

U.S. EPA Environmental Technology Verification (ETV) Program, the Founder of the ETV Concept



Realizing eco-innovations: International Perspectives on ETV
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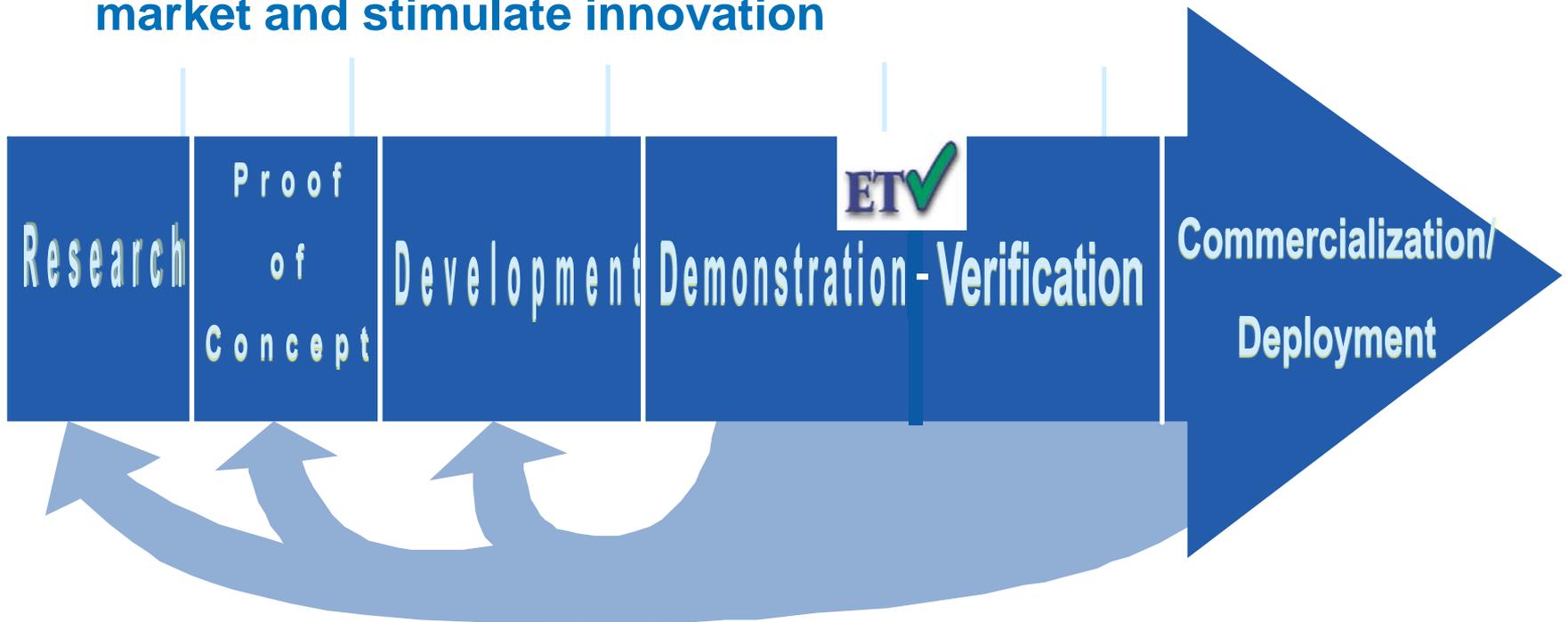
May 23, 2012

U.S. ETV Program Background

- Established in 1995 as public/private partnerships to:
 - Advance industry adoption of innovative, commercial-ready technologies relevant to EPA mission
 - Provide credible performance data to help:
 - purchasers to buy with confidence
 - regulators to permit
 - technology developers/vendors innovate and sell
 - Foster economic growth and jobs in the environmental sector
- ETV does not endorse, certify, or approve technologies

Where is ETV in R&D Continuum?

ETV tests commercial-ready technologies to speed them to market and stimulate innovation



ETV Program Core Values

- Provide performance testing among participants that is:
 - Fair
 - Credible
 - Objective
 - Consistent
 - Transparent
 - High-quality
 - Equally available
- Data credibility and objectivity are important (QA)
 - Tests conducted by third-party verification organizations (VOs)
 - Tests use protocol and/or test plans developed before testing - publicly available

ETV Public/Private Partnership Structure

- Multiple ETV Centers
- Each Center is operated with a VO
 - 6 Centers, 4 VO's



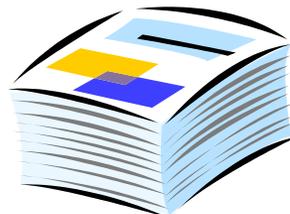
ETV Center (end year)	VO	Contact
Advanced Monitoring Systems (2013)	Battelle Memorial Institute	Amy Dindal dindala@battelle.org
Air Pollution Control Technology (2012)	RTI International	Jason Hill apctvc@rti.org
Drinking Water Systems (2013)	NSF International	Bruce Bartley bartley@nsf.org
Greenhouse Gas Technology (2013)	Southern Research Institute	Tim Hansen hansen@southernresearch.org
Materials Management Remediation (2012)	Battelle Memorial Institute	Amy Dindal dindala@battelle.org
Water Quality Protection (2014)	NSF International	Tom Stevens stevenst@nsf.org



How Does U.S. ETV Verification Program Work?



EPA, verification organizations, stakeholders



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



Conduct technology testing, audits

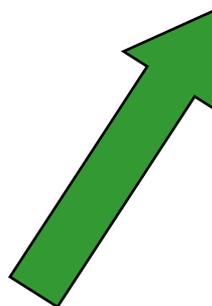


Identify priority technology categories

AND



Identify vendors, collaborators



Write verification report



Benefits of ETV's collaborative structure

Verification Organizations

- 📄 Third-party credibility
- 📄 Entrepreneurial attitude

Stakeholders and Collaborators

- 📄 Relevance
- 📄 Cost efficiency

U.S. EPA

- 📄 Quality, consistency
- 📄 Transparency, fairness
- 📄 Capacity building

Selected ETV Collaborations

Drinking water arsenic treatment	Alaska, Pennsylvania, Michigan, New Mexico, Utah
Emergency response drinking water treatment	U.S. Bureau of Reclamation, U.S. Army, U.S. Navy
Storm water treatment	Georgia, Kentucky, Michigan, Wisconsin
Ballast water treatment	U.S. Coast Guard
Multi-parameter water probes, atrazine	U.S. National Oceanic and Atmospheric Administration

U.S. ETV at a Glance

- Since inception of ETV Program in 1995
 - Over 460 technologies tested
 - Greater than 100 protocols completed
 - More than 500 active stakeholders in technical panels
- Collaborations and cost-sharing leverage ETV
 - 50% of total funds in 2004-7
 - 80-90% in 2008-2010
 - ~ 98% in 2011

U.S. ETV at a Glance

- Website www.epa.gov/etv has between 800K - 3M hits/year
- Global recognition - ETV international
 - Canada
 - European Commission (DanETV)
 - Philippines
 - Korea
 - Japan
 - Possibly China in 2015

Selected 2011 U.S. ETV Verification Statistics

25 verifications completed
(~ 98% cost sharing from others)

AMS Center

- 2 - leak detection and repair (LDAR) technologies
- 1 - alternative technology for radiography cameras
- 1 - ground water nitrate sensor
- 2 - wastewater toxicity monitors
- 2 - *E. coli* and total coliform detection
- 1 - ozone indicator card
- 3 - immunoassay test kits for microcystins
- 1 - carbon sequestration monitor
- 1 - field portable ion chromatograph



Selected 2011 U.S. ETV Verification Statistics (continued)

Air Pollution Control Center

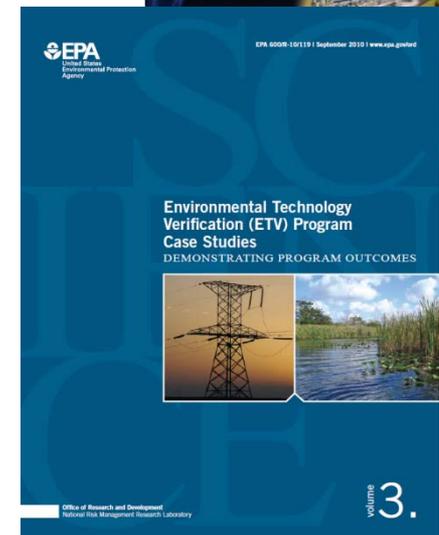
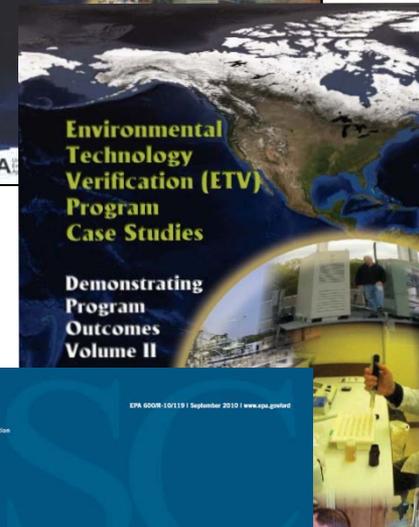
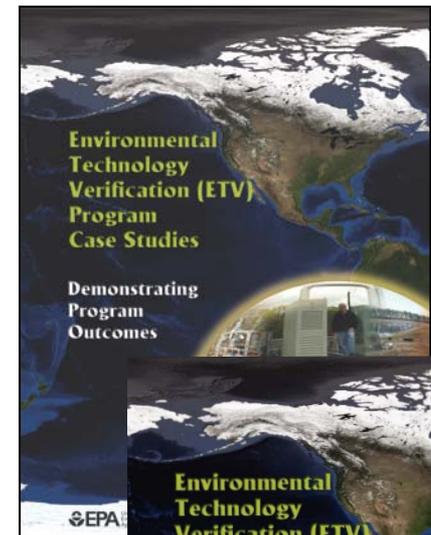
- 3 - baghouse filtration products
- 1 - mobile sources device for selective catalytic reduction

Drinking Water Treatment Center

- 1 - membrane filtration system for reduction of microbiological and particulate contaminants
- 1 - whole building or mobile treatment system for reduction of microbiological and chemical agents

ETV Program Case Studies

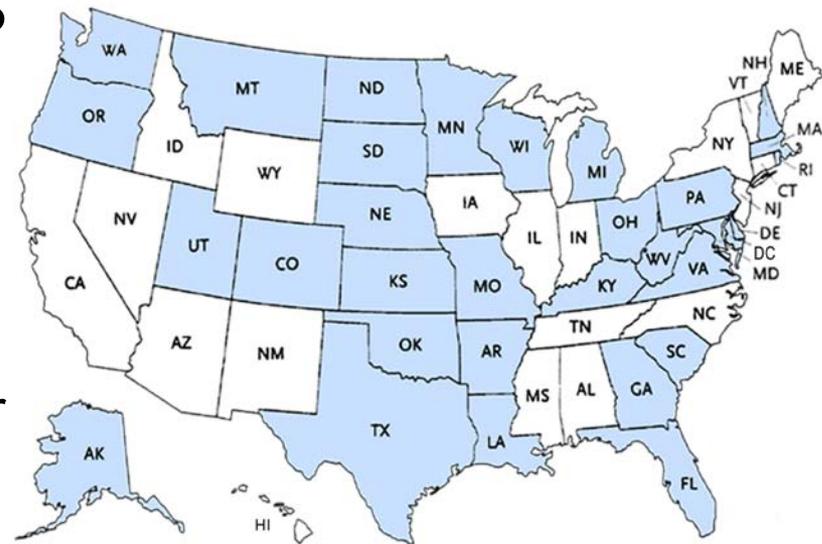
- 17 original case studies
 - + 1 case study update
- Actual and projected outcomes of verifications based on market penetration
- Summarizes available info:
 - vendor sales
 - pollutant reduction
 - regulatory responses
 - science innovation
- Selected projected health outcomes for:
 - arsenic treatment
 - diesel retrofit
 - baghouse filtration products
 - continuous emission monitors for mercury



Regulators use ETV to Permit New Technology

Stakeholders – prepare markets for ETV results

- “ The Association of State Drinking Water Administrators (ASDWA) and its members have consistently supported the . . . DWT Center . . . ASDWA relies heavily on these evaluations to support the use of technologies and products in our industry and assure a proper standard of care.” – Jim Taft, ASDWA, 2007
- ASDWA survey (March 2010) – 35 states using ETV in guidance and to make decisions on permitting new technology; 31 states would allow for reduced pilot testing based on ETV performance data
- For wastewater: > 10 states reference ETV in their guidance or regulations as required or recommended for new technology



States Using NSF EPA Environmental Technology Verification Reports

Case Study: Continuous Emission Monitors for Mercury (2007)

- Mercury (Hg) is toxic, persistent pollutant that accumulates in food chain, particularly in fish – causes neurological effects in humans
- U.S. EPA issued Clean Air Mercury Rule (CAMR), requiring coal-fired power plants to monitor and reduce Hg emissions
- CAMR intended to reduce Hg emissions from 48 tons to 15 tons per year (U.S. EPA, 2005e)
- ETV verified 7 continuous emission monitors (CEMs) for Hg



Case Study (cont.): Continuous Emission Monitors for Mercury

- Verification outcomes:
 - Contributed to advancing Hg monitoring technology, improved monitors produced by participating vendors
 - Informed the refinement of the CAMR rule
 - Allowed small vendors to compete in marketplace
 - Facilitated collaboration with state and federal agencies
 - EPA estimated economic value of reducing Hg at \$200K to \$3M/yr
- EPA may prioritize testing/demonstration of additional units when revised CAMR rule released

Future of ETV and ET at EPA?

- EPA developing strategy for environmental technologies (ET) and innovation
 - Regional (3-state) water ‘cluster’ initiative
 - DOC and EPA collaboration promoting U.S. technology internationally
- ETV has no EPA ‘base’ funding (since 2006)
- Office of Research and Development- NRMRL has notified cooperators that it will not continue agreements that expire in 2012 and 2013
- International ETV participation is limited

Future of ETV and ET at EPA?

- ETV may be reinvented
 - Could be limited to verify technologies EPA prioritizes
 - Could include peripheral QA involvement with private verification programs
 - ISO ETV standard may impact path taken



International ETV Effort

- International Working Group (IWG) Goals - common verification approach, mutual recognition, “*Verify Once, Accept Everywhere*”
- ETV-IWG developing ISO standard
 - Canada, European Commission, Philippines, Korea and Japan involved
 - U.S. has withdrawn, but observing
- Hurdles that may exist:
 - stakeholders
 - quality assurance
 - sustainability
 - role of government
 - transparency
 - openness
 - organization
 - other items?

Advance ETV

- The positives – what we did together!
- Selected examples of joint verifications and protocol co-development :
 1. U.S. & Canada – Joint UST leak detection technology verification underway, joint rapid soil toxicity protocol published, joint verification for airborne VOC leak detection protocol published
 2. U.S. & DanETV – Joint groundwater sampling verification completed
 3. U.S., DanETV, and Canada – Joint *E. coli* and total coliform verification completed, European funded program for 3-party joint verification for rapid water toxicity completed

Conclusion

- Envision harmonized ETV network to help verified vendors access world markets based on ETV-IWG efforts :
 - Harmonized QA
 - Harmonized terminology
 - ISO and/or ANSI standard for verification
 - Mutual/transferrable verification recognition among ETV programs worldwide

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THANK YOU!