European Commission

JRC SCIENCE FOR POLICY REPORT

EU Environmental Technology Verification Pilot Programme Guidance Documents

Guidelines on assessing the environmental added value of an environmental technology in a life-cycle perspective at the proposal stage

Guidance document 004/2016
Adopted on the 26/01/2016
Version 1.0

Ronald Piers de Raveschoot (JRC), Jean-Pierre Schosger (JRC), Ana Barbosa Lanham (JRC), Bernd Gawlick (JRC), Simona Tavazzi (JRC), Pierre Henry (DG ENV), Jiannis Kougoulis (DG ENV)

2016

Produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment

Joint Research Centre

Report EUR 27996 EN

Contact information

SCHOSGER Jean-Pierre

Address: Joint Research Centre, Directorate C - Energy, Transport & Climate, Westerduinweg 3, NL-1755 LE Petten, Netherlands

E-mail: Jean-Pierre.SCHOSGER@ec.europa.eu

Tel.: +31 22456-5209

JRC Science Hub

https://ec.europa.eu/jrc

JRC102301

EUR 27996 EN

PDF ISBN 978-92-79-59814-2 ISSN 1831-9424 doi: 10.2790/164523

Luxembourg: Publications Office of the European Union, 2016

How to cite: Author(s); title; EUR; doi

Title: Guidelines on assessing the environmental added value of an environmental technology in a life-cycle perspective at the proposal stage

Abstract

Environmental Technology Verification (ETV) is a new tool enabling the verification of the performance claims put forward by developers of innovative environmental technologies. The EU-ETV programme, launched in 2011 by DG-ENV, is supported by Technical Working Groups (TWGs), one for each technology area active under the Pilot programme. These TWGs are chaired by the JRC and composed by Commission Invited Experts and by Experts representing the Verification Bodies (VBs) with the overall aim to harmonise and exchange good practices.

The present document provides guidance to help Verification Bodies assessing whether the proposed technology fits within the definition provided in the GVP for "innovative environmental technologies".

This document, adopted on the on the 26/01/2016 by the TWGs, is a guidance document, with the meaning given in the General Verification Protocol of the EU ETV pilot programme (version 1.2), Section A.II.4.3. It has been produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment.
This document is part of deliverable 2.1.5 under the Administrative Arrangement 070307/2011/630755/F4 between DG ENV and JRC (ref JRC No. 32937), "Scientific and technical support for the implementation of the EU Environmental Technology Verification (ETV) pilot programme" (second amendment).

History of this document

V.1.0 adopted on the 26/01/2016

Contents

Acknowledgements

This document is a guidance document, with the meaning given in the General Verification Protocol of the EU ETV pilot programme (version 1.1), Section A.II.4.3. It has been produced by the EU ETV Technical Working Groups, chaired by the JRC, under the auspices of DG Environment.

We thank the members of the EU ETV Technical Working Groups for their contributions to this document. The members of the ETV Technical Working Groups at the time of approving the document were[1]:

Verification Bodies experts:

Katherine ADAMS, Kevin ADAMS, Felice ALFIERI, Stéphanie ARIGONI, Mona ARNOLD, Sandrine AUSSET, Marieke BECKMANN, Thomas BRUUN, Leo CARSWELL, Dominique CHARPENTIER, Tom DOYLE, Trine ERDAHL, Alessandro FICARAZZO, Thorkild Qvist FRANDSEN , Piero FRANZ, Peter FRITZEL, Nathalie GUIGUES, Aleksandra HAJDUK, Paul HAYES, Gerald HEINICKE, John HOLDEN, Matti LANU, Flavie LOWRES, Bartosz MALOWANIEC, Sabrina MELANDRI, Claire MICHAUD, Paul MILLER, Michal MOLENDA, Roman NADRATOWSKI, Ewa NECZAJ, Sue OAKLEY, Evžen ONDRÁĈEK, Maria PAJZDERSKA , Piotr PAJZDERSKI, Liz PALFREY, Agnieszka PASZEWSKA, Izabela RATMAN-KLOSIŃSKA, Emmannuel RÉBUFFAT, Emma RICHARDSON, Laura SEVERINO, Jiri STUDENT, Mich SWAINSON , Jane TURRELL, Rita VALOROSO, Jacques VILLENEUVE, Fatima VILLORIA, Dave WAKEFIELD, Agnieszka WAWRZYNIAK

Commission Invited Experts:

Mika AALTO, Florent BOURGEOIS, Alessandra CAVALLETTI, Maurizio CORONIDI, Colin CUNNINGHAM, Roberto FARINA, Jeffrey FARROW, Uwe FORTKAMP, Damien GAROT, Paul HAYES, Kari HEISKANEN, František KAŜTÁNEK, Ana LANHAM, Tiina LEIVISKÄ, Olivier LORAIN, Jacques MEHU, Jacob MØLLER, Paul OCKIER, Elżbieta RUBEL, Sebastian Reinhold SØRENSEN, Jan SUSCHKA, Thomas TRACK, Robert ÜVEG , Elżbieta UZUNOW, Krzysztof WARMUZINSKI

European Commission:

Ana BARBOSA LANHAM (till 09/2015), Bernd GAWLIK, Pierre HENRY, Jiannis KOUGOULIS, Ronald PIERS DE RAVESCHOOT, Jean-Pierre SCHOSGER, Simona TAVAZZI

[1] We also thank experts who have contributed to the document but have left the Technical Working Groups before the approval.

1. Introduction

1.1. The EU ETV Pilot Programme

Environmental Technology Verification (ETV) is a new tool to help innovative environmental technologies reach the market. It consists of the validation of the performance claims put forward by technology manufacturers, on a voluntary basis, by qualified third parties. This should help manufacturers prove the reliability of their claims, and help technology purchasers identify innovations that suit their needs. As a result, technological lock-in is overcome while more effective and cheaper environmental protection measures can emerge.

The EU ETV pilot programme, run by the European Commission on an experimental basis, is implemented by Verification Bodies (VBs) specifically accredited for ETV. The technical reference defining ETV procedures and requirements is the General Verification Protocol (GVP). It ensures that all verifications made in Europe follow the same process and have the same value. VBs are coordinated by thematic Technical Working Groups, at European level, providing guidance on the implementation of ETV and ensuring the adequate harmonisation of practices.

1.2. Purpose and scope of guidelines on assessing the suitability of an environmental technology in a life-cycle perspective at the proposal stage

1.2.1. Purpose

These guidelines aim at proposing a simple tool to harmonise the criteria used for defining if the proposed technology fits within the definitions provided in the GVP for innovative environmental technologies.

The first stage in the ETV programme is an eligibility check with the purpose of determining whether a technology fits the characteristics defined in the programme. In addition, this also helps the proposer to understand whether it would benefit from undergoing an ETV. The characteristics of this technology and how they should be assessed are detailed in the GVP and have also been further clarified in the TWG Guidance Document 003/2013-10-15 on eligibility criteria.

Since the ETV Programme concerns **environmental technologies**, one of the eligibility criteria ensures that the technologies undergoing ETV provide an environmental added-value as set out in the GVP (section A.I.1):

"It [the technology] *corresponds to the definition of an innovative environmental technology provided under Appendix 1 'Glossary of terms and definitions' with the potential to contribute to efficient use of natural resources and a high level of environmental protection;*

Where, *"**Environmental technologies** are all technologies which provide an environmental added value compared to relevant alternatives."*

And where, "***Innovative environmental technologies*** *are environmental technologies presenting a novelty in terms of design, raw materials and energy involved, production process, use, recyclability or final disposal, when compared with relevant alternatives."*

This criterion is only approached lightly at the eligibility stage (i.e., Quick Scan), since the information shared at that stage may not be sufficient for the VB to understand if it is fulfilled. Therefore, it is necessary to revisit this criterion in the proposal stage, where the proposer and the Verification Body start sharing all necessary technical elements to allow for the verification. Hence, at this stage, the brief evaluation obtained at the eligibility stage (Quick Scan) is revisited and confirmed with the further elements provided by the proposer.

The tool presented in these guidelines enables the identification of the environmental advantages of the technology, as well as an early-stage screening of potential serious risks or environmental issues that could harm the reputation of ETV. It will also provide indications on aspects that may need to be addressed in more detail during the verification process.

The final outcome of this assessment is to help the VB confirm its decision on:

- Does the technology clearly fit within the scope of ETV (in terms of providing an environmental added-value)? In this case, confirm the recommendation given in the quick scan to proceed with an ETV;

- Have negative issues been identified that potentially reduce the environmental added-value of the technology? If this situation was not detected earlier (i.e., quick scan), the VB informs the proposer. The proposer is made aware that it is needed to inform transparently the users about their existence. This could be done by:

- Incorporating these aspects as parameters that will be measured during verification. This is the preferred solution, as it provides a quantified picture of the overall technical and environmental performance of the technology. It is particularly important when it could be expected that these negative aspects may put in question the environmental added value of the technology.

- When quantification is not possible, mentioning the existence of these aspects in the 'additional information' section of the verification. This can be done in a neutral manner, without necessarily using the term "negative" e.g. "Besides the reduction of pollutants abc that have been quantified above, the following parameters have not been quantified: emissions of pollutant xyz to air and energy consumption"), or in the technology description (e.g "during the process, pollutants x and y are also emitted but this emission has not been quantified in the context of this verification".

- If the VB judges that the environmental added value of the technology is compromised, it does not recommend continuing with the verification but the decision is given to the proposer with the full awareness that the negative aspects that have not been verified during the

process will have to be mentioned transparently in the verification statement[2]. This can be done in a neutral manner as explained above (e.g. “emissions of X have not been verified nor quantified”). Have severe environmental impacts been identified that would disqualify the technology from being an ‘environmental technology’ and/or harm the reputation of ETV? Since this was not detected before (i.e., quick scan), most likely due to absence of relevant information, the VB shall refuse continuing with the verification and exclude the technology.

1.2.2. 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 assessment will therefore focus on the differences with the relevant alternative that can lead to a differentiated (higher or lower) environmental added value.

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.

2. DEFINING THE RELEVANT ALTERNATIVE

In order to determine the environmental advantages and disadvantages of each new technology according to the definitions provided in the GVP, the Proposer needs to designate the *‘relevant alternative(s)’* against which a qualitative comparison (quantitative if data is available) can be made. The Verification Body can then accept the proposed relevant alternative or suggest a different one, based on its experience and on any guidance produced by the TWGs. If no appropriate relevant alternatives are found, the VB can take into account the EU/country legal requirements and the available recommendations of the TWGs. Over time, the Technical Working Groups will compile a list of relevant alternatives together with the results of these assessments in the Quick Scan, which will be made available to ensure that the assessments are as much as possible harmonised.

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 proposer's technology would not be available, what would be the alternative(s)?

[2] The proposer could take this opportunity to correct these aspects and improve its technology on this base; the consequences have to be discussed with the VB, in particular regarding the validity of the information and test results provided so far.

Below are a set of criteria that can be used by the proposer or the VB 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 VB 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 proposer'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.

3. SYSTEM BOUNDARIES

The tool used in these guidelines simplifies the life-cycle of the technology into 4 stages (see also Figure 1):

- 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 proposer

- Use and maintenance stage 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.

Figure : Life cycle perspective of a product or a process

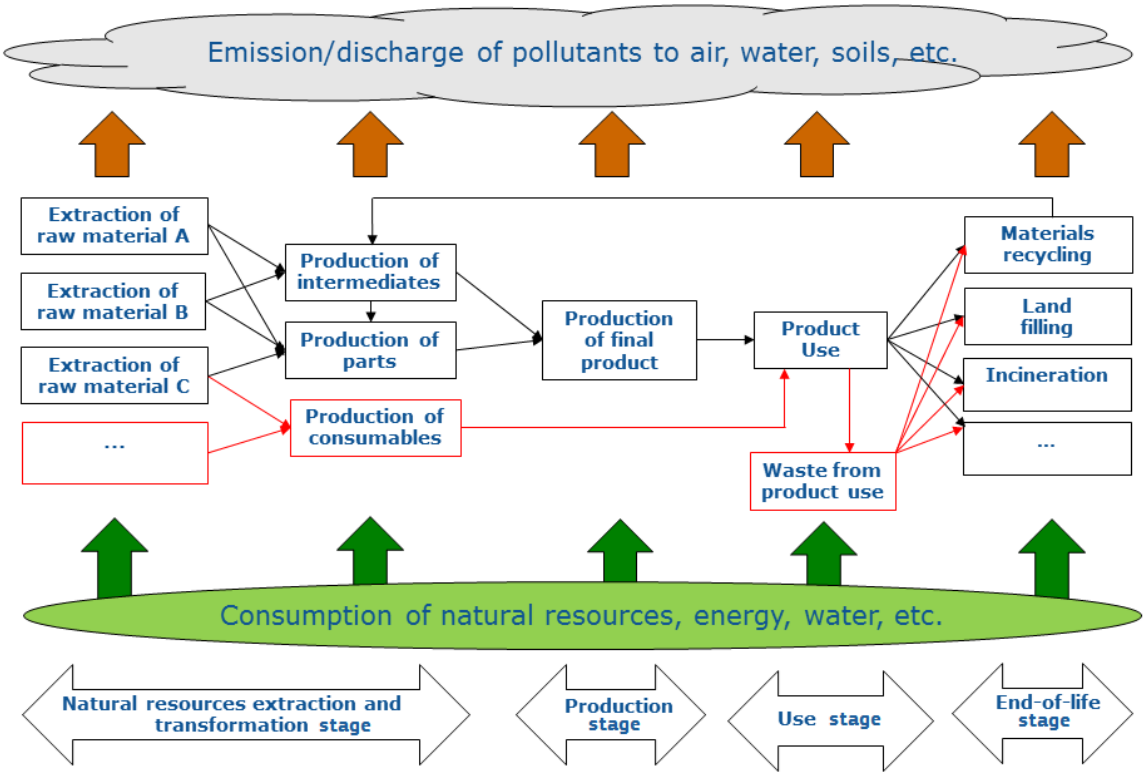

Figure 1: Life-cycle stages of a product or a process. The elements in black picture a simple product that does not require consumables for its operation and does not generate waste. The elements in red picture a more complex situation where the product (or process) requires consumables for its operation (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[3]

The proposer, helped or not by the VB, will then need to provide the following in the proposal template:

> **Identify the life-cycle stages** that could result in different environmental impacts than the relevant alternative. Life-cycle stages that result in identical environmental impacts do not need to be considered.

[3] ETV often addresses technologies that are traded from business to business. In this case, the final product could be in fact an "intermediate product" with different possible final uses (e.g. paper rolls that could be used for packaging or for printing books etc). In this case, the term "use phase" differs from what is understood generally as use phase in LCA (= interaction with final consumer and product user), and the most relevant intended use(s) of this final product is to be considered in the use phase.

Define the key life-cycle stages for this technology: for each stages identified in point 1, the proposer will identify if this stage is likely to present significant differences from an environmental perspective in comparison to the relevant alternative.

In other words, this exercise consists of identifying the environmental hotspots in which the particular technology differs from the alternative. "Environmental hotspots" refer to those specific life-cycle stages, processes, or individual material/energy inputs/outputs that cause concern. If hotspots have already been identified for similar technologies or for the relevant alternative, this information can be used here. For further information regarding the identification of hotspots it is recommended to consult the EC Communication on Building the Single Market of Green Products COM (2013) 196 [4] and the respective Commission Recommendation 2013/179/EU[5].

For each key life-cycle stages identified in step 2, provide qualitative or quantitative information for the various environmental criteria described in section 4. In some instances the proposer 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 stages
- the information is not available[6] or not relevant for the considered technology

Information should be available for at least the manufacturing and use stages. It is expected that for the manufacturing and use stages the proposer 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 proposer may not have access to full details of all of the activities described in the four life-cycle 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

[4] EC Communication on Single Market of Green Products COM (2013) 196 available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0196&from=EN
[5] Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations (2013/179/EU), see in particular section 7.3
[6] LCA databases could be used to look for this information.

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 proposer 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 life cycle stages would then be the manufacturing and the use phase. For both these phases the proposer 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.

4. LIST OF ENVIRONMENTAL PARAMETERS

For each of the relevant life cycle stages, identified in the previous section, information should be provided by the proposer pertaining to a series of environmental parameters: at least qualitative information and when possible quantitative information on the environmental parameters listed below as long as relevant[7] for the technology in question (to be determined in cooperation with VB). These parameters might be part of the selling arguments (better environmental performance without major side-effects)

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 VB could use its expertise or guidance from the TWGs 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.

[7] The environmental "hotspots" as referred before can be used to determine what is relevant. Environmental hotspots are the outcomes of a contribution analysis of LCA results.

- 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. The type of hazardous waste should also be specified where possible using the list provided in Commission Decision 2014/955/EU[8] at the level of two digit code.

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

- Production efficiency – productivity

[8] The list of types of hazardous waste is fond on Page 47 in Commission Decision (EU) No 2014/955/EU of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council Text with EEA relevance (OJ L 370, 30.12.2014, p. 44–86) available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0955&from=EN

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

The Proposer 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 proposer 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 VBs are expected to scrutinise the reliability of the information provided and request supporting information when needed.

Based on experience, the TWGs will progressively determine which aspects have to be investigated for different kind of technologies, in order to simplify the work of the proposers and the VBs.

If the VB or the proposer has the means to go further into the assessment of the environmental added value, the parameters above can be grouped by environmental impact categories. The quantification of these impacts per category is then recommended. Categories to be considered are: Climate change; ozone depletion; human toxicity - cancer effects; human toxicity - non-cancer effects; particulate matter/respiratory inorganics; ionising radiation; photochemical ozone formation; acidification; eutrophication - terrestrial; eutrophication - aquatic; ecotoxicity; freshwater aquatic; land use; resource depletion water; resource depletion - mineral and fossil fuel. It is also recommended where possible to use the impact assessment , models and indicators as defined in Commission Recommendation of 9 April 2013 on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations (2013/179/EU).

5. ASSESSMENT OF THE ENVIRONMENTAL ADDED-VALUE

It is the responsibility of the proposer to provide sufficient and relevant information about the technology. Based on the information provided, the VB will assess the environmental added-value of the technology. This assessment will serve as an aid so as to confirm the decision at the eligibility stage of:

i) 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 that may harm the reputation of ETV.

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 stage	Manufacturing stage	Use stage	End of life stage
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 proposer provided sufficient information to draft a conclusion? Does the VB judge that the key points related to this technology have been addressed?

Yes: Proceed to point 2.

No: Can this be improved using the VB's expertise and/or in further discussions with the proposer?

Yes: Review proposal.

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 proposer 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 leave the decision up to the proposer 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 mentioned in the verification[9]

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 proposer is informed that the negative aspects identified should be mentioned 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 proposer 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 mentioned in the verification
>
> **Yes**: Refuse the technology for ETV

[9] As mentioned in section 2 above, these aspects do not necessarily have to be mentioned as "negative"; the purpose is to inform transparently about their existence. This could be done by incorporating them as verification parameters or mentioning them in the 'additional information' section of the verification (e.g. "Besides the reduction of pollutants abc that have been quantified above, the following parameters have not been quantified: emission of pollutant xyz to air and energy consumption"), or in the technology description.

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 proposer is informed that the negative aspects identified should be mentioned in the verification*[9]
>
> **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 proposer 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 mentioned in 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: *as long as he is aware of the risks and the implications of continuing with the verification such as that and that he is informed that the negative aspects identified should be mentioned in the verification*
>
> **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 proposer 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 mentioned in the verification*

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

6. REFERENCES

1) General Verification Protocol v.1.2 (24/06/2016) - http://iet.jrc.ec.europa.eu/etv/sites/etv/files/documents/gvp_en.pdf

LD-NA-27996-EN-N

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub
ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

Joint Research Centre

EU Science Hub

Publications Office

ISBN 978-92-79-59814-2

Doi 10.2790/164523