

EPA Environmental Technology Verification (ETV) Program

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Battelle: World's Largest Non-Profit R&D Organization (\$5B annually; 20,000 employees)

Will of Gordon Battelle

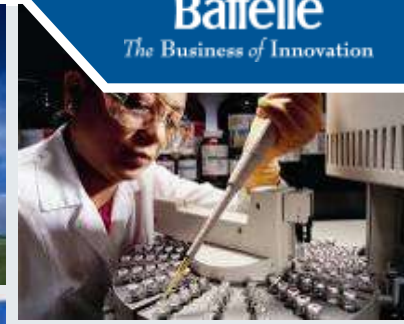


- **Non-profit, charitable trust**
 - Distributions that provide “the greatest good to humanity”
- **Purposes:**
 - “Creative and Research Work”
 - “Making of discoveries and inventions”
 - Better education of men and women for employment
- **Governed by a self-perpetuating Board of Directors**

For 75 years, we have been engaged in scientific discovery and refining approaches to translating discovery into practical applications

What We've Done

- Pioneered contract research and development
- Revolutionized many products and services
- Cultivated alliances and collaborations



- Helped launch new industries
- Redefined how “engaged corporation” interacts with community

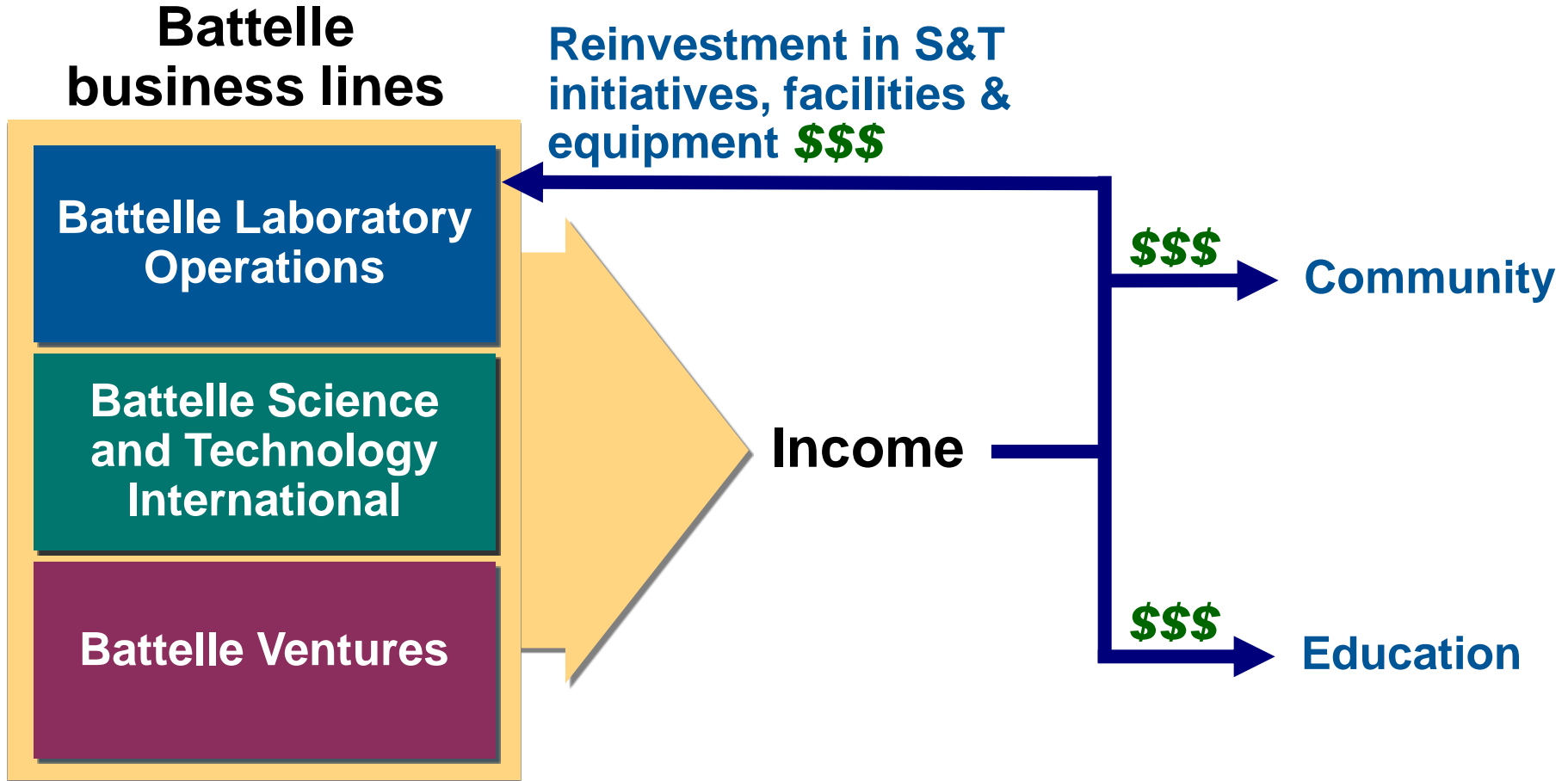
What We've Done – Where We've Been

- Developed new materials
- Improved and created entire industries
- Pioneered new technologies



- Metals and materials including armor plating for U.S. tanks in WWII
- Fuel for *Nautilus*, the first nuclear submarine
- *Xerography*
- Early compact disc technology
- Fiber-optics technology for telecommunications
- Increased fuel cell performance and fuel cell materials
- Affordable clean water purification
- Drug delivery technology
- Threat detection for people/infrastructure

Battelle Invests Profit in Accordance with its Founding Purpose



Battelle Major Technology Centers



Battelle Europe
Geneva, Switzerland



Corporate Headquarters
Columbus, Ohio



**Battelle Eastern Science
and Technology Center**
Aberdeen, Maryland



Battelle Ocean Sciences Laboratory
Duxbury, Massachusetts

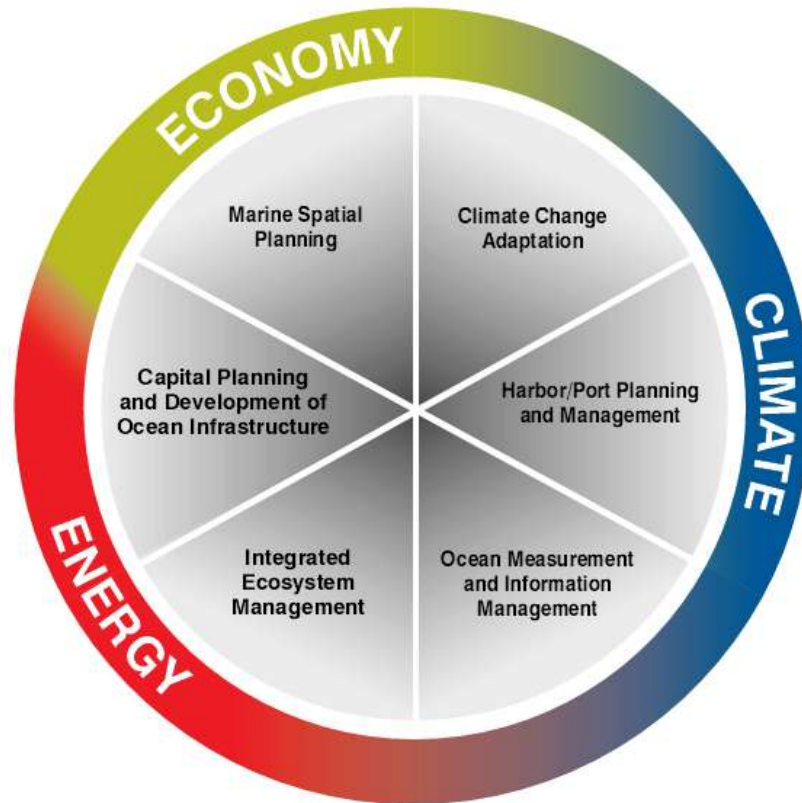


Battelle West Jefferson
West Jefferson, Ohio



Battelle United Kingdom
Ongar, United Kingdom

Ocean and Coastal Solutions



Enabling Adaptation and Sustainability Through Scientific Research and Technology

Marine Spatial Planning

- Coordination, analysis, planning, implementation, monitoring, evaluation and communication services to support diverse human uses are supported while maintaining healthy marine ecosystems
- Synthesis of interrelationships and interdependence of each component within the defined management area, including natural processes, activities, and authorities.

Climate Change Adaptation

- Planning, hazard identification and response tools including impact and vulnerability analysis based on our scientific and technological advances
- Participatory planning processes incorporating multi-criteria uncertainty and risk assessment

Integrated Ecosystem Management

- Monitoring/measurement of ecosystem stressors, drivers, and outcomes and decision support for valuing, evaluating, preserving and restoring ecosystems and ecosystem services
- Conceptual and numeric modeling enabling projection of impacts of anthropogenic and "natural" stressors (including climate change) on ecosystem functioning and services

Harbor/Port Planning and Management

- Advanced environmental measurement technologies to improve data acquisition and facilitate integrated environmental decision making
- Quality control and management of the data essential for both assessment and prediction

Ocean Measurement and Information Management

- Decision-stream analysis linking management decisions to ecosystem service impacts
- State-of-the-art status and trends analysis including valuation methods to balance economic and ecological development goals

Capital Planning and Development of Ocean Infrastructure

- Licensing/permitting support, environmental baseline studies, environmental impact assessment, and stakeholder engagement
- Site investigation and remediation, contaminated sediment management, wetlands reclamation and restoration

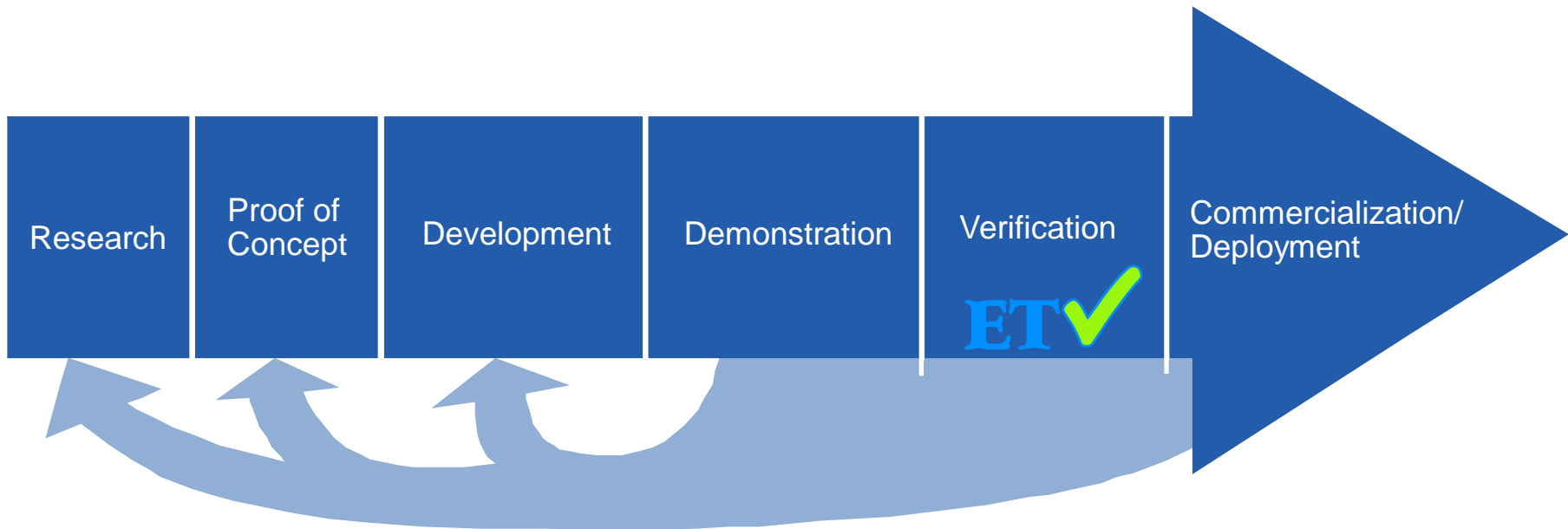
US EPA Environmental Technology Verification (ETV) Program Objectives



- Provide credible performance information for commercial-ready technology to help solve high-risk environmental problems. Help -
 - **Purchasers** in making decisions to purchase innovative technologies
 - **Policymakers and Regulators** in making policy and permitting decisions for innovative technologies
 - **Vendors/Developers** in selling and further developing innovative technologies



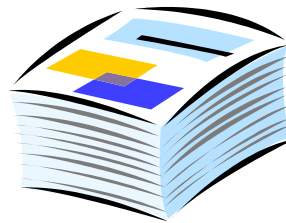
ETV Helps Technology Commercialization and Innovation



ETV Verification Process



EPA, verification organizations, stakeholders



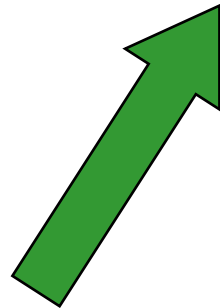
With stakeholders, develop test protocols, quality-assurance test plans
AND



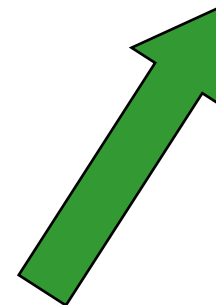
Conduct technology testing, audits



Identify priority technology categories



Identify vendors, collaborators



Write verification report



Six ETV Centers

- **ETV Air Pollution Control Technology Center**
RTI International
- **ETV Advanced Monitoring Systems Center**
Battelle
- **ETV Drinking Water Systems Center**
NSF International
- **ETV Greenhouse Gas Technology Center**
Southern Research Institute
- **ETV Water Quality Protection Center**
NSF International
- **ETV Materials Management and Remediation Center**
Battelle

Plus: ETV ESTE - Environmental and Sustainable Technology Evaluation

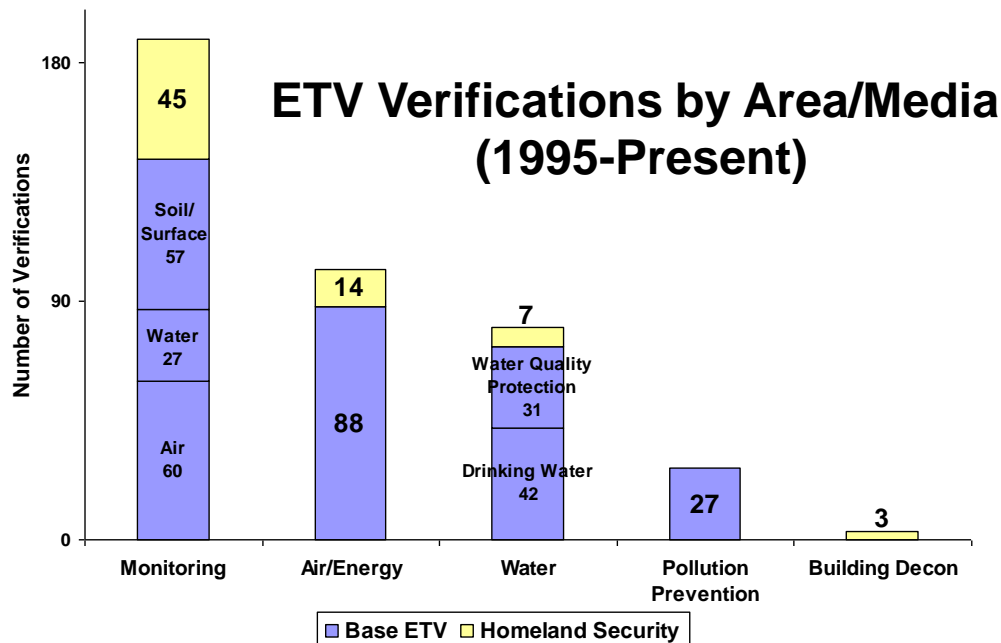
Center Operations

- Each Center addresses different types of environmental technologies
 - Advanced Monitoring Systems Center's scope includes monitoring, sampling, site characterization
 - Materials Management and Remediation Center's scope include beneficial reuse, recycling, remediation
- Voluntary program for vendors that makes objective performance information available to help decision-making
- Guided by the expertise and support of stakeholders (representative verification customers) in technology prioritization, protocol development, collaboration/co-funding, and external peer review
- Coordination with international ETV programs
- Collaboration, vendor cost-sharing, and leveraging of funds are essential components



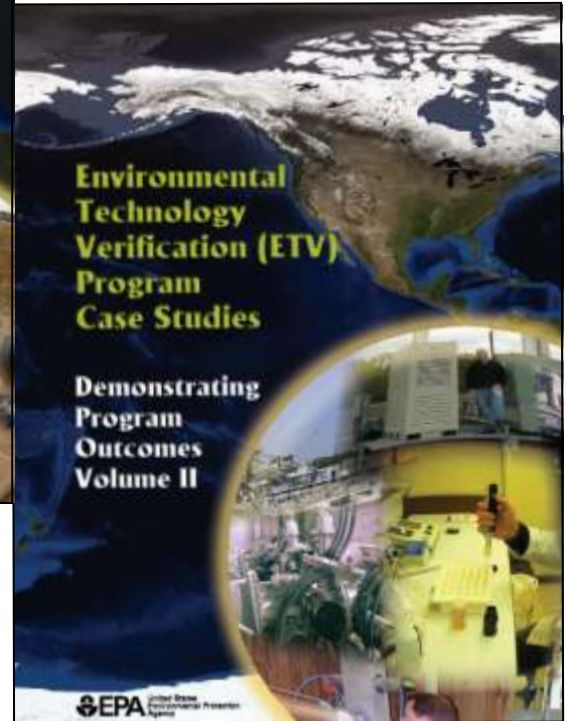
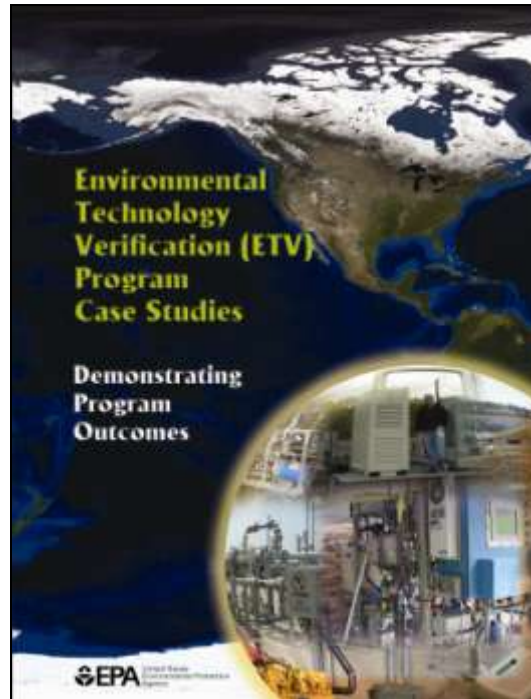
ETV at a Glance

- Collaborations and vendor cost-sharing leverage ETV, generating 80-90% of funding in last two years
- 421 verifications, 90 protocols completed
- Over 300 stakeholders active in advisory groups and technical panels
- Web and international interest (>2.5 M hits/year)



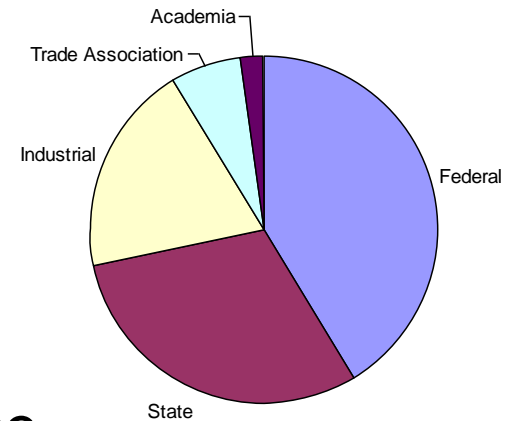
ETV Outcomes

- 15 case studies, plus one update
- Show actual and project likely outcomes of verifications
- Summarizes available information:
 - vendor sales
 - pollutant reduction
 - regulatory responses
 - science innovation
- Projected health outcomes in five cases:
 - arsenic treatment
 - diesel retrofit
 - MF/UF for microbiological treatment
 - baghouse filtration products
 - nanofiltration for DBP treatment



ETV Stakeholder Organizations

- Bayer
- Northeast Waste Mgt Officials Association (NEWMOA)
- US EPA
- Dow
- States of NE, RI, OH, NJ, CT, NY, TX, VT, CA, OR
- VA Tech
- American Petroleum Institute
- Northeast Recycling Council
- USDA
- US Navy
- USACE
- DuPont
- USGS
- Shell
- US Air Force
- BP
- US DOE
- SERDP/ESTCP
- Chevron



New participants are welcome!

Stakeholder vs Collaborator

- Stakeholder: Active participant in advisory panel to support overall Center activities; can also serve as a collaborator
- Collaborator: Provides support (funding and/or in-kind services) for a specific verification test; not necessary to also be a stakeholder
- Potential Commitments and Contributions
 - Meeting participation (quarterly telecons)
 - Assist in identifying or provide funding support for test
 - Assist in identifying or provide in-kind contributions
 - Personnel (technology operators; site support)
 - Site and associated logistics (access, power, shelter, etc.)
 - Reference sampling and/or analyses
 - Review test/QA plans and reports

Example ETV AMS Verifications

Category	Collaborators
Immunoassay test kits for microcystins	Nebraska Department of Environmental Quality, Suffolk County (NY) Department of Health Services, and two technology vendors
Nitrate sensors for ground water monitoring	EPA Office of the Chief Financial Officer, New Jersey Department of Environmental Protection, US Department of Agriculture, and one technology vendor
Leak Detection for Underground Storage Tanks	EPA Office of Underground Storage Tanks; US Army Environmental Command; National Working Group on Leak Detection Evaluations
Carbon sequestration monitoring	EPA Office of Water, Department of Energy, and one technology vendor
Ballast water screening	US Coast Guard and one technology vendor
Estrogen enzyme-linked immunosorbent assay (ELISA) kits	EPA Office of Research and Development, US Geological Survey, and 1 technology vendor
Ammonia monitoring in power plant stack emissions	Electric Power Research Institute, Tennessee Valley Authority, and one technology vendor
Ozone indicator cards	Breathe California of Los Angeles, South Coast Air Quality Management District
Leak detection and repair technologies	EPA Office of Research and Development, Texas Chemical Council, American Chemistry Council, and two technology vendors
Radio frequency identification devices	EPA Region 6, Office of Air and Radiation, Office of Solid Waste and Emergency Response, the Mexican Government, the States of New Mexico and Texas, and two technology vendors
Sealed radioactive source alternatives	EPA Office of Air and Radiation, Office of Research and Development

ETV MMR Center Priority Technology Categories

- Anti-Corrosion Tank Sprays
- Recycling Copper Mine Tailings
- Tire Recycling
- Electronics Recycling
- Concrete Reuse
- Coal Ash Reuse
- Regulated Medical Waste
- Tyvek™ Suit Recycling
- In-situ Chemical Oxidation
- Delivery Methods
 - Pneumatic and Hydraulic Fracturing
 - Pressure Pulsing
- Sediment Remediation
 - Reactive capping
 - Ex-situ treatment/beneficial reuse
- Emerging Contaminant Remediation
 - 1,4-Dioxane



Technology Vendor Interest in ETV

- Domestic and international market potential once verified
- Independent technology verification is required by rule or regulation
- Competition between vendors
- Grant provides support for verification
- Information dissemination potential
 - EPA web site; conferences; press day
- Return on investment

AAPA support of any of the above items will increase vendor participation



Technology Testing and Evaluation Program (TTEP)

- 5-Year \$22M contract focused on homeland security technologies
- Utilizes successful program framework from ETV
- TTEP components
 - Stakeholder Involvement
 - Vendor Cooperation
 - Experimental Design
 - Laboratory and Field Evaluation
 - Active Outreach and Communication
 - Comprehensive Quality Assurance
 - Peer-Reviewed Publicly-Available Results



TTEP (Cont'd)

- Covers broad range of homeland security technologies
 - Water detection
 - Water treatment
 - Water infrastructure decontamination
 - Water and air sampling
 - Computer software
 - Building decontamination
 - Building detection
 - Air cleaning/filtration
- Chem/bio/rad contaminants



Threat Detection and Screening T&E Highlights

- Transportation Security Laboratory (DHS): Primary Developmental Test and Evaluation (DT&E) Technical Services Provider Since 1998
 - T&E of explosives detection systems for baggage, cargo and passenger inspection
 - T&E of protection technologies and systems for blast mitigation
 - T&E support includes development of protocols, standards, procedures and testing tools.



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