

Verification of Advanced Air Monitoring Systems

98-WP77.03

Karen B. Riggs, Thomas J. Kelly, and Gretchen Hund
Battelle, 505 King Avenue, Columbus, OH 43212

Robert Fuerst
U.S. Environmental Protection Agency,
National Exposure Research Laboratory
Research Triangle Park, NC 27711

ABSTRACT

Battelle was chosen, through a competitive cooperative agreement, as the U.S. Environmental Protection Agency's (EPA) partner in the Advanced Monitoring Systems (AMS) pilot, which is part of the Environmental Technology Verification program. This pilot will verify the performance of commercially-available technologies used to monitor for environmental pollutants. The initial emphasis of the pilot is on the verification of air and water monitoring technologies.

The pilot will include the development of standardized verification protocols and test plans, independent testing of technologies, and preparation of verification test reports for broad dissemination. The EPA goal of the verification pilot is to have it ultimately become self-sustaining or "privatized" by operating on pilot-generated income (user fees) and other resources.

The AMS pilot was initiated in October 1997. During the first year of the pilot, Battelle has recruited individuals to serve on two Stakeholder Committees, one for air technologies and one for water technologies. These stakeholders will advise on the development of verification protocols and test plans. They will also advise on the selection of technologies for verification testing, and review the verification test reports. The committee consists of representatives of a variety of groups including regulators (federal, state, and local agencies), regulated communities (i.e., DOD, industry), technology users, professional and trade associations, environmental groups, and financial groups.

With the guidance of the Stakeholder Committees and EPA, Battelle has been identifying key needs for air monitoring technologies, developing technology screening criteria, and soliciting for technologies to be verified. Verification protocols for key technology categories are also being developed.

An initial technology solicitation has been issued. Responses to the solicitation are being screened and prioritized in order to select the initial technologies to be verified. Verification testing of the first air monitoring technologies will begin in the fall of 1998. Additional effort in 1998 and 1999, the second and third years of the three-year pilot, will focus on privatizing the pilot. By the end of the third year, Battelle expects that up to 16 technology areas will be verified.

INTRODUCTION

This paper describes a pilot program funded by the U.S. Environmental Protection Agency (EPA) to verify, under predetermined criteria or protocols with adequate data quality assurance procedures, commercially-available systems for monitoring air, water, and soil. The objective of the pilot is to accelerate the acceptance of environmental monitoring systems in the marketplace through verification and reporting of technology performance.

Battelle, EPA's partner in this effort, has established Stakeholder Committees, which will provide advice to Battelle and EPA throughout the program. With the assistance of EPA and these committees, Battelle has identified priority environmental monitoring needs and solicited vendors with technologies that meet these priority needs to participate in the pilot. This paper identifies the stakeholder affiliations and lists the priority monitoring needs identified by the stakeholders. Verification test results are not included in this paper as testing of the first air monitoring systems is not expected to begin until the fall of 1998. The benefits to vendors who have their technologies verified under the pilot are described, including EPA funding to support testing of the initial technologies verified under the pilot.

BACKGROUND

The pilot project discussed in this paper is a component of the EPA's Environmental Technology Verification (ETV) program, which is nearing the midpoint of its five-year pilot period. By the spring of 1998, all 12 planned ETV pilot projects listed in Table 1 will be under way. The aim of the ETV program is to accelerate the acceptance of environmental technologies in the marketplace, through objective verification and reporting of technology performance. Activities in the 12 pilots will provide independent, quality-assured, third-party performance data, so that potential users and permittees have a credible assessment of the technology. ETV is a voluntary program intended solely to provide defensible performance data to the environmental community. ETV does not intercompare, rank, approve, or disapprove technologies. ETV also addresses only commercially-available technologies, and does not support research or evaluate prototype technologies. The ETV verification strategy is available as an EPA report (1) and links to the pilot projects can be found at www.epa.gov/etv.

Each of the pilot projects is conducted by a "verification partner" organization in cooperation with EPA. The partner organization is guided by a Stakeholder Committee, representing regulated industries and agencies, EPA and state regulating agencies, technology developers and users, consultants, environmental groups, and other interested parties. The Stakeholders advise the verification partner on technology needs and developments, testing procedures, and outreach

activities, and review test plans and reports. The products of a verification test are a report stating quantitatively the performance of the technology, and, if the vendor wishes, a Verification Statement documenting the test results.

In October of 1997, EPA, through a competitive cooperative agreement, selected Battelle, with headquarters in Columbus, Ohio, as its verification partner for the pilot project on Advanced Monitoring Systems (AMS). The scope of this pilot is deliberately broad, including monitoring systems for contaminants in air, water, and soil, with air and water technologies of highest priority at this time.

The timing of the AMS pilot is opportune, because of a move on several fronts toward acceptance of a broader range of environmental measurement technologies. Most prominent is EPA's move toward Performance Based Measurement Systems (PBMS) for environmental monitoring. PBMS is a process in which the data quality needs or limitations of a specific measurement program are used to select appropriate and cost-effective measurement methods. PBMS offers much greater flexibility than EPA's current approach, in which measurement techniques and instrumentation are prescribed for air, water, and soil analysis, and thus it offers an opportunity for vendors of monitoring technologies to achieve greater acceptance of their products. Implementation of PBMS within EPA is expected to take considerable time, and currently there are no procedures established for achieving acceptance through PBMS. However, the AMS pilot will conduct verification testing according to PBMS guidelines as they become available, offering a cost-effective approach to PBMS demonstration. Some aspects of EPA's PBMS approach, such as the importance of data quality objectives and quantitative method performance, the evaluation of methods on actual samples, and the initial PBMS focus on analytical techniques (as opposed to sampling or sample preparation) are particularly compatible with the AMS pilot.

Other moves toward acceptance of new measurement methods include EPA's Advanced Measurement Initiative (AMI), which supports internal development of new measurement technologies (www.epa.gov/ami), and the Superfund-supported SITE program, which has verified over 80 technologies for site remediation since its inception in 1986. Pressure to develop new measurement technologies has come about from the lack of data on the hazardous air pollutants listed in the 1990 Clean Air Act Amendments (2, 3), and the expected listing by EPA of 71 biological, inorganic, organic, and pesticide contaminants for possible regulation under the Safe Drinking Water Act (4).

ADVANCED MONITORING SYSTEMS PILOT

Scope

The objective of the Advanced Monitoring Systems (AMS) pilot is to verify advanced monitoring systems for air, water, and soil. The scope of technologies that could be verified under this pilot is deliberately broad. Air and water monitoring systems are the initial focus in the pilot. Air monitoring systems could address ambient air, stationary source emissions, or

indoor air, while water monitoring systems could address drinking water, surface water, ground water, waste water, or sediment. Remote monitoring systems, field instruments, continuous emission monitors, and laboratory analytical instruments could all be considered for verification.

Verification Process

The verification process has begun on the AMS pilot with the establishment of Stakeholder Committees and the issuance of a Request for Technology (both described below). Vendors who respond to the Request for Technology and whose monitoring systems meet minimum screening criteria will be invited to complete and submit an Application Package that provides more detail, and supporting data, on their systems. Battelle, with guidance from EPA and the Stakeholder Committees, will evaluate the applications to select and rank the monitoring systems for verification testing. Battelle will develop testing protocols and test plans, with stakeholder advice and vendor review. The verification testing will then be conducted according to these protocols and test plans.

The products of a verification test are a Verification Report stating quantitatively the performance of the technology, and a Verification Statement, issued jointly by Battelle and EPA, that summarizes the verification results. A vendor can use the Verification Statement to attract prospective buyers of its technology by providing them with third-party quality-assured data on technology performance under realistic testing conditions. The Verification Statement will also be published on EPA's ETV website.

Stakeholder Committees

Battelle has recruited individuals from various organizations across the United States to participate as stakeholders on the AMS pilot. Two Stakeholder Committees have been formed - one for air technologies and one for water technologies. A listing of the organizations represented by the stakeholders in each Stakeholder Committee is provided in Table 2. Considerable effort was taken in forming these committees to ensure representation from all parts of the United States, as well as from different organization types (i.e., regulated community, federal and state regulators, financial community, environmental groups, technology users, etc.). These committees may be augmented, as necessary, by technical experts in particular technology areas who can provide more detailed advice during verification testing.

- Stakeholders participating in the AMS pilot have the following responsibilities:
- Assist in identifying environmental monitoring needs
- Review selected pilot documents
- Attend stakeholder meetings
- Review verification test results

- Promote pilot benefits and use of verified technologies within their constituents.

Priority Technologies

At the initial meeting of the Air and Water Stakeholder Committees held February 23-24, 1998 at Battelle in Columbus, OH, the stakeholders participated in a process to identify the most critical technology needs facing the environmental community and their own organizations. In addition, the stakeholders assisted in prioritizing the identified technology needs for verification testing. Criteria considered in prioritizing the technology needs included:

- Technology must address a real and pervasive environmental monitoring need
- Multiple commercial systems to meet the need must exist that could be considered for verification testing
- The commercial systems available to meet the technology need could be verified with reasonable effort

The priority technology needs identified in this first meeting are listed in Table 3. Both the Air and Water Stakeholder Committees independently identified a strong general need for monitoring pollutants in the field, to avoid the time delay, high cost, and sample handling involved with sending environmental samples to an off-site laboratory for analysis. This general need is obviously reflected in the specific monitoring needs listed in Table 3.

In March, 1998, Battelle issued a Request for Technology to instrument vendors and manufacturers with monitoring systems that could meet these priority needs. The purpose of this Request for Technology was to identify vendors that were interested in obtaining verification for their monitoring systems under the AMS pilot.

Vendor Benefits and Involvement

Vendors and developers who have their technology verified under the AMS pilot should expect considerable benefit from participating. Potential benefits include:

- Increased credibility from having independent performance data
- Access to expertise in verifying monitoring technologies
- Possible reduction in the number of performance demonstrations needed to gain acceptance from multiple states and municipalities
- Increased likelihood of regulatory acceptance and public recognition of technologies

- Increased recognition in both national and international markets through promotion of verification results
- Increased confidence for investors.

Vendors who have their monitoring system verified under the AMS pilot will be obliged to:

- Commit a commercial-ready system(s) for the duration of verification testing
- Provide operation and maintenance support during verification testing, if necessary
- Review and comment on test plans and verification test reports.

EPA funding will be available in the first three years of the AMS pilot (through September 2000) to partially support verification testing as an incentive to encourage vendor participation and to move the pilot towards privatization. Depending upon the complexity of verification testing, vendors may be expected to pay user fees to supplement EPA funding during this pilot period. Once the AMS pilot has been privatized, user fees are expected to fully cover verification costs.

REFERENCES

1. Environmental Technology Verification Program: Verification Strategy, EPA-600/K-96-003, U.S. Environmental Protection Agency, Washington, D.C., February 1997.
2. Kelly, T. J., Mukund, R., Spicer, C. W., and Pollack, A. J., "Concentrations and Transformations of Hazardous Air Pollutants", Environ. Sci. Technol., 28, 378A-387A, 1994.
3. Mukund, R., Kelly, T.J., Gordon, S.M., Hays, M.J., and McClenny, W.A., "Status of Ambient Measurement Methods for Hazardous Air Pollutants", Environ. Sci. Technol., 29, 183A-187A, 1995.
4. High Risk Drinking Water Contaminants Identified, Environ. Sci. Technol., 32, p. 15A, 1998.

NOTICE

The information in this document has been wholly funded by the United States Environmental Protection Agency. It has been subjected to Agency review and approval for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Table 1. EPA's Environmental Verification Technology Pilots

Pilot Scope	EPA Partner
Advanced Monitoring Systems	Battelle
Air Pollution Control Technologies	Research Triangle Institute
Drinking Water Systems	NSF International
Global Climate Change	Southern Research Institute
Independent Entity	Civil Engineering Research Foundation (CERF)
Indoor Air Products	Research Triangle Institute
Pollution Prevention/Innovative Coatings and Coating Equipment	Concurrent Technologies Corp. (CTC)
Pollution Prevention/Metal Finishing	To be determined
Pollution Prevention/Waste Treatment Systems	State of California
Site Characterization and Monitoring Technologies	Oak Ridge and Sandia National Laboratories
Source Water Protection Technologies	To be determined
Wet Weather Flow Technologies	To be determined

Table 2. Organizations Represented by Stakeholders

Air Stakeholder Committee	Water Stakeholder Committee
<p>World Resources Institute California Air Resources Board DuPont Desert Research Institute U.S. EPA Ohio EPA New York State Department of Environmental Conservation Ashland Chemical Company U.S. Army U.S. Air Force South Coast Air Quality Management District Vorys, Sater, Seymour, and Pease Arizona Department of Environmental Quality EPRI Owens Corning Environmental Business International Zurich American Specialties Emission Monitoring, Inc. Gas Research Institute American Petroleum Institute University of Denver Mid-Atlantic Regional Air Management Association</p>	<p>U.S. Navy Ohio Innovation Fund American Petroleum Institute Massachusetts Water Resources Authority River Watch Network Alcoa Environmental Business International National Groundwater Association ECS, Inc. San Francisco Estuary Institute U.S. EPA Port of Long Beach Nebraska Department of Environmental Quality City of Colorado Springs Northwest Mining Association NOAA SCDHS Office of Ecology Northeast Ohio Regional Sewer District California State Department of Health Services WMX, Inc. University of Nebraska Ohio River Valley Water Sanitation Commission</p>

Table 3. Priority Technology Needs

Priority Air Technology Needs	Priority Water Technology Needs
Real-time field instruments that can measure particulate matter in ambient air or that correlate with the Federal Reference Method for this measurement	Home test kits for measuring pathogens (fecal coliform) or metals (lead, copper) in drinking water
Real-time automated speciating volatile organic compound monitors with sample-tolerant inlets	Chemical-specific field probes for monitoring volatile organic compounds or synthetic organic compounds in groundwater
Portable field NO/NO ₂ analyzers for small sources (e.g., internal combustion units and small boilers)	Real-time field instrumentation for monitoring pathogens or synthetic organic compounds in surface water
Real-time field monitors for measurement of speciated organics and/or inorganics from point sources	