



Project no.: 226824

AdvanceETV

**“Coordination action on Environmental Technology Verification ETV -
Building a framework for international cooperation”**

Coordination action

Area 6.3.3.3

Environmental technologies verification and testing

D 4.2: Identify which standards already exist for ETV

28 January 2010

Organisation name of lead contractor for this deliverable:
Environment Agency for England and Wales

Revision: [final]

Project co-funded by the European Commission within the Seventh Framework Programme (2007-2013)		
Dissemination Level		
PU	Public	X
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Table of contents

- 1. Introduction 3
- 2. Main categories of standard 3
- 4. ETV and conformity assessment – how standards can support ETV 5
- 5. Ongoing standardisation activities that could benefit ETV, and how ETV can benefit the development of standards..... 10
- 6. Summary 10
- 7. References 12

1. Introduction

This report describes the findings of Work Package (WP) 4 of the AdvanceETV project, Deliverable 4.2, to identify which standards already exist that could support an EU-ETV scheme. In simple terms, the following types of standard have already supported ETV schemes throughout the world, albeit not always in a harmonised manner:

- Quality assurance standards for management-systems and verification frameworks.
- Guidelines for descriptions of how standards apply to ETV schemes, and how ETV schemes operate.
- Specific performance requirements, verification protocols and test procedures for environmental technologies.
- Specific ETV procedures for verifying test data and reports.

There have been two pieces of work which complement this deliverable, so this report will not duplicate the work within them, but refer to them. These are *A review of international environmental technology verification (ETV) programs and related conformity assessment mechanisms*, 2009 (Janhager, S. and Neate), and the *First report from the Quality Assurance sub-group of the International Working Group (IWG)*, 2010 (IWG-QG Group). This report will describe:

- The types of standard that are available.
- How such standards have been used within ETV and related schemes (such as type-approval and product-certification schemes).
- What gaps exist amongst standards which could be used for ETV.
- Which standardisation activities are under development and apply to ETV.
- How developing standardisation activities can benefit from ETV.

2. Main categories of standard

The term *standard* has many definitions and in the context of ETV, a standard is defined as a document which either specifies requirements, or provides guidance on such requirements. In this respect, a standard is typically a nationally or internationally agreed set of requirements or guidelines published by national or international standards bodies, mainly the Committee for European Normalisation (CEN) or the International Standards Organisation (ISO). Standards can support an EU ETV scheme in the following ways:

- Providing a framework for the scheme operation.
- Providing a framework for testing.
- Proving performance criteria, performance benchmarks, and test procedures that could be applied to ETV.
- Providing the means for quality assurance.
- Providing the means for harmonisation and mutual recognition.

CEN and ISO standards themselves are divided into four categories, which are shown in Table 1.

Table 1 – Categories of standard

Type of standard	Content	Objective	Identifier	Development time and status
True standards	<ul style="list-style-type: none"> ● Mandatory or normative requirements ● Numerical and procedural requirements ● Typified by the words shall and must. ● May contain recommendations characterised by the word should) and descriptive sections (Informative content) 	<ul style="list-style-type: none"> ● To set compulsory requirements. ● To set minimum requirements. 	EN or ISO	<ul style="list-style-type: none"> ● Ordinarily 3 years to develop. ● Highest on the hierarchy. ● Requires a majority of votes from CEN or ISO member states for approval.
Technical Specifications	<ul style="list-style-type: none"> ● Similar content to true standards 	<ul style="list-style-type: none"> ● To provide an interim standard, or one with a restricted field of application. ● Can be transformed into a true standard. 	EN/TS or ISO/TS	<ul style="list-style-type: none"> ● Ordinarily 1-2 years to develop ● Next on the hierarchy of standards ● Relaxed procedures for approval when compared to standards. ● Not as high a status as true standards.
Guidelines	<ul style="list-style-type: none"> ● No normative requirements. ● Contains descriptions and guidance (Informative text) ● May contain recommendations, characterised by the word should. 	<ul style="list-style-type: none"> ● To provide supporting guidance to true standards. ● To supplement true standards, with recommendations. 	EN or ISO	<ul style="list-style-type: none"> ● Ordinarily 3 years to develop. ● Highest on the hierarchy along with true standards. ● Requires a majority of votes from CEN or ISO member states for approval.
Technical Reports	<ul style="list-style-type: none"> ● Contains descriptions and explanations only. ● May not contain any normative requirements or recommendations. 	<ul style="list-style-type: none"> ● To explain and clarify the requirements of a standard. ● To explain a technical area. 	EN/TR or ISO/TR	<ul style="list-style-type: none"> ● 1-3 years to develop. ● Lower on the hierarchy of standards. ● Requires a majority of votes from CEN or ISO member states for approval.
Agreements or Specifications	<ul style="list-style-type: none"> ● May contain both normative and informative requirements. ● The content can be similar to true standards, technical specifications, guides and technical reports. 	<ul style="list-style-type: none"> ● To provide the means for fast-track standards or guidance. ● Can form the basis of a future standard, guide, technical specification or technical report. ● Can provide a rapid, interim standard or guide in a specific or limited field of application. 	EN WA or ISO/PAS	<ul style="list-style-type: none"> ● 1-2 years to develop. ● Lowest on the hierarchy of standards. ● Does not require a majority of votes from CEN or ISO member states for approval. ● Relaxed procedures for approval when compared to those for other types of international standards.

Within these four categories of standards, there are specific types of standard which can support ETV schemes. Some ETV schemes already make use of these specific types of standard, which are:

- **Management systems standards:** These include *ISO 9001, Quality management systems – requirements*, and the ISO 14000 series for environmental management, life cycle analysis (ISO 14040 series) and performance evaluation (ISO 14030 series).
- **Accreditation standards:** These provide a minimum level of quality assurance for conformity assessment and testing. These standards include *ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories*, and *ISO/IEC 17011, Conformity assessment - General requirements for accreditation bodies accrediting conformity assessment bodies*.
- **Performance requirements:** There exist a number of standards which contain technical specifications for specific types of environmental technologies (ETs). These standards often contain test requirements as well.
- **Product certification standards:** These are a combination of all of the above three types of standard.
- **Specific ETV and related standards:** The above types of standard are typically published by CEN and ISO. However, several countries with ETV programmes have published a large number of test protocols, operating frameworks and quality assurance procedures. These standards include the U.S.EPA procedures and protocols for ETV, the German scheme operated by the Umweltbundesamt for type-approvals of renewable energy technologies and air-pollution monitoring-systems, and the Monitoring Certification Scheme (MCERTS) operated by the Environment Agency for England and Wales. These supporting documents may have different names, but they are all similar in that they set standards for operation, performance and quality assurance.

4. ETV and conformity assessment – how standards can support ETV

Conformity assessment is the processes used to demonstrate that a product, service or management system meets the requirements specified in a standard, law or other document. Management system or body meets specified requirements. Conformity assessment, especially in the context of product standards and management-system standards, has been used worldwide to harmonise processes and reduce trade-barriers. The benefit of using standards and conformity assessment is that this process aids mutual recognition.

The IWG-QA Group has examined this area in detail, and has summarised how different types of standards could support harmonised ETV schemes; this subject is discussed in Deliverable D4.1. Table 2 shows relationships between the related processes in ETV, and how standards have supported these processes, and could do so for the EU-ETV.

There are four main processes within ETV, which are *verification, testing, accreditation/certification*, and *analysis*. There is also an overarching process, in the form of managing verification programmes. Again, at this level of operation, standards such as quality-management systems could also harmonise the processes of ETV internationally. Each level is considered in turn.

Table 2 – How different types of standards could support ETV

	Verification	Test	Analysis	Accreditation
General quality management	ISO 9001 or equivalent			
ETV operation and quality management/assurance	ETV procedure		ISO 17025 or equivalent	ISO 17011, ISO 17021 or equivalent
Verification and test	Protocols prepared according to the ETV procedure	Test plans prepared according to the ETV procedure	CEN/ISO analytical standard methods or equivalent	None relevant

- **Management of an ETV scheme:** If there were an organisation which oversaw an EU-ETV scheme, then a quality management-system could serve as an effective planning and management tool. ISO 9001 would be an applicable framework standard for such a system, and could be supplemented by either specific standards or guidelines.
- **Verification, testing and analysis:** There are differing views on which organisations perform these three functions. One view is that all three functions should be performed by the same organisation, whereas an opposing view is that the process of verification should be separate from testing and analysis.

However, standards applied in an appropriate manner could allow any combination, simply by producing a framework standard for the ETV process (perhaps based on ISO 9001), whilst the processes of testing and analysis could be drawn from a multitude of the following; international standards, guides, technical reports, CEN Workshop Agreements and ISO/national Publicly Available Specifications (CEN, ISO); other national standards and performance specifications (e.g. MCERTS for water monitoring-systems); test protocols from national ETV schemes (e.g. U.S.EPA ETV test protocols, DHI test protocols). Janhager and Neate (2009) have documented a wide array of standards and test protocols applicable to ETV schemes.

As well as there being performance and test standards for specific types of technology, there are also several generic standards which could support ETV. These include several standards from the ISO 14000 series for environmental management, produced by ISO Technical Committee (TC) 207. For example, the ISO 14020 series provides requirements on the labelling of products, related to environmental claims; ISO 14031 provides a means of evaluating the environmental performance of products, covering a wide range of metrics such as energy consumption, waste arisings, and pollution. This standard can be used with the ISO 14040 series for life cycle analysis (LCA) ISO TC 207 has also published a Technical Report, ISO/TR 14062, which provides guidance on integrating environmental aspects in product design. Related to this, a recent UK PAS (PAS 2050) describes a procedure for determining the carbon dioxide emissions which arise from a product or service, from cradle to grave.

- **Accreditation standards:** Test laboratories could be accredited to ISO 17025 and to the applicable test standards and ETV procedures, whilst any ETV-specific management-systems to ISO 9001 could be certified by certification bodies accredited to ISO 17021. Table 2 shows the accreditation standards that could be available to the EU-ETV scheme.

Table 2 – Accreditation standards

Standard	Number
ISO/IEC 17011:2004	Conformity assessment – General requirements for accreditation bodies accrediting conformity assessment bodies
ISO/IEC 17021:2006	Conformity assessment - Requirements for bodies providing audit and certification of management systems
ISO/IEC 17025:2005	General requirements for the competence of testing and calibration laboratories
ISO 15189:2007	Medical Laboratories - Particular requirements for quality and competence
ISO/IEC 17020:1998	General criteria for the operation of various types of bodies performing inspection
ISO/IEC 17024:2003	General requirements for bodies operating certification of persons
BS EN 45011:1998	General requirements for bodies operating product certification systems

ISO 17025 was initially developed as a quality assurance specification for analysis or calibration in test laboratories, rather than as a quality assurance standard for testing. Therefore users and organizations world-wide have developed supplements to ISO 17025, to serve as both guidance and requirements for the application of ISO 17025 to testing; therefore it is highly likely that a future ETV scheme would need at least a guidance note on the application of ISO 17025 to testing for ETV, and most likely a supplementary set of requirements for ETV testing.

It should be noted that whilst this discussion has focused on ISO and CEN standards, there are many other quality assurance and ETV test-protocols/methods that can be used to develop the EU-ETV scheme.

If CEN, ISO or national ETV protocols do not exist, then AdvanceETV could develop these using CEN and ISO procedures to produce either ISO Publicly Available Specifications (PAS) and CEN Workshop Agreements, or documents in the same format as these specifications. These could be developed for all levels of ETV management, quality assurance and test protocols. Indeed, the pilot ETV programmes within the EU have developed two CEN Workshop Agreements for testing and verification. Experience has shown that such CEN Workshop Agreements can be developed within a year, and then form the basis of future CEN and ISO standards.

In March 2010, the EC published its plans for a pre-programme in ETV. This plan lists four main technology areas. Table 3 shows these areas, and summarises which types of existing and developing standards can support ETV.

Table 3 - Preliminary list of technology areas and technology groups (applications)

Technology areas	Standards and methods available
1. Water treatment and monitoring techniques	
Water monitoring techniques, including test kits, probes, analyzers	<ul style="list-style-type: none"> ● CEN Workshop Agreement 32; ● ETV methods developed for existing schemes and ETV pilot programmes within the EU. ● Specific test methods from CEN/ISO. ● UK MCERTS scheme for water-monitoring technologies includes several standards for performance requirements and testing.
Drinking water techniques, such as filtration or disinfection, removal of contaminants	
Wastewater treatment technologies, such as separation techniques, nutrient reduction, disinfection or decontamination	
Groundwater and soil pollution monitoring and remediation, site characterization	
2. Clean technologies including waste and resource recycling	
Buildings materials, energy efficiency in buildings, indoor air quality	<ul style="list-style-type: none"> ● There are several standards available for testing the energy transfer of products, especially building products. ● Specific monitoring standards for water, solids, and gases/air quality; these can be used to measure the chemical content of products, and releases from them during production and use. ● There is an ETV scheme for agricultural products, which has developed test protocols.
Cleaner or low-carbon industrial processes, coating equipment (spray, liquid, powder)	
Separation or sorting techniques for solid waste (end-of-life vehicles, plastics, mixed recyclable waste, metals)	
Recycling techniques for batteries and accumulators, for chemicals	
Separation and removal of mercury from waste, safe storage of mercury	
Environmental technologies in agriculture	
3. Air pollution monitoring and abatement	
Air emissions sensors, analyzers and monitors, including continuous emission monitors	<ul style="list-style-type: none"> ● Europe has a certification and type-approval schemes for technologies which measure ambient air-quality and air-emissions; these are supported by many reference methods, and performance/test standards.
Abatement of pollution from stationary sources (filtration, scrubbers, stabilization of by-products, leakage prevention)	
Technologies related to the combustion of fossil fuels (new fuels, burners, mobile sources devices)	

Technology areas	Standards and methods available
Technologies related to the combustion of waste and technologies transforming waste into sources of energy	<ul style="list-style-type: none"> The EC pilot programme for ETV developed CEN WA42 for determining the effectiveness of air-pollution abatement.
4. Energy technologies and energy efficiency	
Micro-turbine, Combined Heat and Power systems, Hydrogen and Fuel cells	<ul style="list-style-type: none"> There are several CEN and ISO standards available for the performance and testing of solar-PV systems (e.g. EN 61215 and EN 61646), solar water-heating systems (e.g. EN 12975, 6 and 7 series), and wind-energy systems (e.g. EN 61400 series). There are other standards under development within CEN and ISO, for renewable energy technologies (e.g. microCHP , biomass boilers, fuel cells). There are standards available to test the energy balance of products and activities, and the energy efficiency of products.
Biomass burners and boilers, Heat pumps	
Photovoltaic systems and equipment, solar water heaters	
Wind and sea energy systems and equipment	
Energy efficiency in industrial processes	

5. Ongoing standardisation activities that could benefit ETV, and how ETV can benefit the development of standards

At the time of writing, there are several new technical committees in CEN, ISO and within national standard bodies, which are developing standards related to ETV. Many of these technical committees and their working groups are typically developing performance standards and test procedures for technology areas listed in the EC's proposed pre-programme for ETV. These technology areas include renewable energy technologies, fuel cells, and energy efficiency – many of these activities are driven by a need for reduce carbon dioxide emissions. The standards themselves range from international standards (e.g. draft CEN/TR 15941 for sustainability of construction works and environmental product declarations), to national publicly available specifications (e.g. the UK's PAS 67 for micro-combined heat and power generators). The UK has also developed a product certification scheme for renewable energy technologies, known as the Microgeneration Certification Scheme (MCS)(www.microgenerationcertification.org). Germany has a similar type-approval scheme for solar-PV and solar water-heating systems, again using international standards.

As well as standards under development for specific technology areas, there are also generic standards being produced, such as draft ISO 26000 for corporate social responsibility. Although this is not a standard for technologies as such, the draft ISO 26000 does require organisations to consider the environmental aspects of their activities.

These standardisation activities can benefit ETV in the same way as other standards for specific technology types; by providing performance criteria, benchmarks for performance, and test procedures. Even if such standards are not used within formal product-certification schemes, they can still provide frameworks for performance claims and testing.

Similarly, a developing ETV scheme can benefit standardisation, by providing frameworks for standards development, use and quality assurance; and stimulating the need for new standards which fit within the framework created by ETV. In other words, the development of standards and ETV are mutually beneficial.

6. Summary

There is a range of standards that are available to the EU-ETV scheme, which include the following

- | | |
|-----------------------------|--|
| Quality assurance standards | <ul style="list-style-type: none">● Applicable to ETV management frameworks● Includes ISO 9001 and national equivalent standards, e.g. ANSI standards. |
| Accreditation standards | <ul style="list-style-type: none">● Applicable to certification of management systems by accredited certification bodies.● Could apply to certification of ETV processes.● Includes ISO 17025 for test laboratories and equivalent quality assurance standards, e.g. U.S.EPA, ANSI |

Environmental performance standards

- ISO 14001 and EMAS – products made within a framework of environmental management
- ISO 14030 series – environmental performance evaluation
- ISO 14040 – Life Cycle Analysis series
- PAS 2050 – embedded carbon in products and processes

Test and analysis standards

Includes the following:

- ISO standards
- CEN standards
- National standards and schemes (e.g. MCERTS)
- ETV test protocols from national schemes (e.g. USEPA, DANETV, Canadian ETV, EU pilot programme).
- CEN Workshop Agreements and ISO Publicly Available Specifications (PAS) can be rapidly developed.

In conclusion, these standards and related documents are not just available, but will be essential for international harmonization. Furthermore, the application of accreditation and certification of ETV processes will strengthen the scheme and provide international credibility, and hence mutual recognition. Lastly, if there are gaps within existing standards, then experience has shown that the AdvanceETV project partners can fill these by rapidly developing CEN Workshop Agreements and ISO Publicly Available Specifications (PAS), or documents which could then be developed into CEN and ISO standards.

7. References

Janhager, S. and Neate, J. Review of international environmental technology verification (ETV) programs and related conformity assessment mechanisms. 2009. Standards Council of Canada.

IWG-QA Sub-Group, First report from the Quality Assurance sub-group of the International Working Group (IWG), 2010.

EU Environmental Technology Verification (ETV) pre-programme, European Commission, 2010.