were to be comfortable in seeing a given cleanup technology used in their "backyard."

An important tool supporting the interviews and the overall consultation with regulators, users of technology and the public is an interactive computer information system about the VOC-Arid ID technologies. This system - the Prospective Technology Communication System (ProTech) - was developed by Pacific Northwest Laboratory to describe to a wide range of audiences the innovative technologies under consideration for deployment. The system provides, in text and graphics, background information about the technologies being demonstrated at Hanford. The system allows the user to select technologies and criteria and compare them to technologies in use today. ProTech will track the national technology development efforts of DOE's Office of Technology Development.

During the interviews, the public involvement team emphasized the VOC-Arid ID's commitment to showing stakeholders how their contributions were influencing technology evaluation and development. The interviews yielded invaluable information that substantially revised an initial set of criteria. Figure 1 shows the revised criteria. The criteria served as the basis of discussion in two workshops in which stakeholders considered ways to compare new technologies with the way cleanup is currently carried out. Convened in 1992, the workshops brought together a cross section of stakeholders. Participants assigned relative importance to the criteria by designating differential scores to each category of criteria, and, within each category, to each criterion. Participants offered a wide range of comments about the criteria and about incorporating into the VOC-Arid ID the acceptance of regulators, users of technology and the public. The Phase I Report summarizes these comments. (1).

PHASE II: Using Criteria to Evaluate Technologies

Phase II of the VOC-Arid ID's public involvement process involves applying the criteria stakeholders helped develop in Phase I to a system of technologies that will be demonstrated in and above a seven-square-mile plume of carbon tetrachloride contamination at Hanford. The VOC-Arid ID's goal is to evaluate, test, and deploy technologies to clean up contamination of this kind at arid sites throughout the western United States. The system of innovative technologies currently being evaluated consists of:

- resonant sonic drilling to gain access to subsurface contamination;

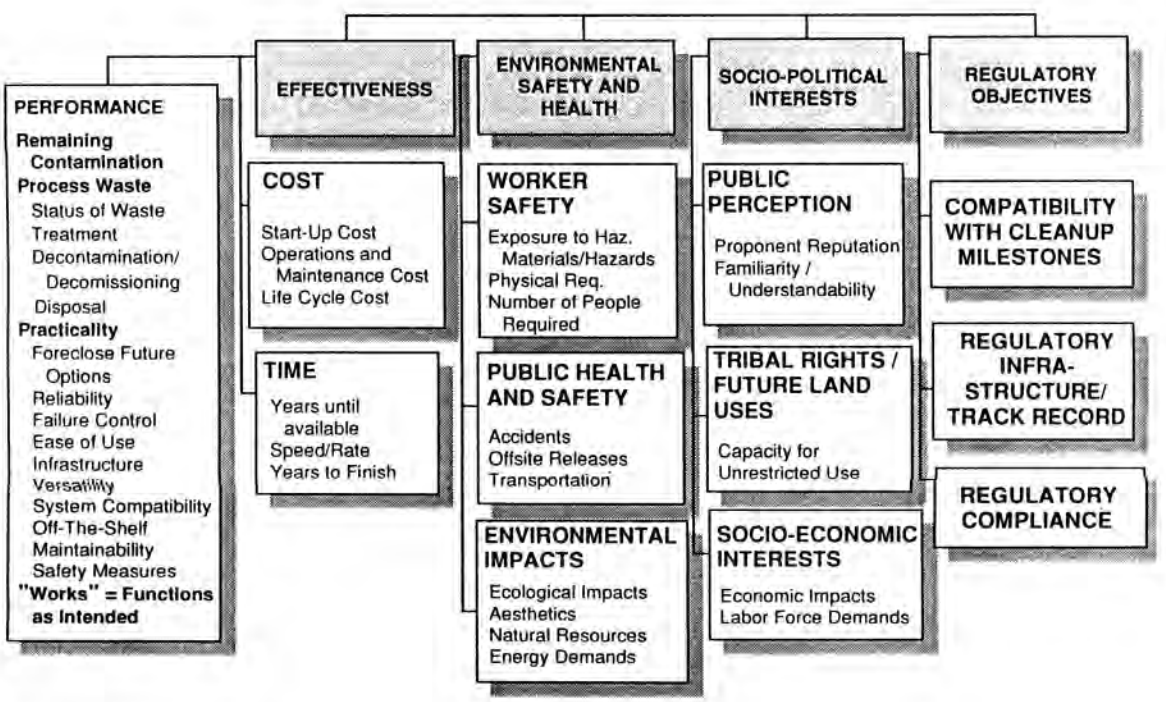

Fig. 1. Technology evaluation criteria developed by stakeholders.

- in-well vapor stripping to retrieve contaminated water vapor;
- membrane separation to condense contaminated vapor into a contained liquid; and
- in-situ bioremediation as either an independent method of degrading VOCs in groundwater, or as a means to complete the cleanup of residual contamination following in-well vapor stripping.

In Phase II, focus group discussions with regulators, representatives of public interest groups and technologists elicited stakeholders' assessments of the VOC-Arid ID's technologies. In the fall of 1993, the public involvement team conducted three focus group sessions in which participants evaluated the four groundwater treatment technologies using the criteria developed in Phase I. Before the meetings, participants received detailed descriptions of the innovative technologies and the "baseline" technologies that would be used if the remediation began today. Participants described the criteria important to them in terms of the technologies under consideration, and gave their perspectives on the technologies in light of their personal and professional experience. They were asked what additional information they would need in order to adequately assess the technologies' readiness and appropriateness to be deployed. Participants' insights, perspectives, and questions were recorded so they could guide the design of the technology test plans.

RESULTS AND FINDINGS OF THE FOCUS GROUP DISCUSSIONS

Participants raised a number of issues that while they may have been inspired by a particular technology are usefully considered in the development of test plans for any innovative technology.

VOC-Arid ID System-Wide Issues (Summarized from "Report. Phase II, Summary of Focus Groups to Evaluate Stakeholder Acceptance of VOC-Arid Integrated Demonstration Technologies".) (2)

With a technology's performance, cost and time exist in balance. Emphasizing one, by necessity, deemphasizes the others. Trade-offs and degrees of possible improvement need to be fully understood for new technologies. Technology test plans must demonstrate costs, benefits, and trade-offs.

Possible air release of contaminants is an important consideration for any remediation technology test plan. All potential air releases need to be evaluated and understood before deployment. Failure testing to prevent air pollution is essential.

A technology's ability to contribute to meeting cleanup milestones is important.

Regulatory objectives may be changing to reflect a recognition that an environmental improvement brought about by remediation is desirable even if that improvement doesn't or can't meet regulatory absolutes (such as Maximum Contaminant Levels in groundwater.) Environmental improvement will no longer be judged only in terms of regulatory absolutes.

Regulatory infrastructure is needed to address the injection of materials into the subsurface.

Demonstrations need to involve regulators early and need to be conducted in a CERCLA treatability study framework. Doing so may save money and provide useful data beyond the VOC-Arid Integrated Demonstration.

Test plans must show how the performance of innovative technologies compares to the performance of remediation methods currently in use.

The first priority for the use of remediation technology should be containment of contaminants. The second priority should be cleanup, and this may involve new technologies when they have been fully tested.

It is important for test plans to specify how the secondary waste generated by any technology will be handled. Commercial treatment, storage and disposal facilities are concerned about tritium in GAC canisters and about other secondary waste coming from sites contaminated with nuclear waste. Test plans must include chemical and radioactive characterization of secondary wastes produced by the use of any technology. Off-site treatment and disposal capacity must be evaluated.

A valuable attribute for a technology is the ability to operate successfully in a variety of geologic conditions and address a variety of contaminants. A technology's acceptance will increase if it can address a range of environmental problems at a range of sites, for example, soil contaminated beneath gas stations by leaking underground storage tanks. Thus, "transferable social benefit" is an important attribute of a technology. Similarly, the development of innovative technology should take into account possible industrial uses. Industry should be involved in the process of technology development.

Potential unintended consequences of any technology must be carefully considered.

Failure control must be realistically and thoroughly planned.

It is important through the public participation/technology development process to convey the complex, long-term nature of the cleanup. The word "cleanup" may imply for some people a complete elimination of waste when, in fact, some level of contamination may remain in the environment at the end of remedial action.

How technology is presented to the public is important. Clear, realistic communication is essential, particularly at this time of public distrust and the low credibility of government agencies. It is important to be clear about a technology's limitations.

New and standard technology should be integrated when possible to achieve maximum performance quickly.

Efficiencies among technologies being equal, technologies that operate underground are preferable because of their ability to reduce exposure to contaminants.

For all new technologies, test plans should address business and deployment considerations. Planning should address the questions: Can the technology be bought, rented, or built? Should services or equipment be bought? How can performance specifications be written?

The cost and price of a technology must be well documented. The cost of licenses, permits, capital and profits need to be taken into account. Problems with sole-source contracting need to be factored in. Test plans should address insurance requirements.

Intellectual property must be considered so there is a way for technology developers to own the technology and make money. The absence of intellectual property can be a significant business problem.

It is possible for a new technology to work and not contribute very much to meeting remediation objectives. The following need to be considered in all test plans: What are the demonstration's data objectives and targets? What can the technology do to meet these objectives?

Risk management and assessment of operational readiness need to be included in test plans.

A review of the discussions reveals agreement as well as differences of opinion about the role and utility of particular technologies. In general, for example, participants reacted positively to membrane separation technology. In contrast, in-situ bioremediation met with mixed reviews.

Notes recording the discussions were sent to participants for comment and then summarized in reports. Stakeholders' issues and concerns were then conveyed directly to the developers of test plans for use in designing the field demonstrations. Stakeholders' remarks and recommendations were grouped under headings including: effectiveness of the technology, failure control, management of secondary waste, cost and regulatory issues.

During Phase II, the public participation team augmented the comments received in the focus groups with interviews and correspondence with environmental management staff of Native American tribes in the Northwest, and discussions and correspondence with other stakeholders. Among others, the following perspectives were offered:

- Stakeholders value participating in substantive, detailed discussion of technical issues, not just in general issues of planning and document review.
- The Native American tribes with a stake in the cleanup at the Hanford Site may have different priorities concerning the remediation program.
- Native Americans' traditional use of native plants and animals may have exposed tribal members to environmental contamination in ways not experienced by other segments of the population.
- In remediating contamination at Hanford, protecting the Columbia River and its aquatic resources, particularly anadromous fish, is a high priority.

Integrated Workshop

Stakeholders involved in the focus groups as well as in Phase I participated in an integrated workshop in February 1994. This was an opportunity for stakeholders to work directly with test plan developers. The heart of the workshop was small group discussions between technology developers and diverse stakeholders concerning each of the four innovative technologies. The workshop allowed individuals to refine and broaden their perspectives through discussion with other stakeholders who may hold differing views. The objective of this interaction was to develop technologies that have been proven to be acceptable and can be broadly deployed.

PHASE III: Identifying the Issues and Concerns of Other Arid Site Stakeholders

Phase III of evaluating the acceptability of the VOC-Arid ID technologies is to assess the concerns and interests of stakeholders at other arid sites with VOC contamination. This phase of public involvement will identify additional issues that may need to be addressed in the VOC-Arid ID to make a technology broadly deployable. Addressing as many issues as possible in the Hanford demonstration will lessen the need to redemonstrate a technology later.

Stakeholder involvement and environmental restoration staff from all arid sites with VOC contamination were briefed on the VOC-Arid ID's process to evaluate technology acceptance and were invited to take part in the integrated workshop. They were also asked to continue their participation for an additional day to help design the most efficient way to identify the concerns of stakeholders at their own sites, *and define* issues that may have been overlooked in focusing exclusively on Hanford.

RESULTS OF THE PUBLIC INVOLVEMENT PROCESS

The VOC-Arid ID's public involvement process has achieved the following results:

- Improved Criteria for the Evaluation of Technology

  Involving stakeholders greatly improved the range and precision of the criteria for evaluating technologies. The Integrated Demonstration's technical staff learned what is important to stakeholders about proposed cleanup methods.

- Test Plans that Reflect Stakeholders' Concerns

  The design of technology demonstrations now reflects the concerns of the interested public, regulators, and technology users.

- Commitment by Test Plan Developers to Stakeholder Involvement

  The technical staff of the VOC-Arid ID has a greater understanding of the value of stakeholder participation and has become committed to involving stakeholders substantively in the evaluation of technology.

- Interest in Seeing the VOC-Arid ID Public Participation Process be a Model for Other DOE Public Involvement Programs

  At the conclusion of Phase I, one activist who follows the Hanford cleanup with keen interest and great skepticism asked that a direct message be taken to DOE that this was the type of early and substantive involvement that interest groups mean when they demand involvement in federal facility decision making. Stakeholders have also praised the VOC-Arid ID's public involvement process by recommending its use with other complex and pressing environmental issues and projects.

- An Effective Method of Public Involvement

  Through three focus groups, three workshops, numerous interviews, and continuing correspondence, the VOC-Arid ID public participation team has developed an effective method of involving regulators, technology users, and the interested public in the substantive consideration of complex, technical issues.

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