



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

DEC 19 2001

THE ADMINISTRATOR

Dr. William Glaze  
Dr. Hilary Inyang  
Dr. Edgar Berkey  
Science Advisory Board  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, D.C. 20460

Dear Dr. Glaze, Dr. Inyang, and Dr. Berkey:

Thank you for writing on behalf of the Science Advisory Board and for sending me a copy of the Environmental Engineering Committee's commentary, *Measures of Environmental Technology Performance* (EPA-SAB-EEC-COM-01-005).

The Environmental Technology Verification Program and the Superfund Innovative Technology Evaluation Program are important parts of the Office of Research and Development's research on innovative technologies. It is essential that the Agency strive to improve research programs through the type of review you have provided. Your guidance and insights are extremely useful in continuing the programs' success and in planning for the future.

The trends noted in your cover letter are important, and we understand the need to ensure that EPA-supported evaluations continue to be relevant to non-regulatory approaches to environmental protection and the global desire for sustainable environments. Our technology-evaluation programs strive to support voluntary environmental improvement programs such as those based on market incentives. In addition, in the Environmental Technology Verification Program, we heavily emphasize those technologies needed internationally for sustainable development, including small-scale, distributed systems for power generation, air pollution control, and waste, storm water, and drinking water treatment.

The measures by which these technologies are evaluated continue to be scrutinized for their completeness and need for expansion. We are assisted in these efforts by broad-based stakeholder groups, and we recognize the need to ensure representation by all potential users of the information generated.

I am enclosing specific comments on the recommendations of the commentary's Attachment A.

Again, thank you. I look forward to benefitting from your continuing contributions to the improvement of Agency programs.

Sincerely yours,

/S/

Christine Todd Whitman

Enclosure

**Responses to Attachment A of SAB's  
"Measures of Environmental Technology Performance: a Commentary  
by the EPA Science Advisory Board"**

**1. Existing EPA Programs and Policies**

The SAB commentary highlights the Superfund Innovative Technology Evaluation Program (SITE) and the Environmental Technology Verification Program (ETV) as these are ORD's essential technology evaluation programs. In this response we will follow SAB's lead and discuss how ETV and SITE can meet SAB's recommendations.

We agree with SAB's list of questions needed to make technology selection decisions. We also concur with SAB on the importance of quality assurance (QA) and data quality objectives (DQOs). Policies on QA and DQOs are being fully implemented within both programs. The SITE program received high marks for its QA program during the last SAB review. In SAB's review of ETV in 2000 the focus was QA - at our request. In ETV we are expanding the importance of DQOs in our revision of the Quality Management Plan (QMP) for the program; in turn this will require that the individual QMPs for the ETV centers be revised to highlight the importance of implementing DQOs. In general, data quality remains a strong foundation to both programs.

**2. The Need for A Wider Suite of Measures**

In its commentary SAB discusses the need for additional measures of performance to show how a technology will perform under realistic and likely conditions of use. We agree with the Committee that collecting data on a wide suite of measures is important to aid decision makers in selecting appropriate technologies and risk management strategies. In many cases we do collect information on the measures that SAB cites. Given budget constraints, environmental heterogeneity and length of testing, it is not always possible to identify or test for all key variables that affect the technology performance and life cycle costs. However, even given these budget constraints, we believe improvements can be made to collect data on a wider suite of measures as SAB suggests.

One mechanism or example that may assist in this area is the newly formed Federal DNAPL (dense non-aqueous phase liquids) Technology Initiative Program (FeDTIP). This group is comprised of four Federal agencies: National Aeronautics and Space Administration, Department of Energy (DOE), Department of Defense (DOD) and EPA. Presently, there are several technologies available for remediation of DNAPL contamination, although their technical and cost effectiveness under various subsurface conditions are not fully understood. The FeDTIP is engaged in an effort to demonstrate and verify the cost and performance of new and relatively mature environmental cleanup technologies for DNAPL source zone cleanup, particularly chlorinated solvents. The results of the activities will provide reliable engineering, performance, and cost information to be used by remediation project managers, site owners and technology vendors. These technology evaluations will also assure that regulatory guidelines and acceptance of the technologies will be easily transferred among interested parties. As this concept of multi-agency cooperation to answer specific science questions around a particular environmental issue progresses, similar groups may be formed.

Another example that has been successful for the SITE Program is the integration of special field demonstration site tours in conjunction with Interstate Technology and Regulatory Cooperation (ITRC) Workgroup Team meetings. This concept capitalizes on multiple state participation and can result in multiple technical issues being addressed in one field demonstration.

For ETV we agree that a wide suite of measures is desirable. The ETV Program utilizes broad-based stakeholder groups to develop protocols for verifying the performance of technologies; these protocols describe the scope and factors to be tested during verification. Since the stakeholder groups include permittees and potential customers of the technologies, the intent is to develop protocols for verification testing that will provide adequate information for these client groups to make decisions on permitting and purchasing technologies. The prevention technologies verified often include extensive cost information and account for energy use and wastes generated. The source water protection and wet weather flow verifications also provide data on energy usage and wastes generated. Other technology categories like drinking water and air pollution control are including more information on capital and operating and maintenance (O&M) costs, however, often testing cost considerations limit the extent of testing. As an example, in the drinking water ETV tests, state regulators have not pushed for a wider suite of measures, in fact, they have stated a preference for less data on more technologies rather than more data on fewer technologies. In technology tests, data on capital and O&M costs can vary greatly due to site considerations, system design, operating flows and water and air quality.

Within the ETV Program we are considering ways to expand the measures for which we can afford to collect information. It is possible that additional studies could be conducted to produce general cost estimates for various design and operating conditions. These data could be used to examine either estimated annualized or life cycle costs for specific types of technologies. For example, where EPA, stakeholders, vendors, and other partners support it, a “phase 2” testing of a class of technologies could be planned that would evaluate field-installed units for more in-depth and longer term testing regimes to gather data for some of the measures SAB recommends, such as ruggedness, O&M requirements, and life cycle costs. We are in the planning stages of a such a “phase 2” testing of mercury continuous emission monitors. Adequate funding for this larger-scale, longer-term testing is an issue, of course. Additional funds beyond what EPA can provide must be found from other sources; in this case Department of Energy and State of Massachusetts are likely candidates.

We are considering another tool for use in ETV as a supplement to the highly quality assured data that is collected as part of the specific quality assurance test plan. This tool is the Pollution Prevention Technology Application Analysis Template (P2 Template) developed by EPA Region 1 to document the practical costs and benefits of a P2 technology as used in real life settings. The template requests information on waste quality and quantity, material recovered or recycled, energy and water consumption, regulatory ramifications and costs of all sorts such as capital and O&M (including qualitative cost estimates for such things as changes in productivity and product quality). The template also calls for documenting “lessons learned” from previous applications of the technology. The P2 Template has its origins in a similar tool that was developed and used to characterize remediation technologies by the Federal Remediation Technologies Roundtable. The template’s use would not have to be restricted to P2 technologies; modified versions of it could be used for all of the technology categories tested under ETV. Stakeholder input on use of the P2 template would also be sought by ETV centers before adopting it.

The cost to do evaluations for an expanded set of measures is not insignificant. We seek to perform these evaluations cost effectively for the vendors and for the users, purchasers and permittees of environmental technologies. The vendors who have their technologies tested are

being asked to pay increasingly larger proportions of the cost to verify their technologies. One of the greatest challenges we will face in the coming years in ETV is to evaluate technologies for an expanded set of measures while maintaining the demand and financial support for technology verification within the vendor communities that pay for these services. Other options for ETV to support broadened measures include increasing funding support from organizations outside EPA that also benefit from the information provided in the verification reports, such as other Federal agencies, states and local governments.

### **3. Stakeholder Involvement in Determining Performance Measures**

The SITE Program recognizes the importance of both Federal to Federal and Federal to state cooperation in common areas of need and interest. This interaction is an important aspect to enhancing the benefits of technology demonstrations. Federal to Federal cooperation allows for leveraging resources, expedited cost and performance information exchange and cross fertilization of technical expertise between federal agencies. State to Federal interaction through organizations such as the Interstate Technology and Regulatory Cooperation (ITRC) Workgroup, provides a mechanism to interact with multiple state regulatory agencies and state specific verification programs. The intent of cooperation between and among the SITE Program, other Federal agencies and states is to build on current working relationships in providing tools to assist decision making at contaminated sites, help regulators and technology users build their knowledge base and raise their confidence about new innovative remediation technologies, and guide technology developers in the collection of performance data to satisfy the requirement of multiple states.

To reduce expenditures and remain at the forefront of innovative technology development, the SITE Program shifted from a technology driven focus to a remediation problem focus, driven by the needs of the hazardous waste community. This approach continues to emphasize the importance of first selecting a site and secondly, evaluating one or more appropriate innovative technologies. As part of this approach, the SITE Program formed a stakeholder review group comprised of representatives from the following organizations: 1) DOD Environmental Security and Technology Certification Program 2) DOE Office of Science and Technology 3) EPA Program Offices 4) EPA Regional Offices and 5) the ITRC Workgroup.

The SAB notes in its commentary that the stakeholder process is a key aspect of the DQO process and that it has been a strength of ETV. SAB states that stakeholder involvement could improve other evaluations. The broad-based stakeholder process of ETV is critical to insuring that the right technologies are tested for the right factors to lead to useful results for permitting and purchasing decision makers. SAB provided in its commentary a list of groups that should be represented. The first groups shown, consisting of regulators, regulated communities, technology users, technology developers, and professional and trade associations, are well represented on ETV stakeholder groups. The remaining groups on the list, environmental interest, financial investment and insurance underwriters, are not as well represented. We will improve the balance by making additional overtures to the less well represented groups to participate as stakeholders in ETV. It may be difficult for environmental groups to afford to participate as most of the stakeholders voluntarily give of their time and even pay their own travel costs. An exception to this is the state organizations for which ETV often funds travel costs to attend meetings.

### **4. Doing More with What We Have**

This issue was raised during the 1996 review of the SITE Program. We agree with the Committee that inter-comparisons and technical extrapolations would be useful to those

selecting technologies for clean-up. Following the 1996 review, the SITE Program began participating as workgroup team members in state regulatory organizations such as the ITRC Workgroup. The ITRC, newly formed in 1995, is a state-led national coalition dedicated to achieving better environmental protection through the use of innovative technologies. The tools and strategies that ITRC creates are helping regulatory agencies and technology developers, vendors, and users reduce the technical and regulatory barriers to deployment of new environmental technologies.

SITE has worked with ITRC in a number of technical areas such as phytoremediation, monitoring and characterization techniques, passive barriers, bioremediation and technology verification teams and more recently the DNAPL team. ITRC technology guidance documents may serve as technology reports on a specific technology such as passive barriers or a decision tree in more complex technology areas such as phytotechnologies. SITE Program data is one source of information that the ITRC uses in developing these documents. As a result of information collected under the SITE Program passive barrier project the ITRC was able to document a cost savings of \$2,700,000 by using passive barriers over conventional treatment and reduced regulatory review time by 10 percent. The SITE Program plans to continue participating and supporting the ITRC in these technical workgroups.

In ETV we publish individual reports and verification statements for each technology verified. Our focus has been to provide high-quality performance data for specific technologies. There are pitfalls of making comparisons between and among technologies that we avoid by not making them. First, there are many technologies that may appear similar, but that are targeted at different markets (e.g., coatings) where comparison would not be appropriate. Second, there are other factors than "best" performance that may play a role. For instance, a lower efficiency technology may be capable of meeting the user's needs (e.g., regulations level) at a lower cost or with lower resource usage (e.g., energy, water, reagents). To avoid the appearance of picking winners and losers we generally do not compare results of one technology with another in a publication.

Even given these pitfalls and our policy to generally avoid making comparisons, we have, at times, presented results of several technologies as a group at technical conferences. In these presentations the approach that we believe is acceptable to vendors and helpful to potential technology users is to provide a matrix to compare data from different technologies, but label technologies as Product A, B, C, and so on, not by name or company. This allows review of the range of results and analyses of trends. If a user is inclined to pursue the information further, full reports and verification statements for each technology verified are available on the ETV website where one can determine the technology identity by matching the data. The benefit is that the user is required to see the data in its complete context and not in a potentially oversimplified comparison which does not fully explain the context of the testing. This approach, we believe, strikes a balance between the needs of the vendors and potential purchasers.

We continue to review ways to make it easy for users of the information to compare results where that is appropriate. In the Advanced Monitoring Systems Center air stakeholder group we have discussed insuring that critical values are presented uniformly in tables in each verification statement and report and providing hot links between tables so that comparisons can be made easily. As SAB suggests we will continue to review how we can accommodate the needs of users of the information to have the results interpreted and compared. We will do this in cooperation with the vendors who are being required to pay for a larger and larger percentage of the verification cost.

It is important to also note that ORD and its National Risk Management Research Laboratory (NRMRL) consider the subject of how to do comparisons of risk management options a research topic in itself. NRMRL through its pilot entitled the Risk Management Evaluation (RME) Program, seeks to provide a protocol for ORD or other researchers to guide them to develop

comprehensive state of knowledge reports on risk management alternatives for high risk environmental issues. Within the venue of the RME reports that result, the technology comparisons that SAB seeks may be provided.

In summary, we thank the Committee for their review comments and their insights. We intend to investigate all of the Committee's suggestions. Our discussions with subsequent feedback from the Committee have been very helpful and supportive. We look forward to updating the Environmental Engineering Committee as our research programs continue.