
ETV
ISO 14034
ENVIRONMENTAL
TECHNOLOGY
VERIFICATION
Environmental
Technologies
Verification (ETV)
Handbook
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Introduction

Environmental Technology Verification (ETV) has been established as environmental scheme tailored to address the performance demonstration needs of new and even disruptive, commercially ready environmental technologies. It provides technology developers and manufacturers access to third-party verification of new environmental technology performance claims in order to prove their credibility, provide market relevant and objective evidence on their performance and the resulting environmental benefits to buyers, investors, and other stakeholders with the purpose to :

- help technology manufacturers, especially SMEs, market their new technologies
- support informed decision-making among interested parties (public or private) e.g. technology buyers, users, permitting and regulatory bodies, financiers, investors,
- drive adoption of new sustainable solutions to advance environmental performance of operations in industry and utilities,
- accelerate market entrance of new environmental technologies into the domestic and international marketplace

1. The ETV scope

With an adoption of the International Standard ISO 14034; Environmental Management: Environmental Technology Verification in 2016[1], ETV provides a globally harmonized and recognised framework for process, procedures and requirements to measure, assess and present information about the performance and benefits of new environmental technologies so that all jurisdictions can rely on the results of ETV.

ETV concerns environmental technologies i.e. products, processes or services ready for market[2] or already on the market which:

1) **demonstrate environmental added value** i.e. more beneficial or less adverse environmental impact with respect to the technologies currently applied in a similar situation to which they are an alternative;

   e.g. treatment technologies e.g. wastewater treatment or soil remediation, biobased materials, secondary raw material based products, energy saving/production technologies, recycling/ resource recovery solutions etc.

2) **measure parameters** that indicate environmental impacts

   e.g. monitoring/ measurement technologies and equipment, testing kits, sampling equipment, ect.

In general, ETV is a scheme for technologies with industrial applications rather than consumer products for which different labelling schemes may add a better value.

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[1] ISO 14034 has been adopted as a European Norm in 2019.

[2] The minimum Technology Readiness Level (TRL) for a technology to be considered for ETV is TRL7.

The International Standard ISO 14034 is technology neutral i.e. besides providing a definition of an environmental technology, it does not predefine any specific technology areas or technology applications to which it applies. Nonetheless, capitalising on the experiences of the EU Environmental Technology Verification Programme3 and other ETV initiatives implemented as ETV programmes at national level, to address a specific challenge or as a market-driven initiative, the technology applications concerned under ETV may be categorised into 7 technology areas:

Categories of environmental technology areas

Water treatment and monitoring

Energy technologies

Materials, waste and resources

Cleaner production and processes

Soil and groundwater monitoring and remediation

Air pollution monitoring and abatement

Environmental technologies in agriculture

The key outputs of the ETV scheme are the Verification Report and the Statement of Verification. The Verification Report presents in detail the verification activities performed to verify a given technology together with the specification of the verified performance expressed as parameters and their numerical values. The Statement of Verification serves as a key document for use in business relations and technology marketing. It includes the specification of the verified performance of the technology expressed as parameters and their numerical values together with a concise summary the verification activities relevant for the technology buyers, users and other stakeholders to properly understand the process which led to the achieved results together with all the conditions, assumptions and constraints which apply to it and the technology. In the meaning of the ISO 17020 standard, these documents have the status of type A inspection body report and certificate, respectively.

ETV is neither an eco- label nor a compliance or certification scheme. Certification confirms whether a product or a service meets specified standards or requirements typically established by independent organisations (e.g. a standardisation bodies such as ISO or CEN/CENELEC) and involves a pre-defined procedure and assessment criteria implemented by a designated organisation (e.g. an accredited or notified certification body). Verification means confirmation by providing objective evidence.

[3] The EU ETV Programme was terminated by the European Commission in November 2022.

ETV is concerned with the technical design of a technology, not with the production series of industrial products i.e. an on-going consistency of the manufacturing process is out of the ETV scope.

ETV is based on a 'snapshot' of the overall technology performance and is recommended for technologies when their innovative features reflected by their technical and functional performance or the environmental added value cannot be fully reflected in the existing regulatory requirements, labelling and compliance certification schemes or standardised performance frameworks for products. The aim is to fill a gap for those technologies falling outside regulations or standards and for innovations which do not fit into existing legislative, labelling or standards frameworks.

For example, an innovative wastewater treatment technology might produce higher quality effluent whilst using less energy than current technologies. ETV would consider many performance parameters together including energy consumption, enabling a useful comparison with relevant alternatives.

ETV addresses parameters quantifiable and measurable through testing. The environmental added value is considered from a life-cycle perspective, i.e. considering the main benefits and impacts at each stage of the technology life cycle. However, ETV does not have the same objective and does not provide the same information as tools based on Life-Cycle Analysis (LCA), such as Environmental Product Declaration (EPD) or Product Environmental Footprint (PEF).

ETV does not involve a regular third-party surveillance to confirm that the technology continues to meet the performance claim(s) as presented in the Statement of Verification whereas certification requires any changes to the certificated technology to be reported in advance to the certification body so that checks can be made to ensure the product continues to meet the requirements for certification.

In ETV, it is the holder of the Statement of Verification who is responsible for ensuring that the verified technology conforms to the published Statement of Verification and for taking action in light of any changes to the technology with respect to meeting the verified performance claims.

ETV is not typically used for well-established technologies, although this is not excluded, for example if there is a need to validate the performance of established technologies. Applicants seeking to prove the compliance of their technology with a product standard should direct to product certification, as defined by the ISO/IEC Standard 17065 and implemented by certification bodies accredited to fulfil the requirements of this standard.

In general, ETV is not intended for consumer products for which dedicated labelling schemes are a better alternative.

2. The ETV Handbook

This document is the first version of the ETV Handbook. It uses as a basis :

- the International Standard ISO 14034:2016 Environmental Management, Environmental Technology Verification
- General Verification Protocol of the EU ETV Programme version 1.3 (published) and version 2.0 of July 2022 (unpublished)

- Selected guidance documents of the EU ETV Programme developed by the Technical Working Groups [4] :
    - Guidelines on assessing the environmental added value of an environmental technology in a lifecycle perspective at the proposal stage, Guidance document 004/2016, adopted on the 26/01/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document and its unpublished version 2.0 of July 2022
    - Guidelines on the Acceptance of Existing Test Data, Guidance document 005/2016, adopted on 07/06/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document its unpublished version 2.0 of July 2022
    - Guidelines on Auditing Test Bodies, Guidance document 009/2016, adopted on 06/06/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document its unpublished version 2.0 of July 2022 .
- Guidance documents developed under the LIFEproETV project:
    - Guide for ETV Applicants
    - Application of ISO/IEC 17020:2012 for the Accreditation of Verifiers Performing Environmental Technology Verification Compliant to ISO 14034. A guidance document for National Accreditation Bodies.
    - How to become a verifier of the Environmental Technology Verification (ETV) scheme?. A primer.

The ETV Handbook serves as a technical guidance for the implementation of ETV in the EU. It integrates in full and complements the principles, procedures and requirements for environmental technology verification process specified in the International Standard ISO 14034 and the corresponding European Norm to be followed by participating entities capitalising on the experiences gained from the ETV scheme implementation under the EU ETV Programme operated by the European Commission. The Handbook provides also a reference for establishing ETV programmes at national, regional or sectorial level to ensure their compliance to ISO 14034 and may serve to establish a governance framework for ETV in the absence of the EU ETV Programme. More specifically, the guidance provided in this Handbook is to ensure that:

- the verifiers in the EU apply a harmonised and consistent ETV approach,
- the national accreditation bodies in Member States develop and apply ETV accreditation schemes in a harmonised way,
- entities seeking accreditation to perform ETV compliant to ISO 14034 receive a common basis for the development of a quality system compliant to ISO/IEC 17020:

[4] These documents have been reviewed in 2022 under the operation of the EU ETV Programme Secretariat appointed by DG Environment. The purpose of this revision was to transform the EU ETV Pilot Programme into a full scale EU Programme and to reflect the consistence of this programme with the standard ISO 14034. Due to the termination of the EU ETV Programme in November 2022, these documents have not been published. The authors of this handbook got access and used these materials upon exclusive consent of DG Environment – operator of the EU ETV Programme.

2012 together with guidance relevant for establishing an ETV process and procedures,

- potential operators of ETV programmes are provided with guidance on creating such programmes based on mutually supportive frameworks involving institutional partners and other stakeholders of environmental technologies marketplace.

In that sense, the ETV Handbook constitutes the “corporate” documentation for specific ETV schemes for individual operators, to ensure a harmonised and consistent development and implementation of their own scheme-specific procedures and documentation and the recognition of the ETV results, which are not described in this document.

The Handbook consists of 5 main chapters:

- Part A: Environmental Technology Verification (ETV) scheme overview
- Part B: Verification procedures
- Part C: Quality assurance and management
- Part D: Glossary of terms
- Part E: Supporting documents (Annexes)

Part A: Environmental Technology Verification (ETV) Scheme Overview

A.I. The ETV standardisation framework

ETV is based on a framework provided by 3 International Standards (Figure 1):

ISO 14034: 2016, Environmental management: Environmental Technology Verification. This standard serves as the main technical reference for ETV. It defines the principles, process and procedures and requirements of the ETV process. It also specifies the following two standards to be applied when performing ETV as a framework ensuring quality and impartiality of the ETV process (further details on the ETV framework for quality and impartiality are provided in Part C);

ISO/IEC 17020:2012, Conformity assessment — Requirements for the operation of various types of bodies performing inspection. This standard specifies the requirements for the competence and impartiality of the entities (i.e. verifiers, sometimes also referred to as Verification Bodies) performing ETV (further details on the requirements for Verification Bodies are provided in Section A.III.1);

ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories. This standard defines the quality requirements of test data used to verify the performance of an environmental technology as a part of the technical requirements (further details on the ETV quality assurance requirements concerning testing and Test Bodies are provided in Section C. II.1);

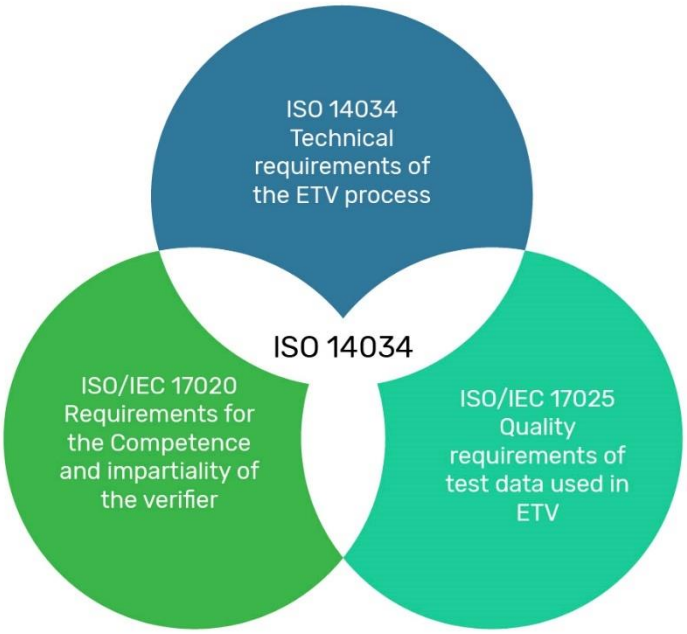

Figure 1. Overview of the ETV standardisation framework

The purpose of the standardisation framework is to provide means for harmonisation and mutual recognition of ETV results recognition at national, EU and international level . This is to ensure that a technology verified under ETV in one Member State will be accepted as verified in other countries, and ultimately at global level. Mutual recognition, however, does not require a total and rigid uniformity of ETV schemes or programs, but the recognition of a common framework of procedures and requirements so that different jurisdictions can rely on the results of the process of ETV. This acknowledgement refers in particular to the recognition of Statements of Verification and the accreditation of Verification Bodies.

A.II. ETV operational framework

ETV is implemented in a collaborative process (Figure 2) that involves a dialogue between the Applicant and the Verification Body. If additional performance tests are needed to generate test data, a Test Body designated by the Applicant gets also involved.

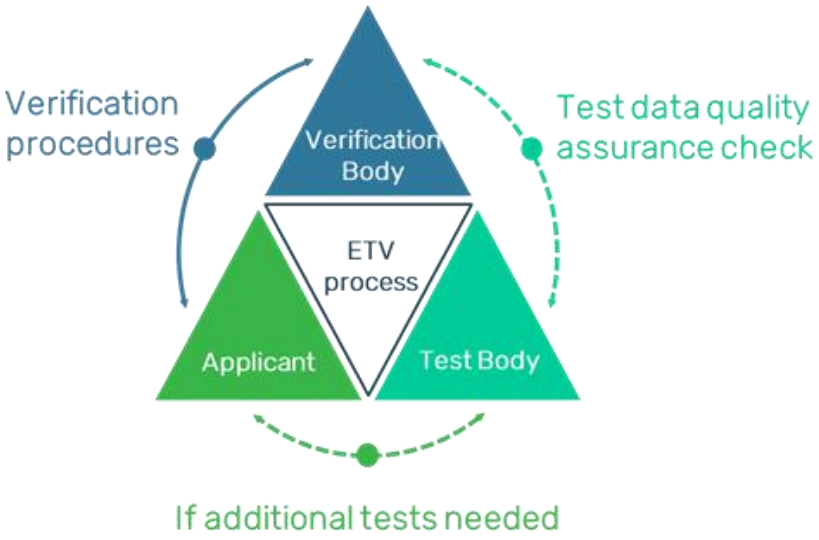

Figure 2. Entities involved in the verification process

The operational framework necessary to implement this collaborative process (Figure 3) involves at a minimum the entities of the ETV process and a National Accreditation Body (NAB) with a role to grant accreditation and provide its surveillance to the Verification Body.

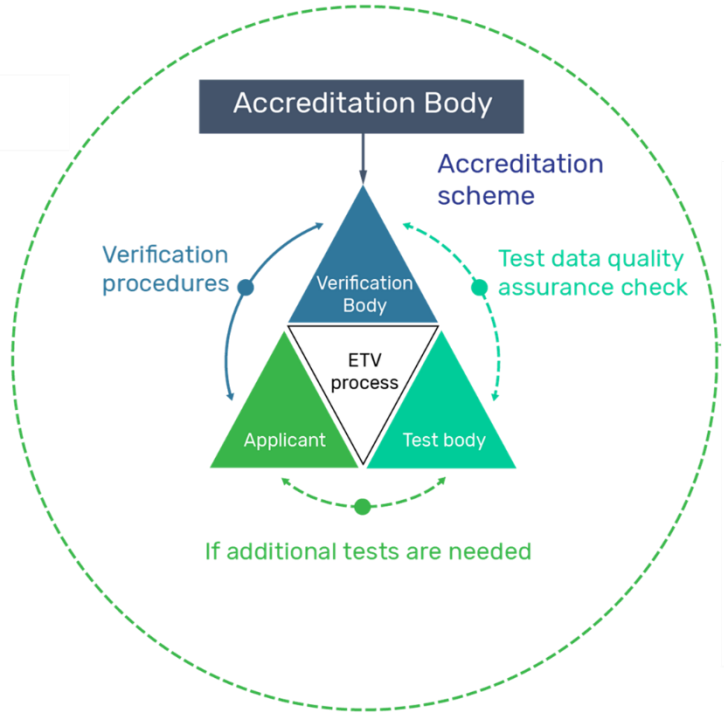

Figure 3. Minimum operational framework for ETV performance

ETV can be operated as an entity-managed programme (operator or scheme owner). Such programme may be established for example:

- at national level e.g. as a national policy or environmental challenge driven scheme with ETV scheme serving as a policy driven tool supporting implementation of environmental, climate or innovation policies, strategies and programmes. Typically, the programme will be operated by an institutional owner such as ministry or environmental agency or an entity designated by them;
- at sectorial level by a professional association with a leading role in a given technology area . The geographical scope of such programme may be at national level or beyond, depending on the operation level of the scheme owner/operator.

The operator, in consultation with its stakeholders, may set rules or requirements for the programme additional to the three standards under which ETV operates (i.e. ISO 14034, ISO/IEC 17020 and ISO/IEC 17025), for example:

- additional rules, requirements and responsibilities of programme entities and their cooperation with operator/scheme owner and stakeholders (e.g. concerning definition of scopes of accreditation of Verification Bodies),
- rules for the common use of ETV visual identity and branding (e.g. a specific logo to be used by Verification Bodies including its placement on the Statement of Verification),
- requirements concerning co-creation or co-definition of criteria for technologies testing or scope of performance parameters to be verified (e.g. testing protocols),
- specific document templates, e.g. of the Statement of Verification,

- a common procedure for numbering/labelling verification certificates and verification reports,
- establishment of communication protocols.

A diagram of an ETV operational programme is presented below (Figure 4):

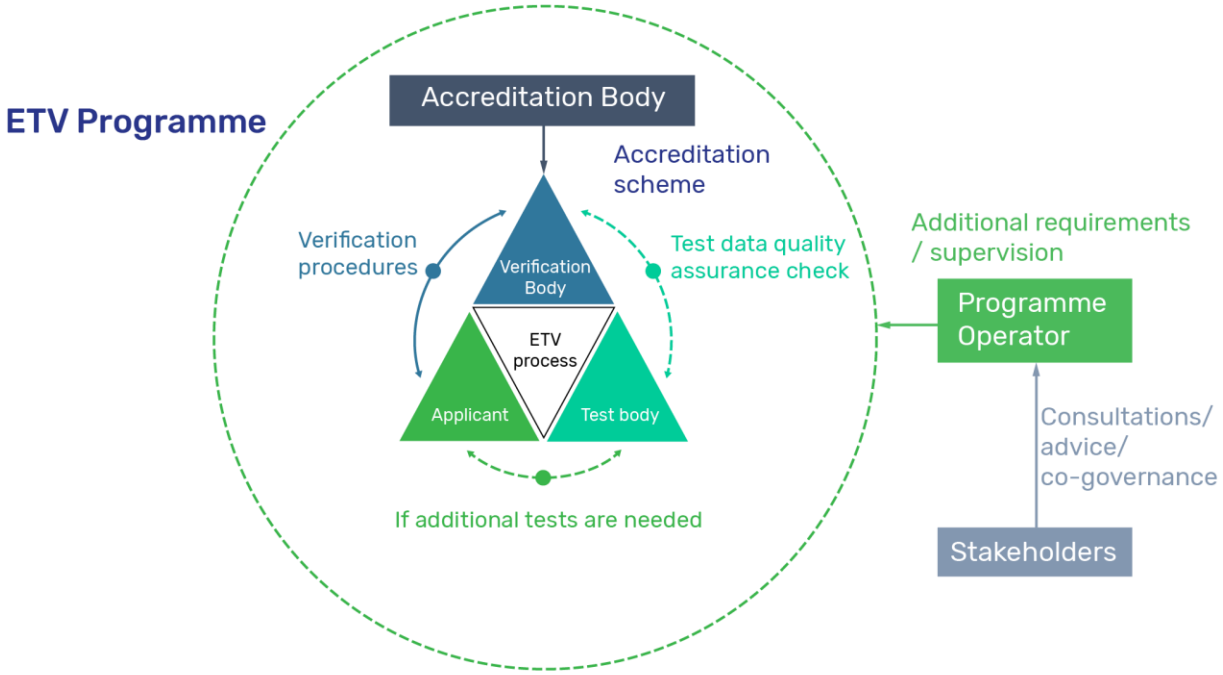

Figure 4. Operational framework of an ETV programme

Part D presents information on best practices and examples of ETV scheme implementation.

A.III. Qualification, roles and responsibilities of the ETV entities

This section explains the nomination, roles and responsibilities of the entities constituting the ETV operational framework.

A.III.1. Verification Bodies (Verifiers)

Qualification

A Verification Body shall:

1) be established under national law and have a legal personality;
2) be accredited to comply with the requirements of ISO/IEC 17020. The Verification Body shall be considered an inspection body type A within the meaning of ISO/IEC 17020. The accreditation shall be granted by National Accreditation Bodies (NABs) established under national law The ISO 14034 shall be part of the documentation describing the inspection activities of the Verification Body. Planned maintenance of accreditation under ISO/IEC 17020 shall include annual surveillance of compliance to the requirements of the ISO 14034.

3) be a third-party body independent of the applicant and of any other interested party interested in the verification. The Verification Body shall meet the requirements for Type A inspection bodies as defined in the normative Annex A of ISO/IEC 17020. A body belonging to a business association or professional federation representing undertakings involved in the development, manufacturing, provision, use or maintenance of environmental technologies, may, on condition that its independence and the absence of any conflict of interest are demonstrated, be considered such a body;

4) define the technical scope of the inspection activities minimum at the level of technology area, or a specific technology groups/ types corresponding with the ETV scope as presented in Section 1, maintaining however a balance between a certain level of flexibility allowing new environmental technologies related to specific fields of application to be verified while ensuring that[5]:

   a) the scope of accreditation is sufficiently precise that potential clients may establish accurately and unambiguously the general field of inspection, it's type and range;

   b) the flexibility does not significantly change the competences, skills, resources and methodologies required for the inspection activity;

5) not be directly involved in the design, manufacture or construction, marketing, installation, use or maintenance of the specific environmental technologies submitted to this body for verification, or represent the parties engaged in those activities. This pertains to the Verification Body, its top-level management and the personnel responsible for carrying out verification tasks. This shall not preclude the use of environmental technologies that are necessary for the operations of the Verification Body or the use of environmental technologies for personal purposes;

6) not engage in any activity that may conflict with their independence of judgment or integrity in relation to verification activities for which they are selected. This pertains to the Verification Body, its top-level management and the personnel responsible for carrying out verification tasks and shall apply to consultancy services;

7) ensure that the activities of their subsidiaries or subcontractors do not affect the confidentiality, objectivity or impartiality of their verification activities;

8) prove that the verification activities will be carried out with the highest degree of professional integrity and the requisite technical competence in the specific field and shall be free from all pressures and inducements, particularly financial, which might influence their judgement or the result of their verification activities, especially as regards persons or groups of persons with an interest in the results of those activities;

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[5] The proposed scope of accreditation should be extensively discussed with NAB relevant to grant accreditation as it determines on the one hand the technical competences (especially personnel requirements) that the entity applying for accreditation shall demonstrate while on the other the need for the NAB to tailor the accreditation scheme including also technical assessors competent for the technology area/type. Additional guidance on the definition of the accreditation scope is provided in a guidance document developed by the LIFEproETV project: *How to become a verifier of the Environmental Technology Verification (ETV) scheme? A primer.*
Link for download: https://etv-hub.eu/Downloads/GuideForVerificationBodies/Guidelines%20for%20potential%20VB-EN.pdf

9) prove that is able to assess of test system and the management system of not ISO 17025 accredited Test Bodies.

10) have in place a system of Quality Management and Quality Assurance documenting, coordinating and monitoring the measures taken to ensure that verification activities are implemented in conformity with the requirements of the ISO 14034 and Part C of this Handbook. In particular, in the proposed scope of accreditation, a Verification Body shall have in place:

    a) the necessary personnel with the relevant technical knowledge and sufficient and appropriate experience to perform the verification tasks;

    b) the necessary agreements or conventions ensuring the availability of the personnel concerned in ETV procedures where these include external experts;

    c) employ on a permanent basis a technical manager (by whatever name this position is called), who is suitably qualified and experienced and who assumes overall responsibility for carrying out inspection activities. The qualifications should include a proof of competence pertaining to ISO/IEC 17020:2012 (for example a completed training course with a certificate), a proof of competence pertaining to ISO/IEC 17025 (for example a completed training course including also internal audit skills with a certificate) relevant for assessment of test data quality, a proof of competence in ISO 14034.

    d) descriptions of procedures in accordance with which verification is carried out, ensuring the transparency and the ability of reproduction of those procedures. It shall have appropriate policies and procedures in place to distinguish between tasks it carries out as a Verification Body and any other activities;

    e) appropriate recording and reviewing procedures of the products of verification activities ensuring their high level of quality and reliability.

11) ensure that the personnel responsible for carrying out verification activities have the following qualifications and skills:

    a) sound technical and vocational training covering all the verification activities in relation to proposed scope of accreditation and ETV procedures

    b) satisfactory knowledge of the requirements of the verification procedures they carry out and adequate authority to carry these out;

    c) appropriate knowledge and understanding of the potential environmental impacts associated with the use of technologies in relation to which the potential Verification Body applies for accreditation, throughout the life cycle of related products, of key environmental aspects of these technologies and of the main technical factors influencing environmental impacts;

    d) expertise in test methods; appropriate knowledge of statistical methods used in the context of tests and related calculations;

    e) appropriate knowledge of the market aspects of the technology groups for which it is accredited, including users' needs and usual practices in the sector, main actors, and the regulatory framework;

f) the ability to draw up reports, records and Statements of Verification demonstrating that verification procedures have been carried out and ETV requirements have been satisfied.

12) guarantee impartiality when carrying out verification activities. This pertains to the Verification Body, its top management and the personnel responsible for carrying out verification tasks;

    The remuneration of the top-level management of Verification Bodies and personnel responsible for carrying out verification activities shall not depend on the number of verifications carried out or on the results of those verifications;

13) take out liability insurance for verification activities;

14) observe professional secrecy with regard to all information obtained in carrying out their tasks during verification. Proprietary rights shall be protected;

15) if plans to subcontract any specific tasks for future verifications shall have in place procedures which ensure that any subcontractor or subsidiary meets the requirements set out in items 3 to 14.

Further requirements concerning demonstration of competence of the Verification Body to conduct verifications compliant to ISO 14034 are presented in Annex 1.

Responsibility of the Verification Body by ETV stages

CONTACT

At the contact step (optional) the Verification Body is responsible for:

- ensuring that the information provided by the Applicant is sufficient, relevant and adequate to:
    - make an initial check if technology is potentially eligible for ETV;
    - understand of the Applicant's expectations concerning the verification;
    - make decision about the ability and competences to perform the requested verification (e.g. if the technology falls in the scope of accreditation of the Verification Body);
- providing feedback to the Applicant whether a technology considered to be proposed for verification potentially meets ETV application requirements;
- providing recommendations relevant to meet formal and technical requirements of ETV application including technology description, definition of the performance claim and additional testing needs.

APPLICATION

At the application stage the Verification Body is responsible for:

- entering a contractual arrangement with the Applicant ensuring that the confidentiality aspects are properly addressed;
- providing guidance on the development of the application within the limits of impartiality;
- performing a formal review of the application to check completeness of the information provided by the Applicant;
- performing a technical review of the application to decide about the eligibility of the presented technology for ETV, and in particular:
    - if the technology fulfils the definition of environmental technology;
    - the proposed performance claim for the intended application of the technology addresses the needs of the interested parties;
    - the information on the technology is sufficient to review the performance claim. This includes an indicative assessment of the applicability of the existing test data provided by the Applicant to substantiate the claimed performance.
- communicate to the Applicant:
    - any issues resulting from the formal and technical review of the application including requests for additional clarification or providing additional information;
    - the decision on acceptance or rejection of the technology for verification with due justification.

PRE-VERIFICATION

At the pre-verification stage the Verification Body is responsible for:

- defining the final set of parameters to be verified in consensus with the Applicant that is relevant and sufficient for the verification of the claimed performance of the technology, and its environmental added value, if applicable, including their numerical values and ranges, conditions, assumptions and limitations and test methods, prior to the development of the verification plan;
- agreeing on the additional parameters pertaining to the technology and its performance relevant for interested parties that will not be verified but included in the verification plan, report and Statement of Verification at the responsibility of the Applicant;
- development of the verification plan and presenting it for approval to the Applicant.

VERIFICATION

At the verification stage the Verification Body is responsible for:

- assessing the test data provided by the Applicant that were generated prior to verification and deciding on their acceptance for the verification of performance claim;
- communicating the assessment result to the Applicant together with the need of performing additional testing, if relevant;
- if additional testing is needed:
    - approval of the Test Body;
    - cooperation with the Test Body to develop a test plan;
    - approval of the test plan;
    - performing the test system assessment to ensure test data quality;
    - approval of the test report.
- assessment of the test data against the performance specified in the verification plan and confirmation of the achieved performance.

REPORTING

At the reporting stage the Verification Body is responsible for:

- development of a verification report presenting the verification activities and the confirmed performance;
- development of a Statement of Verification summarising the verification activities and the confirmed performance;
- presenting the verification report and Statement of Verification for review and comments to the Applicant;
- considering Applicant's comments as deem appropriate.

POST-VERIFICATION

At the post-verification stage, the Verification Body is responsible for:

- publishing at a minimum the Statement of Verification in a publicly available domain (e.g. Verification Body's web site).if a notification has been provided by the Applicant about the change in the conditions as per technology verification:
- determine the impact of these changes on the verified performance of the technology to the verification conditions;
- consider the validity of the Statement of verification and verification report;
- communicate the decision to the Applicant.

A.III.2. Accreditation bodies

Qualification

National Accreditation Bodies (NABs) are established under law in each of the Member States in application of Regulation (EC) No765/2008. They shall comply with the requirements of ISO/IEC 17011 and hold signatory status in the EA Multilateral Agreement for accreditation of inspection bodies to ISO/IEC 17020.

The participation of NABs in the ETV system is co-ordinated by the European co-operation for Accreditation (EA), which ensures EU wide recognition of the procedure for the accreditation of Verification Bodies.

Accreditation Bodies established outside of the European Union, members of the EA and holding signatory status in the EA Multilateral Agreement for accreditation of inspection bodies to ISO/IEC 17020, may have the same role and responsibility as NABs for the ETV system.

Roles and responsibilities

The role of NABs in the ETV scheme is to accredit Verification Bodies according to ISO/IEC 17020 to implement Environmental Technology Verification as described in the ISO/IEC 14034[6]. This ensures:

- the technical competence and capacity of Verification Bodies to implement ETV procedures for specified technology groups;
- that an adequate quality management system is in place, in order to guarantee the required level of quality and reliability for ETV deliverables;
- due recognition of Verification Bodies in the European Union, in order to ensure the acceptance of ETV 'Statements of Verification' in all relevant markets.

A.III.3. Test Bodies

Test Bodies, with the meaning of EN ISO 14034, are organisations responsible for providing an environment for testing, performing and reporting the testing of an environmental technology, including sampling where appropriate, in accordance with the specific verification protocol.

Qualification

The Test Body or organization of which it is part shall be an entity that can be held legally responsible.

Test Bodies shall fulfil the relevant requirements described ISO/IEC Standard 17025 – 'General requirements for the competence of testing and calibration laboratories', that are relevant for the tests to be performed. The Verification Body is responsible for deciding

[6] Explanations concerning specific aspects of developing an accreditation scheme for ETV are presented in a guidance document provided by the LIFEproETV project : Application of ISO/IEC 17020:2012 for the Accreditation of Verifiers Performing Environmental Technology Verification Compliant to ISO 14034.
A guidance document for National Accreditation Bodies.
Link to download: https://etv-hub.eu/Downloads/GuideForAccreditationBodies/Guidance%20document%20for%20accreditation%20bodies-EN.pdf

which requirements of ISO/IEC 17025 are relevant and these shall be clearly indicated in the specific verification protocol established for the technology to be tested,

The specific verification protocol may add further requirements on tests when this is necessary to ensure the quality of these tests and test data for the technology in question.

Moreover, if tests consist of analyses7, the Test Body performing those analyses shall be accredited to applying ISO/IEC 17025 for the relevant analytical methods. Routine analytical quality control data and participation in proficiency tests for the analysis used and the relevant period shall be made available to the Verification Body upon request.

The Verification Body shall control a Test Body demonstrates its conformity by way of accreditation to ISO/IEC 17025 for the methods of testing and calibration relevant for the verification process, it shall be presumed to comply with the requirements of the ISO/IEC 17020 and ISO/IEC 17034 for quality management and for general test requirements for those methods.

The staff of the Test Body shall not be the same as those responsible for the evaluation of the test results in the Verification Body and they shall not be dependent upon these.

In the case where the Applicant performs the necessary tests in-house, in accordance with the provisions of Section B.VII.2, the Applicant shall fulfil the requirements described above for Test Bodies and this is to be controlled by the Verification Body in the same way.

Nomination

In consultation with the Verification Body, Test Bodies shall be designated by the Applicant to perform tests if required. Such consultation is intended to facilitate control of the qualification of designated Test Bodies. The designation of the Test Bodies is a decision made by the Applicant, even when the Verification Body has itself the qualification to act also as a Test Body.

The Applicant is responsible for contracting with Test Bodies, and for payment of the services provided by them.

When several Test Bodies are involved without subcontracting arrangements between them, the Verification Body and Applicant may agree that one of the Test Bodies be given a coordinating role. For example, this role may consist in taking samples and elaborating a general test plan that applies to all Test Bodies.

Responsibilities

Test Body gets involved if the Verification Body decides that additional testing is needed at the VERIFICATION stage.

The Test Body is responsible for:

- entering into contractual arrangement with the Applicant to perform testing;
- developing a test plan, in accordance with verification plan;

[7] Analyses are distinguished from tests when they follow highly standardized methods, independent of the innovation or specific features of the technology at the origin of the test samples. This concerns for example biological or chemical analysis of water samples and other products.

- presenting the test plan for review and approval to the Verification Body and the Applicant;
- undergo training provided the Applicant concerning technology operation, if relevant;
- performing the testing according to the approved test plan and ensuring level of testing quality required by ISO/IEC 17025;
- cooperating with the Verification Body during test system assessment;
- developing test report and presenting it for review and approval to the Verification Body and the Applicant.

A.III.4. Applicants

Qualification

The Applicant can be any legal entity or natural person established in or outside the European Union. The Applicant can be a technology developer, manufacturer, provider, or its authorised representative (e.g. an investor). Typically, the Applicant should have full control over the candidate technology, i.e. be its sole owner. When the Applicant shares the ownership of the technology and the IPR:

- If a key part or parts of the technology directly related to its performance to be verified are unique and offered only by one supplier or designed specifically for the technology by another organisation or owned by other organisation (e.g. used under a licence), they will need to be clearly indicated in the application. The Verification Body will require signed declarations from other owners of the technology or its key parts and those holding IP rights consenting to the verification. The Applicant, however, retains all rights to the technology and technical data produced during the verification.
- If a key part or parts of the technology directly related to the performance to be verified are commercially available and offered by several providers, a relevant technical specification concerning this part or parts in the application should be sufficient. It shall be, however, determined by the Verification Body.

When the Applicant is not the owner of the technology but has a legal right to put the technology forward for ETV (authorised representative), applying for ETV will require a legally binding document from the technology owner specifically consenting the right to put the technology forward for verification. Similarly, as technology owner, the authorised representative is responsible for providing all information about the technology required for the application including, if relevant, confidential data pertaining to e.g. technology design or operation principles.

Responsibilities of the Applicant by ETV stage

CONTACT

Although this step is optional, at this stage it is recommended that the Applicant :

- provides initial information about the technology considered to be proposed for verification (e.g. through submission of a Quick Scan form if applicable) sufficient for the Verification Body to assess if the technology demonstrates the potential to be proposed for ETV.

APPLICATION

At the application step the Applicant is responsible for:

- entering into a contractual arrangement with the Verification Body;
- development of the application file following the formal and technical application requirements. That is considering the comments and recommendations given by the Verification Body as a result of the initial technology assessment during the contact phase;
- providing sufficient, appropriate and relevant information about the technology proposed for verification to state its eligibility for ETV, and to:
- assess the conformity of the technology design with the performance claim. This includes presenting the any existing test data substantiating the claimed performance;
- demonstrate its environmental added value to assess the compliance with the definition of an environmental technology;
- assess the relevance and adequacy of the performance claim for the intended application of the technology with the needs of interested parties.
- responding to additional information and clarification requests of the Verification Body and providing requested data.

PRE-VERIFICATION

At the pre-verification step the Applicant is responsible for:

- reaching consensus with the Verification Body to determine the final set of parameters to be verified that is relevant and sufficient for the verification of the claimed performance of the technology. The environmental added value, if applicable, including their numerical values and ranges, conditions, assumptions and limitations and the test methods, prior to the development of the verification plan;
- agreeing on the additional parameters pertaining to the technology and its performance relevant for interested parties that will not be verified but included in the verification plan, report and Statement of Verification. This could e.g. be the expected service time during which the claimed performance is relevant overall service life, health and safety issues, installation and maintenance requirements etc.;
- reviewing and approving the verification plan.

VERIFICATION

At the verification step the Applicant is responsible for:

- ensuring access to the technology which performance is verified, relevant accessories, and manuals;
- providing all test data (test plans and test reports) relevant to the verified performance if not provided so far to the Verification Body for assessment.

If additional testing is needed:

- providing an adequate number of units of a technology/product for testing;
- choosing a Test Body if additional testing is needed and present it for approval to Verification Body;
- providing training on the operation of the technology including safety requirements where applicable to the personnel of the Test Body;
- entering into a contractual arrangement with the Test Body;
- ensuring that there is cooperation between the Test Body and the Verification Body to develop a test plan and perform a test system assessment assuring test data quality;
- reviewing and approval of the test plan and test report and providing both documents for review and approval to the Verification Body.

REPORTING

At the reporting step the Applicant is responsible for:

- reviewing the verification report and providing comments on it if necessary;
- reviewing the Statement of Verification and providing comments on it if necessary;
- Approving the Statement of Verification.

POST VERIFICATION

At the post-verification step the Applicant is responsible for:

- complying with the requirements concerning the use of the Statement of Verification and the verification report;
- notifying the Verification Body about any change pertaining to the conditions under which the technology was verified, the Statement of verification and the report (if applicable) were published. These changes may refer for example to the changes in the verified technology which may influence its performance, change of Applicants' company name etc.

The diagram below (Figure 5) summarises the roles of the Applicant, Verification Body and Test Body throughout the ETV process.

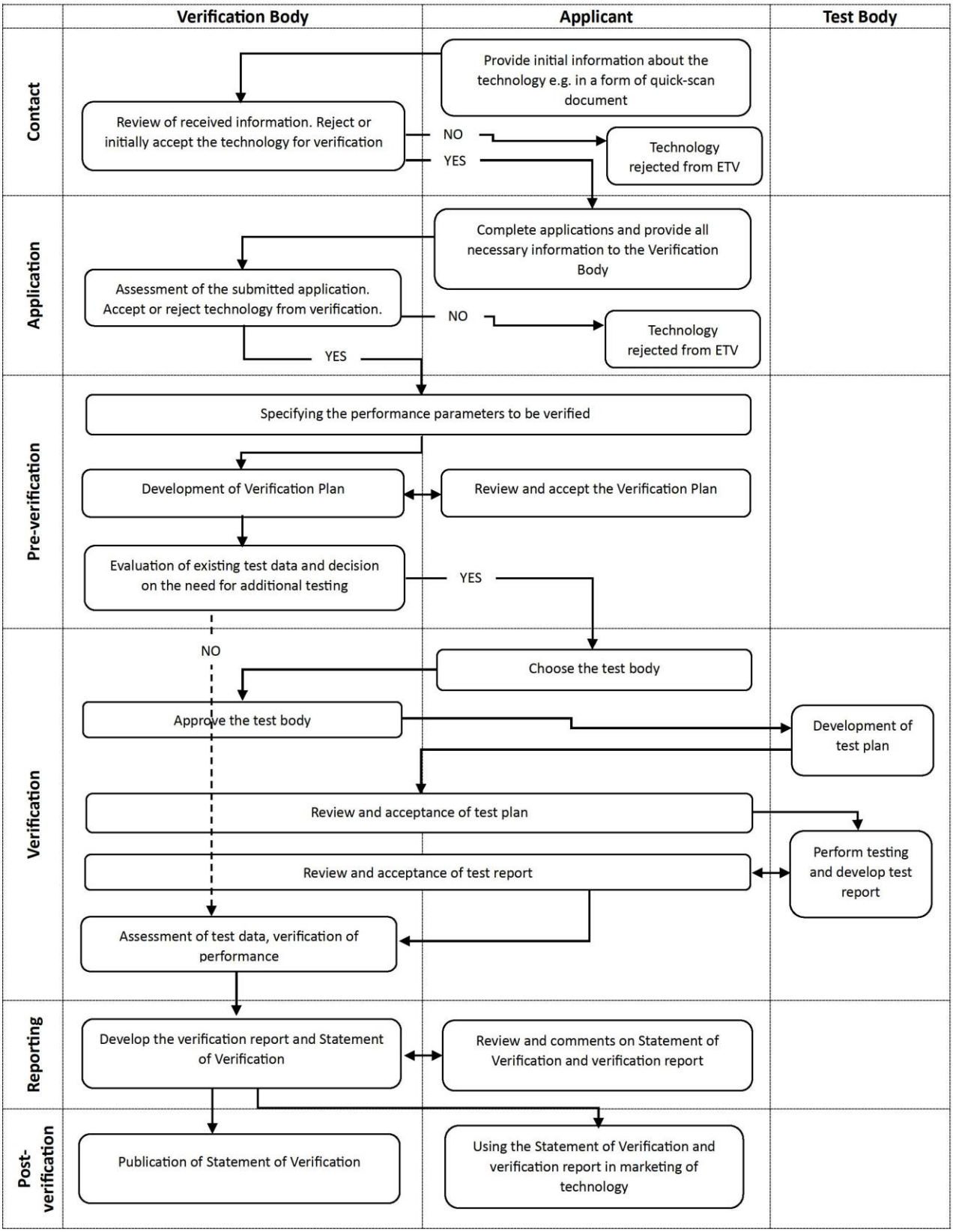


Figure 5. Overview of the roles of: Applicant, Verification Body and Test Body in the steps of the ETV process

Part B: The ETV process

B.I. Introduction

ETV consist in proving in a credible and objective way that the claims about environmental technology performance made by providers are true and based on performance test data generated in a quality assured and controlled conditions. The verification process follows procedures defined in the standard ISO 14034: Environmental Management: Environmental Technology Verification which are summarised in 5 step (Figure 6):

1. Application,
2. Pre-verification,
3. Verification,
4. Reporting
5. Post-Verification

The ETV process is implemented in dialogue with the Applicant. The following sections explain each step in details.

Contact and Application

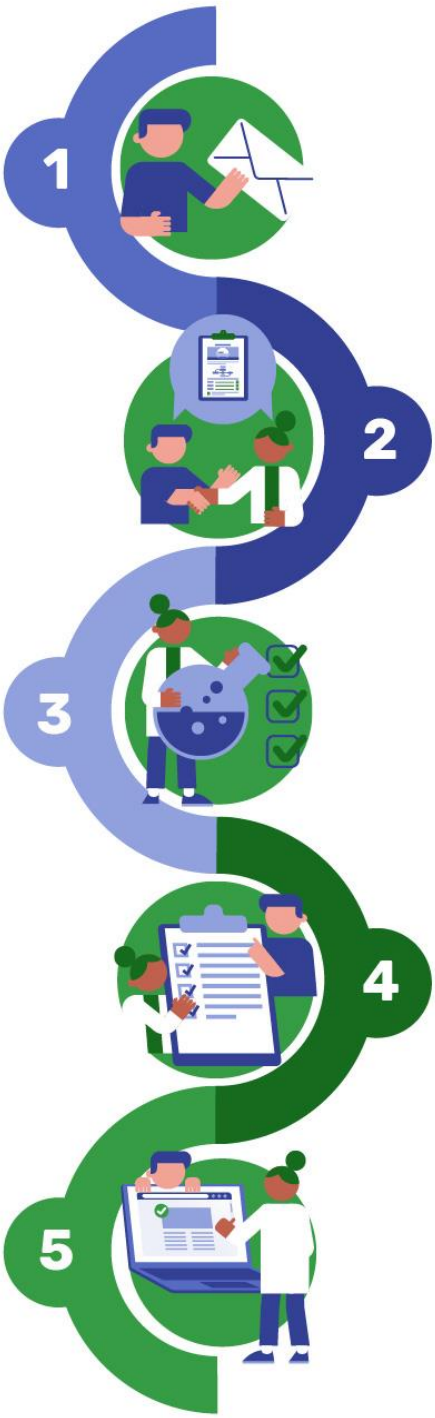
- Applicant contacts a Verification Body for information and eligibility for ETV check.
- Verification Body may request some initial information about the candidate technology in a form of document e.g. Quick Scan prior to application submission.
- Applicant submits an application file including initial performance claim and available test data
- Verification Body reviews the file, decides on the eligibility of the technology for ETV and revises the performance claim together with the applicant.
- The verification contract is concluded

Pre-verification

- Verification Body and the applicant specify the performance parameters to be verified.
- Verification Body develops a verification plan (specific verification protocol) which details how exactly the stated performance will be verified including the testing requirements.

Verification

- Verification Body assesses available test data on technology performance and decides if further testing is needed
- If such data is not available or it does not meet the testing requirements, applicant is requested to contact an independent test body to do the testing.
- Verification Body reviews the final set of data, concludes on the on the actual performance achieved by the technology and the verification is completed.



Reporting

- Verification Body develops a verification report reflecting all the technical and operational details of the performed verification together with a Statement of Verification summarising the verification results including the verified performance and provides them to the Applicant.

Post-verification

- Verification Body registers and publishes the Statement of Verification in a publicly available directory (e.g. website).

Figure 6. General overview of the process and explains the key activities of the 5 verification steps

B.II. Contact

To apply, the Applicant must contact a competent Verification Body[8]. This initial stage is not addressed in the ISO 14034. It may be, however, organised by the Verification Body as a formal procedure in order to recognise the Applicant's expectations concerning the verification of the performance of the technology proposed for ETV or whether the technology falls under the accreditation scope At this stage the Verification Body may requested the Applicant to provide the following initial information about the technology structured in a way using a dedicated form e.g. a Quick Scan:

- short description of the technology including:
- a brief explanation of the specific problem(s), needs or opportunities for interested parties that the technology addresses;
- intended application for which the performance of the technology is to be verified;
- stage of the technology development (market readiness);
- initial proposal of the performance claim(s);
- information on available test data supporting the claim(s);
- information about environmental added value;
- Intellectual property rights to the technology.

This approach may avoid unnecessary work with preparation of the full application or direct the application request to a different Verification Body if the contacted one is not competent to perform ETV.

Based on received information the Verification Body can recommend or not to the Applicant to develop a full application file including comments concerning improvements in the provided information to meet formal and technical requirements of the application. In the case when the Verification Body is not competent to perform the process, it should direct the Applicant to the one which potentially is.

[8] A list of Verification Bodies is available in section ETV network at the http://etv-hub.eu

It is recommended that the Verification Body will suggest the applicant to use the self-assessment tool before developing an application file.

The tool provided by the ETV-HUB in the section "Get started with ETV" and serves as an aid to prepare a successful ETV application in line with the ISO 14034 ETV requirements:

- it checks if the applicant already has all necessary and relevant information to develop an ETV application file,
- provides immediate feedback to applicant's answers and indicate what information must still be collected and prepared,
- explains why certain information is need and how it is used to verify a technology,
- provide applicant with guidance and tips on how to obtain the missing data and information,
- allows the applicant to assess whether the technology potentially meets the eligibility requirements for verification.

Using the tool before or during the development of an ETV application file:

- helps the applicant understand the process and its requirements allowing to determine if ETV is an adequate scheme for the technology,
- reduces the time and cost necessary to develop an application file appropriate to the technology in line with the technical and formal requirements of ETV,
- speeds up the process of its evaluation by the verification body so that the technology, if eligible for ETV, can be verified faster.

Website address: http:// ETV-HUB.eu/get-started/

B.III. Contractual arrangement

The contractual arrangement are also not covered by ISO 14034 but result from the ISO/IEC 17020 requirements. Before the verification process is initiated i.e. the application is developed and submitted for review to the Verification Body, the Applicant and the Verification Body enter into a contractual agreement. The contracting procedure may consist of one or more steps depending on the complexity of the verification and internal procedures at the Verification Body.

In some cases, parts of the verification contract may need to be revised after the review of the application. It refers in particular to the situation when upon the technical and formal review the technology and /or the Applicant are not able to satisfy the ETV eligibility criteria and the Verification Body rejects to continue the process. In such cases, the Applicant and the Verification Body may conclude a contract only to perform the technical and formal review of the application and leave the remaining steps of the process for another contract. Alternatively, the contract may be revised after performing the application review.

A check list of issues which a verification contract should include:

- ☑ Intellectual Property Rights e.g. ownership or control over the technology must be guaranteed by the Applicant, he will also retain all rights to the technology and all technical data produced during the verification. The Verification Body will retain all rights to the verification process, protocols, plans, methods and procedures developed during the process;
- ☑ information and communication principles between the Applicant and the Verification Body including also notification on the changes to verification conditions if such occur;
- ☑ specification of Applicant's and Verification Body's obligations under the contract for verification;
- ☑ a schedule for the verification procedures;
- ☑ rules and statement on the use of the Statement of Verification, verification report; and ETV logo;
- ☑ a description of limitations for the use of the verification results e.g. a statement that the verification results reflect the performance of the technology at the time and under the conditions of verification and thus cannot be understood as guaranteeing the same level of performance in future or under other conditions; The Applicant may not use or refer to either the Statement of Verification or to the verification report, for any other technology or application, and not to use extracts of the Statement of Verification for any purpose;
- ☑ terms and conditions for withholding the verification procedure or withdrawal of parties from the verification process;
- ☑ terms and conditions for payment;
- ☑ legal regime applicable and competent legal authorities in the case of a dispute related to the verification procedure;
- ☑ confidentiality issues. Verification Body is obliged to maintain the confidentiality of all information received from the Applicant at any time, which is guaranteed by the ISO 17020 Type A accreditation. Throughout the entire verification process, the Verification Body is obliged to observe professional secrecy regarding all information obtained in carrying out their tasks during verification activities. Verification Body must ensure that the activities of its subsidiaries or subcontractors do not affect the confidentiality, objectivity, or impartiality of its verification activities.

The verification contract in general does not include the cost of tests. If the Verification Body, after assessment of existing test data, decides that additional tests are needed, it is up to the Applicant, in agreement with the Verification Body, to choose and conclude another contract with an appropriate testing body and approved by the Verification Body.

If the Applicant is a collective body of organizations that together form a consortium, or is not the sole owner of the technology, the organisation entering a contractual arrangement

with the Verification Body should be a legally authorized representative of these organisations acting as the sole intermediary for conducting arrangements with the Verification Body.

B.IV. Application

The application procedure follows the requirements of the ISO 14034:

- Clause 5.2 Application and includes:
    - Sub-Clause 5.2.1 Application requirements specifying the scope of information to be provided in the Application documentation;
    - Sub-clause 5.2.2 Formal review
    - Sub-Clause 5.2.3 Technical review

To implement this ETV procedure , the Verification Body may use a template of an Application document addressing the information requirements specified in Sub-Clause 5.2.1 which is presented in Annex 2.

The Verification Body may also provide technical advice to the Applicant if there is any doubt in completing the Application document

B.IV.1. Information about Applicant

The required information about the Applicant includes:

- full name of the organisation,
- registration number
- contact details (telephone number and email address, person responsible for the application file with the contact details).

B.IV.2. Description of the technology

The technical data provided in the application to describe the technology at this stage must be sufficiently detailed to allow the Verification Body to thoroughly understand the nature of the technology and determine its environmental added value, including the scientific principles, its purpose, reference to regulatory requirements and major environmental impacts and aspects associated with its life cycle, etc The key aspects concerning the scope of required information are presented below..

B.IV.2.1. Unique identifier of the technology

The Verification Body should ensure that all documents produced during the verification, including the Application, the verification plan, testing data documentation, Statement of Verification and the verification report must have an unambiguously indication to which technology they apply. Therefore, a unique identifier of the technology is e.g. a commercial name, a series identification number or a version number must be provided by the Applicant.

B.IV.2.2. Introduction or context

The technology should be presented in the context of its application including for example the explanation of the specific problem(s) or needs of the users or buyers it addresses or opportunities it can provide to the interested parties. The problems and needs addressed should be presented in a concrete way possibly with reference to solutions to which the technology is an alternative (relevant alternatives) and focus on the deficiencies of these technologies in addressing a problem. For example, current solution may be effective in treatment but may at the same time consume a lot of energy which is a problem to the user. A technology proposed for verification may perform in similar way but with less energy consumed.

B.IV.2.3. Information about the intended application of the technology

The intended application should refer to the performance claim proposed for verification and must be defined in terms of purpose, matrix. and technical conditions and under which the claimed performance is achieved as presented in Table 1.

Table 1. Intended application of technology

Matrix	The type of material that the technology is intended for. Matrices could include soil, drinking water, ground water, alkaline degreasing bath etc. A technology may be intended for more than one type of matrix. For example, if the purpose of the technology is to extract the solid fraction from manure, it could also be used for domestic wastewater. The characteristics of the material should be provided in a way allowing to define the effect of the technology on the material that can be measured trough testing. Key parameters of the matrix which affect the claimed performance should be specified and defined in terms of numerical values (typically in ranges of limit values).
Purpose	The measurable property that is affected by the technology and how it is affected. It is possible to define more than one purpose. The purpose should be expressed in a way that can be measured or monitored. For example, “reduction” can be measured by determining the parameters of the matrix before and after the implementation of the technology. The matrix and purpose will translate into performance parameters as described below. Examples include a given reduction of nitrate concentration in wastewater, separation of volatile organic compounds, reduction of energy use, recovery of energy released by the panel, etc.
Technologies	The practical application of the technical or scientific principles in the environmental area to achieve the purpose and a short description of the relevant alternative or state-of-the-art to which the technology may be compared.

	The term 'technology' covers a variety of products, processes, systems and services. Examples include a heat exchanger, a recycling process, a membrane technology etc.
Technical conditions	All other information related to the technical conditions of operation or test of the technology for the given matrices and purposes described above. The technical conditions will translate into operational parameters, environmental parameters and additional parameters as described in detail below.

B.IV.2.4. Information sufficient to understand the operation and performance of the technology

The Verification Body should ensure that the information provided by the Applicant is sufficient to understand the operation and performance of the technology. The scope of information and required documentation is presented in Table 2.

Table 2. Scope of information and documentation presenting operation and performance of the technology.

Conceptual design of the technology	A conceptual design of the technology typically presented in a form of a diagram or scheme with relevant descriptions and explanations necessary for the understanding the design and operation of the technology. The conceptual design should also indicate any interactions or processes. If the technology to be verified is part of a larger installation or a system, the conceptual design should clearly indicate where the technology fits into the installation/system (interfaces) with an indication of input and output points.
Manufacturing drawings or similar schematics	Manufacturing drawings or similar schematics should provide information on how the technology is constructed and manufactured. They should present components, sub-assemblies, circuits, etc. Similarly, as the conceptual design, the drawings and schemes should be accompanied with descriptions and explanations necessary for understanding them and the operation of the technology. Manufacturing drawings may be particularly relevant for the verification of products or equipment.
Technical and scientific principles relevant to the performance and operation of the technology	A description on how the technology achieves its purpose explaining which scientific or technical principles and techniques underline the technology. For example, technologies for environmental monitoring and assessment rely on principles of sensor technology, data analysis, and remote sensing to collect and analyse environmental data.

B.IV.2.5. Development status of the technology and its readiness for market

The minimum Technology Readiness Level (TRL) of a technology to be proposed for ETV is TRL 7 - System Prototype Demonstrated in Operational Environment.[9] In practical terms, the information on the development status of the technology and its market readiness should indicate if the technology is:

- a commercially available unit,
- a prototype that is the final design and represents a pre-commercial unit,
- a pilot unit with demonstrated scale-up factors that do not influence its performance.

At a minimum one unit of the technology must be available at the stage of development where no substantial changes affecting its performance will be implemented before applying for ETV.

To prove sufficient development status of the technology, the Applicant may be requested to demonstrate that:

- the technology performs in a stable and predictable way under application conditions (proven by e.g. relevant test data),
- variables that influence its performance (e.g. relevant parameters of matrix or operational environment) are defined,
- standard operational practices of the technology as well as its maintenance & servicing requirements are defined.

B.IV.2.6. Information about relevant alternative(s) to the technology

A relevant alternative means a technical solution with the same function/purpose that is currently used in a similar situation (e.g. a conventional technology) as the technology proposed for verification. There may be more than one relevant alternative available. A relevant alternative may be also a combination of technologies that all together give the same result, for example technologies working in sequence, e.g. in recycling, a material sorting procedure including dismantling can be an alternative to a crusher.

Relevant alternatives are identified to allow for a determination of the benefits of an environmental technology, especially the environmental added value and the innovation. They provide a baseline for benchmarking performance and could include, for example:

- current best available technology,
- existing technologies on the market with similar applications and purposes,
- conventional technologies having a similar application or producing similar outputs,

[9] The following definitions of Technology Readiness Levels (TRL) could be used – e.g.
- TRL 7 – System prototype demonstration in operational environment;
- TRL 8 – System complete and qualified;
- TRL 9 – Actual system proven in operational environment

- state-of-the-art technologies.

It is important to avoid the selection of poor performing or otherwise irrelevant alternatives to ensure that a comparison of the technologies does not result in a more positive impression of the proposed technology.

If the technology proposed for verification is a completely new solution to a problem, the relevant alternative could be a commercially available technology (or a combination of technologies) currently used to address this problem. For example, in the case of an entirely new process for recycling a certain waste that has never been recycled before, the relevant alternative could be its disposal without recycling, e.g. landfilling, incineration.

Relevant alternative also serves to demonstrate the innovation of the technology proposed for verification e.g. novelty in terms of design, raw materials and energy involved, production process, use/operation, recyclability, or final disposal compared to a conventional solution. They also help determining the environmental added value of the technology proposed for verification proposed for verification through a qualitative comparison. Therefore, the scope of information about the relative alternative should also include qualitative information about its major environmental impacts and whenever available also quantitative data. Details are presented in section below.

B.IV.2.7. Information on significant environmental impacts and environmental added value.

Available information concerning environmental aspects and impacts of the technology serves to demonstrate its environmental added value and assess the compliance to the definition of an environmental technology by the Verification Body.

Therefore, as much qualitative and quantitative information as possible should be provided regarding the significant differences in the environmental impacts with focus on the life stages of the technology where these differences whether positive or negative are likely to occur in relation to relative alternatives

For determining the environmental impacts and aspects the following should be concerned: use of raw materials, water, energy and other consumables, presence of pathogenic bacteria, together with all types of emissions, products, and wastes etc.

The life stages concerned include: material acquisition, design, manufacturing, use or end-of-use.

For example:

- if a technology uses biodegradable materials rather than conventional materials, as used in the relevant alternative, information on the environmental impacts related to the material acquisition and end of use of this technology should be provided in addition to information on the manufacture and use phases.
- if a technology proposed for verification uses a different manufacturing process than that of the relevant alternative in order to increase its efficiency during its use phase, but uses natural resources similar to those used by the relevant alternative, information on the environmental impacts for the manufacturing and use of the technology should be provided.

Providing quantitative information showing the differences in the major negative or positive environmental impacts between the technology proposed for verification and the relevant alternative(s) applies in particular to these differences which are directly linked to the performance parameters included in the performance claim and/or reflect the innovative features of the technology. Such information can be derived from the knowledge of the environmental performance parameters of the relevant alternative(s), especially when they are directly linked to the purpose of the technology or from understanding the environmental problems and issues of the technology users and concerns of the interested parties.

For transparency reasons, during the technical review, the Verification Body may request to include some parameters resulting from the identified major differences in impacts (whether beneficial od adverse) as parameters to be verified considering them as important information from the users' point of view (e.g. a technology may achieve better performance in a pollutant removal compared to the conventional technology but at the same time it may consume more energy or require maintenance involving the generation of hazardous waste) compared to the alternative.

For the life stages where potentially no significant differences in the major environmental aspects and impacts occur or are unlikely to occur, an explanation is required.

When reviewing the application file, the Verification Body will analyse the information about the differences, considering also other information provided about the relevant alternative and check if the differences are properly recognised.

B.IV.2.8. Performance claim

The performance claim of the technology shall be a concise declaration consisting of a set of parameters and their numerical values which:

- describe the functioning or performance of the technology in a specified application and under specified conditions of technology use and operation;
- are directly related to the technology itself, and not e.g. to the environmental management of the company, to the sources of raw material;
- highlighting the advantages and innovative features of the technology;
- reflect potential, direct environmental impacts of the technology in the specified application and under specified operational conditions;
- are quantitatively verifiable through tests.

The performance claim prosed for verification may refer to both technical/functional performance parameters of the technology and/or the resulting reduced environmental impacts related to its intended application.

Technical/functional performance refers to the performance of the technology in fulfilling its purpose in specified conditions of use and operation. Parameters presenting reduced environmental impacts generally refer to environmental added value of the technology, for example:

- parameters referring to the required use of resources for production of the equipment/technology itself: consumption of raw materials (e.g. steel used in

construction; this parameter may also be combined with the end of life and decommissioning parameters in the context how much steel was used for production and how much can be recovered);

- consumption of electricity or other energy (heat);
- use of hazardous substances;
- use of recycled material/raw materials substitutes;
- waste generated (biodegradable / recyclable / hazardous, etc);
- emissions (air, water);
- longevity: e.g. robustness/vulnerability to changing conditions of use or maintenance;
- end of life decommissioning and disposal: e.g. reusability, recyclability (fully or in part), parts needed to be disposed.

When proposing a performance claim., the following main aspects should be considered:

- **technology users' needs and other interested parties**. These may include, for example, regulatory or permitting bodies (e.g. when the verified performance is to support environmental permits, requests or to demonstrate compliance with BAT requirements), public buyers (e.g. when the verified performance is to demonstrate compliance with technical specification/green criteria defined for a public tender or some specific requirements of the target market), funding bodies (e.g. if the verification is performed under a project funded by a programme with specific performance indicators) investors (e.g. when the verified performance is to prove that the project involving the verified technology may be considered as a green investment in the meaning of ESG reporting or to help demonstrate the improvements of the environmental performance of the user's organisation in the meaning of compliance to the technical criteria of the EU Green Taxonomy), industrial associations or value chains of large enterprises as they may have some common additional performance indicators or technology performance/reduced environmental impact requirements resulting from joint commitments,
- **legal requirements of the target** market applicable to the performance of the technology in its intended application (technical or legal reference values). The most important are these which concern the effect of operation and usage of the technology, methods and measurements required to obtain significant data that are significant to quantify its impact on the environment. Knowledge of the legal requirements of the target market allows to define a performance claim to be verified that includes parameters relevant from the viewpoint of the target market with reference to these requirements. It applies to the knowledge of reference values defined in the relevant regulatory and legal requirements (e.g. BAT reference values or values defined in technical or ISO standards) especially when the performance claim is to prove better performance than legally required,
- **environmental added value** (where significant positive differences between technology proposed for verification and the relevant alternatives throughout the life cycle),

- innovative aspects of technology,
- **technical conditions for use and operation** including relevant constraints, assumptions and limitations (see explanation below),
- **market requirements** for the specified application. They may refer to specific user demands and conditions which the technology should fulfil to succeed in the market. Additionally, there may be specific rules regarding the installation functionalities, use of the technology, or the necessity for compliance with other certifications,
- **required use of resources for operation**, e.g. energy demand; raw materials demand including and/or demand for water (e.g. quality and quantity), chemicals, reagents, hazardous specific substances necessity etc.

The performance claim should clearly define the technical conditions of use and operation under which the performance claim is achievable. The technical conditions consist of operating conditions and constraints, assumptions, and limitations.

Operating conditions (also referred to as technical or process conditions) are a set of defined measurable parameters under which the technology is assumed to perform as claimed, fulfilling its purpose. They should be defined as normal conditions referring to the intended application of the technology.

Examples of parameters defining the operating conditions are: production capacity, ambient temperature, humidity, concentration of non-target compounds in the matrix, water flow, pressure in the boiler, wind speed, temperature range, pH range, presence of raw materials etc.

Limitations, assumptions and constraints relevant to the claimed performance apply to the technology use, operation and performance to be verified. Constraints, limitations and assumptions may be directly derived from operational/process/technical conditions or pertain to the properties of the matrix.

Examples of the possible constraints and limitations may include: a minimum capacity requirement for the technology to operate, ambient temperature ranges, servicing and maintenance requirements, detection limits, a maximum concentration of a compound in the matrix, etc.

Limitations, assumptions and constraints refer to conditions that may prevent the claimed performance to be achieved and therefore must be considered together with the operating conditions. They are also relevant for the technology users who want to know under which conditions the technology will work as claimed.

A relevant performance claim should:

- be related to the technology itself (e.g. not reduced eutrophication of surface waters but removal rate of phosphorus in wastewater);
- expressed in a specific and unambiguous way using absolute measurable figures so that only one interpretation is possible e.g. energy consumption expressed in MW/ton of production units, not as 2% reduction compared to average energy consumption of similar technologies available on the market;
- specify the minimum rather than the maximum achievable performance (e.g. at least ….and not up to….);
- precisely define the technical conditions of use and operation under which the minimum claimed performance is achievable (e.g. temperature range, water flow rate, etc);
- meet the minimum standards required e.g. by legal regulations for the technology or other technical standards (e.g. relevant EU criteria for drinking water as well as targeted markets drinking water criteria or Best Available Technologies values in relation to the Industrial Emissions Directive);
- be measurable using whenever available standardised test procedures and analytical techniques.

For a measuring technology the following examples of performance parameters to be verified may apply :

- Limit of detection
- Range of application
- Precision (repeatability/reproducibility)
- Robustness
- Accuracy
- Specificity
- Interferences
- Linearity

A measurement technology could also claim to yield results more quickly and cost-effectively than the relevant alternatives. For example, a detection technology that can estimate fungal or bacterial biomass concentrations on site in less than one hour offers an advantage over a technology that requires a long analysis time. This claim would support applications such as on-site screening and monitoring of water and air quality to help prevent and control pollution.

For a technology resulting in an environmental added value i.e. treatment technology the following examples of performance parameters to be verified may apply:

- achieved cleaning/treatment effects.

- range of application: Variation of cleaning effects.
- by-product formation.
- Residual chemical.
- emissions to water, air, soil.
- waste generation.
- energy efficiency.
- resource use.

The textboxes below present 2 examples of performance claims.

EXAMPLE 1

Technology: AUTOMATIC SOLID BIOFUEL QUALITY CONTROL SYSTEM

Matrix: solid biofuel feedstock e.g. forest residues chips, stem wood chips, bark, saw dust with the moisture content in the range 10-75 % of water content.

Purpose: The technology measures in real-time the quality parameters of solid biofuel feedstock such as moisture content and presence of foreign objects (e.g. impurities such as stones) in its mass volume directly during its transportation on a conveyer belt. The technology allows to calculate the calorific value of the transported fuel before its feeding to optimise its parameters e.g. in the mixing process prior to combustion so as to ensure stability and effective combustion performance.

Performance claims proposed for verification:

- The technology determines the fuel moisture with a maximum deviation of +/- 1 – 5% of water content, depending on the fuel type (matrix) and its moisture content
- Technology detects at least 80% of foreign objects such as stones and metals with a cross section >25 mm.

Operational parameters:

- Ambient temperature (outdoor conditions): -30°C – 45°C.
- Material thickness (vertical cross-section) on the conveyor belt: 100mm – 600 mm.
- Required throughput: minimum 100 m^3/h, maximum – 1000 m^3/h.
- Moisture content of matrices: between 10% and 75%.

Limitations: Scrapers on the conveyor belt will shield for the x-ray and foreign objects close to the scrapers will not be detected. Large objects in same location but in different depths, will be registered as one object.

Technology: A MICROBIOLOGICAL PROCESS FOR UPGRADING BIOGAS INTO METHANE

Matrix: Biogas with 20 – 40 % of CO_2 and < 1000 ppm hydrogen sulphide

Technology purpose: The technology converts the CO_2 contained in the biogas into CH_4 with addition of H_2 to achieve the parameters enabling its injection to the natural gas grid.

Performance claims proposed for verification:

- The technology converts feed streams of biogas with 20 – 40 % CO_2 and up to 1000 ppm hydrogen sulphide into methane, with the following quality specifications: > 95%vol. methane, < 4% H_2, < 1% CO_2 , 5 mg/Nm³ H_2S
- Electricity consumption (including H_2 generation) less than 25 kWh/Nm³ of produced CH_4 for the flow of 20 Nm³/h of CO_2

Operational parameters:

- Flow range of CO_2 between 5 – 30 Nm³/h
- Required addition of H_2: 4m³ per m³ CO_2
- Reactor temperature between 60°C and 65°C
- Pressures up to 10 bar.
- Content of impurities in the biogas: below 5000ppm of hydrogen sulphide

Limitations: The system is designed to operate within specifications at normal outdoor conditions for the site (-10°C to 35°C), however its testing in the outdoor temperature limits is not possible due to lack of controllable test parameters**.**

Constrains: Once at operation temperature and pressure is reached, the system can achieve the nominal conversion performance within 15 minutes. The system can be stopped and stay idle without energy input for 2 hours.

Additional information:

The system can be stopped in less than 1 minute. The H_2 can be delivered from an electrolysis unit or from any other process with excess H_2. The oxygen can be utilized in the aeration tanks of the biogas plant to increase the efficiency there. The heat produced by the water electrolysis and the methanation reactions can be exported, for instance for the heating of the biogas plant, to increase the overall energetic efficiency.

B.IV.2.9. Relevant existing test data

Existing test data refers to data sets from testing of the technology generated prior to application for ETV. These data sets may address the tests pertaining to the claimed performance of the technology itself i.e. provide evidence supporting this claim (e.g. the specification of the performance parameters, their values and ranges), to demonstrate stability of technology performance, the characteristics of the matrix, in particular to its parameters that may affect the performance claim to help determine testing conditions, etc.

The test data could be generated by in-house testing or by third party testing body. Such data sets can be produced, for example, at the final stage of the technology development

during the validation of its operation in the real environment (e.g. under a demonstration project), for compliance testing or for market implementation activities. As a part of the application documentation, the existing test data sets should be accompanied by information under which conditions, when and by whom they were generated.

The existing test data may be used, in part or in full, for the verification of performance if sufficient, adequate and relevant to the performance claim and generated compliant to ISO/IEC 17025 requirements. The existing test data referring to the performance claim will be analysed by the Verification Body during the technical review of the application to provide an indicative assessment concerning its applicability for verification of the claimed performance.

B.IV.2.10. Relevant legal requirements, or standards related to the technology and its use

This information should specify any relevant standards applicable to the technology proposed for verification and include especially these standards that relate to its performance and use, to the test and measurement methods required to produce relevant test data needed to verify its performance or to the quantification of relevant environmental impacts.

For example:

- for a water quality monitoring equipment aimed to detect and measure Escherichia coli and coliform bacteria based on the most probable number method, the relevant standard would be ISO 9308-2 (Water quality — Enumeration of Escherichia coli and coliform bacteria — Part 2: Most probable number method);
- for a water recycling method aimed to produce water for food crops irrigation purposes, the relevant standard/ regulatory requirement would be REGULATION (EU) 2020/741 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 May 2020 on minimum requirements for water reuse.

B.IV.2.11. Statement on technology adherence to applicable regulatory requirements

Ensuring legal compliance is the responsibility of the Applicant. Therefore, the Applicant should know which legal and regulatory requirements that the target market apply to the technology presented for verification for its performance in its intended application. The purpose of this statement is to potentially dismiss from environmental technology verification technologies that do not comply with the minimum regulatory requirements. Where relevant, the statement should refer to the regulatory requirements directly applicable to the technology or to its intended use. The statement should be a part of the contractual arrangement (see Section A.VI).

The compliance with the legal and regulatory requirements may require demonstrating that the technology meets the reference values defined in regulations, technical or ISO standards related to performance parameters, Best Available Technologies values provided in BAT reference documents (BREFs) in relation to the Industrial Emissions Directive). For example, equipment that gets in contact with drinking water must have an appropriate certificate; a drinking water treatment technology shall meet drinking water criteria of the target market, some technologies must meet CE mark requirements. Therefore, depending on the scale and readiness level of the technology, beside the statement in the contract,

the Verification Body can request evidence that the technology demonstrates a potential to perform in line with legal and regulatory requirements.

B.IV.2.12. Supporting information relevant to the interested parties

The scope of the supporting information may include any information offering additional insight into the technology application and performance, for example:

- installation and operating requirements,
- service and maintenance requirements.
- expected length of time for which a technology functions under normal operating conditions.
- any applicable health and safety requirements and considerations.

B.V. Application review

The Verification Body performs a formal and technical review of the application file to determine the eligibility of the technology for verification. If not done during the initial contact phase, the Verification Body shall exclude a technology from verification if it does not fall within its scope of accreditation,

B.V.1. Formal review

The formal review is focused to determine if the information and supporting documents are complete, relevant and sufficient to perform a technical review and whether the application and the applicant meet formal requirements e.g. ownership of the technology.

B.V.2. Technical review

The technical review is focused on determining the eligibility of the technology for verification including in particular its:

- sufficient level of market-readiness,
- environmental added value assessment and compliance to the definition of an environmental technology,
- quality and relevance of the performance claim to satisfy the information needs of interested parties .

The level of technological innovation is not an eligibility criterion per se but it may be included in the assessment of the environmental added value, and it may be part of the feedback provided by the Verification Body to the applicant in the following review.

The assessment whether the technology demonstrates sufficient level of the market-readiness should be made considering the aspects, information and documentation described in Section B.IV.2.

The assessment of the environmental added value is key to state the compliance to the technology to the definition of an environmental technology. Annex 3 provides a procedure which the Verification Body can apply to make this assessment[10].

The assessment of the quality and relevance of the performance claim should consider in particular:

- if the parameters are relevant and complete to meet the stakeholder's needs (e.g. some additional parameters may to be included in the claim to describe the environmental aspects of the technology or an expected result from the application);
- if there is a need to supplement the set of the performance parameters with some additional parameters which may be non-verifiable but may be relevant for the interested parties to make an informed choice (e.g. a drinking water disinfection technology may allow to achieve an extra purity level of drinking water, however this process may be more energy consuming, so the energy parameter should be provided as an additional information);
- if the claimed performance meets the requirements imposed by a regulatory framework specific for the candidate technology (e.g. if a standard giving relevant performance parameters for the technology under verification and its verified application is available, reference to this standard can replace the precise definition of the performance parameter);
- how does the claim refer to the state of the art performance of similar technologies so as to enable useful comparison where relevant (e.g. knowledge of comparable technologies and users' needs may indicate that a given parameter could be expressed differently);
- if the parameters are quantitatively verifiable and expressed in a specific and unambiguous way using absolute measurable figures;
- if the specified operating conditions valid for the claimed performance are described in a relevant and adequate way.

The technical review includes also an initial assessment of the existing test data provided with the Application concerning their. applicability for verification. Based on this review, the Verification Body may request the Applicant to revise or further complete the Application.

Based on the Application assessment the Verification Body makes the decision to:

- recommend the technology for verification;
- refuse to verify the technology with an explanation justifying the decision; or
- not recommend technology for verification but allow the Applicant to proceed with the verification at own risk.

[10] The procedure for the assessment of the environmental added value is adopted from the EU ETV Pilot Programme Technical Working Groups Guidance Document No 4: Guidelines on assessing the environmental added value of an environmental technology in a life-cycle perspective at the proposal stage.

If the technology is recommended for verification, at the end of the review:

- the conditions for verification planning should be defined and agreed with the Applicant including the performance claim and indicative information on the applicability of the existing test data provided with the application for performance claim verification
- an indication of the range of costs, excluding testing costs should be provided.

The Verification Body communicates the result of the assessment and the decision to the Applicant. If the review does not lead to halting the verification process, a contractual arrangement to continue the subsequent stapes of the process should be concluded between the Verification Body and the Applicant.

B.VI. Pre-verification

Once the technology is recommended for verification by the Verification Body or the Applicant decides to proceed with the verification at own risk without the recommendation, the verification process needs to be specifically tailored to the performance claim and the technology. The pre-verification procedure involves 2 steps: specification of performance parameters to be verified and, based on them, development of the Verification Plan, sometimes also referred to as Specific Verification Protocol. The procedure and its steps are defined and described in the International Standard ISO 14034:

- Clause 5.3 Pre-verification
- Sub-Clause: 5.3.1 Specification of performance parameters to be verified
- Sub-Clause 5.3.2 Verification planning

B.VI.1. Specification of performance parameters to be verified

Based on the performance claim revised and agreed with the Applicant as a result of the technical review of the Application and considering the feedback provided by the Verification Body concerning any additional aspects to be taken account of in the verification process resulting from this review, the Verification Body in consultation with the Applicant develops a specification of the performance parameters to be verified.

Depending on the claim, the specification may include the following types of parameters:

- **performance parameters** related to the performance of the technology in fulfilling its purpose (also referred to as technical or functional performance);
- **operational parameters** related to the technical conditions of the intended application, taking account of the scale and readiness level of the technology. The operational parameters shall be used to determine the testing conditions. Examples of operational parameters include ambient temperature and concentrations of non-target compounds in matrix. These parameters are typically measured, controlled/monitored during the testing;
- **environmental parameters** related to potentially significant impacts and benefits on the environment, directly and indirectly, along the life cycle (e.g. raw materials, production, use, recycling, end-of-life disposal). These may include for example energy consumption or emission of pollutants to air or water. The definition of

environmental parameters should be based on the assessment of the environmental added value in the proposal. Environmental parameters directly linked to the purpose of the technology should be considered as performance parameters;

- **additional parameters** related to information about the technology that is useful for users but that may not necessarily be measurable through tests and therefore not included in the list of verification parameters above. Examples of possible additional parameters include the expected service time during which the claimed performance is respected[11], overall service life, health and safety issues, installation and maintenance requirements and operating costs. They may also include other indicators like water footprint etc. In the Statement of Verification, the additional parameters are to be listed under "Additional Information".

When specifying the performance parameters to be verified, the Verification Body should ensure that :

- they are relevant and sufficient for the verification of the performance of the environmental technology, and its environmental added value, if applicable;
- they correspond in full to the needs of the interested parties;
- they can be quantitatively verified through testing;
- their numerical values can be verified under set operating conditions;

For the specification of the performance parameters, the Verification Body, whenever available, should consider existing verification plans or publicly available testing protocols and relevant technical references including standard test methods, preferably international standards.

Since specification of parameters to be verified determines the development of the verification plan, including the testing requirements and, if applicable, the need to generate additional test data, any modifications of the performance parameters proposed by the Verification Body should be consulted with and approved by the Applicant.

B.VI.2. Development of Verification Plan

When the performance parameters to be verified are specified, as next step, the Verification Body develops a Verification Plan.

The plan defines how a specific verification of an individual technology will be carried out considering the agreed specification of performance parameters. The key elements of the Verification Plan include:

- the specified list of performance parameters to be verified, their assigned numerical values and the description of how they will be verified (i.e. test methods to be used, including sampling and equipment requirements;

[11] If the expected service time of the technology can be estimated through tests, this can be included as operational parameter rather than additional parameter.

- technical and operational details of the planned verification including overall description of testing activities (e.g. continuous or batch tests, test scale: laboratory/field, site requirements);
- specification of the requirements for the test data, including quality and quantity, test conditions, matrix parameters etc;
- a description of methods for the assessment of the test data and their quality, including e.g. calculation methods, determination of uncertainty and statistical methods, data management etc;
- whenever possible the test methods used should be standardised internationally or nationally or provided in specifications recognised otherwise. In the absence of such standards, the test method should be determined by other means in a dialogue with the Applicant, the Verification Body and the Test Body.

A sample structure of the verification plan is presented in Annex 4.

During the Verification Plan development, the Verification Body may request the Applicant to assist in specifying the requirements for testing and/or for the test data, defining the testing methods and any specific requirements which shall be fulfilled (e.g. for laboratory analyses) to be included in the plan.

The requirements shall reflect the definition of verification parameters. However, specific requirements for the test design shall be given whenever necessary in order to ensure that the test data will enable the final data assessment and completion of the verification procedures. The requirements on test design shall include:

- overall test design e.g. continuous or batch tests, scale, test methods etc;
- scale (laboratory/simulated environment/field) and actual matrix used for tests; it should be the same matrix for which the verification parameters have been defined;
- parameters to be measured;
- methods to be used, including sampling, test and calculation methods, determination of uncertainty and statistical methods;
- testing conditions;
- data management;
- quality assurance including test system audit where applicable;
- test report contents.

Where appropriate, the Verification Plan shall include specific requirements on the choice of the test methods or provide already the complete reference or description of the test method to be used. To the extent possible, the choice of the method should be explained, especially where several methods are applicable. If specific requirements for analytical methods or their performance have been identified as necessary, these shall be given.

If available and relevant, existing standard methods (e.g. ISO, CEN) should be used. Where no standard methods exist, documented methods shall be required and/or clearly described in the verification plan or reference made to publicly available documents such as peer reviewed scientific articles.

The Verification Plan shall also:

- define the requirements for the management of test data with respect to the format of data storage;
- define or make a reference to appropriate methods for the processing of raw test data into verification parameters;
- specify appropriate statistical methods for determination of uncertainty and claim verification and, where appropriate, define required levels of confidence consistent with the professional practice for the technology group in question;
- mention explicitly the criteria for acceptance of test data in the context of the ETV process, if they are not obvious from the methods and requirements set.

The requirements concerning the testing site should be defined in the verification plan and further in the test plan. The general requirements which must be considered when choosing the testing site include:

- the site must be clearly related to the matrix, purpose and operational parameters defined for the verification.
- it must be accessible (e.g. the Applicant must either provide access to the technology if installed at a field site or provide a requested number of its pieces when tested at the Test Body's site etc.);
- if the technology is installed and used at the field site, the site should be free from any commercial or other interests which could influence the test results (the field site should not be dependent upon the Applicant). For example, the Applicant must ensure that the test site is secured against access by unauthorised persons. If a test setup is left unattended, there is a potential risk that the setup may be altered.

B.VII. Verification

Verification of the performance involves:

- acceptance of existing test data for verification,
- generation of additional test data if needed,
- confirmation of performance based on the analysis and assessment of the test data.

The verification procedure and its steps are defined and described in the International Standard ISO 14034:

- Clause 5.4 Verification
- Sub-Clause 5.4.2 Acceptance of existing test data
- Sub-Clause 5.4.3 Generation of additional test data
- Sub-Clause 5.4.4 Confirmation of performance

B.VII.1. Acceptance of existing test data for verification

At the application stage the Applicant shall provide as much of existing test data from technology tests as available together with test plans, test reports. This test data is

indicatively assessed for applicability to verify the performance during the technical review of the application by the Verification Body with an aim to inform the Applicant whether additional testing will potentially be needed. If any of the provided data sets have been initially recognised by the Verification Body as applicable to verify the performance claim, they are assessed in full at this stage, once the parameters to be verified are defined and agreed with the Applicant together with the test methods and any other information relevant to the testing requirements (e.g. testing conditions, quality assurance and control measures).

The assesses the existing test data to qualify for performance verification considering the following requirements:

- the test data is relevant, sufficient and adequate for the performance to be verified i.e. they correspond to the parameters, methods and target values of the specified performance parameters to be verified;
- the test data is produced and reported according to the requirements of ISO/IEC 17025 for example a detailed test plan that was followed during the testing and a test report are available, the quality assurance and control measures implemented during the testing comply with the requirements Verification Body of ISO/IEC 17025, the testing was performed in a way ensuring its impartiality, etc;
- the test data meets the requirements specified in the verification plan e.g. they were produced with the same test methods as the ones specified for performance parameters to be verified and generated in testing conditions corresponding to the intended application (and purpose and matrix) defined for the verified technology and its performance together with the operational parameters, assumptions, constraints and limitations applying to the performance claim;
- the test data is provided in a format that allows assessment against the above mentioned requirements.

The Verification Body should have appropriate procedures in place to evaluate existing test data against the parameter requirements, methods, quality and target values set for the verification. The preparation of procedures for the evaluation and possible acceptance of existing test data can be based on the guidance presented in Annex 5.

In order to accept the existing test data, the Verification Body may need to perform their quality control by assessing the test system which generated them. The Verification Body will determine whether the test system and quality management system applied by a Test Body to generate test data for verification purposes comply with the requirements of ISO/IEC 17025 and of the verification plan. Depending if the testing was performed by an accredited laboratory or not, the test system may include the review of the relevant accreditations, or an in-depth audit including the review of relevant procedures, observation of actual practices and evaluation of test performance. Where applicable, the audit may also include examination of control data for relevant period, participation in proficiency testing and/or control of calibration of measurement devices. It is aimed to provide the necessary evidence for the test system assessment.

In addition to checking documentation and test data, the Verification Body may undertake one or more of the following actions to evaluate the acceptability of the existing test data, in particular in the absence of accreditation or in the case of test data produced by the Applicant or by bodies dependent upon the Applicant:

- spot checks, in which test performance data are collected in a random fashion and their quality assessed;
- witness checks, in which tests are witnessed, in full or in part, by staff of the Verification Body;
- conditional acceptance of existing test data, in which case the conditions for acceptance shall be detailed in the specific verification protocol and reviewed during the assessment of all test data; these conditions may include re-testing.

The Verification Body should have in place the procedures for onsite auditing of technology testing and test system of the Test Body. The Verification Body should be competent in this regard. The preparation of procedures for auditing Test Bodies can be based on the guidelines presented in Annex 6.

In order to facilitate the acceptability of the existing test data, it is recommended that tests carried out before an ETV proposal are performed by organisations accredited as complying with the requirements of ISO/IEC 17025 for the relevant test methods.

In some cases, the existing relevant test data developed by a Test Body, may have been generated for different conditions than those specified in the claim. This should be considered, if relevant, when specifying the performance parameters, as mutually agreed between the Verification Body and the Applicant, with the result that the performance claim including the conditions for which it is achieved could be modified so as to correspond to the existing data, in which case no additional testing may be needed.

B.VII.2. Generation of additional test data

Additional testing is needed when the Verification Body states that the existing test data provided by the Applicant does not meet the requirements defined in section B.VII.1.

Verification Body does not perform testing. The Applicant is responsible to designate one or more Test Bodies to perform the necessary tests and enter a contractual arrangement concerning the testing.

The contractual arrangement should ensure that the following activities are executed by the Test Body:

- development of a Test Plan for test data generation following the requirements provided in the Verification Plan and in consultation with the Verification Body;
- tests performance following the Test Plan;
- development of a Test Report following the requirements of the Verification Body;
- training concerning operation, maintenance and safety issues of the tested equipment, if relevant,
- any interaction with the Verification Body concerning requests to provide supplementing information and documentation about the performed testing activities and the quality control check of the performed tests including a test system audit if relevant (e.g. then the Test Body is not an ISO/IEC 17025 accredited

laboratory). Such activities may include, but are not limited to spot checks in which test performance data are collected in a random fashion and their quality assessed, witness checks, involving on-site visits of the Verification Body staff in which tests are witnessed, in full or in part.

It is essential that the Applicant coordinates the designation of the Test Body with the Verification Body who may also advise on the quality requirements which the Test Body shall fulfil the requirements to be a qualified test data provider for the needs of the verification.

In the case of difficulties with finding a Test Body accredited to ISO/IEC 17025 for the relevant methods of testing and calibration, other appropriate Test Body can be designated by the Applicant. However, in order to accept the test data generated by such body, the Verification Body will perform a detailed audit of the test system provided by the Test Body to generate the needed test data. The scope of such audit is based on the analysis of the ISO/IEC 17025 requirements that must be followed when performing the testing and depends on the types of tests performed and the risks identified by the Verification Body related to quality assurance and control as well as potential lack of compliance to the requirements of the verification plan concerning test data.

Alternatively, and where appropriate, the Applicant may perform the necessary tests in-house. This may be the case when the necessary test equipment or skills are not easily available outside of the Applicant. In this case, the Applicant shall demonstrate the compliance to the requirements of the Test Bodies as specified in Section A.III.3. The test plans, all preparatory measures such as sampling and the actual tests shall be prepared and implemented by the Applicant in agreement with, and where appropriate witnessed by, the Verification Body.

The Test Plan is unique for each tested technology and gives the exact information required by the test staff to conduct the tests and if needed to trace back the testing process.

The test plan shall be drafted by the Test Body, reviewed and approved by the Applicant and the Verification Body. Where tests are performed in-house by the Applicant, the test plan shall be drafted by the Applicant and approved by the Verification Body.

The Applicant shall play an active role in drafting the Test Plan and execution of the tests. It is the responsibility of the Applicant to review, provide comments and approve the Test Plan. For testing, the Applicant should ensure the access to the technology (e.g. provide, the necessary number of technology/product units for testing, provide access to the field site etc.) or accessories, to provide user manual and if necessary, training to the Test Body on the operation of the technology including health and safety aspects if relevant etc.

Reference to the verification plan used shall be given. A table of contents for the Test Plan is given in Annex 7.

Once the tests are completed, the Test Body summarises the results and presents them in a Test Report. The Test Report should contain the information provided in Annex 7. The Applicant submits the Test Report to the Verification Body for review and approval. When

approved, the Test Report including the test data is used for the final test data assessment and performance verification.

The format and location for archiving the raw test data shall be indicated in the test report. Raw data shall be accessible to the Verification Body. The list and summary of any amendments to the Test Plan and deviations recorded during tests shall also be included.

The test report shall also include all measured and calculated data as well as naming the staff that performed the test. The test and calculation methods shall be described, if not given in the analytical and test methods used. If relevant, details on equipment and software used shall be included.

Accredited Test Bodies are often obliged to use the Test Report format/template provided in their quality system which may differ in structure and content from the content of the Test Report required to report testing for the needs of ETV. When modification of the format/template is not possible, the Test Body may issue a test report following the format/template as defined in their quality system with the Test Report generated for the ETV needs as attachment.

B.VII.3. Assessment of all data and confirmation of performance

It consists of the following steps:

- Test report review;
- Conclusion of the test system assessment;
- Assessment of all test data;
- Confirmation of performance.

B.VII.3.1. Test report review

The Verification Body shall review the Test Report(s) from the formal and technical viewpoint. The formal review should address the requirements related to the scope and completeness of information presented in the Test Report. The technical review can support the test system assessment and the assessment of test data as presented in section B.VII.3.3 .The review shall also include an assessment of whether the tests followed the requirements of the Verification Plan and the Test Plan.

B.VII.3.2. Conclusion of the test system assessment

At this stage of the verification process, the Verification Body has to conclude the test system assessment, and decide whether the test system in which the data has been produced is suitable; considering in particular:

- the general test data requirements as specified in Sub-Clause 5.4.2 of the ISO14034, the quality control and assurance aspects as presented in Section C.II.1;
- other relevant requirements of the verification plan. Where applicable, this assessment incorporates the results of the test system audit.

B.VII.3.3. Assessment of test data and confirmation of performance.

The Verification Body shall collect all test data relevant for the verification of performance, i.e. existing test data accepted after assessment, additional test data if generated and approved and assess whether these collected test data are complete and satisfy the requirements and criteria for acceptance provided in the Verification Plan and Test Plan. Special attention is paid to the determination of the associated uncertainty. The Verification Body shall also carry out a critical review of the test data, including raw data where appropriate, e.g. through random consistency checks. This assessment can be part of the test report review, and in the case of existing test data it can be carried out earlier (i.e. as a part of the verification planning procedure). If the conclusion from the assessment of test data is positive, the Verification Body shall confirms the verified performance and associated uncertainty in conformity with the calculation methods provided in the verification plan, and determines whether the test data supports the performance claim, using appropriate statistical techniques, and considering appropriate levels of confidence. The end result of this stage is a confirmation or determination of the performance of the technology based on reliable test results (the verified performance claim).

Where applicable, the Verification Body shall assess the appropriateness and usefulness of additional information for the Statement of Verification, and draft the necessary caveats to avoid confusion or misleading interpretation of this additional information. These will include:

- additional parameters mentioned
- information on operating conditions not considered for verification (e.g. limit temperatures or atmospheric moisture, maximum longevity etc.);
- qualitative information on environmental impacts (e.g. origin of raw materials, reference to complete life-cycle analysis or life cycle inventory, requirements on suppliers, instructions for re-use or recycling of materials);
- other information, e.g. information about operating costs, provided by the Applicant under its own responsibility.

In some cases, the technology performance achieved, as verified using the test data qualified to be used for verification, may not match the performance originally anticipated by the Applicant in the performance claim provided in the application.

B.VIII. Reporting

Reporting includes development of the Verification Report and a Statement of Verification by the Verification Body. The reporting procedure and its steps are defined and described in the International Standard ISO 14034:

- Clause 5.5 Reporting
- Sub-Clause 5.5.1 Verification report
- Sub-Clause 5.5.2 Statement of verification

The Verification Body submits both documents for review and comments to the Applicant to ensure that:

- that technology description and Applicant information included in the documents are accurate and complete;
- the Applicant understands the results and details of the verification and that the documents are clear and concise; and
- the input from the Applicant is provided and considered.

The Applicant either accepts the confirmed performance or may decide to alter the technology specification, design and/or operating conditions and to modify the values of the performance parameters from those specified in the verification plan. Any change to the technology or performance parameters would require modification of the verification plan and a repeat of the verification procedure, if agreed to by both parties.

Although the Applicant can provide feedback and comments on the Statement of Verification and the verification report, it is solely up to the Verification Body to decide whether to incorporate the Applicant's input into the final documents. In making any changes to the report or statement of verification, the Verification Body considers the Applicant's comments with impartiality and transparency.

B.VIII.1. Verification Report

At the end of the verification procedure, the Verification Body shall produce a Verification Report. The verification report is a comprehensive summary of all verification activities carried out throughout the entire process. Its main parts include:

- a detailed description of the technology and its application,
- the verified performance,
- operational conditions, constraints, and limitations under which the verified performance is achieved,
- all measurement uncertainties and relevant assumptions taken into consideration during the verification process,
- description of the tests performed and the obtained results,
- description on how the requirements for the verification of the performance and for the test data, as specified in the verification plan, were met, including reporting of any deviations,
- final assessment of all data from the test report and from acceptable existing data prior to verification,
- quality management and control procedures applied,
- any other information necessary to understand and use the performance claim; this may include information not verified under the ETV, however this should be clearly stated and explained.

All relevant documents produced during verification should be attachments to the Verification Report as appendices. These can include in particular :

- The application;

- The verification plan;
- The test plan;
- The test report.

The content of the Verification Report shall follow the structure provided in Annex 8.

The report is owned by the Applicant. It may only be published by the Applicant himself or by the Verification Body or other interested parties with the Applicant's consent. If the Verification Report is published, it should be published in full. In some cases, the Verification Body may accept publication of parts of the report; however, this may happen only if the legitimate interests of the Applicant in relation to the verified technology, in particular intellectual property, could suffer disproportionately great harm because of the full publication of the report. Before publishing parts of the report, the Verification Body checks that the parts to be published may not lead to any misinterpretation of the meaning or results of verification. It must be clearly pointed out that it is an extract from a verification report.

B.VIII.2. Statement of Verification

Upon a successful completion of a verification procedure, the Verification Body shall issue a Statement of Verification. The content of Statement of Verification is provided in Annex 9.

The Statement of Verification is a summary of the verification report. The document contains at the minimum:

- unique identification number and a date of issuance, dates/period of verification,
- a summary description of the technology verified, purpose and conditions of use,
- the verified performance and the operational conditions, constraints and limitations under which it is achieved,
- a summary of the procedures followed by the Verification Body, and by Test Bodies where relevant, to verify the claim, including the statistical confidence range on specifications where applicable,
- description on how the requirements of the verification specified in the verification plan were met including reporting of any deviations,
- any other information necessary to understand and use the performance claim. This may include information not verified under the ETV, what should be clearly stated and explained.

For the purpose of establishing verification dates for the verification report and Statement of Verification the Verification Body should use application submission date by the Applicant as the start date of the verification and the date of the acceptance of the verification report and statement of verification by the Applicant as the end date of verification

B.IX. Post-verification

Post- verification involves publication at a minimum of the Statement of verification and the aspects of ensuring statement's validity. The post-verification procedure and its steps are defined and described in the International Standard ISO 14034:

- Clause 5.6 Post-verification
- Sub-Clause 5.6.1 Publication
- Sub-Clause 5.6.2 Validity of the verification report/verification statement

B.IX.1. Publication

Once the verification process is completed, at a minimum the Statement of Verification must be published by the Verification Body in a publicly available directory e.g. the Verification Body's web site and the ETV-HUB.com. For marketing purposes, it is also recommended that the Applicant publishes the statement at own web site. The Statement of Verification must be published in full, and it cannot be used in parts for any purpose.

Publication of the verification report is not obligatory. However, the Applicant is recommended to make the Verification Report publicly available for the sake of transparency of the verification result and thus to make it more attractive to technology buyers and users but also other stakeholders.

B.IX.2. Rules for using the Statement of Verification and ETV logo

The Applicant may use the Statement of Verification for marketing purposes and for official approvals. It may be included in the technical documentation of the verified technology. The Applicant shall make the Statement of verification available in full and shall not use parts of the statement for any purpose.

The Applicant may refer to the Statement of Verification as follows:

> *The XX technology was verified in the framework of ISO 14034 Environmental Technology Verification (ETV) scheme for the application AA (including purpose and matrix) by BB Verification Body on DD.MM.YYYY. The Statement of Verification has been registered under number NN and is accessible at the following address: https: (provide the address where the statement is published).*

The ETV logo was developed under the LIFEproETV project and registered by IETU as a European Trade Mark, is an essential visual identifier of the ETV scheme.

The condition of the use of the ETV logo by the Verification Bodies who joined the Network are listed in the Memorandum of Understanding (MoU) for the ETV Network and are the following:

> *The ETV logo may be used in promotional materials of the Verification Body and documents produced as key deliverables of the verification process i.e. at a minimum on the Statement of Verification and Verification Report and other communications to signify that technologies have been verified under the ISO 14034 based ETV scheme.*

Verification Body is responsible for ensuring the proper and consistent use of the ETV logo in accordance with guidelines provided by IETU and jointly agreed.

Any misuse or unauthorized use of the logo by Verification Body may result in the suspension of the license to use the logo.

The Applicant shall not use the ETV logo alone either on products or on published (printed, web or other) matter other than the Statement of Verification. The ETV logo may be used on publications together with the reference to the Statement of Verification, as provided above, if the meaning of ETV is correctly reflected by the publication, avoiding in particular any confusion with endorsement or approval of the technology. The Verification Body should include such a provision in the verification agreement with the Applicant and the Applicant should be informed of this at the time of receipt of the Statement of Verification.

B.IX.3. Validity of the Verification Report and Statement of Verification

In general, there is no validity period defined for a Statement of Verification and a Verification Report, unless other requirements are provided for example by an ETV Programme. The Statement remains valid as long as the technology with the same unique identifier for which it has been issued is on the market. However, the Applicant may request that the Statement of Verification and associated report be withdrawn from the web if, for example, the technology is no longer on the market. This request should be made in writing to the Verification Body, committing to no future use of the Statement of Verification, reference to it or the ISO 14034 ETV scheme logo.

The Applicant shall ensure that the verified technology (i.e. technology with the unique identifier specified in the Statement) continues to conform to the published Statement of Verification.

If any of the following changes to the verified technology have occurred, the Applicant shall report to the Verification Body with the data needed to evaluate whether the conditions for verification have changed:

- change of ownership,
- design changes,
- change of intended application or operational conditions,
- other changes likely to modify the performance results reported in the Statement of Verification.

Substitution of one part with another with the same documented specifications is not considered a change, unless it affects the environmental added value or one of the parameters reported in the Statement of Verification.

The Verification Body shall evaluate reported changes and data at the cost of the Applicant. If, after evaluation, the Verification Body concludes that the conditions for verification have changed, a new verification procedure shall be engaged by the Applicant for this technology or alternatively, the Statement of Verification shall be withdrawn.

The Statement of Verification shall be withdrawn by the Verification Body if misused by the Applicant. In the case of withdrawal, the Statement of Verification and verification report shall be removed from all web sites where it is available.

Part C: Quality assurance and management

C.I. Overview of the quality assurance and control for the verification process

Principles of quality assurance in all steps of verification and testing are shown (for illustration only) in Figure 7. Principles of quality assurance in ETV (indicative only).

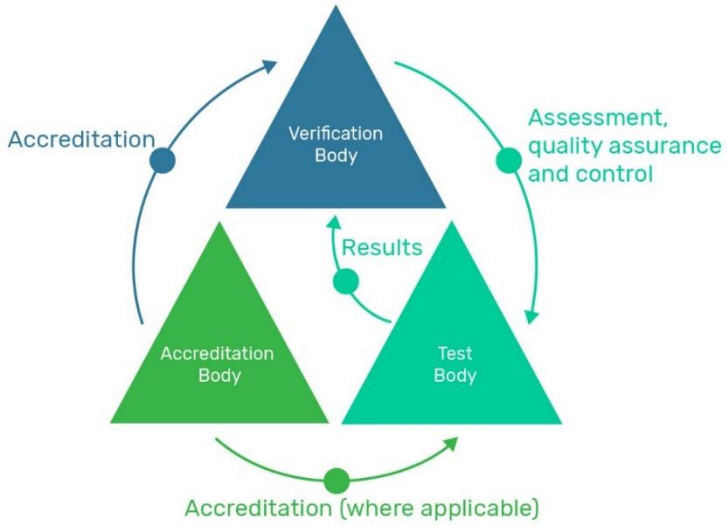


Figure 7. Principles of quality assurance in ETV (indicative only)

The National Accreditation Bodies shall ensure that ETV Verification Bodies conform to the requirements of ISO/IEC 17020 for inspection bodies (type A) and ISO 14034 and, where applicable, that Test Bodies conform to the requirements of ISO/IEC 17025 for the relevant test or analytical methods.

The Verification Body has the overall responsibility for ensuring that the verification is conducted according to ISO 14034. The Verification Body shall control that the Test Body performs test planning, execution and reporting according to the requirements of the relevant Verification Plan and ISO/IEC 17025 .

The quality management and general test data requirements of ISO 14034 are those requirements of ISO/IEC 17025 that are considered relevant for the tests to be performed. A list of requirements that need to be considered can be found in Appendix 10. A Test Body can demonstrate meeting these requirements by means of accreditation to ISO/IEC 17025 for the methods of testing and calibration relevant for the specific verification process concerned.

In order to ensure that all quality requirements provided in the ISO 14034 are met, the Verification Bodies and the Test Bodies shall undertake the reviews, assessments and audits provided in Section C.II Quality Assurance.

C.II. Quality Assurance

C.II.1. Verification Body

The Verification Body shall have and apply appropriate procedures for ensuring that the plans, performance and outputs of verification activities meet the required level of quality and reliability, i.e. how the Verification Body plans quality assurance in terms of review, assessment and audit. This shall include the reviews, assessments and audits provided in Table 4 'Quality assurance steps for Verification Bodies'. The procedure shall describe the process of Test Body audits and audit evaluation, including audit responsibilities and planning, auditor training and competences, and audit reporting.

Table 3. Quality assurance steps for Verification Bodies

Entity	Object	Verification Body
Verification Body	Verification Plan	Review (internal reviewer)
Test Body	Test Plan	Review
Test Body	Test system and Test Body quality management system	Test system assessment, with or without test system audit
Test Body	Test Report	Review
Verification Body	Verification Report	Review (internal reviewer)
Verification Body	Statement of verification	Review

The test system assessment must include a test system audit for test activities that are not covered by an ISO/IEC 17025 accreditation. A test system shall be understood as specified in ISO 17025, i.e. a system for generating test data consisting of human factors, accommodation and environmental conditions, test and calibration methods and test validation, equipment, measurement traceability, sampling and the handling of test and calibration times.

The quality assurance planned for a specific verification must be described in the verification plan, providing the names of auditors, as well as the timing of reviews and audits, where applicable. This may require amendment following the assessment of existing test data.

C.II.2. Test Body

The Test Body shall have and apply appropriate procedures for ensuring that the plans for the performance of and products of testing activities are of the required level of quality and reliability. It shall include the reviews and audits provided in Table 4 'Quality assurance steps for Test Bodies', unless provided differently in the Verification Plan.

Table 4. Quality assurance steps for Test Bodies

Entity	Object	Test Body internal reviewer	Test Body staff responsible for test activities
Test Body	Test plan	Review	-
Test Body	Test system and Test Body quality management system	Test system audit	-
Test Body (analyses)	Method performance		Validation
Test Body (analyses)	Analytical performance		Quality control and review
Test Body	Test report	Review	-

The quality assurance planned for a specific test must be described in the test plan, providing the names of experts and reviewer/auditor, as well as the timing of reviews and audits (where applicable). The review of analytical performance should include:

- laboratory stated uncertainties and limits of detection;
- analytical quality control data;
- information on participation in proficiency tests for the analysis used and the relevant period.

The reviewing process shall be documented to ensure an adequate level of quality and reliability. A description of the method for documenting reviews shall be provided.

Non-standard test methods must be clearly described in the Verification Plan or in the Test Plan, including required calibration and quality control procedures. Non-standard test methods have to be validated as per ISO-17025.

The records of test data (raw data) shall be stored, transferred, maintained and controlled in order to ensure data integrity for a period defined in the test plan, but not shorter than 5 years from completion of the test.

Applicant's complaints shall be addressed in accordance with the relevant procedures of the Test Body and reported to the Verification Body.

Part D: Glossary of key terms and definitions

The use of this guide requires knowing and understanding some key terms and definitions provided by the ISO 14034 ETV that apply to the verification process and its outputs. When terms used in this Handbook are the same as terms used in the ISO Standard 14034, the definitions provided in ISO 14034, Clause 3 'Terms and definitions' apply. The following definitions are either key to understand this document or complement the ones provided in ISO 14034.

(1) Technology refers to the practical application of technical or scientific principles in the environmental area to achieve a given purpose. It covers a variety of products, processes, and services.

(2) Environmental technology it's a technology that either results in an environmental added value or measures parameters that indicate an environmental impact.

(3) Environmental added value of environmental technology means that the technology results in a more beneficial or has less adverse environmental impact in comparison to the relevant alternative.

(4) Environmental impact is a change to the environment, whether adverse or beneficial, wholly or partially resulting from material acquisition, design, production, use or end-of-use of a technology.

(5) Relevant alternative it is a technology applied currently in a similar situation to the environmental technology.

(6) Quick scan – a contact form containing information about the technology presented by the Applicant to the Verification Body in order to make an initial check of the environmental technology eligibility for ETV.

(7) Performance claim - statement of performance of the environmental technology declared by the Applicant.

(8) 'Operational parameters' means measurable parameters that define the application and the verification and test conditions.

(9) 'Environmental parameters' means measurable parameters related to potential environmental impacts or the environmental added value in a life-cycle perspective.

(10) 'Life-cycle perspective' means the consideration of the main environmental benefits and pressures or impacts generated by a technology along its life cycle, from the extraction of raw materials, manufacturing process, use and maintenance, until the end of life of related equipment or products.

(11) 'Additional parameter' means information on a technology, not covered by performance, operational or environmental parameters, but considered in the verification process because of its usefulness and relevance for technology users.

(12) 'Matrix' means the type of material that the technology is intended for.

(13) ‘Purpose’ means the measurable property that is affected by the technology and how it is affected.

(14) 'Technology area' means a class of technologies serving the same or closely related purposes (i.e. used in the same application).

(15) 'Accreditation' shall have the meaning assigned to it by Regulation (EC) No 765/2008.

(16) 'National Accreditation Body' shall have the meaning assigned to it by Regulation (EC) No 765/2008.

(17) ´Ready to market´ means that the technology is available on the market or at least available at a stage where no change affecting its performance will be implemented before introducing the technology on the market.

(18) Performance claim - statement of performance of the environmental technology declared by the Applicant.

(19) Verification plan – (also sometimes named Specific Verification Protocol) a planning document detailing the implementation of environmental technology verification for the technology proposed for ETV; it is developed by the Verification Body upon completion of the technical and formal review of the application with a conclusion stating the eligibility of the proposed technology for verification.

(20) Verification report – a document detailing the performed environmental technology verification and its results, developed by the Verification Body and provided to the Applicant.

(21) Statement of Statement (or Verification Statement) – a document summarizing the results of environmental technology verification developed and published in public domain by the Verification Body and provided to the Applicant upon completion of the verification.

(22) ´Amendment´ is a change to a Verification Plan or a Test Plan done before the verification or test step is performed.

(23) ´Deviation´ is a change to a Verification Plan or a Test Plan done during the verification or test step performance.

(24) ‘Test system assessment' means determining whether the test system and quality management system applied by a Test Body to generate test data for verification purposes comply with the requirements of ISO 14034 and the Verification Plan . It includes the review of the relevant accreditations, and may include a test system audit.

(25) ‘Test system audit’ means the examination of a test system and of a quality management system. It is achieved through the review of relevant procedures, observation of actual practices and evaluation of test performance. Where applicable, it includes the examination of control data for relevant period, participation in proficiency testing and/or control of calibration of measurement devices. It is aimed to provide the necessary evidence for the test system assessment.

Part E: References

1. ISO/IEC 17020:2012 Conformity assessment – Requirements for the operation of various types of bodies performing inspection
2. ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories
3. ISO 14034: 2016 Environmental Management: Environmental Technology Verification
4. Guidelines on assessing the environmental added value of an environmental technology in a lifecycle perspective at the proposal stage, Guidance document 004/2016, adopted on the 26/01/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document.
5. Guidelines on the Acceptance of Existing Test Data, Guidance document 005/2016, adopted on 07/06/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document.
6. Guidelines on Auditing Test Bodies, Guidance document 009/2016, adopted on 06/06/2016, Version 1.0, EU Environmental Technology Verification Pilot Programme Guidance Document.
7. General Verification Protocol (GVP), Version 1.3, 1st April 2018, EU Environmental Technology Verification Pilot Programme

Part F: Supporting documents (Annexes)

Annex 1. Checklist for competences of Verification Bodies

The Verification Body should be able to identify possible risks and benefits of innovative or non-standard technologies and translate possible risks into technical criteria to assess the behaviour and performance of the technology in relation to the Applicant's performance claim.

To be able to identify and prioritise risks associated with innovative technologies, verifiers must have the following skills or qualifications:

- in-depth knowledge of the relevant standards, procedures and other requirements to be followed;
- an understanding of the technological areas covered by their scope of accreditation;
- In-depth technical knowledge of the technology being verified;
- in-depth knowledge of specific risk areas, technical aspects of the technology and specialised scientific fields (e.g. drinking water treatment requirements);
- knowledge of stakeholder views and measures to ensure their balanced consideration;
- the means to consider the risks associated with the management of the overall process, the specific requirements of the verification, impartiality and quality assurance.

This knowledge and understanding may be contained in the Verification Body's own organisation or, in part, in the network of external bodies that the verifier actively manages or works with in a professional manner.

The Verification Body should be able to design and validate appropriate methods (e.g. tests, simulations or calculations) to assess and verify performance, taking into account the state of the art, including justification for the selection and application of technical criteria.

To develop appropriate methods, the verifier should:

- have experts (directly employed or contracted) with knowledge of the technologies and their applications in the domains of the verifier's expertise;
- have experts (directly employed or contracted) with knowledge of best practice in assessment and verification methods for such technologies and products;
- ensure that all personnel involved in verification have an objective approach, are impartial in their professional judgement and are able to work with other Verification Bodies and external organisations and expert groups in a balanced,

consensus-based and technically competent manner to agree on a plan that takes into account production, operational and regulatory requirements.

The Verification Body should be able to verify the performance of the technology based on the agreed methods and technical criteria and provide a concrete implementation of the results in the form of a verification statement as requested by the Applicant.

In order to carry out a technology verification, the verifier should:

- comply with the applicable procedures and rules;
- have an in-depth knowledge of the technology field and the conditions of use relevant to the technology being verified;
- have experts (directly employed or contracted) with the experience to assess conformity or non-conformity with the technical criteria and regulations that apply to the technology and its use.

Experts should have proven knowledge of:

- processes and procedures for handling ETV applications;
- the technology and the specific technology area;
- the market and user needs for the specific technology area;
- the environmental implications of the use of the technology from a life cycle perspective;
- relevant applicable test methods;
- statistical methods to evaluate test results and calculations.

The expert's expertise can be documented through written conclusions, professional achievements and other objective evidence based on the expert's CV, publications and other relevant documentation.

The Verification Body should ensure consistency, reliability, objectivity and traceability of its work by applying appropriate governance principles.

Verification Body should follow the procedures described in ISO 14034 and have documented management procedures to ensure:

- Sound contract offer and review practice - ability to pursue requests from Applicants, identify resources and determine time requirements leading to a contract offer to the client that clearly defines the scope of work, responsibilities of both the verifier and client and associated fees;
- Objectivity and impartiality - having policies and procedures in place to ensure the objectivity of the verification work, ensuring independence from any special interests;
- Document control - having a document control system to ensure that all documents relevant to the verification procedure are recorded, traceable, maintained and retained;

- Confidentiality - having policies and procedures to ensure the protection and non-disclosure of confidential information of which the verifier or any of its partners become aware during the assessment and verification procedure;
- Appropriate staff qualification - having policies and procedures for the assessment and qualification of experts (continuously or on a case-by-case basis), together with the development and implementation of plans for the development/updating of experts' knowledge;
- Appropriate validation - having policies and procedures to ensure that validation of verification and related decisions and documents is carried out by staff independent of those who carried out the testing and evaluation of the technology or product;
- Sound internal audit and management review practice - having policies and procedures to ensure that compliance with management procedures is regularly monitored and that any non-compliance is resolved by management;
- Notification of changes - having policies and procedures for notifying clients of changes that the verifier intends to make to assessment and verification requirements;
- Handling appeals - having policies and procedures in place to ensure that customer appeals or complaints are dealt with in an objective manner and that records of both the appeal and any follow-up are maintained;
- Quality assurance - having policies and procedures to ensure compliance with the quality requirements of ISO 17020 for the verifier and ISO 17025 for the test data.

Annex 2. Application form template

VB logo	ETV Logo

Environmental Technology Verification

Application for Verification

Purpose: This form intends to collect further information on the technology you would like to propose for verification after the first eligibility check. At this stage, all relevant information is exchanged between the Applicant and the Verification Body in order to conclude a verification contract and allow for the preparation of the specific verification protocol. This Application is to be completed by the Applicant and assessed by the Verification Body. The boxes for responses, in grey, may be extended. Additional information and documents may be attached, with references in the core text for clarity.

Verification Body	Applicant
Name:	Name:
Contact:	Contact:
Address:	Address:
Telephone:	Telephone:
Email:	Email:

Application for Verification Reference Number:

Technology name (a unique identifier for the technology, e.g. commercial name):

Technology Description– technical documentation

The technical documentation shall make it possible to understand the technology, to define the performance claim and to assess the conformity of the technology design with the performance claim. It shall contain at least the following elements:

a general description of the technology;

conceptual design and manufacturing drawings, schemes of components, sub-assemblies, circuits, etc;

descriptions and explanations necessary for the understanding of those drawings, schemes and operation of the technology;

where relevant, standards or technical specifications applied in full or in part;

results of design calculations made, examinations carried out, etc.

Technology Description:

Intended application of the technology

The application of the technology should be defined by describing the matrix and the purpose(s) of the technology. The matrix refers to the type of material for which the technology is intended e.g., soil, drinking water, ground water, cooling water, alkaline degreasing bath, effluent from domestic wastewater treatment plant etc.

The purpose(s) is a measurable property that is affected by the technology e.g, reduction of nitrate concentration, separation of volatile organic compounds, reduction of energy use (MW/kg), bacterial removal, monitoring of NOx, improvement of heating value etc. It is important that the purpose describes the claimed effect in quantitative terms, e.g. reduction of nitrate concentration in mg NO3/L. For further information on how to define the matrix and the purpose, please refer to the General Verification Protocol, Table 1 in Section B.III.1 or to the Guide for Applicants.

Matrix:

Purpose:

Technical conditions:

Initial performance claim

The specifications included in the initial performance claim shall relate to the technology itself and shall be quantitatively verifiable through tests. The initial performance claim shall state the conditions under which the specifications are applicable and mention any relevant assumption(s) made. For further information on how to define a clear initial performance claim, please refer to the Guide for Applicants.

Initial performance claim:

Market readiness

Is the technology already on the market?

☐ No ☐ Yes, number years:

If no, is there a prototype or a demonstration unit available?

☐ No ☐ Yes ☐ Pilot scale ☐ Full-scale

When transforming the prototype/ demonstration unit into a marketable product, will any changes affect the technology's performance?

☐ No reason:

☐ Yes How substantial will the changes be?

Comments:

A verification will check whether the technology matches the claimed performance. Ideally this verification should only be done once the product is finished, so as to reduce costs of new verifications with changes or upgrades to the technology.

The intention is to determine if the technology is ready to market: "is it available on the market or at least available at a stage where no substantial change affecting its performance will be implemented before introducing the technology on the market (e.g. full-scale or pilot scale with direct and clear scale-up instructions)".

What is the target market for this technology?

☐ EU ☐ Specific country/countries:

☐ Other:

Does the technology fulfil the legal requirements in the targeted market(s)?

☐ Yes ☐ No

Comments:

Intellectual Property Rights (IPR)

Are you the sole and full owner of the technology? ☐ Yes ☐ No

If no, do you detain intellectual property or other rights on the technology?

☐ Yes

Description of the license or other contractual arrangement giving you the legal right to ask for the technology to be subject to a verification procedure:

☐ No

Are there any Intellectual Property issues in respect of this technology or any part or aspect of the technology that might prevent its development and/or which could result in any legal or other issues for the ETV?

☐ Yes ☐ No

Comments:

Description of tests performed and existing test data

The tests performed on performance parameters shall be described with all necessary details, including the qualification of testing bodies, test methods used (with references to standards where appropriate), test plans and test reports. Consult the Verification Body if there are confidentiality issues related to the information on tests.

Are there available test results or other data to back-up the technology's performance?

☐ Yes

Description of test plan:

Description of test methods, including reference if standard methods were used:

Description of existing test data:

Qualification of the Test Body for the relevant tests:

☐ ISO 17025 ☐ none ☐ other:

☐ No

Is there a test plan available? ☐ Yes ☐ No ☐ Unknown

Is there a test method available? ☐ Yes ☐ No ☐ Unknown

Full description:

Environmental added-value

Please provide as much information as possible on the positive and negative environmental aspects resulting from your technology Firstly, please identify the technologies that constitute relevant alternative(s) to your technology since this may help to identify the environmental added-value of your technology. Then indicate the phases which are most relevant to your technology, in terms of environmental aspects. You may indicate that a particular phase is not relevant to assess the environmental aspects of your technology when:

the technology will lead to environmental pressures/impacts that are not significantly different than those of the relevant alternative(s)

those environmental pressures/impacts are negligible compared to those of the other phases

the information cannot be obtained – please provide a short justification in this case. It is expected that for the manufacturing and use stages the Applicant will normally possess relevant information, as designer and manufacturer of the technology.

For each of the identified phases, and especially for the manufacturing and use phases please indicate as much qualitative information as possible regarding each environmental parameter. When available, support the elements provided with quantitative information. You may present information based on a comparison with the relevant alternative, or you may present absolute values, if you are unable to compare the performance of your technology with the one of a relevant alternative(s).

Relevant alternatives (if available):

Natural resources (raw materials, energy) extraction and transformation phase:

Is this stage under your direct control? ☐ Yes ☐ No

Do you have information concerning environmental aspects for this stage? ☐ Yes ☐ No ☐ Partial

In terms of environmental impacts or environmental added value, are there significant differences in this stage between your technology and relevant alternatives?

☐ Yes ☐ No

Major positive and negative environmental aspects:

Extraction, refining, processing, transformation and transport of natural resources including every aspect of all activities involved before the manufacture of the technology's equipment, sub-assemblies or products. By definition, this also includes all of the raw materials, the energy and water used and all waste or emissions released to the environment during these activities.

Manufacturing phase:

Is this stage under your direct control? ☐ Yes ☐ No

Do you have information concerning environmental aspects for this stage? ☐ Yes ☐ No ☐ Partial

In terms of environmental impacts or environmental added value, are there significant differences in this stage between your technology and relevant alternatives?

☐ Yes ☐ No

Major positive and negative environmental aspects:

Manufacturing of parts, components, machinery and of products including every aspect of the production of the technology. In general, it is expected that this will include the production of most if not all sub-assemblies. This also includes all of the water, energy and consumables used, together with all of the emissions and all of the products and wastes. This will generally occur on production sites under control of the Applicant.

Use phase:

Is this stage under your direct control? ☐ Yes ☐ No

Do you have information concerning environmental aspects for this stage? ☐ Yes ☐ No ☐ Partial

In terms of environmental impacts or environmental added value, are there significant differences in this stage between your technology and relevant alternatives?

☐ Yes ☐ No

Major positive and negative environmental aspects:

Use and maintenance phase of a product, a process or a service including estimates of its use by the client/end-user refers to consumables, maintenance, and all raw materials, energy and water used for its functioning, as well as all the emissions, products and waste streams.

End of life phase:

Is this stage under your direct control? ☐ Yes ☐ No

Do you have information concerning environmental aspects for this stage? ☐ Yes ☐ No ☐ Partial

In terms of environmental impacts or environmental added value, are there significant differences in this stage between your technology and relevant alternatives?

☐ Yes ☐ No

Major positive and negative environmental aspects:

For the phases identified above as different from the relevant alternative(s) or presenting major positive or negative environmental aspects,, please provide information as detailed as possible on the following environmental parameters:

Indicate relevant phase:

End of life of a technology including every aspect of all activities involved in the 'End of Life' of a product or an equipment, when it is discarded by the client/end-user, including its recycling, dismantling and/or disposal of all components. This also includes all of the water, energy and consumables used, together with all types of emissions, all of the products and wastes.

Emission of pollutants to air:

Identify or quantify air pollutants including those listed under the green-house gas emissions

Emission of pollutants to water:

Identify or quantify water pollutants

Emission of pollutants to soil:

Identify or quantify soil pollutants

Consumption of natural resources:

Identify consumption of natural resources, especially rare raw material required for the process Energy and water consumption will be addressed in the two following points.

Energy consumption:

Identify energy consumption and energy sources (indicate use of non-renewable or renewable energy)

Energy emissions (heat, light) and noise:

Water consumption and related processes:

Identify the consumption or the use of water but also the quality of the water used and the necessary treatment before and after use, the consumption or the use of water. This section includes process water, but also water used in bulk such as cooling water.

Production of non-hazardous waste:

Identify or quantify non- hazardous waste

Production of hazardous waste:

Identify or quantify hazardous waste

If relevant, additional information on the overall productivity of the technology should also be provided, namely:

Production efficiency – productivity:

Indicate any significant differences in productivity of the technology vs. the relevant alternative (e.g. for recycling: ratio of substance recycled vs. quantity of substance contained in the waste).

Production efficiency – final quality:

Indicate the differences in the quality of the final product vs. the relevant alternative (e.g. for recycling: the level of purity of the recovered substance).

Conformity with applicable standards:

Indicate the standards or equivalent technical references applicable to the technology and any certificate or test results showing conformity with these standards.

Other information (additional information that might be useful for the assessment relating to e.g., economic, social and safety aspects):

Provide additional information that could justify or complement the information provided for environmental criteria. For example, a technology might be proposed that has little or no environmental benefits in comparison to the existing commercially available alternatives but provides greater social, economic or safety benefits

Assessment of Application (for the Verification Body)

Assessment of the technology		
Performances parameters correctly described:	☐ Yes	☐ No
Innovative technology:	☐ Yes	☐ No
Ready-to-market:	☐ Yes	☐ No
Prototype in advanced stage of development:	☐ Yes	☐ No

Assessment of environmental aspects

Conclusions:

Preliminary assessment of existing test data

Tests performed on technology:	☐ Yes	☐ No
Comments:		
Test Body suitably qualified:	☐ Yes	☐ No
Comments:		
Test plan available:	☐ Yes	☐ No
Comments:		
Test plan suitable:	☐ Yes	☐ No
Comments:		
Test method available (standards):	☐ Yes	☐ No
Comments:		
Test methods described:	☐ Yes	☐ No
Comments:		
Test methods suitable:	☐ Yes	☐ No
Comments:		
Test methods reproducible:	☐ Yes	☐ No
Comments:		
Test methods accurate:	☐ Yes	☐ No
Comments:		
Test results available:	☐ Yes	☐ No
Comments:		
Test results relevant to the performance claim:	☐ Yes	☐ No
Comments:		
Test results can be used in the verification process	☐ Yes	☐ No
Comments:		

Conclusions on the Application:

Applicant:	Verification Body:
Name:	Name:
Date:	Date:
Signature:	Signature:

Annex 3. Guidelines on assessing the environmental added value of an environmental technology in a life-cycle perspective at the application stage

This guideline is based on the Guidelines on assessing the environmental added value of an environmental technology in a life-cycle perspective at the proposal stage, Version 1.0 2014, produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment for the EU Environmental Technology Verification Pilot Programme.

Scope

According to the definition of innovative environmental technologies, this tool has to allow a comparative assessment with a 'relevant alternative' so that the key environmental aspects can be identified in a simple and qualitative way.

The guidelines below will provide a "life-cycle perspective" approach, meaning that the assessment should focus as much as possible on a holistic view of the environmental pressures of a technology during its entire life-cycle. If results from life-cycle inventories (LCI) or assessments (LCA) are available, then they can be used but the life-cycle perspective approach used for ETV does not require any life-cycle assessments or calculations on the impact of the technology. The "life-cycle perspective" should help at least to qualitatively determine if a technology provides an environmental added-value at the cost of much higher use of consumables, energy or water, or at the cost of higher pollution in other aspects of its life-cycle, when compared to a relevant alternative.

Defining the relevant alternative

In order to determine the environmental advantages and disadvantages of each new technology according to the definitions provided in ISO14034, the Applicant needs to designate the ‘relevant alternative(s)’ against which a qualitative comparison (quantitative if data is available) can be made. The Verifier can then accept the proposed relevant alternative or suggest a different one, based on its experience. If no appropriate relevant alternatives are found, the verifier can take into account the EU/country legal requirements..

- It is not always an easy process to determine what the relevant alternative should be, but in principle it should be the answer to the following question:
- If the Applicant's technology would not be available, what would be the alternative(s)?

Below are a set of criteria that can be used by the Applicant or the verifier to choose the best relevant alternative.

The relevant alternative should perform an identical or similar function and achieve a similar end-result than the technology under verification. The technology and the relevant alternative could be:

- Very similar technologies, e.g., a pump and a more efficient pump
- Very different technologies, e.g., a UV water disinfection system and a sand filter
- An association of technologies working in sequence to produce a similar ultimate function, e.g. a sorting procedure including dismantlement can be an alternative to a crusher.

The verifier will confirm whether this alternative is appropriate, or whether a more suitable technology should be used based on existing operational technologies for the targeted market.

- The relevant alternative should refer to a technology that is both current and commercially available. It should be legal and accepted by the end-users on the specific targeted market. In some very dynamic fields, the relevant alternative could also be defined as the state of the art in that particular topic or application. However, it should be noted that if the state of the art for that field yields already a significantly high level of environmental added-value, then a comparison should be weighed with care as a lower performance could be equally acceptable and still overall positive. For example, in the case of an advanced wastewater treatment process, such as a granular activated sludge process, the choice would be between a conventional wastewater treatment process such as activated sludge, which would be the standard process, or for example choosing another system of granular sludge that would be the current state of the art.
- If the technology is a similar or improved version of something already on the market, then the relevant alternative should be the already existing version of this technology on the market unless this technology is not sufficiently widespread or accepted. For example, in the case of a new versatile LED lamp, the relevant alternative could be another type of LED lighting or fluorescent lighting (which is maybe the more widespread solution) depending on the particular application.
- If the Applicant's technology is a completely new solution for a certain problem, then the relevant alternative is not using this technology at all. For example, in the case of an entirely new process for recycling a certain waste that was never previously recycled, the relevant alternative could be the disposal without recycling, such as landfill, incineration etc. The relevant alternative must also be aligned with the EU or each country's legal requirements for that particular situation.
- Preferably, the relevant alternative should be recognised as having the highest possible general level of environmental protection but also a fair market acceptance. This is to avoid making comparisons with technologies that are so innovative and so advantageous in providing an environmental added-value that the assessment does not truly reflect the advantages in comparison to what is commonly used in the market. In the case where all alternatives provide a poor level of environmental protection, then one should choose the one with the least harmful pressures. For example, if the market offers technologies that are either

non-energy efficient or energy-efficient and if both are current, then the relevant alternative should be energy-efficient.

System boundaries

The tool used in these guidelines simplifies the life-cycle of the technology into 4 stages

Extraction, refining, processing, transformation and transport of natural resources (raw materials, energy)

Every aspect of all activities involved before the manufacture of the technology's equipment or products; this is likely to include the extraction, treatment, transformation and processing of natural resources (raw materials, energy) together, where appropriate, with the production of any remote components. By definition, this also includes all of the raw materials, the energy and water used and all waste or emissions released to the environment during these activities.

Manufacturing of parts, components, machinery and of products

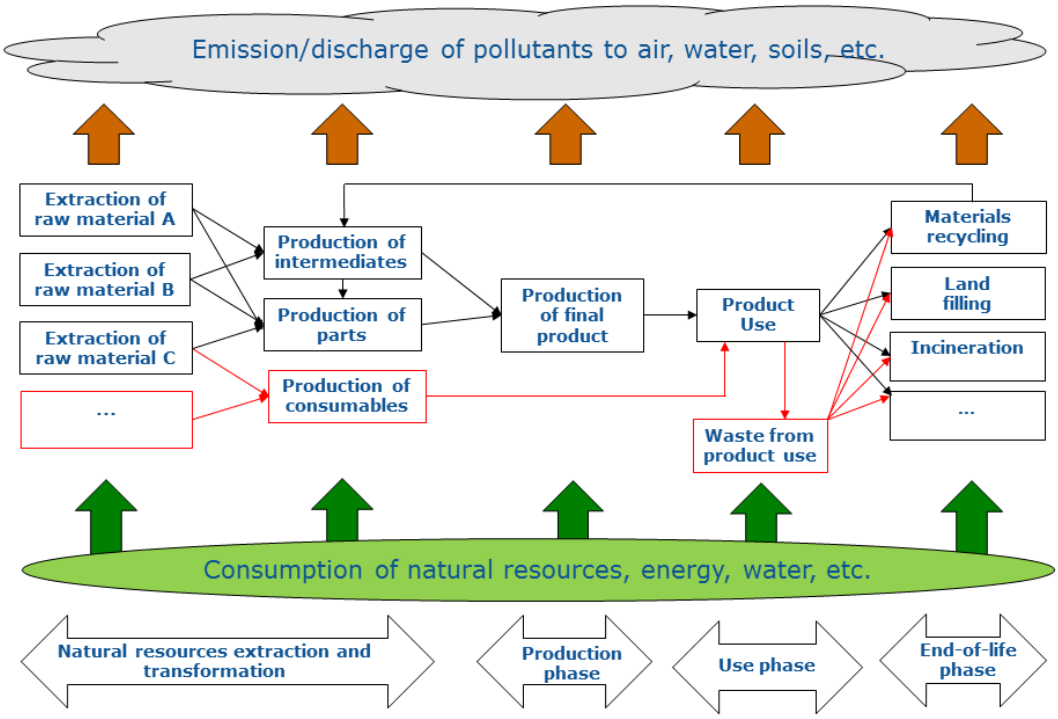
Every aspect of all activities involved in the production of the technology. In general, it is expected that this will include the production of most if not all sub-assemblies. This also includes all of the water, energy and consumables used, together with all of the emissions and all of the products and wastes. This will generally occur on production sites operated by sub-contractors or under control of the Applicant

Use and maintenance phase of a product, a process or a service

Every aspect of the use of and maintenance of an equipment and/or a product by the client/end-user, including consumables and where applicable their life-cycle, and all raw materials, energy and water used for its functioning, as well as all the emissions, products and waste streams.

End of life of an equipment or of a product

Every aspect of all activities involved in the ‘End of Life’ of a product or an equipment, when it is discarded by the client/end-user, including its recycling, dismantling, reusability and/or disposal of all components. As above, this also includes all of the water, energy and consumables used, together with all types of emissions, all of the products and wastes.



Life-cycle stages of a product or a process. The elements in black picture a simple product that does not require consumables for its operation and does not generate waste. The elements in red picture a more complex situation where the product (or process) requires consumables for its operation (e.g., filters, oil) and generate waste (e.g., wasted filters, waste oil). These elements may have to be taken into consideration in a life-cycle perspective of the technology

The Applicant helped or not by the VERIFIER, will then need to provide the following in the application template:

1. **Define the important phases for this technology**. For each of the above-mentioned stages, the Applicant will identify if this phase is likely to present significant differences from an environmental perspective in comparison to the relevant alternative.

2. For each important phase, provide qualitative or quantitative information for the various environmental criteria described in section 4. In some instances the Applicant may be unable to provide information for one or more of the stages. This is the case when he can justify or provide convincing evidence that:

    - the technology will lead to environmental pressures/impacts that are not significantly different than those of the relevant alternative
    - those environmental pressures/impacts are negligible compared to those of the other phases
    - the information is not available or not relevant for the considered technology

3. **Information should be available for at least the manufacturing and use phases**. It is expected that for the manufacturing and use stages the Applicant

will normally possess relevant information, as designer and manufacturer of the technology

The following considerations could be useful when filling the necessary information:

- Lack of information, especially concerning raw materials, sub-assemblies and components. It is understood that the Applicant may not have access to full details of the all of the activities described in the four stages above, especially where materials or sub-assemblies are produced by others in the supply chain, and for activities involved in the 'end of life' stage (perhaps in other countries). In these cases, if specific information is not available, consideration should be given to the materials, 'substances' and processes involved in these stages - based on generic information that is reasonably available. For example, if it is known that a sub-assembly requires specific raw materials, unless particular information is available it could be assumed that these will be sourced from the country which is the major producer of those materials, using the methods and processes which are prevalent in that country.
- Important environmental parameters should be included in the verification. If some environmental parameters are considered important, they should be considered for inclusion in the verification. If after verification there is still uncertainty about potentially important environmental factors, this should appear in the verification statement.

The focus on the life-cycle stages could be different whether a product, a process or a service is being verified and depending on the innovative characteristics of the technology. E.g., if a technology is innovative because it uses biodegradable materials instead of conventional materials, then, apart from the information on the manufacture and use phases, the Applicant shall provide information for the "extraction, refining, processing and transport of natural resources" stage and for the "end of life" of this technology. On the other hand, if the technology proposed will use a manufacturing process different from the relevant alternatives so as to increase its efficiency during the use phase, but the natural resources used are similar to the relevant alternatives, the key stages would then be the manufacturing and the use phase. For both these phases the Applicant shall indicate the differences with the relevant alternative but may indicate that for the natural resources extraction the technology would be similar to the relevant alternative although specifying that he has no precise information to confirm this.

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LIST OF ENVIRONMENTAL CRITERIA

For each of the relevant stages, identified in the previous section, information should be provided by the Applicant pertaining to a series of environmental parameters.

For the relevant stages identified in the previous section, the Applicant shall provide at least qualitative information and when possible quantitative information on the environmental criteria listed below as long as relevant for the technology in question (to be determined in cooperation with verifier). To facilitate the qualitative process, the information may be provided in relation to standard knowledge available for the relevant alternative or it may be provided in absolute terms and the verifier could use its expertise to assess how this information compares to the relevant alternative.

Emission of pollutants to air

Identify or quantify additional, increased, reduced or removed air pollutants including green-house gas emissions vs. the relevant alternative.

Emission of pollutants to water

Identify or quantify additional, increased, reduced or removed water pollutants vs. the relevant alternative.

Emission of pollutants to soil

Identify or quantify additional, increased, reduced or removed soil pollutants vs. the relevant alternative.

Consumption of natural resources

Identify differences in consumption of rare raw material required for the process vs. the relevant alternative.

Energy consumption

Identify differences in energy consumption and in energy sources (indicate differences in use of non-renewable or renewable energy) vs. the relevant alternative.

Water consumption and related processes

Identify differences in the consumption or the use of water vs. the relevant alternative but also the quality of the water used and the necessary treatment before and after use. This section includes process water, but also water used in bulk such as cooling water.

Production of non-hazardous waste

Identify or quantify any additional, increased, reduced or removed non- hazardous waste vs. the relevant alternative.

Production of hazardous waste

Identify or quantify any additional, increased, reduced or removed hazardous waste vs. the relevant alternative.

If relevant, additional information on the productivity of the technology should also be provided, namely:

Production efficiency – productivity

Indicate any significant differences in productivity of the technology vs. the relevant alternative. The proposed technology could have a higher performance but at the expense of a lower productivity or vice-versa (e.g.: for recycling, ratio of substance recycled vs. quantity of substance contained in the waste; for a ion-exchange resin, the treated flow rate).

Production efficiency – final quality

Indicate the differences in the quality of the final product vs. the relevant alternative. The technology could be more environmentally beneficial but resulting in a product that is of lower quality that the relevant alternative (e.g. for recycling: the level of purity of the recovered substance; or for a particular material such as a plastic: a material that costs less energy to make but that resulted in lower quality characteristics).

For any relevant item, the Applicant should provide enough information in order to allow the verifier to understand the nature and magnitude of potential environmental pressure/impacts. However it is acceptable under certain items for the Applicant to demonstrate or provide supporting information, that a particular item is not relevant or that it has no significant impact on the environment.

The Applicant may also provide extra information that might be useful for the assessment relating to economic, social and safety aspects – if they are not already included in the "potential to meet user needs" section – so as to justify or complement the information provided for environmental criteria. For example, a technology might be proposed that has little or no environmental benefits in comparison to the already commercially available alternatives but that provides greater social, economic or safety benefits and therefore could be equally recommended for ETV since it could improve the availability or acceptance of environmental technologies.

The Applicant should, as far as possible, provide relevant documentation to support the information provided in the tables, especially when this information is crucial for the evaluation. The verifiers are expected to scrutinise the reliability of the information provided and request supporting information when needed.

ASSESSMENT OF THE ENVIRONMENTAL ADDED-VALUE

It is the responsibility of the Applicant to provide sufficient and relevant information about the technology. Based on the information provided, the verifier will assess the environmental added-value of the technology. This assessment will be provided to the Applicant, for information, discussion and in order that improvements may be made where appropriate.

This assessment will serve as an aid so as to confirm the decision at the eligibility stage of:

- recommending a verification; ii) not recommending a verification since the environmental added value does not seem to justify the need for an ETV; iii) refusing the verification due to serious environmental issues (noncompliance with the definition of environmental technology).

Each item of information will be 'scored' on the following basis:

- Major negative differences in comparison to the relevant alternative (--)
- Significant negative differences in comparison to the relevant alternative (-)
- No significant differences in comparison to the relevant alternative (0)
- Significant positive differences in comparison to the relevant alternative (+)
- Major positive differences in comparison to the relevant alternative (++)
- Not relevant (NR)
- Not available (NA)

The results can be compiled in the following table:

	Raw materials extraction phase	Manufacturing phase	Use phase	End of life phase
Emission of green-house gas				
Emission of pollutants to air				
Emission of pollutants to water				
Emission of pollutants to soil				
Raw materials consumption				
Energy consumption				
Water consumption				
Production of non-hazardous waste				
Production of hazardous waste				
Production efficiency – productivity				
Production efficiency – final quality				

The scoring will then be evaluated in the following way:

1. Has the Applicant provided sufficient information to draft a conclusion? Does the VERIFIER judge that the key points related to this technology have been addressed?

- **Yes**: Proceed to point 2.
- **No**: Can this be improved using the Verifiers expertise and/or in further discussions with the Applicant?
    - **Yes**: Review application.
    - **No**: Is there a good justification for the absence of all the necessary information, e.g., if a technology has not yet been tested in full-scale or even at prototype level, but lab-scale research data indicates promising environmental benefits?
        - **Yes**: Proceed to point 2.
        - **No**: Defer the application and recommend that the Applicant returns when adequate information is available.

2. Are there severe negative aspects identified (--)?
    - **No**: Proceed to point 3.
    - **Yes**: Are there more than 2 severe negative aspects (--)?
    - **Yes**: Are there sufficient environmental benefits (++) or any special circumstances that can justify the poor environmental performance in some criteria?
    - **Yes**: Not recommend pursuing an ETV but should leave the decision up to the Applicant as long as he is aware of the risks and the implications of continuing with the verification, and that he is informed that the negative aspects identified should be included in the verification
    - **No**: Refuse the technology for ETV
    - **No**: Are there sufficient positive aspects that balance the negative environmental pressures (should have at least the same number of important environmental benefits (++) than major negative aspects or an overall significantly better performance than the relevant alternative for all other criteria (+))?
    - **Yes**: Recommend pursuing an ETV as long as the Applicant is informed that the negative aspects identified should be included in the verification
    - **No**: Are any of these important negative aspects sufficiently severe to risk the reputation of ETV and to outweigh any positive environmental benefit?
    - **No**: Not recommend pursuing an ETV but should leave the decision up to the Applicant as long as he is aware of the risks and the implications of continuing with the verification
    - **Yes**: Refuse the technology for ETV

3. Does the technology proposed present any environmental added value in comparison to its relevant alternative (+)?
    - **No**: Are there any other reasons, for instance related to social, economic or safety, that strongly support the suitability of verifying this technology, in particular if the relevant alternative chosen is already proving a high level of environmental protection?
    - **Yes**, there are several other reasons such as relevance to the market, lower costs, higher safety level or higher social acceptance*: Recommend pursuing an ETV as long as the Applicant is informed that any negative aspects identified should figure in the verification as well.*
    - **No**: Are there any negative aspects in comparison with the relevant alternative?
    - **Yes**: Not recommend pursuing an ETV but should leave the decision up to the Applicant as long as he is aware of the risks and the implications of continuing with the verification.
    - **No**: Recommend pursuing an ETV, in particular in situations where the relevant alternative is already providing a high level of environmental protection
    - **Yes**: Are there any negative aspects in comparison with the relevant alternative?
    - **No**: Recommend pursuing an ETV
    - **Yes**: Do the negative aspects qualitatively outweigh the positive environmental aspects?
    - **No**, the environmental added value seems to be far greater than any negative aspect identified, especially in situations where the relevant alternative already provides a high degree of environmental protection: *Recommend pursuing an ETV as long as the Applicant is informed that any negative aspects identified should figure in the verification as well.*
    - **Yes**, the quantity and significance of the negative aspects identified partly or greatly overweighs the only/few environmental benefits: *Not recommend pursuing an ETV but should leave the decision up to the Applicant as long as he is aware of the risks and the implications of continuing with the verification.*

This scoring is proposed as a guide to decision and should not be substituted to the Verifiers knowledge and judgement of the specific technology at hand.

Annex 4. Sample structure of the verification plan

1. Identification of the verifier:
    a. Organisation name,
    b. Address of the physical location,
    c. Organisation registration number,
    d. Organisation contact,
    e. Accreditation status,
    f. Phone number,
    g. Email address,
    h. Website.
2. Identification of the Applicant:
    a. Organisation name,
    b. Address of the physical location,
    c. Organisation registration number,
    d. Organisation contact,
    e. Phone number,
    f. Email address,
    g. Website.
3. Unique identification of the verification plan and date of issue:
    a. A unique verification plan document number should be assigned.
    b. Person(s) responsible for verification: contact details of persons responsible for verification
4. Description of the technology:
    a. Brief description of the technology and its technical and scientific principles,
    b. Intended application including matrix, purpose, technologies, technical conditions,
    c. Key environmental impacts and emissions (including anticipated environmental benefits),
    d. Market readiness, etc.
5. Technical and operational organisation of the planned verification.

6. A description specifying the steps of the verification, verification logistics, roles and responsibilities of the involved bodies (including the Applicant), specification of experts involved, information on data files or documentation needed from the Applicant and Test Body, etc.
7. List of performance parameters, their assigned numerical values and the description of how they will be verified; technical and operational details of the planned verification.
8. A table listing the performance parameters with their numerical values, along with details on how these performance parameters should be evaluated and verified.
9. Requirements for the test data, including quality and quantity and test conditions;
10. Methods for the assessment of the test data and their quality. Requirements for the management of test data and data storage, as well as information on how performance parameter values will be calculated based on the raw measurement data, including calculation methods, statistical methods, assessment of uncertainty, confidence levels, etc.
11. Information pertaining to test data quality should also describe the means for evaluating test quality (e.g. a test system assessment for compliance to ISO 17025 requirements).

Annex 5. Guidelines on the Acceptance of Existing Test Data

This guideline is based on the Guidelines on the Acceptance of Existing Test Data, Version 1.0 2015, produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment for the EU Environmental Technology Verification Pilot Programme and the revision of the document made by the ETV Secretariat in 2022.

1 Existing test data in the context of ETV

Verification of an environmental technology performance claim under the ETV schemes requires a defendable and complete data set produced through testing. The Verification Body specifies performance parameters to be verified and develops a Verification Plan that includes a test design detailing which parameters have to be measured, test methods to be used, test conditions and data quality requirements as well as specifies the evaluation methods and quality assurance of the testing process.

ETV allows two options concerning the generation of the test data:

1. the tests are carried out during verification, based on the requirements of the Verification Plan;
2. the Applicant may already possess some test data before the verification is initiated. ISO 14034 Sub-Clause 5.2.1 on Application requirements explicitly includes specific requirement (d) allowing the inclusion of such 'existing data' in the application documentation. The Verification Body assesses the test data, and may report reports on their acceptability already in a dedicated section already in the Verification Plan or upon the assessment of all test data in the Verification Report

2 Conditions for acceptance of existing test data for performance verification

Sub-Clause 5.4.2 of ISO 14034 describes under which circumstances the existing test data can be accepted for verification.

The existing test data shall meet the following requirements:

a. are relevant for the performance to be verified;

b. are produced and reported according to the requirements of ISO/IEC 17025;

c. meet the requirements specified in the verification plan.

The purpose of existing test data assessment for their acceptance for ETV is to enable the Verification Body get evidence and confidence that the test data was generated and the testing was performed properly and in line with the Verification Plan and the Test Plan, e.g. by qualified personnel, using adequate and properly calibrated instruments, following appropriate methods, using suitable sampling and data management procedures etc in line with ISO/IEC 17025 requirements.

Existing test data shall include sufficient information for its assessment considering these 3 aspects, i.e.:

- a clear indication of the object of testing to enable tracing to which object of testing the data refers to e.g. a commercial name of the technology,
- an identification number or applicable version, and the full address and status (e.g. independent/dependent, certifications and accreditations etc.) of the data supplier and of any third parties involved (e.g. test design, witnesses etc).
- a test plan and test report shall be provided along with any other information covering in substance the content.

The Verification Body shall assess the existing test data to qualify for performance verification considering the following requirements:

- The test data are relevant, sufficient and adequate for the performance to be verified i.e. they correspond to the parameters, methods and target values of the specified performance parameters to be verified;
- The test data are produced and reported according to the requirements of ISO/IEC 17025 for example a detailed test plan that was followed during the testing and a test report are available, the quality assurance and control measures implemented during the testing comply with the requirements of ISO/IEC 17025, the testing was performed in a way ensuring its impartiality, etc;
- The test data meet the requirements specified in the verification plan e.g. they were produced with the same test methods as the ones specified for performance parameters to be verified and generated in testing conditions corresponding to the intended application (and purpose and matrix) defined for the verified technology and its performance together with the operational parameters, assumptions, constraints and limitations applying to the performance claim;
- Test data is provided in a format that allows assessment against the above mentioned requirements.

3 Assessment of existing test data in the ETV process

Available existing test data may be considered by the Verification Body during:

3.1 Initial contact (prior to Application): IDENTIFICATION

During the initial contact the Verification Body should identify if there is any existing test data with a potential to be accepted for verification. The cost and the complexity of the verification may be influenced by the existence of relevant test data. Therefore, it is important to clarify at this stage if there are any existing data relevant to the performance claim and to have some preliminary idea if this data will meet the requirements of ISO 14034. It is important to stress that at this stage, the Verification Body is not expected to perform an in-depth review of the existing data. Such in-depth review must take place at a later stage and be based on the Verification Plan, that establishes how the verification and testing relevant to the performance claim should be conducted. Therefore any indication given by the Verification Body at this stage is indicative only.

3.2 Application PRELIMINARY ANALYSIS AND EVALUATION

The aim of the Application is to provide all relevant information needed to conduct the ETV process. The Applicant is requested to provide any existing test data including test plans, test reports, test methods and the qualifications of the Test Bodies.

The eligibility check, through which the Verification Body assesses the eligibility of the technology for verification may require analysis of existing test data to evaluate for example the maturity level of the technology, the quality of performance claim, potential environmental aspects and impacts and to give an indication of the complexity and potential cost of verification.

The conclusion reached at this stage is a preliminary judgement that will help to enable initial assessment of costs, draft the time schedule of the verification, provide feedback for the development of the test design in the Verification Plan, and sometimes to modify the claim. However, it is very clear from ISO 14034 that meeting the test data generation requirements set in Sub-Clause 5.4.2 is an essential criterion for accepting the existing data . Therefore a firm judgement on the acceptance of the existing test data for the purpose of verification can only be made as a part of the Verification procedure, once the Verification Plan under the Pre-verification process is completed .

It is important to highlight, that any existing data that is not accepted for the purpose of verification may be used for other purposes as background information. For instance, it could provide useful information for test design (e.g., the standard deviations computed from the data may provide indication concerning the size and number of samples needed). Some information could also be provided as 'additional information' in the statement of verification (with the relevant caveats).

3.3 Verification: VALIDATION

Verification procedure compliant to Clause 5.4 of ISO 14034 includes the core activity related to existing test data acceptance assessment. The assessment is done in relation to test data requirements specified in the Verification Plan through the **"test system assessment**". Without an ISO/IEC 17025 accreditation valid at the moment of the testing covering the tests under consideration, then test system assessment has to include a "**test system audit**" which includes the review of relevant procedures, observation of actual practices and evaluation of the test performance. Where applicable, the audit may also include examination of control data for the relevant period, participation in proficiency testing and/or control of measurement device calibration. The main difference with new data is that, in the case of existing data, the Verification Body has to consider the situation at the moment of testing and not the current one, which can make things more complicated and uncertain.

4 Evaluation of the test and quality management systems

As indicated above, without an ISO/IEC 17025 accreditation valid at the moment of the testing covering the tests under consideration, then test system assessment has to include a "test system audit". The test system audit is meant to help the Verification Body in evaluating the suitability of the quality management and the test systems to produce test data for the needs of ETV. For more details see Annex 6.

It has to be noted that this audit is more complicated to perform and may be less conclusive when the tests are old (more than 1-2 years), as the situation of the Test

Body may have changed (new personnel, new procedures, new equipment….) Auditing the current situation would not reflect the situation that prevailed when the existing data were generated. Therefore, the Verification Body would have to consult the archives of the Test Body to find out what situation prevailed at that time, a difficult and time consuming task. It has to be stressed that ETV is directed at innovative technologies, and therefore it is not very suited for situations where data are particularly old. One could wonder the relevance and feasibility of evaluating data that are particularly old, although old data with very good quality records could still be considered as valid (risk based assessment).

A good practice would be that the Applicant anticipatively invites the Verification Body to perform a test system audit before or during the tests (i.e. before the start of the verification and in the context of a specific contractual arrangement). The Verification Body could then use the collected information during the verification process (see witness check below).

When the test system does not exist anymore (e.g. test facilities have been dismantled), the audit shall include at least an in-depth desk review of the Test Body Quality Assurance (QA) documentation related to tests performed, in force at the time of testing. Whenever possible and relevant, the desk review shall be accompanied by on site observations performed at the place of testing.

The above mentioned QA documentation is made of procedures and records (staff training and qualification, calibration of instruments, measurement and data logs, tractability sheets, non-conformities, test methods and method validation reports…). If such documentation is not available or not suitable/sufficient, the data cannot be accepted.

When performing the audit, attention should also be paid to the reliability of the tests by reviewing past records documenting the reliability of the data produced by the Test Body (e.g., laboratory control data for relevant period, evaluation of data from laboratory participation in proficiency test and control of calibration of online measurement devices,…).

Since the audit is similar for both new and existing data, the specific guidance document related to auditing of Test Bodies should be used (see Annex 6).

The results of this assessment are reported in Verification Report and Verification Statement.

5 Appropriate Test methods

The test data shall be collected using robust and appropriate measurement methods and sampling/reporting procedures in order to make sure that the figures correctly reflect the parameters to be assessed. The test method shall be in line with the requirements of the verification plan

In cases where the existing data have been produced using non-standard methods, the documented evidence supporting the(se) method(s) shall be provided. The Verification Body shall evaluate the suitability of the method, paying special attention to elements including: method validation, skills, traceability etc. This evaluation may include consultation with relevant test laboratories while respecting the necessary

confidentiality requirements. The result of this evaluation shall be documented in Verification Plan.

6 Final evaluation of existing test data

As indicated earlier, the data and accompanying documentation must be sufficient and provided in the appropriate format in order to allow this evaluation.

Meeting the requirements of the verification plan is an essential requirement. Deviations to the Verification plan have to be reported and evaluated. Deviations that are not judged acceptable to the Verification Body shall lead to the rejection of the data, possibly after a dialogue with the Applicant. This requirement is not discussed further here, because it derives directly from the Verification plan, which should provide the method or criteria for evaluating the compliance of data with requirements.

Besides the Verification Plan requirements, the Verification Body should have a critical look at the existing data, examining in particular whether the data are:

- reliable, i.e. collected using appropriate methods and procedures and within an appropriate quality system
- of sufficient quality, e.g. within the sufficient level of precision,
- relevant, i.e. related to the current version of the technology (and not to an outdated version), but also reflecting adequately the verification parameters set out in the verification plan,
- complete, i.e. covering all the relevant parameters including environmental and performance parameters. (NB: incomplete existing data does not necessarily have to be rejected, provided it can be complemented by new data).

If an important parameter is missing from the data sets, the existing data may have to be rejected. For instance, if ambient temperature influences the performance of an energy saving device, but ambient temperature was not monitored during testing, then the data should not be used for the verification, or only with extreme caution and with the necessary caveats in the Verification Report and verification statement.

A statistical analysis has to be performed in order to determine the validity of the results, e.g. are the standard deviation and confidence intervals within acceptable limits, are there outliers etc. In principle adequate acceptance criteria should have been developed in the Verification Plan.

All the relevant new and existing data that have been collected have to be presented and discussed. Partial or selective elimination of data is not allowed unless there is a good reason for doing so, e.g. in the case of outliers that can be attributed to experimental errors. When such a situation occurs, this shall be acknowledged and duly justified in the Test and Verification Reports and, if potentially impacting the conclusions of the verification, in the Verification Statement.

7 Test data assessment tools

The 'tools' presented below allow deeper insight in the acceptability of the existing data. To the extent possible, their eventual usage should be anticipated in the verification plan.

Spot checks

The terms 'spot check' refer to the random checking of a certain portion of the data. For example it can be considered advisable that between 5-10% of the existing data for each claim is checked. The checks should concern all the steps where the introduction of an error is possible. It can be for example the transcription of raw data into a spreadsheet, or the statistical calculations and interpolations carried out by the Test Body.

If a mistake is identified, its origin should be investigated and, when possible, the values should be corrected. In this situation, a broader range of data should be checked in order to detect other possible mistakes. Eventually, a complete check may be needed in cases where several mistakes are identified.

Correction of mistakes can only be done once their source is identified and one is sure that the corrected dataset adequately reflects the situation. Such corrections have to be reported in the Verification plan, or in the Verification Report where applicable.

If errors cannot be corrected satisfactorily, or if the errors cast doubt on the reliability of the data, then the existing data should be rejected, partially or totally. However errors that will not influence the conclusion of the whole verification can be tolerated but should be reported anyway, with the reason for accepting them. For example, if there is doubt whether the value of 1 sample out of 50 samples is 782,8 or 788,8. The impact of the error on the value of that particular sample is less than 1% and the impact on the average value of all samples is less than 0,015 %. If the required precision for this particular test is 1%, the error can be tolerated.

Witness checks

This covers several possibilities:

A visit to the Test Body's premises and evaluate 'quantitatively' the 'performance' of the tests. Typically this would involve repeating some tests using the same methods and procedures as for the existing data and see whether any significant difference arise. Samples with known properties could be tested in order to determine the accuracy of the measurement chain (e.g. actual detection limit and precision). The checks may focus on the measurement devices that have been used in order to determine the repeatability and accuracy of the results.

Alternatively, this may refer to the witnessing by the Verification Body of the tests performed before the start of the verification, while respecting the conditions of independence between Verification Body, Applicant and Test Body. The observations (e.g. evidence that quality assurance and testing procedures have been respected and possible deviations) made by the Verification Body on this occasion would then be included in the elements used by the Verification Body to evaluate the existing data.

Conditional acceptance of existing data

Conditional acceptance of existing data is a powerful tool to ensure suitability of the existing data. Typically, conditional acceptance may be linked to additional testing confirming the existing data or to the execution of the test system audit. When the new tests show significant differences with the existing data, the reasons need to be

investigated and, when applicable, the existing data should be rejected. This leads to an iterative verification process.

Conditional acceptance may also be linked to the successful outcome of the spot checks, the witness checks, and/or the test system audit mentioned above. If case the test system audit could not be carried out before the finalisation of the verification plan then conditional acceptance of the existing data is necessary.

In the case of conditional acceptance, this provisional conclusion about the acceptance of existing data should be reported in the verification plan with the conditions attached to the acceptance explicitly and clearly mentioned. The conclusion on the possible need for further tests, should logically be also conditional. The final conclusion on the acceptance of existing data should in this case be reported in the Verification Report, together with the results of spot checks, witness checks and/or test system audit where relevant and any other check or assessment of the existing data undertaken after the verification plan stage.

In principle, the acceptance should remain conditional until the Verification Body has examined all evidence supplied by the Applicant, gathered all elements needed to perform the verification, including results from any tests, checks and audits, and has made sure that all requirements related to existing data are met, i.e. in most cases until the Verification Report is finalised and approved.

Annex 6. Guidelines on Auditing Test Bodies

This guideline is based on the Guidelines on Auditing Test Bodies, Version 1.0 2016, produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment for the EU Environmental Technology Verification Pilot Programme and a revised version of this document provided by ETV Secretariat in 2022.

The credibility and reliability of ETV depends on a well understood and well implemented quality system as outlined in Chapter C of this Handbook. The quality system is based on a standardised framework. Central in this quality system are the qualifications of the Test Body and its ability to perform properly the required tests and generate quality assured test data. This depends on the ability of the Test Body to deploy a test system and a quality management system that are suitable for the tests to be performed. The test system is the system in which the tests are carried out. It covers aspects like:

- Personnel resources and their qualification involved in testing,
- Facilities and environmental conditions used for testing
- Equipment used to perform testing
- Metrological traceability
- Provision of external products and services if relevant (e.g. when some test are subcontracted)
- Process requirements including selection of appropriate test methods, sampling procedures, calibration of equipment involved in testing,
- Technical records, data transmission etc.
- Measurements uncertainty
- Reporting of results

To ensure the appropriateness of the test system and of the quality management system, the Verification Body shall perform a **test system assessment** i.e. determine whether the test system and quality management system applied by a Test Body to generate test data for verification purposes comply with the requirements of ISO 14034 and the Verification Plan.

ISO 14034 specifies standard *ISO/IEC 17025* – 'General requirements for the competence of testing and calibration laboratories' as reference for test data quality assessment. These standard covers both quality management and technical requirements related to the test system and serves as a basis for the definition of the test system assessment scope i.e. with or without test system audit. '**Test system audit'** means the examination of a test system and of a quality management system. It is achieved through the review of relevant procedures, observation of actual practices and evaluation of test performance. Where applicable, it includes the examination of control data for relevant period, participation in proficiency testing and/or control of calibration of measurement devices. It is aimed to provide the necessary evidence for the test system assessment.

TEST SYSTEM ASSESSMENT

The Verification Body is obliged to assess the capability of the Test Body to perform the tests and produce reliable, quality assured test data. by examining the suitability of the quality management system and of the test system. This is achieved through the test system assessment, as indicated above.

The assessment is *de facto* a risk assessment, trying to identify 'what could go wrong' when executing the tests as specified in the Test Plan and Verification Plan . The risk is substantially lower, when the test system used to generate test data for the needs of ETV was operated by a Test Body accredited to ISO/IEC 17025 for the methods of testing and calibration relevant for the test data generation.

A key step in the assessment is the decision as of whether to perform a test system audit or not. In the absence of ISO/IEC 17025 accreditation for the methods of testing and calibration relevant for the test data generation, the audit of the Test Body is necessary. In case of such accreditation the audit may be omitted, but the Verification Body may still decide to perform an audit if there is a perceived risk, based on elements like complexity of the tests, reputation of the Test Body, its accreditation history, experience with previous testing, etc.

Below are the circumstances under which it is considered justified not to perform the 'test system audit' for existing data:

a) At the time of testing, the Test Body was ISO / IEC 17025 accredited for the methods of testing and calibration relevant for the verification process

b) At the time of testing, the Test Body was ISO / IEC 17025 accredited for tests that are very similar to those involved in the verification process, in that they provide data of the same quality.

c) When the Verification Body has positively audited the Test Body for identical or very similar tests, within a period of 12 months before or after the tests, and has sufficient confidence in the quality of the test system for the tests at hand.

The scope of the test system assessment (with our without an audit) should be anticipated in the Verification Plan. Table 1 provides an indication which requirements of ISO/IEC 17025 should be considered when designing a test system assessment scope.

Table 1. Relevance of ISO/IEC 17025 requirements when scoping the test system assessment under ETV

ISO-17025:2017 Requirement	Relevance for ETV			Comment
	Essential	Important	Minor	
4. General requirements				
4.1 Impartiality	4.1.1 to 4.1.5			
4.2 Confidentiality	4.2.1 to 4.2.4			
5. Structural requirements	5.1, 5.2, 5.3, 5.4, 5.5, 5.6	5.7.b)	5.7.a)	
6. Resource requirements				
6.1 General	all			
6.2 Personnel	all			
6.3 Facilities and environmental conditions	all			

ISO-17025:2017 Requirement	Relevance for ETV			Comment
	Essential	Important	Minor	
6.4 Equipment	all			
6.5 Metrological traceability	all			
6.6 Externally provided products and services	6.6.1, 6.6.3	6.6.2		focus should be on the services and supplies that are used in the tests applicable to the verification
7. Process requirements				
7.1 Review of requests, tenders and contracts	7.1.2, 7.1.3, 7.1.7	7.1.1, 7.1.4, 7.1.5, 7.1.8		
7.2 Selection, verification and validation of methods	all			
7.3 Sampling	all			
7.4 Handling of test or calibration items	all			
7.5 Technical records	all			
7.6 Evaluation of measurement uncertainty	all			
7.7 Ensuring the validity of results	all			
7.8 Reporting of results	7.8.1, 7.8.6, 7.8.7, 7.8.8		7.8.2, 7.8.3, 7.8.4, 7.8.5	7.8.2, 7.8.3 and 7.8.5 are replaced by appendix 7 of the GVP as far as test reports are concerned
7.9 Complaints		All		
7.10 Nonconforming work	7.10.1, 7.10.2	7.10.3		
8. Management system requirements				
8.1 Options	all			
8.2 Management system documentation (Option A)		All		
8.3 Control of management system documents (Option A)	all			
8.4 Control of records (Option A)	all			
8.5 Actions to address risks and opportunities			all	
8.6 Improvements (Option A)			all	
8.7 Corrective actions (Option A)	all			Essential when the nonconforming work could reoccur during the tests related to the verification
8.8 Internal audits (Option A)		All		
8.9 Management reviews (Option A)			all	

TEST SYSTEM AUDIT

The purpose of the audit is to collect and evaluate relevant objective evidence allowing to assess the suitability of the quality management system and of the test system of the Test Body and its compliance to ISO/IEC 17025 requirements.

The scope and content of the audit shall focus on those requirements of ISO/IEC Standard 17025 - General requirements for the competence of testing and calibration laboratories, that are considered relevant for the tests to be performed (see Table 1) . The scope of the audit may be extended to address additional requirements set in the Verification Plan.

The audit has basically 3 components:

I. The test system, i.e. the general test requirements of ETV, covered by Sections: 6.Resource requirements and 7. Process Requirements of ISO/IEC 17025.

II. The quality management system (QMS), i.e. the quality management requirements of the ETV, by Section 5 Structural requirements and Section 8 'Management requirements' section of ISO/IEC 17025.

III. The performance of the tests themselves

The verification The scope and depth of the test system audit has to be decided in a risk-based perspective and a case-by case basis by the Verification Body , in light of the nature complexity of the tests, the experience of the Test Body, its possible accreditations, notifications or certifications.

A step-wise audit procedure as suggested in the following section may help focus on-site observations to the essential elements.

AUDIT PROCEDURE

It is recommended to perform the test system audit in several steps:

1. Preliminary assessment, for example through a questionnaire to be filled by the Test Body. If available, the reviews of the Test Plan and of the Test Report can also provide valuable pre-audit information. Thanks to the preliminary assessment, some potential gaps can be identified, the Test Body is given a chance to perform corrections, and then the detailed audit can be performed.

2. Desk review: review of the QMS and test procedures. It can be performed remotely (off-site) if all procedures and manuals can be made available to the Verification Body. It can be facilitated using a dedicated check list. This can be seen as the "say what you do" part of the audit.

Those two steps could allow to focus the scope of investigations to be performed on-site in the third step, in a risk-based perspective, as explained above.

3. On-site observations: control of the adequate implementation in practice of the QMS and test procedures, performed on-site. This can be seen as the "do what you say" part of the audit. It aims at obtaining confirmation of proper implementation of the procedures that can influence the outcome of the tests: is there evidence that the Test Body adequately follows these procedures? It will

notably look at the suitability of the measurement method, the test system, and test operators, by examining the test in operation, methods, equipment, data quality control and review, and operator understanding and competence.

A more detailed audit procedure can be recommended as presented in diagram below:

Step 1: preliminary assessment	1. Test Body fills-in the questionnaire (see annex for typical questions) 2. Verification Body reviews questionnaire (and other relevant material like test plan and test report if available) 3. Verification Body gets further insight via remote phone and/or video conference 4. Verification Body identifies possible 'gaps' 5. If no significant gaps, the audits can be further carried out (go to step 10) 6. If important gaps are identified, Verification Body discusses with Test Body how to fill the gaps 7. Test Body take steps to fill the gaps 8. Test Body informs Verification Body about steps taken 9. Verification Body approves or requires further work (back to step 5)

Step 2: detailed assessment	10. In-depth review of quality documentation based on the results of the preliminary assessment 11. Scope of on-site investigations is decided

Step 3: On-site visit	11. Verification Body goes on-site and performs the necessary observations 12. Verification Body collects test performance data

Audits conclusion	13. Verification Body performs overall assessment based on audit(s) results and other sources of information (documentation) 14. If the outcome is negative then back to step 6, or another Test Body has to be designated by the applicant (extreme case).

HOW MANY AUDITS?

As many test system audits have to be carried out as necessary. If there is one Test Body, then it is expected that in most instances one audit will be enough, but here are instances that can justify carrying additional audits:

- If the verification involves more than one test system. This would be the case for example when different tests are planned at different moments with different personal, different measurement equipment, maybe in different locations. Note that it may be possible to cover several test systems in a single on-site visit, depending on the availability of the test systems at the moment and place of the audit.
- When measurements span over a long period and when there is not sufficient evidence to demonstrate that the quality of data can be maintained (e.g. lack of either internal or external audits).
- When a first audit results in a negative outcome, a second audit may be required in order to control the improvements put in place by the Test Body as a result of the first audit.
- When there are doubts about the qualifications of a Test Body, the Verification Body may decide to come on site several times to witness the key phases of the testing procedure.
- When time did not allow to collect all required information during a first visit, or when the assessment of collected evidence reveals a need for further on-site investigations.
- When questions/doubts arise as a result of issues found in the test plan and /or report.

Technically, some of these instances can be seen as one audit split in several test site visits. The last instance (questions/doubts as a result of issues found in the test plan and /or report) implies that additional audits may have to be decided even at the end of the verification process.

WHEN TO CONDUCT AN AUDIT?

It is possible to conduct the test system audit before, during or after the tests. The options can be combined.

Before testing (pre-qualification audit)

Conducting an audit before testing allows identify in advance potential weaknesses in the quality or the test and quality management systems, and could allow to propose possible areas of improvement.

For instance this audit may be relevant when there are doubts about the competence/suitability of a given Test Body (e.g. Test Body unknown to the Verification Body, poor reputation, Test Body has little experience in the domain of the tests to be performed…). In the worst case it could allow to rule out an unqualified Test Body. If needed, the audit can even be performed before the Test Body elaborates the test plan, with a view to make sure that the Test Body does not engage in significant work without then applicant/Verification Body having sufficient evidence about Test Body suitability. Otherwise it is recommended to wait for the test plan before carrying the audit, as the test plan could contain useful information related to quality assurance issues.

It is advised to complement this audit with an on-site visit during testing, unless the audit findings provide high confidence in the capability of the Test Body to conduct the considered tests and to produce reliable and reproducible results. However, an audit before testing is not likely to be sufficient if at the time of the audit the Test Body is not carrying out tests that are similar to the tests planned in the verification. In such case, a second audit during testing is required

During testing (standard audit)

Conducting this audit allows to witness to operation of the Test Body for the specific tests at hand, and therefore to make pertinent observations about the relevant testing and quality management practices. In case of serious concerns, test results already obtained may have to be rejected. It is therefore recommended to perform the audit early in the testing process.

After testing (ex-post audit)

An ex-post audit comes generally as an additional audit that is supplementary to other audit(s) already performed. It can provide great benefits for example with selective and limited retesting, to determine the reproducibility, and/or parallel tests comparing measurements with those from an accredited test laboratory.

If no other audit is carried, then the ex-post audit should also look at current practices related to similar tests, and include an in-depth auditing of records related the period in which the tests have been carried out. Interview with personnel that was involved in the testing is also useful, if these personnel are still present. The ex-post audit can be used for instance in the case of existing data (data produced before the verification started).

In case of existing data, the ex-post audit is the normal situation. See Annex 5 for more information.

WHAT KIND OF EVIDENCE IS NEEDED?

The test system audits should be performed by collecting different types of objective evidence, for instance:

Desk review:

- Questionnaire (check-list)
- Relevant manuals and procedures and other documents
- Previous audit results and recommendations (internal and/or third parties)
- Test performance data: Laboratory control data for relevant period, reports of laboratory participation in proficiency testing etc.

On-site observations

- Examination of records (staff training and qualification, calibration of instruments, measurement and data logs, tractability sheets, non-conformities, method validation reports)
- Staff interview
- Examination of test equipment and premises

- Observation of practices (e.g. witnessing the tests and other relevant activities such as calibration, filling in of records, sample handling, data handling).

Moreover, the review of the test plan and test report, if available, is expected to deliver useful pre-audit information, e.g.:

- Which tests are covered by ISO 17025 accreditation?
- Which tests follow recognized methods?
- What are the quality insurance measure foreseen?
- Does the test plan/report refer to internal procedures?
- Do the test plan/report provide the relevant information about staff, measurement devices, test site, calibrations etc. ?

The relevant documents shall be used as main reference against which to make observations: test plan/report, verification plan, internal quality procedures relevant to the tests at hand, applicable standards and methods etc.

It may be useful to let investigations go beyond the tests at hand, in order to obtain confidence that the Test Body has a proven track record of good practices in various domains of testing. This is particularly true when the Test Body has little experience in the tests at hand.

The in-depth and exhaustiveness of the audit have to be tailored to each specific situation. In particular if there is satisfactory evidence of sound and robust procedures being well enforced, the number of spot checks can be reduced. In the opposite case, the number of checks has to be increased (e.g. verify that ALL relevant instruments have been properly calibrated).

DURATION OF THE AUDIT

The duration of the test system audit will depend on the complexity of the tests and of the test system, the qualifications of the TB and its experience with the considered tests, previous audit experience with the same TB, and VB's own experience with such audits. For a VB's first audits of this kind, 3-days duration for on-site observations is advised, to be progressively reduced according to experience if deemed advisable.

Another element to consider is the duration of the tests themselves. If their duration is limited (e.g. one to two days or less) then it may be worth to include in the audit the witnessing of the whole tests. This is all the more relevant when there is lack of evidence that the TB does have sound, robust and well-enforced quality and test procedures.

The audit involves some preliminary work, as well as an assessment of the collected evidence and the drafting of a report. This does not need to be performed on-site, and is not included in the three days duration mentioned above. The total effort for the audit could therefore be one week, but it could be also less or more, depending on the complexity and other factors highlighted above.

WHAT TO AUDIT?

As indicated earlier, the test system audit has three components.

a) Quality Management System (QMS) component

In case of ISO 9001 certification, the QMS component of the audit may be simplified: after a satisfactory desk review of QMS procedures, the VB may consider that the QMS requirements, or part of them, do not need to be verified on-site.

b) Test system component

The audit shall cover key factors that contribute to measurement reliability. The main question is "what could affect the quality of the result?" The factors to consider are:

- Competence of personnel
- Accommodation and environmental conditions
- Test methods and method validation
- Equipment
- Metrological traceability
- Sampling
- Handling of test and calibration items
- Quality of test and calibration results
- Reporting

The importance of those various factors has to be assessed according to the context, and the focus of the audit has to be adjusted accordingly. For example, is calibration crucial, is the personal quite familiar with those tests, is there a complex data transmission chain, are samples likely to deteriorate etc ?

When performing the audit, a special attention to the requirements of the Verification plan and the test plan is needed.

c) Test performance component

The test performance component of the audit aims at answering the following question: is there quantitative evidence of the reliability of the tests? This can be achieved through the review of relevant documentation e.g. calibration data, laboratory control data for relevant period, laboratory participation in proficiency testing, limited retesting to determine the reproducibility, parallel testing for comparing measurements with those from an accredited test laboratory etc. Whether this requires a site visit has to be determined on a case-by-case basis.

OUTCOME OF THE AUDIT

One important objective of the test system audit is to obtain satisfactory evidence that sound and relevant procedures exist and that they are efficiently enforced. This will give confidence that tests will be performed appropriately even when the auditor has left the

test premises. If procedures are poorly designed and/or enforcement level is weak, then the consequences have to be fully evaluated.

Overall, in case of doubtful audit outcomes, at least the following questions need to be addressed:

- Are test results already obtained valid?
- Is the Test Body allowed to proceed with testing?
- Are improvements required?
- Is supplementary testing required?
- Is another audit needed?
- Is it needed to witness all tests?
- How will this be reflected in the outcome of the verification itself (i.e.in the Verification Report and in the Statement of Verification) ?

In the worst case, the Test Body has to be considered as not qualified and therefore the applicant has to designate another Test Body.

AUDIT REPORTING

A summary of collected the evidence and test system audit conclusions shall be compiled in an audit report. The report structure should be in line with the elements audited.

The outcome of the audits including possible deviations has to be outlined in the Verification Report and in the Statement of Verification. To provide additional credibility to the verification, the audit report should be attached as an appendix to the verification report.

Annex 7. Table of Contents for the Test Plan and Test Report

Test plan

1. Introduction
    1.1. Name of technology
    1.2. Name and contact of Applicant
    1.3. Reference of the verification plan
    1.4. Name of Test Body/test responsible
2. Test design
    2.1. Test site
        2.1.1. Types of test sites
        2.1.2. Addresses
        2.1.3. Descriptions
        2.1.4. Special needs (e.g. access restrictions or clearance, training needs)
    2.2. Tests
        2.2.1. Test methods (incl. sampling methods)
        2.2.2. Test staff
        2.2.3. Test schedule
        2.2.4. Test equipment
        2.2.5. Type and number of samples
        2.2.6. Operation conditions
        2.2.7. Testing
        2.2.8. Technology maintenance
        2.2.9. Health, safety and wastes
        2.2.10. Analytical performance requirements (if applicable)
        2.2.11. Preservation and storage of samples (if applicable)
        2.2.12. Data management including storage, transfer and control (where applicable)
3. Quality assurance
    3.1. Test plan review
    3.2. Performance control – analysis

3.3. Data integrity check procedures

3.4. Test system audit

3.5. Test report review

4. Test report

4.1. Amendment report

4.2. Deviations report

5. References

Appendix 1 Terms and definitions

Appendix 2 References methods

Appendix 3 In-house test methods

Appendix 4 In-house analytical methods

Appendix 5 Data reporting forms

Test Report

1. Introduction

1.1. Name, description of, the condition of, and unique identifier of the technology tested

1.2. Name and contact of Applicant

1.3. Name and contact of Test Body

1.4. Unique identification reference of the test report ,

2. Test design

2.1. Reference to test plan and verification plan

2.2. Identification of the method(s) used

3. Description of the method for selecting the technology item(s) to be tested and date of receipt where relevant

4. Test results

4.1. Date(s) and location(s) of performance of the tests

4.2. Test results with estimation of the uncertainty

4.3. Information on specific test conditions, such as operational conditions

4.4. Test data summary

4.5. Test performance observation, including opinions and interpretations where appropriate and needed, additional information if required by specific methods

4.6. Test quality assurance summary, incl. audit results where applicable

4.7. Amendments to and deviations from test plan

4.8. The name(s), function(s) and signature(s) or equivalent identification of person(s) authorizing the test report

5. References

Appendix 1 Terms and definitions

Appendix 2 Test data report

Appendix 3 Test system audit reports (where applicable)

Appendix 4 Review of analytical performance (where applicable)

Appendix 5 Amendment and deviation reports for test

If the verification involves sampling, the section 3 above (Description of the method for selecting the technology item(s) to be tested and date of receipt where relevant) shall include the following sub-sections, where necessary for the interpretation of test results:

3.1. The date of sampling;

3.2. A unique identifier of the substance, material or product sampled ;

3.3. The location of sampling ;

3.4. A reference to the sampling plan and procedures used;

3.5. Details of any operational conditions during sampling that may affect the interpretation of the test results;

3.6. Any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

Annex 8. Table of Contents for the Verification Report

1. Introduction
    - 1.1. Name of technology and unique identifier of the technology being verified
    - 1.2. Name and contact of Applicant
    - 1.3. Name of Verification Body and responsible of verification
    - 1.4. Organisation of verification including experts, and verification process
    - 1.5. Deviations from the verification protocol
2. Description of the technology and application
    - 2.1. Summary description of the technology
    - 2.2. Intended application (matrix, purpose, technologies, technical conditions)
    - 2.3. Verification parameters definition
3. Existing test data
    - 3.1. Description of existing test data
    - 3.2. Assessment of existing test data
    - 3.3. Accepted existing test data
4. Evaluation
    - 4.1. Calculation of verification parameters including determination of uncertainty
    - 4.2. Evaluation of test quality
        - 4.2.1. Control data
        - 4.2.2. Audits
        - 4.2.3. Deviations
    - 4.3. Verification results (verified performance claim)
        - 4.3.1. Description of statistical methods used
        - 4.3.2. Verification parameters
        - 4.3.3. Additional parameters, with comments or caveats where appropriate
    - 4.4. Recommendations for the Statement of Verification
5. Quality assurance
6. Comments of the Technical Working Group on the draft report and draft Statement of Verification and responses
7. References

Appendix 1 Terms and definitions

Appendix 2 Application

Appendix 3 Verification plan

Appendix 4 Amendment and deviation report for verification

Appendix 5 Test plan

Appendix 6 Test report

Appendix 7 Test system assessment report

Annex 9. Table of Contents for the Statement of Verification

The Statement of Verification shall have the following table of contents:

First page shall contain:

ETV Network logo, Verification Body logo, technology name, Registration number, Date of issuance, time of verification, details of Verification Body and Applicant, Signatures of representatives of Verification Body and Applicant, Accreditation Mark: accreditation register or certificate number, Internet address where this Statement of Verification is available

The following pages shall contain:

1. Technology description
2. Application
    - 2.1. Matrix
    - 2.2. Purpose
    - 2.3. Conditions of operation and use
    - 2.4. Verification parameters definition summary
3. Test and analysis design
    - 3.1. Existing and new test data
    - 3.2. Laboratory or field conditions
    - 3.3. Matrix compositions
    - 3.4. Test and analysis parameters
    - 3.5. Tests and analysis methods summary
    - 3.6. Parameters measured
4. Verification results (performance, operational and environmental parameters)
5. Additional information, including additional parameters
6. Quality assurance and deviations

Annex 10.ETV promotional tools and materials

These tool and materials have been developed by the LIFEproETV project

The ETV HUB (https://etv-hub.eu/) has a wide range of information about ETV and various tools that can complement this document which are presented in Table . The Hub, as a publicly available domain may also serve for publication of the ETV Statements of Verification.

Table 1. ETV Tools available on ETV HUB

Name of the document/tool	Purpose of the document/tool
The ETV ISO 14034 brochure: **Unlocking the trust in green innovations: Environmental Technology Verification (ETV)** [EN] | [PL] | [ES] | [HU] | [IT] | [SI] [DE] [FR]	The brochure is dedicated to technology developers, providers, buyers and users, decision and policy makers and other interested parties who are actors of the environmental technologies marketplace. It offers a comprehensive understanding of ETV aiming to propel the scheme towards widespread acceptance and recognition in the market as the scheme dedicated to green innovations when they are ready for commercial uptake and up-scaling.
Guide for ETV Applicants [EN]	This document provides guidance to technology developers, manufacturers, providers and other entities who wish to propose their environmental technology for performance verification following a process based on standard ISO 14034: Environmental Management: Environmental Technology Verification (ETV).
Application of ISO/IEC 17020:2012 for the Accreditation of Verifiers Performing Environmental Technology Verification Compliant to ISO 14034 – A guidance document for National Accreditation Bodies. [EN]	The document is intended to be used by the National Accreditation Bodies (NABs) seeking to establish accreditation programmes conforming to ISO/IEC 17011:2017 for ETV verifiers, when assessing the competences of verifiers under accreditation surveillance or in relation to requests for extension of the accreditation scope. The guidance document is aimed to ensure a harmonised and consistent approach to the development and implementation of the accreditation requirements and surveillance of ETV verifiers.
How to become a verifier of the Environmental Technology Verification (ETV) scheme? A primer. [EN]	This primer provides key information essential for the management and technical staff of an entity to consider when seeking to become a verifier to perform ETV compliant to the International Standard ISO 14034:2016.
On-line tool: Self-assessment tool for ETV applicants	The tool serves as an aid to prepare a successful ETV application in line with the ISO 14034 ETV requirements:

Name of the document/tool	Purpose of the document/tool
Link: https://etv-hub.eu/get-started/	○ it will check if the applicant already has all necessary and relevant information to develop an ETV application file, ○ provide immediate feedback to applicant's answers and indicate what information must still be collected and prepared, ○ explain why certain information is need and how it is used to verify a technology, ○ provide applicant with guidance and tips on how to obtain the missing data and information, ○ allow the applicant to assess whether the technology potentially meets the eligibility requirements for verification.
3 Videos: • **ETV Introduction** Link: https://youtu.be/8p5J8HOHANI • **Presentation of the ETV process** Link: https://youtu.be/mcH-QAAiqhI • **ETV - a trusted compass for guiding purchase and investments in green innovations** Link: https://youtu.be/c3OJhJtBECo	Can be used for promotional and educational purposes.