

Overview of Existing Environmental Technologies Evaluation/Verification Programs

FOREWORD

At the beginning of this year, the European Union adopted the Environmental Technology Action Plan (ETAP) to improve the development and wider use of environmental technologies. Implementing ETAP will consist of a long list of actions, one of which involves improved testing, performance verification and standardisation of environmental technologies. If implementing a European program for such purpose, it would be useful to carefully study the experience of such programs in other parts of the world. This paper provides a succinct overview of existing verification programs around the world. It is based on a detailed description of these programs carried out in an on-going IPTS project on this subject. Some of the lessons learned from the ongoing programs are described. They will be taken into consideration during the next phase of the study, when possible models for a European level program will be developed and analysed.

THE CONCEPT

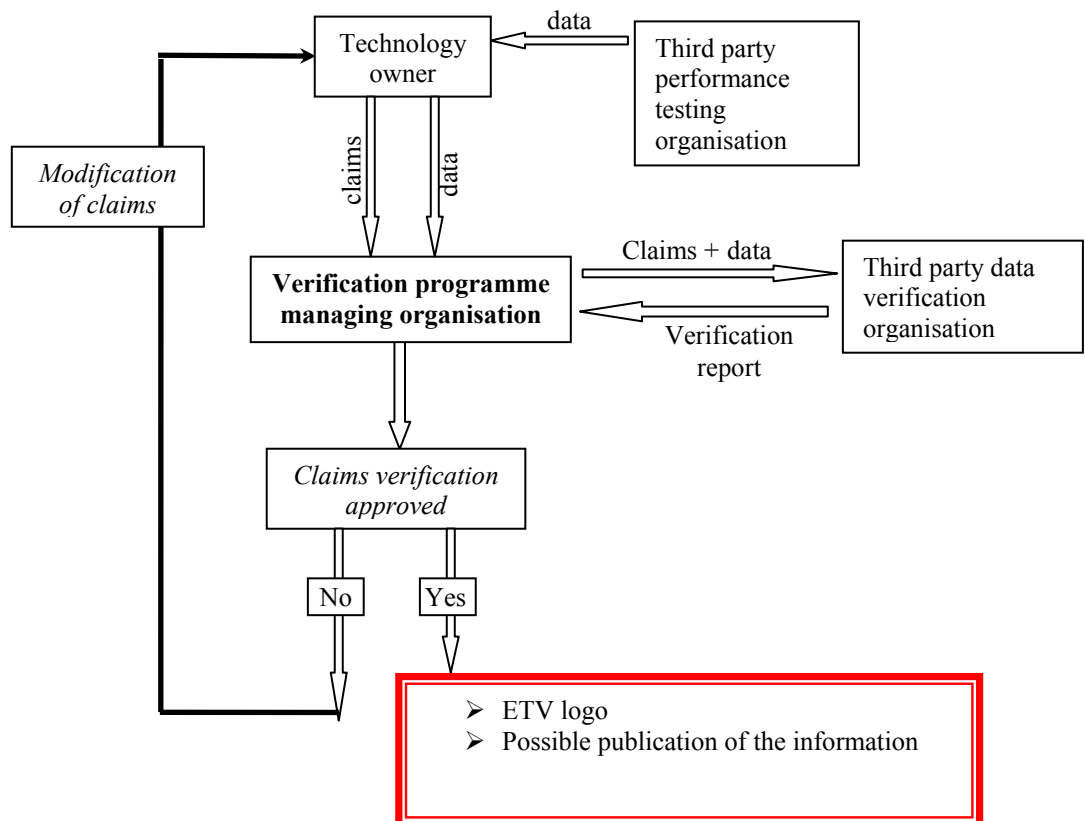
Environmental Technology Verification (ETV) programs are a recent development, which originates in North America where they started in the mid-90's. The objective is to accelerate market acceptance of innovative technologies by providing users with information about performance, thereby substantially reducing the uncertainty for purchasers. Vendor-generated data have been viewed with scepticism and, consequently, high performing innovative technologies that have the potential to protect the environment have faced substantial market barriers. It has therefore been considered necessary to establish a market based verification process in cooperation with the private sector in order to overcome those market barriers and assure that data could be accessible, understandable, and credible. Verification must not be confused with certification. The former involves the independent assessment of a technology's performance without any judgement of it, while certification normally goes one step further by guaranteeing that specific standards or performance criteria are met. It is important to remember that verification is a voluntary tool.

National verification programs have been running for almost ten years in the US, Canada and South Korea. Japan started a program in 2002, which is still in a pilot phase. Many other countries, mainly in Asia, have been contacted by the North Americans and, as a result, China is now about to launch a national verification programme based on the Canadian system.

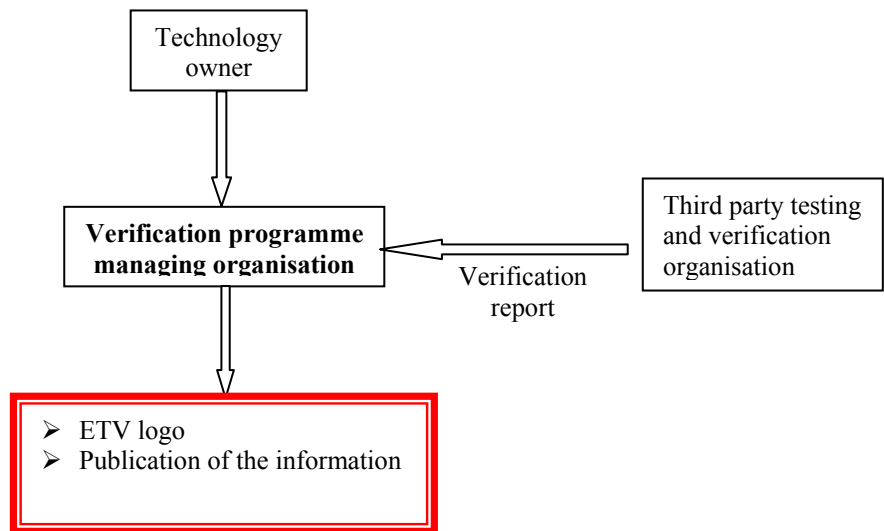
The existing programs belong to either the US (South Korea, Japan) or the Canadian (China, Bangladesh, New Jersey) model. In the Canadian model, the program managing organisation collects the claims and all the data provided by the technology owner and submits them to a third party verification organisation, which first verifies that the data are reliable and then compares them with the vendor's claim. On the contrary, in the US model, the program managing organisation has the testing of the technology entirely performed by one of its partners, a third verification organisation. One could say that the US model aims to make public the technology performance

data without judging the results while the Canadian model checks whether the vendor's performance claims are true.

There is no similar approach to any of these on national level in Europe and it furthermore seems that the knowledge is poor regarding the programs in Canada and the US. However, most stakeholders so far contacted consider such a scheme on a European level to be of significant importance for the dissemination of environmental technologies and, thus, furthermore for the competitiveness of this industry.



Canada Model
applied in Canada, New Jersey, China, Bangladesh



USA Model
applied in USA, Japan, South Korea


UNITED STATES ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

Introduction

The clear objectives of the US program are to provide credible performance data for commercial-ready environmental technologies to aid vendors in selling innovative technologies and regulators and purchasers in making their decisions. The result is high-quality data and information, not technology approval or endorsement. There is no certification and no “technology winner”.

This is carried out through public private partnerships for business efficiency and third party objective testing. A broad-based stakeholder process helps choosing technologies, developing testing protocols and approving verification reports. EPA has the overall responsibility to ensure science relevance, fairness and consistency across partner organisations. General data are listed in Table below.

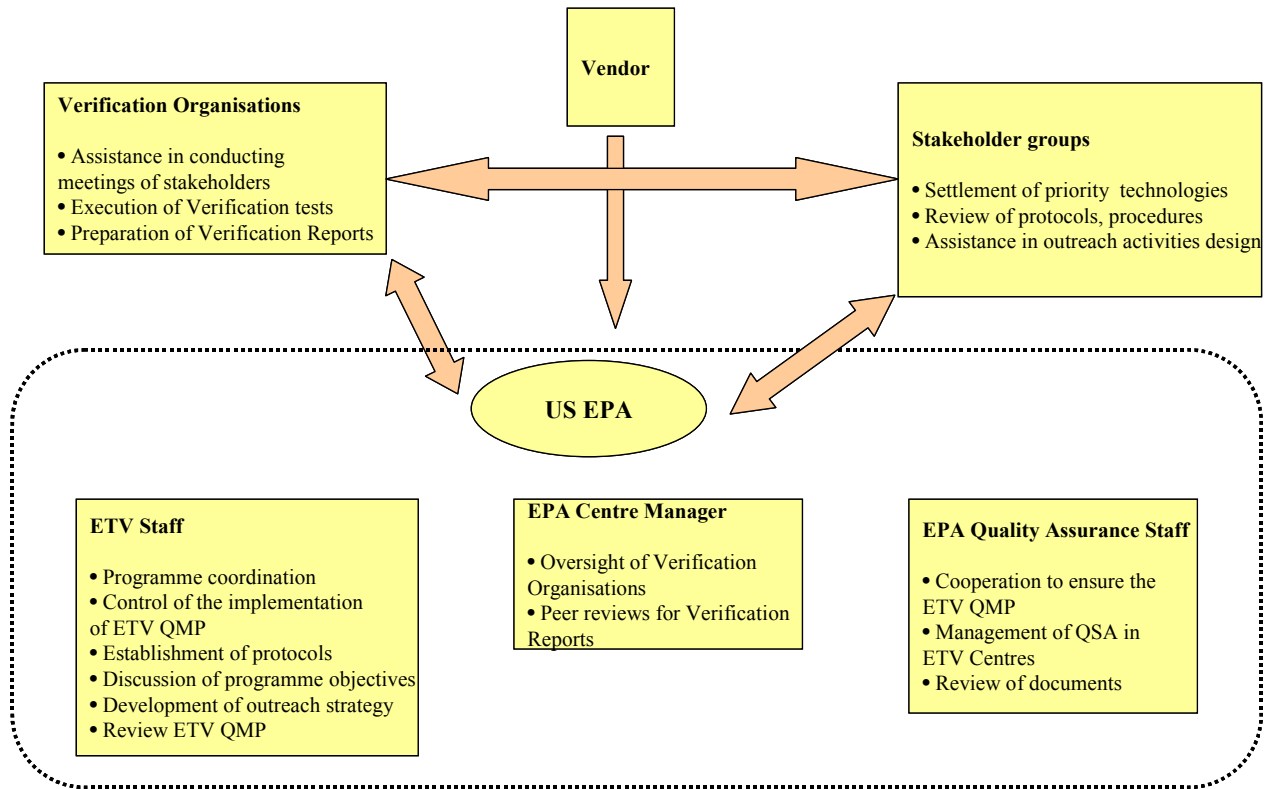
Programme identity	« Environmental Technology Verification Program - ETV »
Managing organisation	US Environmental Protection Agency
Scope	National
History	Oct. 1995: ETV established by US EPA 1995-2000: pilot phase 2001 ~ : full implementation
Current technological areas	<ul style="list-style-type: none"> • Advanced Monitoring Systems • Air Pollution Control Technology

	<ul style="list-style-type: none"> • Drinking Water Systems • Greenhouse Gas Technology • ETV Water Quality Protection • Building Decontamination Technology • Pollution Prevention (P2), Recycling, and Waste Treatment • Safe Buildings Monitoring and Detection Technology Effort • Safe Buildings Air Filtration and Cleaning Technology Effort
Programme features	<ul style="list-style-type: none"> • Operates through public/private testing partnerships • Evaluates the performance of environmental technology in all media: air, water, soil, ecosystems, waste, pollution prevention, and monitoring. • Operates through six verification centres and one pilot programme, as well as separate efforts aimed at verifying technologies for monitoring and treatment of intentional contaminants in buildings and public spaces • Created to accelerate the entrance of new, commercial-ready environmental technologies into the domestic and international marketplace.
Fundings	<p>Pilot phase : primarily government funded efforts and secondarily private sector funded.</p> <p>Now : partly government funded, partly vendor funded</p>
Logo/certificate awarded	
Key figures	<ul style="list-style-type: none"> • Environmental technologies verified: 261 • Protocols developed : 78 • Over 1200 stakeholders in 18 groups • EPA funding for ETV from 1995 to 2004 : over \$63M • Cost per verification or protocol : <ul style="list-style-type: none"> - 1995 : ~\$580,000 - 1999 : ~\$120,000
International dimension	<ul style="list-style-type: none"> • reciprocity agreements : only one, with Singapore, under development since May 2004 • several foreign technologies have been awarded the ETV certificate • many contacts for tuition and assistance to other countries
Contact & website	<ul style="list-style-type: none"> • http://www.epa.gov/etv/

	<ul style="list-style-type: none"> • Teresa Harten, Director • (harten.teresa@epamail.epa.gov)
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Structure of the program

A number of parties is involved, both outside EPA and inside.



EPA/ETV

EPA oversees the verification organisation and has the ultimate responsibility. The so called ETV team consists of EPA employees actively working on the ETV program. Among their tasks are to coordinate the overall program, including multi-year strategies, objectives, operating principles, protocols, implementation activities and annual budgets and to communicate the activities and outputs to EPA, congress, customers and public and to furthermore give recommendations on future activities. The ETV staff makes up several ETV Centres, one for each technology category (and to which a verification organisation and a stakeholder group is linked).

Verification Organisation

The Verification Organisations (VO) are the public and private sector organisations that hold cooperative or interagency agreements or contracts to assist EPA in implementing the ETV program. They are responsible, together with stakeholder groups and EPA/ETV, for the selection of technology categories, which are under continuous review and frequently change to reflect the changes in the marketplace. They manage and oversight and conduct the verification activities, develop, conduct and oversee test and quality assurance plans in cooperation with technology vendors, operate the activities, solicit vendor proposals and products, prepare verification

reports based on tests and furthermore a verification statement at the completion of each verification. Each agreement is overseen by an EPA project manager and there is an active quality assurance program in force. Moreover, each verification organisation is contractually required to fully implement EPA QA requirements.

Stakeholder group

For each technology area, there is a stakeholder group. Stakeholders are often considered to be experts in their fields and are furthermore selected to represent the interests of technology developers and buyers, consulting engineers, financial interests, industry associations, public interest groups and government. They meet several times a year and provide valuable input to the program and make sure the program serves real market needs. More concretely, they set verification priorities, review protocols and operating procedures and are involved in outreach activities. Currently, with 18 stakeholder groups, about 1200 individuals are participating.

Technology Vendors

The program is open to all vendors of commercial-ready environmental technologies, both domestically and internationally. In general, the program is open to any technology but to manage it all, stakeholder groups are asked to help setting priorities. Thus, after a technology category is selected, all relevant technology vendors who might be interested in verification are contacted and this can be done in several ways. Vendors can naturally also apply spontaneously. The program is voluntary and vendors may choose not to have a verification statement issued or they can even withdraw from the program before testing if they so wish. They can also request a re-test on their own expense.

It is the responsibility of the vendor having their technology verified to contribute to the evaluation by providing advice to the verification organisation for the draft test /QA plan, paying a participation fee, providing commercially ready units for the testing as well as operation and maintenance support and reviewing the verification report.

Once the verification has been successfully completed, the vendor receives the completed report and statement and from there on, he can use the logo to advertise the availability of information verified by the ETV.

Funding

Costs for the verification per vendor range between \$5,000 and \$100,000 each, depending on the complexity of the test and the number of participants sharing the cost.

The original goal when the pilot started was to have a complete private sector sponsorship within three years. This was later on revised and it was considered that, at least in the short term, 10 to 20 % of ongoing costs would have to be paid by EPA to keep the activity viable. By 2001, it was expected that vendors would pay the full cost of testing and possible partial cost of quality assurance oversight as well as report writing. However, still in 2003, EPA's contribution of \$ 3 million was still nearly three times as large as the vendors' contribution.

Selection criteria for technology categories in the pilot and current criteria

In the pilot, five different criteria were used in order to as far as possible test a variety of variables; address important environmental needs, present substantial business opportunities for the private sector, involve multiple developers and vendors, address the full range of environmental media, test a variety of verification organisation types. The selection process was organised so that the first criteria had to be passed in order to make it for the second, and once passing the latter, the third one was checked. The last two criteria worked individually.

With the completion of the pilot and the move into full implementation, priorities must be established since it is impossible to address all technologies that vendors may want to have verified. The stakeholder groups assist ETV by representing the marketplace for a given group of environmental technologies in terms of need and feasibility. Three main criteria for selection are considered: there must be a legitimate environmental need for the technology, there must be at least one commercial-ready technology available for testing, testing protocols must be available or capable of being developed within a reasonable timeframe and cost range to make the verification activity feasible within the constraints of ETV funding.

The verification process

Once the definition of priority technologies and pre-screening applications have been done, the development of a generic protocol and test plan follows and this is conducted by the ETV Centres and with the agreement of EPA. The protocols provide testing guidance for a particular technology category but not for a specific technology. However, they should be detailed enough to allow for a testing organisation to duplicate the test and obtain similar results. Issues can be experimental design, equipment capabilities, field test sites, laboratory test sites, quality assurance, data handling, health and safety etc. Test plans, on the contrary, provide detailed instructions for the verification testing of a single technology during a specific test event. These plans must be reviewed and approved by EPA, the vendor, the test site and the stakeholder group in order to have the verification test conducted. Both protocols and plan are publicly available on the ETV web site.

The verification test can then take place and the verification organisation is in charge of this step. The results with data are publicly reported. The program does not compare vendors by name but innovative technologies may be compared to standard technologies if appropriate. The same verification organisation drafts the verification statements and reports, which are reviewed by EPA, the vendor as well as peer reviewers. EPA and the verification organisation sign the report and statement and place them on the ETV web site. The last step for EPA is to revise the generic verification protocol for that particular technology category, to reflect lessons learned.

Results

Three major changes were recommended based on the pilot experiences: simplification of the structure into six ETV Centres that focus on the most attractive market areas, emphasis on conducting more efficient verifications and, lastly, greater

involvement and funding support from participating vendors, states and communities which will benefit from the ETV verification.

In total, by March 2004, more than 260 verifications were completed and 50 generic protocols had been produced. Statistics show that about 65 % of the vendors with verified technologies are small business and there are as many as 40 vendors which have had more than one product verified by ETV. Furthermore, care has been taken to check for vendor appreciation and the following has been found:

- 85 % said verification would not be as valuable if EPA was not associated with it
- 73 % were using ETV information in product marketing in 2001
- 73 % believe customers will be impressed by ETV verification
- 92 % would recommend ETV to others
- 37 % said verification takes too long.

The latter is the common negative comment and ETV is regularly seeking methods that will speed up the process, particularly in the data analysis and report development stage. An overview shows that the average for a totally completed verification is 16 months, where typically 3 months are needed for the test plan development, 1 month for the actual testing and 7 months for report writing and approval but there is a great variation in these numbers.

International dimensions

In total, 30 technologies from international vendors have been verified by the ETV program, 10 from Canada, 5 from Japan and 9 from Europe. Furthermore, ETV training programs have been delivered to Taiwan, Thailand, Malaysia, India and the Philippines. Interestingly, over 10 % of the web site visits from outside USA.

From the start, it was meant to be enhanced cooperation between similar programs, between the US one and the Canadian one but also with different state based programs within the US. Measures have been implemented in order to facilitate and pursue mutual recognition but although tools for reciprocity have been established between some programs, there is not one US ETV-verified technology that has benefited from a reciprocity agreement. As for the status with Canada, as late as in March 2003 it was said that there were no plans to offer reciprocity with their program.


CANADA ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

Introduction

The objectives of the Canadian ETV program are similar to the US ones but the following issues are also very much stressed: the growth and marketability of the Canadian environmental industry, Canada's reputation by emphasising its capabilities and credibility in the environmental market, and help companies access foreign markets and thereby increase their competitiveness. The approach is to provide the markets with as assurance that a vendor's claim of performance for an environmental technology is valid, credible and supported by quality independent test data and information. These claims must be specific, unambiguous, measurable and verifiable and moreover meet minimum standards. Supporting data are collected by an independent third party and analysed by an accredited laboratory. A verified claim is

only valid if the technology is operated within the operating conditions stated in the claim.

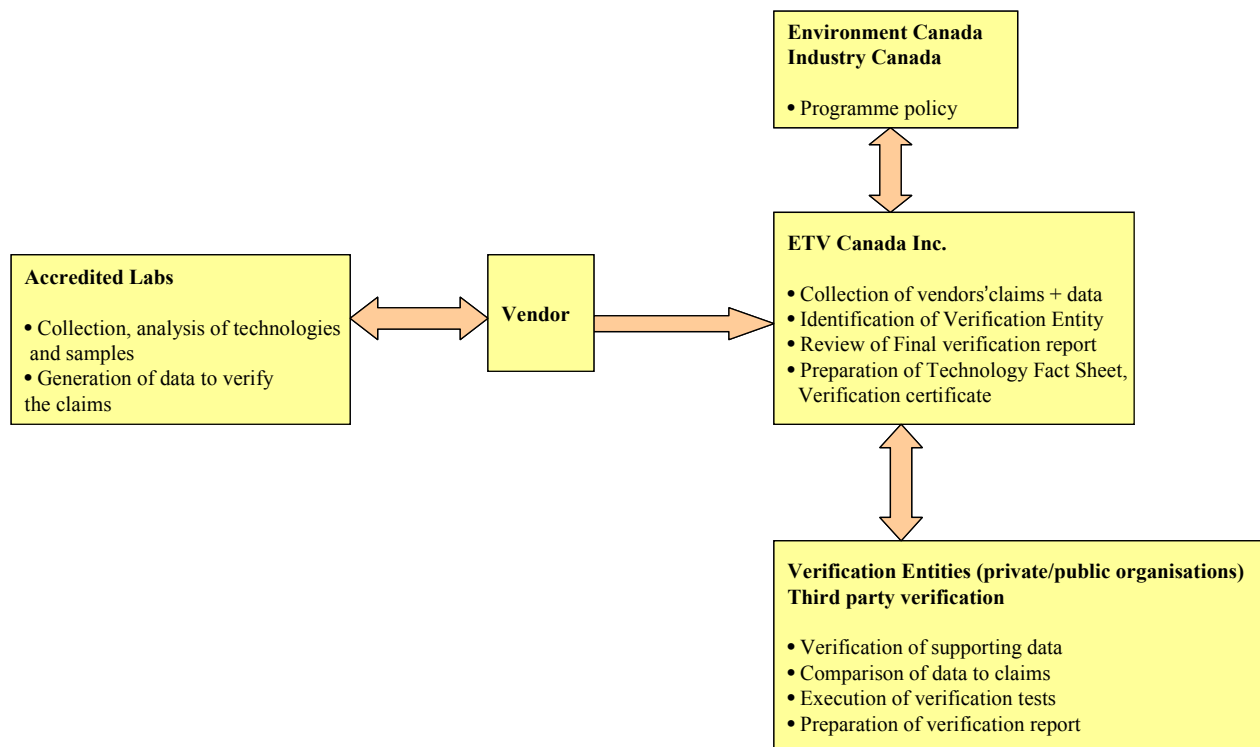
There are no specific technology areas but any methodology, treatment process, equipment of material used to control pollution, treat waste of treat drinking water or other water supplies. General data are listed below.

Programme identity	«Environmental Technology Verification Program - ETV »
Managing organisation	ETV Canada Inc., a private sector company that operates under a license agreement with Environment Canada
Scope	National
History	1997 : ETV programme established by Environment Canada and Industry Canada
Current technological areas	All environmental technologies and environment monitoring systems based on verification of vendors' claims. No specific area
Programme features	<ul style="list-style-type: none"> • Applies to technologies currently commercially available or commercially ready for full-scale application. • Fosters the growth and marketability of Canada's environment industry by providing validation and independent verification of performance claims. • Participation in the programme is strictly voluntary. • The verification needs to be renewed on 3rd anniversary of receiving certification • ETV Certificate made compulsory by law for some specific technologies
Fundings	<ul style="list-style-type: none"> • Fully funded by vendors • Environment Canada often provides subsidies
Logo/certificate awarded	
Key figures	<ul style="list-style-type: none"> • Canadian ETV certificates awarded: 60 • Test plans developed: 30 to 40 • 3 verified technologies are from the US, and 1 from China
International dimension	<ul style="list-style-type: none"> • MOU with the Government of Korea • MOU with China • MOU with the State of New Jersey

	<ul style="list-style-type: none"> • Bilateral Agreement between the Governments of Canada and Bangladesh for an Arsenic Mitigation ETV Programme
Contact & website	<ul style="list-style-type: none"> • http://www.etvcanada.ca/ Deborah Mc Nairn (dmcnairn@etvcanada.com) John Neate, President of ETV Canada (jhneate@etvcanada.com) Ed Mallett, Director of OCETA (emallett@oceta.on.ca) Phone: (905) 822 4133

Structure of the program

The ETV program was developed by Environment Canada in the lead role together with Industry Canada and with input from the environmental industry sector. It is delivered privately by ETV Canada Inc. (owned by the Ontario Centre for Environmental Technology Advancement) under a 10-year licence agreement with Environment Canada. Apart from the vendors, accredited labs and the verification entities play an important role in the scheme.



Environment Canada

Environment Canada is responsible for program policy and general direction. It provides quality oversight and performance review and it is also responsible for negotiating bilateral agreements with other countries and agencies seeking program reciprocity.

ETV Canada Inc.

The tasks of ETV Canada are to collect vendors' claims as well as data from independent laboratories, review the applications for completeness, identify Verification Entities, transmit information to these entities and, also, to prepare a final verification report, a technology fact sheet and a verification certificate. Furthermore, and most importantly, ETV Canada proposes an optional service to vendors, the provision of technology markets assistance and detailed advice on the required technical performance data needed to support quantifiable technology performance claims.

Laboratories

Independent (from the applicant) laboratories, which are accredited by a recognized certification agency analyse technologies or samples which they collect to generate data that can verify the performance claims made by the vendor. The laboratories are directly appointed by the vendor.

Verification Entities

These entities are private or public organisations in charge of conducting the third party verification and comparing data to claims. They do various tests in order to verify supporting data, such as test relevance, test quality and test adequacy of data and they test operating conditions.

Technology developers and vendors

Participation in the program is strictly voluntary. Upon entering in the program, the company must submit a pre-screening application. Any kind of environmental technology is allowed to undergo the verification process but there are certain prerequisites, which are described later under "selection criteria" and which are checked in the pre-screening phase. If the technology and performance claim are eligible to apply, the applicant submits a formal application and a non-refundable CAD 1,000 application fee. The formal application should contain additional information about the technology, the claim to be verified and the data and information that is available to support the claim. If the application is not considered complete, the applicant may choose to modify and resubmit it.

Funding

The program is in principle fully funded by vendors. The formal application fee of CAD 1,000 is paid by every applicant and the full cost is normally around CAD 20,000. However, According to OCETA, owner of ETV Canada, it has committed substantial internal financial resources to support the development of ETV as a means of assisting new environmental technologies to achieve commercialisation. The program is focussed on emerging new technologies and these are primarily generated

by early stage or start-up companies with limited financial resources. Such clients pose high financial risks and have had difficulties in financing ETV participation.

Nevertheless, the program often benefits from subsidies of Environment Canada, sometimes targeted at specific technologies. In 2003, the government granted CAD 5,000 per verification, irrespective of the technology.

Selection Criteria

To be eligible to the ETV program, a technology must meet the following prerequisites:

- A technology that offers an environmental benefit or address an environmental problem.
- An equipment-based environmental service that can make claims based solely on measurable performance of the equipment.
- Meet minimum Canadian standards
- Be currently commercially available or commercially ready for full-scale application.

The verification process

When the formal application is submitted, ETV Canada reviews the information and proposes a verification process for the claim, including the identification of a Verification Entity and cost estimate for the verification program. The cost will include the administration and management of the application process by ETV Canada as well as the actual validation by the Verification Entity. The cost will vary from application to application and will depend on the scope of effort involved in the verification process.

The Verification Entity analyses the data and decides if the claim is adequately substantiated or if additional testing is required, which in that case is conducted by an approved testing agency and paid by the applicant. A report is prepared with the results and submitted to ETV Canada for review, and, finally, the applicant is provided with a copy. Upon successful verification, the vendor is entitled to a presentation of a verification certificate (for use in marketing), a technology fact sheet which defines the performance claims, a detailed verification report and the use of the TV logo on specified documents. The verification is valid for three years after which a license renewal fee will apply should the vendor wish to continue the program.

International dimension

Memorandums of Understanding on the reciprocity have been signed between Environment Canada and South Korea, the state of New Jersey and California (program no longer running).

Moreover, ETV Canada recently completed the first phase of a Canadian International Development funded project to assist China to develop an ETV program and in Bangladesh, a program for verifying Environmental technologies for arsenic mitigation has been developed along the same lines. Both these programs naturally build on the Canadian structure and experience.

NEW JERSEY CORPORATION FOR ADVANCED TECHNOLOGY VERIFICATION PROGRAM

Introduction

The objective of the program is i.a. to identify beneficial and innovative technologies which require assistance with regulatory mechanisms and requirements, foster the development and commercialisation of technologies to abate and prevent environmental pollution and promote energy conservation in a cost-effective manner, provide technical assistance for the development of technologies with commercial applications for expeditious commercial use and encourage new businesses that are engaged in such operations to locate in the State of New Jersey and assist existing enterprises to remain and expand.

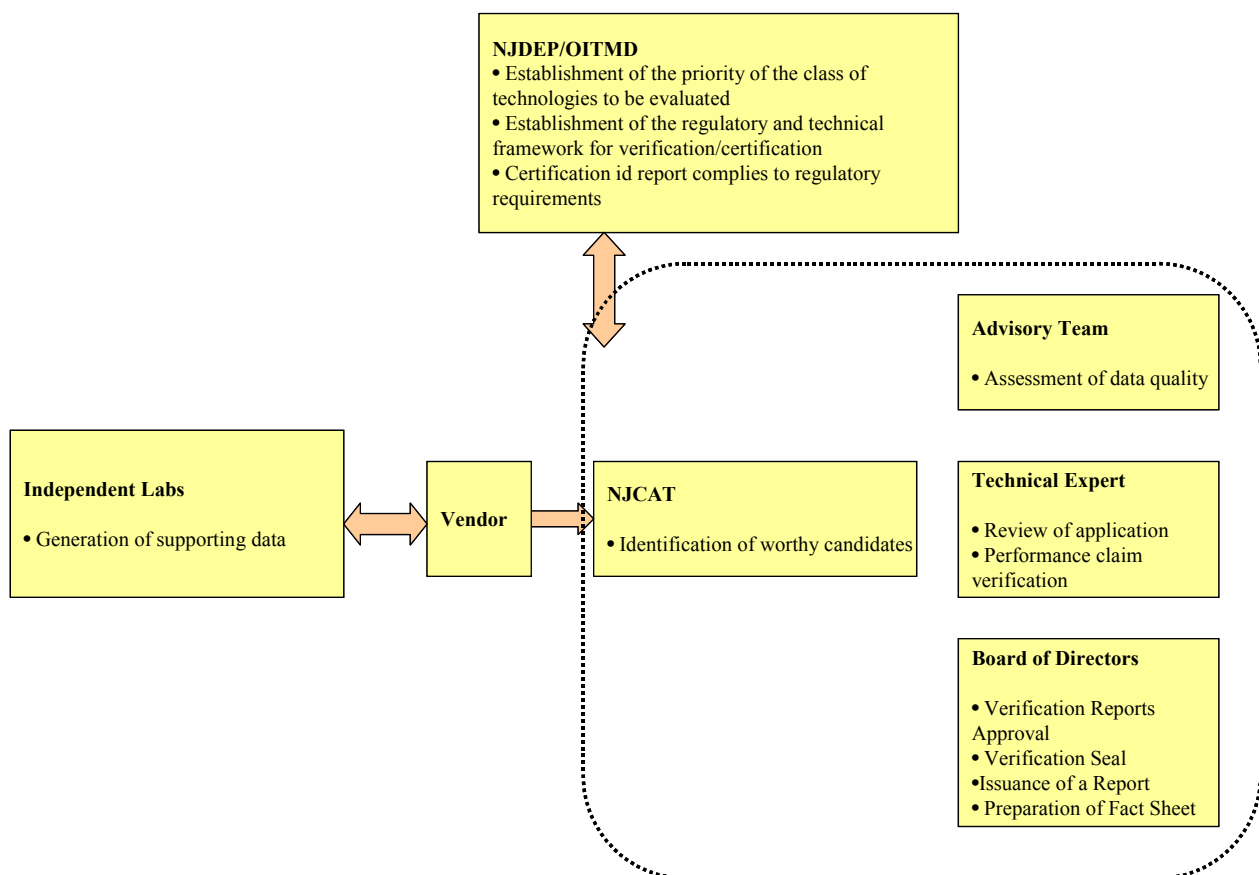
The approach relies on public-private partnerships for business efficiency and third party objective testing, the verification process and assistance with regulatory mechanisms and requirements. General data are listed below.

Programme identity	« Energy and Environmental Technology Verification Program -EETV »
Managing organisation	NJDEP which developed and implemented the programme, NJCAT which is the verification entity, independent to government
Scope	State
History	2000: the Energy and Environmental Technology Verification Act authorises the New Jersey Department (NJDEP) to implement a verification and certification process
Current technological areas	All environmental technologies and environment monitoring systems based on verification of vendors' claims. No specific area
Programme features	<ul style="list-style-type: none"> • Applies to technologies currently commercially available or commercially ready for full-scale application. • Provides assistance with regulatory mechanisms and requirements. • Fosters the growth and marketability of New Jersey technology-based environmental and energy-related products by providing validation and independent verification and certification of performance claims with reference to regulatory issues. • Participation in the programme is strictly

	voluntary.
Fundings	NJCAT is mainly funded by the vendors
Logo/certificate awarded	NJCAT Verification Mark
Key figures	<ul style="list-style-type: none"> • EETV technologies verified: 19 • 1 verified technology is from the UK
International dimension	<ul style="list-style-type: none"> • Interstate reciprocal agreements • MOU with Canada
Contact & website	<ul style="list-style-type: none"> • http://www.njcat.org Rhea Weinberg Brekke, Executive Director E-mail: rwbrekke@njcat.org

Structure of the program

The structure between the different parties involved is similar to that in the Canadian program.



The New Jersey Corporation for Advanced Technology (NJCAT)

This is the third party verification entity and it has a partnership agreement with the New Jersey Department of Environmental Protection to verify energy and environmental technologies according to an agreed upon procedure. It is a private/public partnership and its main responsibilities are to identify technology candidates, to assist developers of new technologies and services with the regulatory, commercial, financial and technological support required to bring their product to market, to provide third party credible and independent verification of performance claims, to assist participants in identifying alternative funding sources, to assist in patenting, licensing etc, to sponsor forums, exchange programs and seminars.

An advisory team within NJCAT assesses the completeness of the application and if so, a technical expert is selected to perform the actual verification and to prepare the written report. The expert, together with the technical director, develops an evaluation protocol for each claim. A board of directors finally approves the verification report, issue a report and develop and distribute a fact sheet.

New Jersey Department of Environmental Protection (NJDEP)

In the initial phase of a contact between vendor and NJCAT/NJDEP, the NJDEP must be consulted to establish the priority for the class of technology to be evaluated based on the anticipated net beneficial effects and priorities of NJDEP. If passing this initial screening, the regulatory and technical framework through which the technology will be verified is established. Later on, upon receiving the verification report, the NJDEP shall review the report and once more ensure that the technology provides a net environmental benefit. It can then go on to certify that the technology is innovative.

Vendor

It is strictly voluntary to participate in the program but once the vendor has decided to do so, he sends a limited preliminary application along with the required application fee to NJCAT for evaluation. This application contains i.a. target performance claims, which must be specific, measurable and verifiable. NJCAT will discuss with the vendor to ascertain the potential for successful verification. If verification is not recommended, the applicant will get advice for further development of the technology. If a claim during the verification process can not be verified by available data, the applicant has three options: to modify the claim, to generate additional data or to withdraw from the program.

Funding

The program is essentially funded by the vendors. The application fee is \$1,000 and upon acceptance to the program, various fees (\$20,000 -\$100,000) depending on corporate revenue apply. The average fee, however, is \$20,000.

Selection criteria

All kinds of environmental technologies are eligible, however some criteria must be met: the technology must provide an environmental benefit and/or resolve an environmental concern, it must not create a new or alternative environmental concern and the regulatory framework of the NJDEP must be able to permit the use of the technology.

The verification process

Once an application has been submitted, NJCAT reviews it to assess its completeness and this is done within 30 days. The technical expert selected, together with the technical director of NJCAT identifies an evaluation protocol for each claim. The claim development process is designed to be an interactive process, creating a dialogue between the applicant and NJCAT. The combined efforts of the technical expert, the NJCAT technical director and the NJCAT peer reviewers are the ultimate reviewing authority within NJCAT and members, drawn from NJCAT member organizations, will vary depending on the technology to be assessed.

When the claim has been verified the NJCAT team further evaluates the relevance and the quality of the data. When having passed this step, the technical expert prepares the verification report, which then goes to a board of directors for final approval. The same board issues a report and develops and distributes a fact sheet. It is finally the NJDEP which issues the certification.

Reciprocal agreements

It is the NJDEP which is in charge of entering into reciprocal agreements with other federal, State or local agencies. Consequently, New Jersey has signed technology Acceptance Reciprocity Partnership agreements with a number of other states. However, reciprocity agreements with foreign countries are also vital and a Memorandum of Understanding has been signed between Canada and the State of New Jersey. To date, though, no technologies have benefited from this.

SOUTH KOREA ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM


Introduction

The objective of the Korean program is to verify, assess and recognize environmental technologies developed or improved in Korea in order to promote distribution of excellent technologies and nurture industries in the environment area.

There are two main approaches to do this, designation of new environmental technologies through document and field review and verification of new environmental technologies through document review and field verification. The former is permitted when a developer has sufficient data to prove state of the art, advancement and validity and the latter is applied when such data is not available and on-site testing/field verification is performed by an official field assessment organisation.

The South Korea Ministry of Environment (MoE) began operating this system at the request of technology developers. The technologies that demonstrate outstanding functions are designated as “New Technology”, which provides various incentives such as extra points to users at public project biddings. Apart from this program, MoE has taken other measures to support environmental technologies. It has created an Environmental Venture Fund and has actively identified and supported promising venture companies. It has instituted a Venture Nurture Centre at the National Institute

of Environmental Research to assist venture activities of those at the frontier of environmental technology development. General information about the Verification program is presented below.

Programme identity	« ETV programme in Korea »
Managing organisation	Environmental Management Corporation (EMC) (non-profit public organisation under the Ministry of Environment - MOE)
Scope	National
History	1997: Investigation and introduction of system 1998: Start of the programme 2001: 1 st revised regulations 2003: 2 nd revised regulations
Technological areas	First developed specific protocol (1997) <ul style="list-style-type: none"> • Treatment of sewage (Nitrogen and phosphorus removal technology) • Incineration technologies (Stoker, Gasification & melting) Second developed specific protocols (2001) <ul style="list-style-type: none"> • Waste water (nitrogen and phosphorus removal tech) • Incineration (stoker, gasification & melting, rotary kiln, etc.) • Treatment of dust & Acidity Gas (SCR, SNCR, Dioxin control, deodorisation)
Programme features	Programme organisation <ul style="list-style-type: none"> • Operates through EMC management, and field assessment institutes Expectations through programme: <ul style="list-style-type: none"> • Promotion of « new environmental technologies » Scope of assessment <ul style="list-style-type: none"> • Designation of new environmental technology • Verification of new environmental technology • Verification of environmental technology (including a category for verification of « overseas technology »)
Funding	MOE funding in 2001 and 2002
Logo/certificate awarded	

Structure of the program

Ministry of Environment

The role of the ministry is to accept applications, the notification in official gazettes for the collection and coordination of opinions of stakeholders and the issuance of certificate of designation/verification.

Environmental Management Corporation (EMC)

This is the control body of ETV program in Korea. It is a non-profit public organization under the Ministry of Environment. It deals with issues like: reviewing and supporting applications, building and operating an environmental technology assessment deliberative committee, issuance of verification report, designation of official field assessment organisations.

Environmental technology assessment deliberative committee

The committee works in a pool system with close to 600 members (professors, researchers etc.) from 25 areas. It is in charge of the review of applications, review of assessment criteria, review of designation of field assessment institutes and the coordination of stakeholder opinions.

Field assessment institutes

These institutes are responsible for conducting the field assessments for verification. They should execute agreements with the applicant before the assessment, carry out the field assessment according to the assessment criteria and develop a verification report.

Funding

There is a registration fee of 2 million Won (US\$ 1400) for both designation and verification. This is paid by the applicant to EMC. For the designation alternative, there is obviously no cost of field tests but for the verification alternative there is, and this is paid by the applicant to the field assessment organization, which agree on the cost. There are furthermore loans offered for this purpose. It is moreover important to notice that there is a special budget allocated to support SMEs for the costs for field assessments and since 2003, the government reimburses 50% of the verification cost for SMEs.

Another specificity of this program is that it aims to promote new technologies through incentives. Verified technologies get points which work as incentives at public procurement and costs can be reimbursed.

Selection Criteria

The table with general data shows the technological areas in which the program works. Furthermore, the environmental technology should be developed in South Korea for the first time, or imported from a foreign country and then further improved

and it should be recognized as higher state of the art, advancement and validity than other existing technologies.

The verification process

This process consists of a notification in official gazette, document review, field survey, field assessment and the announcement of results of the review. The steps naturally vary depending on if the assessment concerns the designation of a new environmental technology or a verification of an environmental technology. The former is scheduled for 90 days and the latter for 120 days. The results are public. The validity is three years.

International dimension

Korea has signed a Memorandum of Understanding with Canada, which model it is partly based upon. However, according to ETV Canada Inc., no technology in neither Canada nor Korea has benefited from this reciprocity.

JAPAN ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

Introduction

The ongoing Japanese pilot project strives to accelerate the dissemination of environmental technologies developed by ventures companies and to contribute to the activation of economic activity through environmental protection and the advancement of regional environmental industries. An overview of general data is listed below.

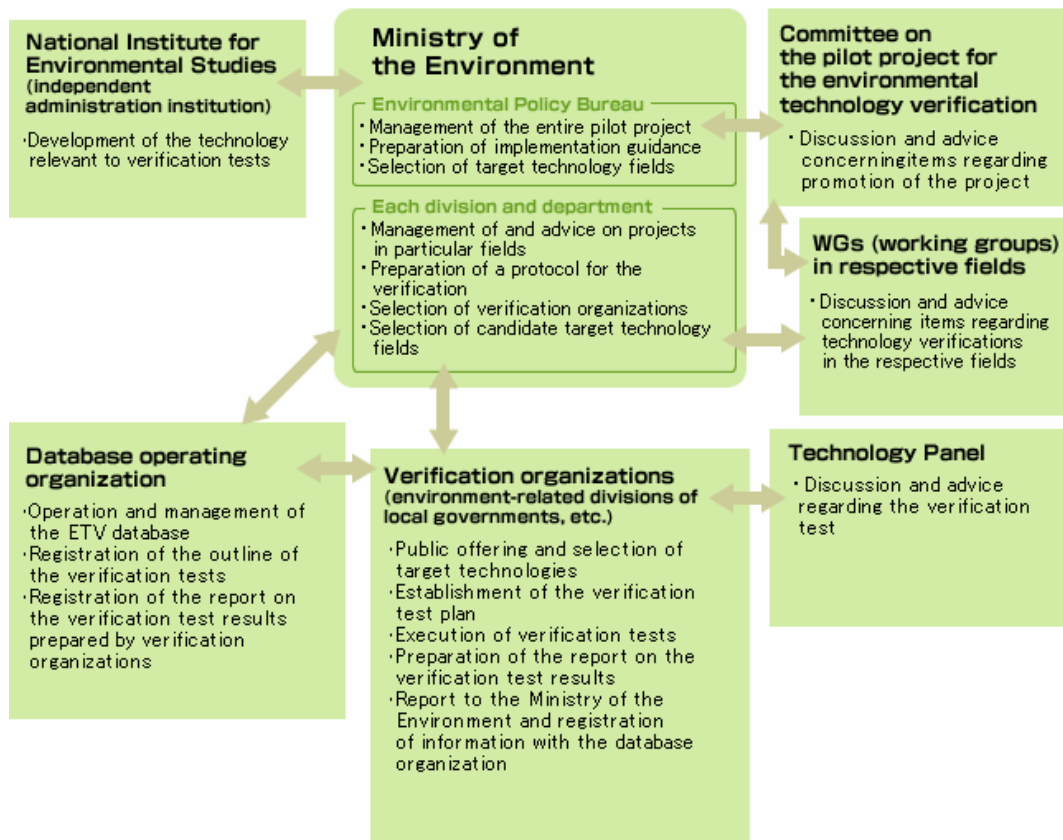
Programme identity	« The Pilot project of ETV in Japan »
Managing organisation	Japan Ministry of Environment
Scope	National
History	2003 : launch of pilot phase for 5 years
Current technological areas	Target technologies 2003-2004 <ul style="list-style-type: none"> • Ethylene Oxide Treatment Technologies Treatment Technologies for Human Waste in Mountain District • Organic Wastewater Treatment Technologies for Small-scale Establishments (Kitchens/Restaurants and Food Manufacturing Plants) • Simplified Analysing Technologies for Monitoring • Heat Island (abnormal thermal condition in the metropolis) Mitigation Technology

	<ul style="list-style-type: none"> • Treatment Technologies for Human Waste in Mountain District
Programme features	<p>Programme organisation</p> <ul style="list-style-type: none"> • Operates through Ministry of Environment control, and environment-related local organisations <p>Expectations through programme:</p> <ul style="list-style-type: none"> • Promotion of dissemination of the technologies verified in this project developed by venture companies, etc., through objective verification • Promote environmental conservation initiatives • Stimulation of economic activity, for example those in the regional environmental industries
Funding	<p>Ministry of Environment during pilot</p> <p>Contribution of technology vendor not determined at implementation phase</p>
Logo/certificate awarded	Under consideration
Key figures	<ul style="list-style-type: none"> • Environmental technologies verified: 16 (2003) • Number of technology areas: 5 • Estimate MOE funding for ETV from 2003 to 2007 : US\$10 to 15 million • Cost per verification: about 50,000-100.000 US\$ • Average cost for 5 verifications in one same technology field: 70,000 US\$ per technology • Cost efficiency: depends on technology. Protocol development cost is considered to be covered by performing 6 to 10-15 verifications.
International dimension	<ul style="list-style-type: none"> • Currently national level • Reciprocity agreements : reciprocity with US ETV undecided • English publication of the testing results considered

Structure of the program

The pilot project is carried out by the Ministry of Environment, in cooperation with the Verification Organisation (local municipalities, entities etc.), which are independent organizations that conduct technology verification under the entrustment and contract of the ministry. The different actors and their responsibilities are thoroughly described in the figure below.

Structure for Project Implementation



The Verification Organisations are environmental entities of local administrations appointed upon a bid process by the MoE and the tests are conducted by research institutes related to the Verification Organisations. Their responsibilities are (apart from what can be seen in the figure), to administer all processes of the pilot project, to establish and administer the Technology Panels, to approve test sites (can be both a site where the apparatus are already in place or it can be a site where it has to be installed for the purpose of verification) and to audit the procedure for the verification test.

The verification report prepared by the Verification Organisation does not provide any kind of judgment of the technology. It must however comply with existing environmental standards.

The technology developers must provide a detailed application form, propose a test site, cooperate with the verification organization on issues like the establishment of the test plan and the preparation of the verification report and they bear the cost and responsibility for transportation, installation and removal, operation and maintenance of the apparatus needed as well as for chemical, supplies and utilities that might be required.

Funding

The funding of the pilot project is covered by the Ministry of Environment.

Selection Criteria

The targeted fields are related to environmental management technology. The selected fields are those where the private sector is the primary developer and technologies are thought to be difficult to assess by users themselves. The current fields are described as innovative monitoring technology, wastewater treatment technology for small scale operations and atmospheric contamination prevention technology for small-scale operation.

The verification organization further selects the technologies to be studied, based on the advice from the Technology Panel and with the approval from MoE. In this case, the criteria to select certain technologies for verification are: to fall under a targeted field, to be in a commercial stage, to be possible to complete the verification from cost and organizational standpoint, to establish a suitable test plan, to scientifically explain the principle and mechanism of the technology, it must not cause side effects environmentally speaking, it has to provide a high environmental positive effect and it must be innovative.

BANGLADESH ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

The objective of the program is to enable the Government of Bangladesh to authorise widespread purchase of reliable, proven arsenic removal technologies for households and small community applications. It is furthermore to build capacity in the Bangladesh Government, through its scientific and technical institutions, to operate an ongoing program of verification and monitoring for present and future arsenic removal technologies.

The need for this is strong since the main source of potable water comes from groundwater sources that underlie the whole country. The geology of the aquifer is derived from the Himalayas and contains amounts of naturally occurring arsenic iron complexes. To address this problem, OCETA and ETV Canada developed the Environmental Technology Verification Arsenic Mitigation Program (ETV-AM). This is a multi-year program funded by. The water treatment technologies currently being field-tested and the large number being proposed will be subject to a rigorous verification process.

Technology proponents are offered two possible courses for verification. The first works with invitation to participate in the process. Applications are screened based upon a series of technical, social and fiscal parameters specific to Bangladesh, through which a limited number of technologies will emerge. The program absorbs costs associated with assessment and field verification of the technologies emerging from this screening. However, there is a second option and that is for a proponent to proceed directly to the technology assessment and the field verification stages of the process, thus skipping the screening. In this way, they applicant has to bear all costs associated with the assessment and field verification himself.

The verification process constitutes of screening, laboratory performance evaluation and review, field testing and verification, issuance of verification report and technology fact sheet.

CHINA ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

The Chinese government is establishing an environmental management system that conforms to a market economy. An ETV program would support this work since it finds innovative technological solutions to human and environmental problems stemming from economic development. Three technology verification programs were already running in China before the start up of the current one but they were mainly based on subjective experts' opinions. Thus, the Chinese government, unsatisfied with the existing systems, decided to adopt Canada's ETV system through a Memorandum of Understanding between the two governments.

The project is funded by Canadian International development Agency (CIDA) and OCETA and ETV Canada are part of the managing organizations. Phase 1 (1999-2000) established an ETV program in China and in phase 2, Canada has started the development of the ETV system for China. The regulatory framework should be established as well as institutional requirements.

EVALUATION PROGRAMS IN EUROPE

There are no national programs in Europe dealing with verification of environmental technologies but there are a few national or sectoral programs that concern the evaluation or certification of a specific type of technology.

United Kingdom

The Monitoring Certification Scheme (MCERTS) provides for the certification of instruments, the competency certification of personnel and the accreditation of laboratories based on international standards. It addresses a number of monitoring systems such as continuous emissions monitoring systems (CEMs), manual stack emission monitoring, continuous ambient air quality monitoring systems, continuous water monitoring equipment and chemical testing of soil.

Under the MCERTS scheme, there is a type-testing and approval scheme for CEMs for air pollution from industrial stacks and some benefits are:

- Give confidence to regulatory authorities that instrumentation, once certified, is fit for purpose and capable of producing results of the required quality and reliability.
- Give confidence to users that the instrumentation selected is robust and conforms to performance standards that are accepted by UK regulatory authorities.
- Provide instrument manufacturing companies with an independent authoritative endorsement of their products, which will facilitate their access to international markets and increase the uptake of their products in the UK.

Both the performance standards and the test procedures are based on relevant CEN, ISO and national standards. Testing comprises a combination of laboratory and field tests and the program and evaluation of results is carried out by Sira Certification Service, using a group of independent experts known as the Certification Committee. The certification is valid for five years and is then subject to review.

A similar scheme exists in Germany and the UK Environment Agency and the German UBA agreed in 2000 on measures to minimize the burden on instrument manufacturers seeking both certificates and approval under these schemes. The aligned scheme between the UK and Germany is not forming the basis of European standards for the testing and approval of analysis instruments for stack emissions and ambient air.

Germany

Germany has a scheme very similar to the UK one and is not described further here.

Belgium

Vito (the Flemish institute for technological research) has three projects relevant to the development of a European verification program.

The first is a BAT-centre (funded by regional government) which main tasks are to build an information system concerning environmentally friendly techniques, to select best available techniques at the sector level and to support the Flemish authorities and the Flemish companies to put BAT into practice. In order to do this, performance assessments are carried out by means of verifying information from suppliers as well as analyzing information of techniques already in use (surveys, plant visits).

The second is called PRODEM (funded by EFRD, regional government and industry) and encourages SMEs to introduce environmentally friendly process technologies. The project sets up demonstration tests and pilots to investigate the feasibility of selected technologies since this was found crucial for SMEs to guide them to do the right investments in cleaner technologies.

The last one is CERTIPRO (funded by industry), and is a certification and control service for individual wastewater plants and septic tanks but the program expects to extend the range of types of products in a near future.

PRELIMINARY CONSIDERATIONS FOR A EUROPEAN VERIFICATION PROGRAM

Cost-effectiveness of the program

When deciding for an environmental technology verification program, a balance between the number of technologies expected to be verified and the cost of implementing such a program must be taken into account. E.g., Australia did consider an ETV program but decided later to not implement it, mainly due to insufficient business case. Furthermore, the structure of such a system and whether it should be funded mainly by public or private money must be carefully considered.

Eligible data

The two main systems presented above, the US and the Canadian, have some important differences. The main one may be in the way data from an accredited independent laboratory can be used. In the US model, these data can not be used since the ETV procedure imposes that the data must be collected by a specific verification organization. This naturally has an impact on total cost, which technology developers, mainly SMEs, can see as an obstacle. On the contrary, in the Canadian model, such

data can be used and, thus, the system makes use of all of the country's competence system apart from being more flexible and cost effective.

What technologies should qualify?

A number of general questions must be considered when deciding on the technologies that could qualify for a verification process. It must be carefully considered whether the environmental performance of (any) technologies could be of interest or whether it is the performance of environmental technologies (end of pipe and process integrated) that should be the target of the program. Furthermore:

- Should the environmental features be the main criteria?
- Should the existence of standards be a prerequisite?
- For a technology with no existing standards, should minimum performance levels be set before starting verification procedures?
- If so, can the scheme still be qualified as a verification system or does it become a certification?
- What is the relation/compatibility with existing legislation? E.g., could the suggested limit values in the IPPC BREF documents be used?

Further considerations

Structure of the system

- Should there be a network of national systems or one European system?
- Some European programs are related to verification schemes and could be used when developing a verification model.
- How could the different stakeholders within the process be incorporated in the best way?
- It could be better to have several testing centres for each type of technology around Europe rather than only one, since having only one centre could lead to increased prices.
- How does a verification system combine with the internal market?
- What would be the relation between ETV and public procurement?
- The Japanese approach could be considered with the possibility of building up a database on the web that gathers data on technologies that have been verified and those that have not.

International co-operation

- Cooperation with other programs worldwide may ensure cost effectiveness of the European system and accelerate its full implementation. Effective cooperation could concern sharing of protocols and enabling mutual recognition of verification results.
- All the running programs are open to foreign technologies and so should a European version be.

Support preliminary to verification

An important feature of the Canadian program is the support provided to assist technology developers in establishing claims and providing proper performance data. This is highly appreciated by the applicants. The UK MCERTS program assists the vendors in a similar way.