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The Value of Adding Regional to Local Stakeholder Involvement in Evaluating the Acceptability of Innovative Technologies

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ABSTRACT

Technology is urgently needed to clean up contamination by volatile organic compounds at United States Department of Energy (DOE) sites. In many cases, however, existing technology is too slow, inefficient, or expensive. The record of technology development is, in some cases, similarly disappointing. Remediation technologies developed at great expense and evaluated piecemeal over long periods have not been deployed because, in the end, the public judged them ineffective or unacceptable.

The need for successful methods of remediation is too great and resources too limited to continue with ineffective technology evaluation. In order to make good decisions about which technologies to deploy, remedial project managers need to know stakeholders' requirements for the performance of proposed technologies. Expanding stakeholder involvement regionally identifies the concerns of a broad range of stakeholders at arid DOE sites throughout the West – issues that must be taken into account if technologies are to be accepted for wide deployment.

THE PURPOSE OF STAKEHOLDER INVOLVEMENT IN TECHNOLOGY EVALUATION

Volatile organic compounds (VOCs) are the most prevalent hazardous waste contaminants at Department of Energy sites throughout the United States. Effective, economical technologies are needed to clean them up. But innovative remediation technologies have proven difficult to deploy partly as the result of public opposition, arising in some measure from stakeholders' sense that they have not played a meaningful, timely role in evaluating proposed approaches. Given this history, stakeholder involvement in technology evaluation has three purposes:

To define those stakeholder issues and concerns that must be addressed in order for a given technology to be accepted for deployment. These issues and requests for information ("data requirements") can then be incorporated into technology test plans.

To identify early in the process of technology development those technologies or aspects of technologies that require modification in order to be deployable. This avoids allocating resources to technologies that ultimately will be unacceptable.

To provide stakeholders with the results of technology demonstrations so they can make reasoned judgments about the acceptability of given approaches.

To achieve these purposes, to expedite the deployment of effective technologies, and ultimately to advance environmental cleanup, Battelle, with funding from the U.S. Department of Energy's Office of Technology Development, has carried out a three-year stakeholder involvement program.

EXPANDING STAKEHOLDER INVOLVEMENT

In its first phase this program, part of the VOC - Arid Sites Integrated Demonstration hosted at Hanford, Washington, involved Hanford stakeholders in evaluating six innovative technologies for the remediation of VOCs in soils and ground water. Because a guiding principle of this effort is "Test once, deploy broadly," it was necessary to determine data requirements at the arid sites other than Hanford that must be a taken into account if test plans are to be truly comprehensive and responsive to stakeholders' concerns. In addition, the team conducting the stakeholder involvement program wanted to subject the criteria for evaluating technology (Figure 1) and the issues highlighted by Hanford stakeholders to a regional assessment. Were the priorities identified by Hanford stakeholders shared across the arid west? Were there site-specific issues that because of their surpassing local importance would determine the deployability of a technology at a particular site? The public involvement team wanted to identify those issues and concerns that must be taken into account in considering any technology for deployment at any site as well as those site-specific issues of overriding local concern.

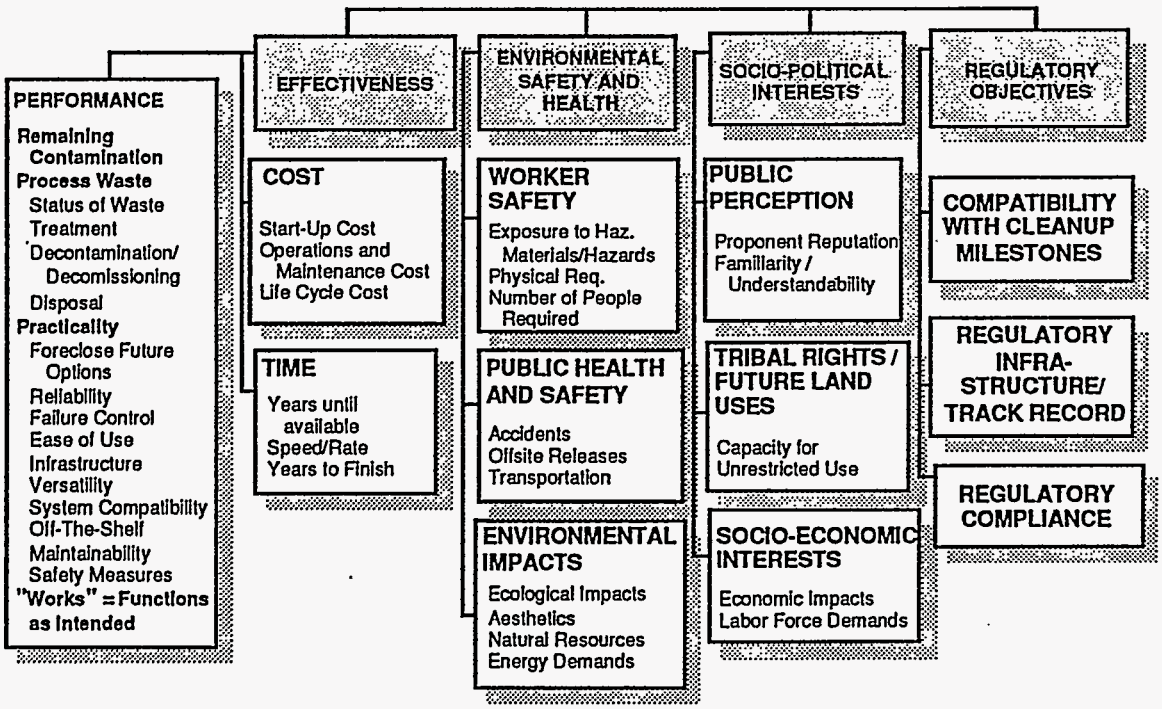

Figure 1. Technology Evaluation Criteria Developed by Stakeholders

To this end, the VOC-Arid public involvement team conducted 75 interviews with stakeholders at Sandia and Los Alamos, New Mexico, Rocky Flats, Colorado, and the Idaho National Engineering Laboratory. Those interviewed represented a cross section of the public concerned about the cleanup of particular DOE weapons complex sites in the West, and included local elected officials, regulators, Native Americans and Hispanic community members and representatives of environmental, public interest and civic groups.

Hanford-site Stakeholder Involvement in the Evaluation of Innovative Technologies for the Remediation of VOC Contamination

The foundation and context for these interviews was two years of consultation with Hanford stakeholders. Hanford stakeholders helped develop detailed criteria for evaluating innovative technologies to remediate VOC contamination. By participating in interviews, focus groups, and workshops, they defined data requirements that have been incorporated in the test plans now guiding technology demonstrations. (These data requirements are presented in a series of reports prepared by Battelle on ground water and soil remediation technologies.) Hanford stakeholders stipulated specific standards of performance for technologies. Overall, they have provided a detailed sense of what concerns the public about technologies and what technologies will have to do and be in order to be accepted and used.

Among the criteria for evaluating technologies, issues of technical effectiveness, cost, and time occurred most frequently in the comments of Hanford stakeholders. In addition to data requirements specific to each of the technologies under consideration, Hanford stakeholders identified the following data and performance requirements as pertinent to all the methods being assessed. (Please see *Phase II Stakeholder Participation in Evaluating Innovative Technologies: VOC-Arid Integrated Demonstration, Ground Water Remediation System*, Battelle Seattle Research Center, April 1994 for data requirements specific to particular technologies.)

1. Define remediation objectives to ensure that the technology truly contributes to the objectives.

2. Conduct integrated comparisons of an innovative technology to the technology currently in use.

3. Design demonstrations to provide data on performance, cost, and time to reduce uncertainty and better define trade-offs.

4. Demonstrate the technology considering differing site conditions to measure its versatility.

5. Define the demonstration assumptions and expectations about secondary waste.

6. Define the risk management strategy and the elements of and process for assessing operational readiness.

7. Define how effectiveness of the technology, both in terms of its performance and its effect on the environment, will be monitored.

8. Plan for unintended consequences and define and test all potential failure control mechanisms.

9. Define the liability implications and insurance requirements for the deployment of the technology.

10. Demonstrate that future cleanup is not foreclosed by using the technology.

11. Have a credible third party evaluate demonstration data.

RESULTS OF REGIONAL STAKEHOLDER INVOLVEMENT

In expanding consultation to include stakeholders from four other DOE weapons complex sites in the arid west, the stakeholder involvement team intended to test the hypothesis that data requirements different from those identified by Hanford stakeholders will pertain at these other sites given geographic, cultural, regulatory, and institutional differences. The underlying assumption remains that if a technology is to be widely deployable, this broadened set of data requirements must be taken into account.

The regional stakeholder involvement program yielded a number of findings. Foremost is that a technology will be put into use beyond the location of its demonstration only if issues significant at other possible sites are identified and addressed. Failing to identify or address these site-specific concerns during technology demonstration will increase the time and cost of deployment, and could result in the rejection of the technology.

Regional stakeholders validated the criteria developed by the Hanford stakeholders. There was also agreement about which criteria are most important. Hanford and regional stakeholders placed the most emphasis on technical effectiveness. More comments from Hanford and regional stakeholders focused on performance than on any other criterion.

Similarly, regional stakeholders raised many of the same issues and concerns about the six VOC remediation technologies as Hanford stakeholders.

There are, however, certain local concerns that if not addressed in a technology's demonstration will prevent a technology's deployment at a site. These issues will dominate the local evaluation of a technology. Identifying them at the outset is essential to understanding a technology's potential for deployment.

Taken together, these requirements are basic conditions with which stakeholders will evaluate the acceptability of any remedial technology. They should be considered by those responsible for developing and selecting environmental remediation technology in the western states.

Requirements Identified at All Sites

- Technologies should destroy contamination on site rather than concentrating it for transportation and destruction elsewhere. Those technologies that meet this requirement will be regarded more favorably than those that do not.

- Technologies should not transfer contamination from one environmental medium to another. For example, the action of the technology should not result in moving contamination from ground water into air.

- The number of steps in a technology's treatment system should be minimized as much as possible.

- Technologies should be able to be operated and maintained by existing staff.

- Technologies should be economical, understandable, and robust.

- Technologies must be able to treat co-contaminants. In order to be accepted for deployment, a technology must be effective with more than just its target contaminant. Acceptable technologies will have the ability to deal with radioactive co-contaminants. The inability to do so may be a "showstopper."

- Acceptable technologies are those which solve all aspects of a contamination problem, not just part. It is not acceptable to solve one environmental problem only to create another in a different place or in a different environmental medium.

- A technology's entire treatment system is important. Stakeholders will evaluate the entire system, not just the most visible or active component. The entire system must be maintainable and economical. Secondary waste from each component must be dealt with safely.

Across-the-Board Requirements with Site Specific Relevance

Certain site-specific concerns will determine the deployability of technologies:

- Technologies will be evaluated within the regulatory framework prevailing at a particular site. To enhance a technology's acceptability, the technology and its demonstration must be presented in terms of that site's specific regulatory framework. Applicable regulations vary among states and tribal nations. For example, in New Mexico tribal governments may have more stringent cleanup standards than state government, particularly in terms of water quality. Also in New Mexico, RCRA alone will govern technology demonstration and deployment. At this time, DOE sites in New Mexico have no CERCLA liability. Conversely, environmental regulators in Idaho may use RCRA or CERCLA; for example, VOC vapor may be regulated under CERCLA and VOC liquid under RCRA.

- Where a natural resource is considered special, impacts on that resource will determine a technology's evaluation and acceptance. For example, water is extremely important in the arid west. Communities, particularly in the Southwest, are discovering that the quantity of available ground water is significantly less than previously predicted. Therefore technologies that do not remove and reinject ground water are regarded favorably. In another example, the Snake River Plain Aquifer is of such economic, cultural, and political importance to southern Idaho that any proposed technology's impacts on it will take precedence in the evaluation of that technology. Similarly, Southwestern stakeholders prize the clarity of their air, and therefore will scrutinize any proposed technology's air emissions.

- Remote sites place special requirements on technologies. These include the ability to withstand vandalism and operate reliably and automatically for long periods. Remoteness raises the question of power supply, an issue involving concerns about the visual impact of power lines and the air emissions from generators.

- The ability to operate in locally prevailing weather will determine the acceptability of any technology. Extremes of temperature and humidity, high winds, particularly at

Rocky Flats, and deep snows are among the conditions that must be taken into account.

- Trade-offs among criteria will vary from site to site. Local conditions will determine how stakeholders weigh the benefits and drawbacks of some of a technology's characteristics in relation to its other capabilities.

- Versatility applies to all criteria, not just to performance. To be acceptable, a technology must be versatile and adaptable in terms of all the criteria used to evaluate it. For example, regulatory compliance means something different in each of the states where stakeholders were interviewed.

In conclusion, not considering these issues in designing, demonstrating, and selecting a technology may result in decisions that are delayed or reversed, and technologies that are never deployed.

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