ECOFYS

sustainable energy for everyone

First findings and recommendations

Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive

ENER/C3/2012-523

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- Confidential –

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Date: 7 February 2014

Project number: BUINL13345

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Table of contents

Executive Summary

S1 Background

The European Commission has launched a review process to evaluate the effectiveness of the Directive 2010/30/EU on energy labelling as well as specific aspects of the Ecodesign Directive 2009/125/EC. The aim of the study is to compile, analyse and provide the Commission with all the information required for the review, and to identify options and provide recommendations for a possible revision of the current legal framework. Findings are based on the outcome of desk research, an online consultation, interviews, position papers, two public consultation meetings, five case studies, and feedback on a number of new label designs. One further public consultation meeting will take place and then the findings will be revised into a final report.

S2 Achieving Energy Labelling and Ecodesign objectives

The Energy Labelling and Ecodesign Directives are capable of generating substantial savings in a cost-effective manner. Energy savings projected in impact assessments amount to 400 to 460 TWh annually by 2020 compared to BaU on electricity and 2350 PJ_{prim} on heat, corresponding to around 13% of 2020 BaU electricity as well as heat consumption in the EU. These savings are cost-effective, generating benefits for consumers and for European's economies. A fundamental question is to what extent these Directives actually do capture the full potential of savings. This is both a question of the levels of the requirements in the implementing measures and the success of their implementation.

The level of requirements could be raised. Most stakeholder groups agree that while for some product groups implementing measures and labels have shown the right ambition level, many other groups have shown levels of ambition that are too low compared to what is technically and economically feasible. Industry is the exception, and, in general, finds the ambition of the measures about right, rating the ambition levels a step or two more ambitious than other stakeholders. Ambition clearly varies by product group. This general picture (ambition levels that are either correct or too low, but never too high) broadly agrees with the team's own analysis.

The capturing of the full potential of savings is limited in several ways. Apart from the inconsistent ambition levels, stakeholders identified 1) long rulemaking processes, leading to out-dated technical and preparatory work as well as increased lobbying, 2) weak enforcement, 3) reduced effectiveness of labels following introduction of A+ and up classes, and 4) a trend towards larger products increasing absolute energy consumption; all as factors that limit the full potential savings. In addition, the study team found that 5) major assumptions made in the modelling of energy savings may turn out to be different in practice (e.g. the usage of VSD drives for motors). Finally, 6) since the expansion of scope to ErP of energy labelling, no B2B products have been labelled, except tertiary lighting, despite the existence of information failure in the B2B sector as well. The setting of ambitious requirements can also be impeded by consideration of aspects required to be taken into account in the Directive, such as the affordability and functionalities of the remaining products, or European industry's competitiveness and employment in the EU.

Energy saving potential of product systems could be better exploited. Potential energy savings on a systems level are substantially higher than potential savings purely on a product level. Ecodesign and Energy Labelling regulations can take into account certain aspects of systems, and already have done so. In fact, the two regulations with largest savings estimates rely on such system aspects (motor systems and the label for boilers). Such possibilities definitely need to be explored more systematically. However, there are also some challenges to deal with. As the approach and its implementation is novel it is recommended to closely monitor its implementation. In addition, policies additional to product policies (ELD,ED) will be needed to ensure an optimal cooperation of system components. These may, for example, include overall performance requirements or evaluations for systems (such as energy performance requirements for buildings via the EPBD), target management processes (such as EMAS), or introduce training and incentives for the installers and engineers that assemble the system. Our recommendation is to further explore potentials for including system aspects in the current directives and methodology, coordinate them with other policy tools, and pay ample attention to market surveillance aspects.

Other environmental impacts could receive more attention. Regulations to date have mainly addressed the use-phase impacts, most importantly, energy consumption, as this represents, in varying degrees, the most important contribution to the environmental impacts of the covered products. Some environmental impacts have already been addressed by both the Ecodesign and Energy Labelling Regulations, including those in other life-cycle phases for Ecodesign. Nonetheless, potential for further reduction of environmental impacts in ErP's has been identified in several studies, e.g. on aspects of reusability, recyclability, and recoverability, recycled content, use of priority materials, hazardous substances, and durability. For broad coverage of other environmental impacts a number of issues must be examined in more detail. In tackling such impacts the Ecodesign Directive requires that there should be no significant negative impact on consumers in particular as regards the affordability and the life cycle cost of the product. Coverage and suitability for other regulations (e.g. WEEE, ROHS, REACH) should be checked. Last but not least, for properly including non-energy aspects (be it for ErP or non-ErP), modifications to the MEErP methodology and of data sourcing strategies would be necessary.

A single primary energy factor at the EU level is recommended. For simplicity, practicality and legal compliance a single primary factor at the EU level is recommended. Future changes to the PEF need to be considered to ensure that EU-wide progress made on renewables is better reflected. This can be done through frequent reviews and revisions (e.g. every 3-5 years), linear reductions, or forward looking PEFs being used in the label calculations. A pragmatic way forward for the energy label could be to introduce a 'scale within a scale' concept (see Figure 14 in section 4.6). This would allow for a better comparison of technologies using the same energy carrier.

S3.1/2 Coherence with other EU policies

The overall policy framework is coherent and mutually supportive. In general, different policies complement each other by addressing different life cycle stages, impacts, actors, or employing different mechanisms. Still, there can be incoherencies for specific products or issues, and there may be losses due to double work in misaligned procedures. Specific issues and products need to be checked to achieve more coherence. Progress has been made by the adoption of the Energy Efficiency Directive, which amended the Ecodesign Directive. Member States may now set tougher requirements under EPBD that may limit the installation of products that are in compliance with Ecodesign regulations. Further steps could regard the development of a unified European Buildings Certificate under the EPBD that would be coherent with the Energy Label format. The same is true for car labelling, which is currently in a different format in various Member States. An alignment with the EU Energy label format would avoid consumer confusion.

A merger of Energy Labelling and Ecodesign should be made contingent on considerations of practical and political feasibility. Mergers of policies may be a result of working towards more coherence, but are not in themselves helpful. The question whether to merge or not should be a practical one.

An integrated workplan, evidence base, and decision procedures are needed. The ED working plan, which is already now used for both ED and ELD, could be legally made the common ED and ELD working plan in order to better accommodate ELD specific product choice criteria (see also Chapter 5). On this basis, common preparatory studies could be set up to create a unified evidence base including, depending on the product, for other policies such as Ecolabel, RoHs, F-Gas regulation or CPR. Integrated decision making processes for these policies may also be envisaged, covering, in one process, questions such as: Are further substance bans envisaged, or should a product be exempted from RoHs? Should specific provisions be made under the F-gas regulation for a product group, such as the pre-charge ban for heat pumps? Should the Commission, by a delegated act, set up more specific declaration requirements under CPR? How can information requirements under Ecodesign and CPR be streamlined?

Potential overlaps need to be identified early in the process of setting product-related requirements, and a clear task sharing should be developed. When conducting preparatory studies, the methodology for analysing existing policies currently conducted within task 1 and 7 of the MEErP could be refined. Currently, no detailed guidance is given how this analysis has to be conducted, how policies should be selected, which aspects of them should be considered or which framework should be used to analyse them. For better guidance, we suggest developing a heuristic framework for mapping policies. This may lead to arriving at a clear task sharing between policies that avoids gaps and a "passing the buck syndrome" on the one hand, and double legislation, on the other. Also, calculation methods and documentation requirements should be aligned.

During revisions, existing Implementing Measures and Delegated Acts for specific products need to be scanned for inconsistencies. Building on the stakeholder input discussed above and further consultations in the course of the revision process, every product-specific regulation should be scanned for inconsistencies with other policies, including incoherent requirements, documentation rules, calculation methods etc. These can be remedied in the course of the revision.

In the same process issues not covered by the policy framework should be identified, and the extension of the Implementing Measure's coverage could be considered on these grounds. It should be identified whether there are, for a given product, significant issues not yet sufficiently covered

by any legislation (e.g. certain life cycle phases or environmental impacts). If there are, this could be an argument for checking whether it is feasible to extend Ecodesign measures to (further) non-energy aspects or not-in-use-phase impacts in order to cover these issues.

Different policy instruments can work together better to promote top performing products. The criteria and requirement levels of different pieces of legislation (GPP, ED, ELD, Ecolabel) should be better adjusted. For example, as a general rule, the Energy Label should not show energy classes below the Ecodesign minimum requirements. The Ecolabel should always set the highest energy class as a requirement), especially as Green Public Procurement takes into account the Ecolabel. Another possibility would be to make Green Public Procurement mandatory (which would, as far as energy efficiency requirements are concerned, have to be regulated in the Energy Efficiency Directive,). Also, a mechanism updating public authorities on the products with highest energy class for procurement purposes could be envisioned. If the whole system is also regularly revisited, these elements would work together to promote top performing products more effectively.

There is a need for streamlined conformity assessment and documentation requirements. Unified procedures for conformity assessment, and market surveillance on the one hand, and for documentation / information requirements on the other, should be introduced across a number of instruments. For example, unified product fiches or "product passports" across different instruments could be introduced which integrate all the information required under those instruments (and possibly all the relevant life cycle information for a product such as material content, energy efficiency, feasibility of dismantling) and could be assembled in one database and made accessible via a QR code. Such fiches could be introduced both for market surveillance and for consumer information purposes while the information from the former should be used as much as possible to create the latter. However, as there is as yet little information on how product fiches are used, and their cost and administrative burden, further research would be needed, including a test of the use of QR codes in practice.

Uniform market surveillance procedures are important. In case *the Energy Label and Ecodesign directives were merged,* the conformity procedures would clearly have the same set of general requirements as well. This could contribute to an easier ability to perform surveillance activities towards both the Energy Label and Ecodesign requirements.

S3.3 Scope expansion

The inclusion of new products in the scope of the Energy Labelling and Ecodesign Directives should be evaluated based on three main issues: necessity, feasibility and added value. Significant environmental impact and improvement potential has already been identified by previous studies for some product groups. Some of the identified improvement options relate to production practices that cannot be verified in the final product and cannot easily be included in a ranking of environmental impacts. In those cases other instruments based on best-practices regulation would be more effective. These include certification schemes (e.g. organic food products) and horizontal measures such as the IED Directive.

For impacts that cannot be verified on the product itself, methodologies for certification covering the entire supply chain would have to be developed. Due to the nature of the current scope of products covered, the MEErP methodology focuses mainly on technological aspects of the product itself, which in the case of non-ErPs are often not the cause for environmental impact or the basis for

improvement. Some product groups (e.g. garments) have very long supply chains covering different non-EU countries which would make it difficult to develop such methodologies. Labelling schemes based on practices and supply chain certification have, so far, been of voluntary nature due to the significant burden it imposes on manufacturers and market surveillance authorities. The Environmental Footprint pilot phase is testing verification approaches for embedded impacts in an attempt to identify a method that balances reliability and feasibility. After the end of the pilot phase in 2016, it is necessary to look into the conclusions of the verification phase and how it can further inform handling non-ErPs.

Using the EcoReport tool for assessing the environmental impacts of non ErPs would require inclusion of more raw materials, their regional origin, and transportation. To date, the limited number of material options available in the EcoReport tool has not significantly affected overall results of the assessment since the use-phase has by far the highest contribution to the environmental impact. This is not the case for non ErPs where the production phase is sometimes the highest contributor to the environmental impact of the product. Although the option exists to manually introduce extra materials into the database, available LCI (Life Cycle Inventory) information on materials is scarce. A limitation of the EcoReport tool is furthermore that it does not take into account transportation issues specific to different product groups. The regional origin of the raw material should also be taken into account in the EcoReport tool as some products are included in a global supply chain.

For means of transportation by road the existing legal framework (Emissions and CO_2 regulations) presents itself as a sufficiently effective option. Still, the introduction of an energy label or environmental label for these energy using products would not present itself as a major burden. This is because standardized methodologies exist for measuring GHG emissions, fuel consumption and other emissions to air, which are already part of the information requirements for passenger cars. If minimum performance requirements for specific car models were to be formulated, further categories would have to be developed according to vehicle characteristics and use. The use of electric bicycles is clearly beneficial when compared to other products that fulfil the same function and, therefore, the introduction of ecodesign or labelling requirements for these products would be an unnecessary burden to producers with very little improvements achievable. A single label for comparison across all transport modes would be difficult to develop due to the large amount of variables to consider and its impact would have to be evaluated particularly in what regards consumer understanding. The stakeholder consultation and literature review have not produced evidence pointing to the need of setting individual ecodesign or energy labelling requirements on transport product groups such as trains, boats, airplanes.

Although measures could be implemented through the Ecodesign Directive, in some cases other existing instruments are better suited to tackle the environmental impacts of non-ErP. Existing instruments include for instance REACH or the CO_2 and Emissions Directives for cars. For these policy instruments accepted testing methods have been developed.

S4 Appropriateness of the energy label

The label scale needs to be revised but all options entail rebasing of the current efficiency classes. To ensure the future relevance and effectiveness of the energy label as an informative market transformation tool the greatest necessity is to revise the energy label scale so that higher efficiency levels can be communicated in the future. A thorough conceptual analysis shows that all options will require a rebasing of the efficiency classes currently applied to products already subject to labelling i.e. that the designation of a product's energy performance class will necessarily change in some way following revision

of the label design. This is because the class is not just defined by a letter and plusses but also by its colour within the green to red colour code scale and the length of arrow within the stacked horizontal arrow scale. The success of the current label is built upon these three mutually reinforcing mnemonics and care needs to be taken to ensure any future design is equally successful at communicating relative energy performance.

Consumer understanding should be the chief concern for future label revisions. The other key performance parameters are the design's ability to motivate consumers to invest in higher efficiency and the ability of the information to be recalled during the procurement process. Conceptual analysis of the strengths and weaknesses of different label design options has been confirmed by intermediate consumer research findings from the companion study by IPSOS/LE, which shows that the closed A-G scale is the easiest to comprehend and is the most motivating for consumer investment decisions. This finding is consistent with findings from previous consumer research. Therefore, re-grading the A-to-G efficiency scale would appear to be preferable to alternative numeric and open-ended scales and is also likely to be preferable to adding additional plus signs to the top classes.

In addition to doing further research to inform the decision regarding the optimal future label energy performance scale it would also be worth testing whether the labelling of energy consumption per cycle or per year is more motivating to consumers for products that are not used continuously, as well as testing whether the use of national language to clarify units, icons or other elements might not be more beneficial than having a single language free label. A number of problematic icons (as on labels for TVs, fridges, washing machines and dishwashers), and the 'Energ[y]' text on top of the label also need to be assessed. Finally, label comprehension could be enhanced through educational campaigns. These could also help to raise awareness that the labelling scheme is operated by the European Commission with support from Member States.

There is ample opportunity to build on the success of the present label and further improve its design and scale. Regarding the scale itself, it is recommended that label scales cover the range of energy performance of appliances that are or may become active on the market, and do not display empty classes at the bottom of the scale without in some way indicating that they are no longer active. The upper label classes should be set at a level that promotes further innovation towards more efficient products. Ideally labels should have seven active classes to allow for a proper display of the spread in energy performance, but a reduced number should also be permissible providing there is no further technical opportunity to create new higher energy performance classes to replace those that are no longer active. Label scales should be set with particular attention to where the boundary is set between the green and the yellow classes, as this threshold is a key differentiator motivating consumers to purchase more energy efficient products. The development of labels using sub-scales within the main energy performance scales should be considered and evaluated for products that provide a common service but have distinct technological and/or energy carrier characteristics (e.g. if all electric appliances are in class C, it could be broken up into C1, C2, C3 etc. to differentiate between electric appliances).

It is recommended that the ranking of individual products on the label scale rewards (1) low absolute energy consumption; and (2) the provision of information on low energy user behaviour. Higher energy using appliances should not be unfairly favoured and rather the efficiency metrics should err towards scales that favour lower energy solutions. Absolute energy consumption could be included in the energy efficiency index defining the label's thresholds. Labels should ensure that promotion of low absolute energy consumption remains a guiding principle, even when renewable energy supply is considered, for the sake of consistency across labels and products. On the contrary, products that

deploy technical features that save energy by intelligent operation that overrides, or requires confirmation of (after a period of time), high energy consuming operational settings or otherwise educates users in a verifiable way that will save significant energy through improved user behaviour should be eligible for ranking bonuses on the energy label scale. While it is possible to use information on environmental performance to affect the ranking of a product on the scale, it would be desirable to adopt a consistent approach across products to do this and efforts should be made to further examine the options to do this.

The possibility to display additional (environmental and/or cost) information on the energy label should be maintained. Nevertheless, currently it is suggested not to add new environmental information, monetary information or whole life cycle impacts information on the energy label until and unless sufficient evidence is made available to demonstrate their viability and to confirm that there is a net benefit from doing so. In general, it should be possible to adjust the number of parameters on the label to the needs for individual product groups. Additional information such as monetary information could be considered to be displayed not on the label itself but for instance on the price tag.

The opportunity to use bonuses in the energy efficiency index should be explored to include some environmental aspects or to ensure that the product life phase with the most impact is taken into account, providing that doing so does not lower the motivational impact that the label information has for consumers and procurers. In the case of product fiches, the evidence base seems too thin to comment on the current fiche in terms of its burden or actual use and benefit by consumers in shops or at home. Both need to be explicitly investigated before decisions can be made.

ICT offers an interesting potential to convey additional information, and would need to be further explored and tested. For instance, QR codes could be added to the label to lead to on-line fiches providing extra information. In the future, it may be possible for appliances to give feedback on user behaviour; however, it is probably premature to reflect these options within delegated acts currently. Although technology evolves rapidly and consumer up-take seems to follow pace, field trials are needed to understand in detail the type of information to convey and what proportion of the public would actually be ready to use ICT tools.

While the current energy label is clearly understood and highly effective, several options to improve on the current design would be worth investigating. Suggestions in this respect include: A) a scale where the length of the coloured arrows is proportional to the average efficiency in the respective classes; B) a secondary horizontal scale at the bottom of the label to present environmental performance; C) a greatly simplified design such as a single coloured arrow "sticker" with a label class for products in small packages; D) a sub-scale within a scale to show efficiency differentiations for product technologies that some users are constrained, or opt, to use but which would not be distinguishable on a scale applicable to all product technologies providing the same fundamental service. Another option, E), includes a rebased A-G label with a somewhat differentiated design compared to the current label and an indicated year value, to distinguish it from the preceding label. Design examples illustrating these concepts are presented in the main body of the report.

S5 Rulemaking process

Transparency on planning of the regulatory process, including a target date for publication, is much needed. In order to gain more control of the planning of the regulation process, while maintaining some flexibility in it, it is recommended that the Commission devises such a targeted planning during the

final stages of the preparatory study. At that time more is known about the technical complexity and the contentiousness of the product. Capacity within the Commission to meet the planning should be secured. Planning should also make clear until when or during which periods stakeholder comments can be received.

Guidelines for the preparation of ED and ELD measures would support the regulatory process, and would need to be updated frequently to take account of lessons learned. Such guidelines would facilitate participation of stakeholders in the process, help lead to a smoother process, and contribute to the creation of a greater institutional memory. An increase in resources may be required to improve the quality of preparatory studies.

Data collection may be improved by a timely assessment of data availability, the possible use of engineering analysis whenever empiric data are absent, and a comprehensive product database. Problems in the later phases of the regulation process may be prevented by building in an evaluation step after tasks 1 – 4 of a preparatory study to assess whether the data gathered is of sufficient quality to continue the study, perform the required analyses, and in the end formulate robust conclusions. It is also recommended to build in the possibility to add an extra phase of data gathering using screening analysis and engineering analysis. This will help to avoid the problem that a lack of good quality data during the preparatory study slows down the remainder of the regulatory process. Finally, a database with Ecodesign and Energy Labelling product specification could be established based on information requirements from existing legislation for all regulated products. It is recommended to make it mandatory for manufacturers to supply the required information to the proposed product registration database.

There is a clear need for more and better tools that may help to establish sufficient ambition levels, and several options have been identified in this respect. Measures with low ambition should be avoided, as they generate lower savings and need to be revised more frequently, incurring unnecessary administrative efforts. Some improvement options should be standard, such as taking into account the price and efficiency effects of technological learning in the Life Cycle cost analysis in a preparatory study, and making better use of benchmarks. As product details vary, the possibility of using other improvement options should be judged on a case by case basis. These options include: (1) for product groups that do not show a clear correlation between price and efficiency other guiding principles than LLCC may be necessary, e.g. a combination of equal or lower LCC, taking into account affordability and banning a significant market share over time)(2) to consider the value of adding empty classes at the BNAT level when setting energy labelling classes; and (3) to base requirements on a balanced mix of energy consumption and energy efficiency. Guiding principles on how to do this, based on physical principles as well as consumer understanding aspects for ELD, should be developed. The revision of measures of some white good appliances (washing machines, refrigerators) could be a starting point.

For future new products preparatory studies should pay more attention to non-energy aspects. If these aspects do not get regulated in one go, it should at least be considered to define general information requirements in the area and to define benchmarks on those aspects.

The availability of standards needs be considered early in the process, and market surveillance authorities could have a greater role in their development. In order to avoid the stalling of the preparatory study process due to lack of standards and data based on these standards, it is recommended to perform a pre-screening as early as possible (i.e. by the time the Working Plan is published) of the existence of standards for products being newly regulated. Given the importance of MSA's as users of technical standards, it is of utmost importance that they have a role in the process of development of

technical standards. They should at least be involved in approving mandates as well as designing and approving standards, and they should be enabled to perform this role.

Voluntary Agreements can be maintained as a policy option. However, transparency in monitoring is a key factor to evaluate the validity of recognition of the VAs compared to implementation measures. Therefore, it is recommended to finalise Guidelines for Voluntary Agreements and update them when necessary, based on on-going experience with VAs.

S6 Market surveillance

Scarce resources are a fundamental obstacle to effective market surveillance activities with Member States and the European Commission. Effective market surveillance will lead to societal benefits related to avoided energy loss from non-compliant products, and it is recommended that these benefits are quantified to gather support for freeing up resources for market surveillance. A successful implementation of ELD and ED regulations critically depends on this. In general, it is recommended to ensure sufficient funding, which could be substantial, as well as available expert capacities available for market surveillance. This could be done via e.g. EU joint enforcement activities aimed at greater harmonization of market surveillance activities, and national government funded programmes ensuring sufficient level of market surveillance, and by recovering the costs of testing from manufacturers of non-compliant products. If these funding options turn out to be insufficient, other mechanisms would need to be put in place that result in more substantial funding, for example a manufacturers' obligation, as is also done for the WEEE Directive. Once sufficient resources have been secured the definition of a minimum level of national market surveillance activities could be considered. This could involve, for example, a specification of annual or periodic plans and reports on activities, and mandatory publication of verification results.

National market surveillance needs clear rules and precisely planned outcomes and strategies. To achieve this, it is necessary to require a minimum level of activities to be performed and monitored, as well as a mandatory publication of results of closed cases of products tested and the shop visits (at least aggregated in terms of number of activities and sectors covered in both cases. It is important that the Market Surveillance Package under discussion will be fully applicable to the Energy Label and Ecodesign legislation. Surveillance could be facilitated by simplifying compliance procedures to a one step procedure, the results of which would be discussed with the manufacturer thereby avoiding related costs, i.e. of testing three additional units of the same model, to lower the costs of testing, allowing MSAs to carry out more surveillance activities. The level and form of penalties need to be dissuasive, possibly reflecting the amount of total value of energy lost due to noncompliance, and also including the publishing of closed cases of noncompliance, concerning both product testing and shop visits. Finally, it is recommended to maintain the option of third party certification for individual product groups, to be evaluated in individual product related legislation processes.

EU coordination and cooperation between Member States needs to be enhanced to maximize synergies from individual activities. In general, a greater exchange of surveillance plans and results by Member States is recommended. Member States could participate in concerted EU projects (joint enforcement activities with a participation of at least the majority of member state authorities) resulting in the application of surveillance results to all relevant countries. Non-participating (or all) countries could be obliged to at least publish their surveillance results.

High level participation of individual authorities in ADCO Energy Label and Ecodesign groups is recommended, and outcomes of these meetings should be accessible to other relevant stakeholders. The identification of product families and equivalent models needs to be streamlined to be able to adapt results of specific compliance checks to all equivalent products, nationally and at EU level. An EU-wide full use product surveillance database is supported and recommended to help identify equivalent models and technical documentation, and to keep track of the results of market surveillance. Products identified as noncompliant on some national markets need to be removed from other EU Member State markets, where they are available. Individual market surveillance authorities should streamline processes on how to interact with EU level manufacturers if their headquarters are in a different country, or work closely with the respective MSA. Foreign test laboratories should also be used more often. Reports from laboratories could be standardised to contain all relevant, and directly comparable information.

Energy Label and Ecodesign regulations could better address market surveillance and enforceability. Legal texts should leave little room for misinterpretation and include requirements that are measurable and enforceable. All (new) parameters required to be displayed or documented need to be reasonably practical to measure and verify for Authorities and possible to enforce.

S7 Market effects

In general, benefits from Energy Labelling and Ecodesign are perceived to outweigh costs, both for organizations and for society as a whole. Benefits relate both to environmental gains, including greenhouse gas reductions, and to cost savings for consumers and businesses. ELD/ED have not affected the long term downward trend of prices, with the exception of lighting and circulators. Some industrial stakeholders report that profit margins have been put under pressure though following increased production costs.

Overall, Energy Labelling and Ecodesign have had little perceived impact on overall market sizes, market structure, or product choices. The Directives do not seem to have significantly impacted overall market sizes as other economic forces have appeared much more powerful. There is some evidence for increasing market concentration in affected product groups but the role of the measures in altering pre-existing trends is unclear.

The impact of Energy Labelling and Ecodesign on competitiveness was perceived as positive, in particular for Energy Labelling. For Ecodesign this tendency was less clear. The impact of labelling was considered especially positive for refrigerators, washing machines, domestic dishwashers and laundry dryers. Views on the comparative advantage of manufacturers vs importers diverge. Some anticipate competition is unfair to manufacturers, in particular if enforcement in the EU is limited, while others expect that manufacturers will benefit from their own production of high quality products.

The impact of Energy Labelling and Ecodesign on innovation is perceived positive across product groups. This holds in particular the labelling of refrigerators, washing machines, domestic dishwashers and laundry dryers. For Ecodesign this tendency was less clear. The strength of the innovation impact is closely related to the level of requirements that are set, with stricter requirements generally stimulating more innovation, but too strict requirements creating resistance in the regulatory process and putting more pressure on firms, particularly SMEs, to adapt. Innovation impacts are also stronger in slower moving product groups such as white goods, as opposed to faster moving consumer electronics product groups which are already highly innovative, although not necessarily on energy efficiency.

The impact of Energy Labelling and Ecodesign on small and medium enterprises is generally considered positive. However, SMEs may have more limited technical and financial capacity to comply with ELD/ED regulations, which is a risk. On the other, they may benefit from new niche markets. The market for LEDs is an example.

1 Introduction

1.1 Context and purpose of the evaluation

According to Article 14 of the Energy Labelling Directive (ELD), the Commission has to evaluate the effectiveness of the directive and of its delegated acts not later than 31 December 2014.

Likewise, according to Article 21 of the Ecodesign Directive (ED), its review should be performed not later than 2012. The final report of this evaluation study was published on 16 April 2012. However, certain aspects of the application of the Directive could not be assessed thoroughly because the Directive had been in force for only two years. For this reason an assessment on the basis of new data and evidence is required.

In consequence, the Commission has launched a review process to:

a) Evaluate the effectiveness of the Directive 2010/30/EU on energy labelling and of the implementing measures adopted under the Directives 2010/30/EU and 92/75/EEC, and
b) Evaluate specific aspects of the Ecodesign Directive 2009/125/EC (that are identified further in this document).

Purpose of the study
The aim of this evaluation study is to compile, analyse and provide the Commission with all the information required for the review process and the possible revision of the directives to the extent this is justified. In addition to this, the evaluation will identify options and provide recommendations for the improvement of the current legal framework and its application by the national authorities and industry. These recommendations will be supported by an analysis of the most relevant arguments for and against identified options.

1.2 Priorities

According to the specifications for this study, seven priorities are to be to addressed in the evaluation of the Energy Labelling Directive:

1. Assess whether energy labelling has fulfilled its objectives in terms of informing consumers about the environmental characteristics of products during their use.
2. Evaluate the appropriateness of the existing energy labels for meeting the objectives of the Directive and the delegated acts and implementing directives.
3. Examine the effectiveness of the application of energy labelling in the EU and the Member States.
4. Examine whether the criteria and procedures for defining and developing delegated acts and implementing directives on the one hand, and as implemented by the Commission on the other hand have been effective and cost efficient.
5. Examine the political, legal and (if appropriate) procedural relationship of energy labelling with other relevant EU policies and instruments, i.e. the Energy Performance of Buildings Directive, Green public procurement, the regulation on labelling of tyres, and the EU Ecolabel.

6. Examine the appropriateness of laying down labelling requirements for non-energy related products, product systems, means of transport[1], thus extending the scope of the Directive.
7. Evaluate effects of energy labelling on the market and on industry's competitiveness (including innovation).

Additional evaluation of the Ecodesign Directive is needed on the three following aspects:

1. The effectiveness of the mandatory and self-regulatory implementing measures adopted under the Ecodesign Directive.
2. The appropriateness and feasibility of laying down ecodesign requirements for non-energy related products and systems and means of transport.
3. The effectiveness of the standardisation process carried out for the Ecodesign Directive.

1.3 Approach and study deliverables

Findings for each of the evaluation priorities listed above were collected in several ways.

Firstly, an extensive literature review was conducted during the summer of 2013. Results of that work were updated in November, and are presented in *Background document I: Literature review*.

Secondly, an open online consultation was published on the Your Voice website running from 30 August to 30 November 2013. The consultation consisted of a short version targeting consumers as well as individual (small) retailers and manufacturers, and a long version targeting other stakeholder groups (governments, larger industries, interest groups, etc.). The outcome of the survey questions is discussed in *Background document II: Survey report*. It includes the statistics of the multiple choice answers in annexes.

Thirdly, interviews were conducted with 35 stakeholders with various backgrounds: European Commission (6), national energy agencies (6), surveillance bodies (3), other government bodies (1) environmental interest groups (3), industrial interest groups (11), a retailer interest group (1), a consumer interest group (1), an international organization (1), and independent experts (2). Interviews typically covered three out of a list of eight topics: objectives of Energy Labelling and Ecodesign; appropriateness of the energy label; rulemaking process; implementation; relation to other EU policies; market effects; effectiveness of standardisation; and scope expansion of ELD and ED to cover non-energy-related products and means of transport. For each interview two topics were proposed by the study team, while one was chosen by the interviewee. In this way all review priorities could be covered in the interviews, while each individual interview remained focused and tailored towards the background of the interviewee.

Transcriptions of the interviews, which were confidential, were all approved by the interviewees before they were used in the evaluations. Findings of the interviews are reflected in this report, and were taken into account when formulating conclusions of the evaluation.

Fourthly, non-governmental organizations and Member States were invited to submit position papers to highlight the most salient issues that the study team would need to consider. In total 32 position papers were submitted.

[1] Power generating devices were also initially included here but have been removed following further discussion with the Commission.

Fifthly, five case studies are conducted to underpin conclusions and recommendation. These will be presented in *Background document III: Scope expansion.*

Sixthly, a number of label designs will be elaborated as input to a consumer understanding that runs in parallel to this evaluation study. These are introduced in section 4.6.

Finally, three public consultation meetings are conducted to provide stakeholders the opportunity to express their views to the Commission in the presence of a larger audience. The objective of the first stakeholder meeting (27 June 2013) was in particular to collect stakeholder views on the scope and focus of the online consultation. The second stakeholder meeting (14 October 2013) was to present initial results from the literature review, and to have a public debate on different aspects of the review. The third and final stakeholder meeting will be held on 18 and 19 February 2014. Views expressed in the first two meetings are reflected in this report, and were taken into account when formulating the first findings and recommendations.

In this report, extensive use is made of information from the above described sources of information. In doing so, it is made clear where the information originated: literature report, survey report ('stakeholders'), additional references added to this report or own analysis.

1.4 Focus and structure of this report

This report summarizes results from the evaluation collected in each of the ways described above. Findings from the literature review, the online consultation, the interviews, the public consultation meetings, and the case studies are used to arrive at conclusions and recommendations.

This report is structured as follows. Chapter 2 provides an overview of projected energy savings per product group, together with a discussion of ambition levels, and of factors affecting realized levels of energy savings. Chapter 3 addresses the coherence of the Energy Labelling and Ecodesign Directives and the broader EU policy framework, and explores the potential for improved synergies in the legislation. This chapter also presents a summary of the findings on the need and feasibility of expanding the scope of the Directives, referring to the underlying *Background document III: Scope expansion.* All aspects of the energy label are evaluated in chapter 4. This chapter results in a number of suggestions for label designs that would be worth investigating. Chapter 5 continues with an evaluation of the present regulatory process, and includes recommendations for improving both its quality and speed. Chapter 6 deals with the effectiveness of market surveillance by the EU Member States, and with ways for enhancing this. Finally, the effects from Energy Labelling and Ecodesign on markets, competitiveness and innovation are discussed in chapter 7.

2 Achieving Energy Labelling and Ecodesign objectives

2.1 Introduction

The principal objectives of the Energy Labelling and Ecodesign Directives (ELD and ED) include saving energy and contributing to meeting the EU target of a 20% reduction in energy consumption by 2020. The goals for Ecodesign are wider, also encompassing the EU single market and other environmental impacts occurring along the full life-cycle of the product.
Before entering into discussions on the details of the Directives, barriers and possible improvements, this chapter is devoted to giving an overview of what has been achieved to date and what is still to come, in terms of energy savings as well as addressing other environmental impacts.

The Energy Labelling Directive foresees that the preparation of energy labels for product groups, will give clear information to consumers, enabling them to take into account the energy performance of products in their purchase decision. The energy label will be discussed in detail in Chapter 4.

The Ecodesign Directive aims at reducing the environmental impacts of products by setting generic and specific 'Ecodesign requirements'. These requirements concern the following types of environmental impacts:

- Material, energy and water resources
- Waste
- Emissions to air, water and soil
- Hazardous substances
- Physical impacts in the use phase

These impacts can occur in all life cycle phases of the product, the main phases being the manufacturing phase, the use phase and the end-of-life phase.

Even though the scope of the Energy Labelling Directive is focussed on energy in the use phase, it also covers the consumption of other resources during use. Thus, some other impacts can be included in the label (such as water consumption of washing machines, noise levels of household appliances, also in the use phase).

The consumption of energy has been a focus of regulations to date, as it was the largest environmental impact. Thus, the focus of Ecodesign requirements is often on minimum energy efficiency requirements.

In terms of the product types covered by Ecodesign and Energy Labelling we distinguish the following types:

- Energy using Products (EuP) for private consumers.
- EuP for business to business (B2B) applications
- 'Product-systems'
- Energy related Products (ErP, products that have an influence on energy consumption)

Until 2009 the scope of the ED was limited to EuP. Until 2010 the scope of the ELD was limited to EuP for private consumers. The current scope of the ELD and ED is Energy related Products: any good that has an impact on energy consumption during use. A possible scope extension discusses the inclusion in the Directives scope of non ErP (extension to basically all products) and means of transport.

Ecodesign requirements are based on the least-life cycle cost principle: to set requirements at the level where life cycle costs are the lowest. This principle ensures that products are optimised with respect to energy and life cycle costs for consumers. Sticking to this principle gives an important benefit: that the energy efficiency achieved is also cost-effective. This makes it beneficial for consumers and beneficial for European economies.

A study that quantified the economic benefits of the ED and ELD directives estimated that, based on projected energy savings:

- Net savings for European consumers and businesses amount to €90 billion per year (1% of EU's current GDP) in the year 2020. This means net savings of €280 per household per year;
- Reinvesting these savings in other sectors of the economy would result in the creation of 1 million jobs;
- Dependency on imports of energy would be reduced by 23% and 37% for natural gas and coal, respectively. This means the EU could slash natural gas imports from Russia by more than half and imports of coal from Russia could be stopped altogether (Molenbroek 2012).

In the next section, we discuss these projected energy savings in more detail.

2.2 Projected energy savings per product group

Existing work on the energy savings that have been, or will be, achieved is analysed in the accompanying literature report (Ch 8).

Table 1 provides an overview of energy saving estimates as provided in European Commission documents, alongside another comprehensive estimate of energy savings made [Irrek 2010]. In the literature report (chapter 8.24) an effort was made to score the Ecodesign regulations implemented thus far on ambition level, scope and whether the estimated energy savings as listed in the table are expected to be reached. It turned out to be impossible (given constraints on time and available data) to apply a standardised method for the scoring. In the end the judgement had to be done on a case by case basis. This limits the value of the analysis, with the overview of savings restricted to reporting projected values.

It is also important to note that these numbers are the result of the modelling efforts and assumptions at the time the regulation was prepared. As an example, the impact assessment supporting the Ecodesign Regulation on electric motors estimated that two thirds of the total motors sold would be equipped with a Variable Speed Drive (VSD) after the regulation was enforced. The estimated savings of 135 TWh compare to only 18 TWh resulting from improving the efficiency of the motor. However, motor manufacturers (CEMEP) expect that only between 30% - 40% of users have preferred an IE2 motor equipped with a VSD over a (more efficient) IE3 motor alone. This will have a negative impact on the achieved savings of this product group, which is the group with the largest projected electricity savings (Ch 8.2 literature report). It should be noted that the study by Irrek (2010) was conducted when only a very limited amount of implementing measures was finalised. However, the study is interesting because it examined the interrelationship between product groups savings, accounting for overlaps (e.g. motors present in other

product groups), and a rebound effect. Therefore, it serves to put the EC numbers in perspective. In case a range of savings (min – max) is given for the Irrek (2010) numbers the measure was not implemented yet at the time of the report.

Table 1: Projected annual electricity savings by 2020 [TWh] for regulated product groups (sources: EC, preparatory studies, Impact Assessments), savings by Irrek (2010), electricity consumption in the starting year and 2020, % savings for Ecodesign (the levels in the regulations). For groups in italics energy labelling also applies, savings in this case are combined Ecodesign and Energy Labelling savings.

Product group	EC projected savings 2020 (TWh)	Electricity savings 2020 (Irrek2010) -min	Electricity savings 2020 (Irrek 2010) - max	Energy consumption starting year (TWh)	BAU consumption 2020 (TWh)	Ecodesign savings (%)
Electric motors, Lot 11	135	83.4	83.4	1067	1252	10.8%
Domestic lighting (non-directional), Lot 19	*39*	*25.6*	*31.7*	*112*	*134.7*	*29.0%*
Televisions, Lot 5	*28*	*22.3*	*22.3*	*60*	*132*	
Tertiary Lighting, Lot 8-9	*38*	*32.1*	*32.1*	*200*	*260*	*14.6%*
Standby and off-mode losses, Lot 6[2]	36	27.9	27.9	54	90	40%
Ventilation fans, Lot 11	34	34.7	47.7	390	629	5.4%
Directional lighting, Lot 19-part2	*25*	*78.9*	*81.5*			
Circulators in buildings, Lot 11	23	18.2	18.3	50	55	41.6%
Vacuum cleaners, Lot 17	19	25.1	25.1	18	34	
Imaging equipment, Lot 4	15	2.3	2.3	45.1	51.9	28.9%
PCs and servers, Lot 3	12.5 to 16.3	5.5	7.6	53.1	96	
Room air conditioning appliances, Lot 10	*11*	*10.1*	*24.7*	*30*	*74*	
External power supplies	9	7.2	7.2	17	31	
Simple set-top boxes, Lot 18a	9	7.2	7.2	6	1	-
Complex set-top boxes, Lot 18	6.5	2.6	4.6	6	10	65.0%
Domestic refrigerators and freezers, Lot 13	*6*	*3.6*	*3.6*	*122*	*83*	*7.2%*
Laundry driers, Lot 16	*3.3*	*0.3*	*1.3*	*20.7*	*31.3*	*10.5%*
Electric pumps, Lot 11	3.3	2.3	5.2	109	136	
Domestic dishwashers, Lot 14	*2*	*combined with washing machines*		*26*	*33.7*	*5.9%*
Domestic washing machines, Lot 14	*1.2*	*15.1*	*15.1*	*35*	*37.7*	*3.2%*

[2] Including networked standby

Another study run by the Commission services has the objective to consolidate the scenario analyses accompanying the individual measures, in order to bring greater consistency in terms of approach and assumptions on constants, such as electricity prices, correcting the potential differences stemming from divergent approaches. The results of this exercise will be reflected in the savings attributed to each product group in the final report of this study.

In addition to the product groups that concern mainly electricity savings two measures were adopted recently that involve savings from various energy carriers and are expressed in primary energy. These are given in the table below. For comparison: the measure with the largest electricity savings (motors) represents primary energy savings of 486 PJ.

Table 2: Projected annual energy savings by 2020 [PJ_{prim}] for regulated product groups (sources: EC, Regulations)

PRODUCT GROUP	EC projected 2020 savings/yr (PJ_{prim})	Energy consumption starting year (PJ_{prim})	BAU consumption 2020 (PJ_{prim})	Ecodesign savings (%)
Space and combination heaters (lot 1)		12089	10688	18%
Water heaters and hot water storage tanks (lot 2)	450	2156	2243	20%

Projected total energy savings by 2020

The EC estimates from the product groups regulated to date in total approximately 460 TWh / year of energy savings in 2020 compared to BaU, while the estimates by Irrek suggest a range of 400-450 TWh / year savings for regulations to date. For heat the total projected savings from product groups regulated to date amounts to 2350 PJ/year in 2020, while the estimates by Irrek suggest a range of 960 – 1740 PJ / year in 2020. This corresponds to approximately 13% of total EU electricity consumption and 13% heat consumption in 2020. As already noted earlier in this section there is significant uncertainty associated to these numbers (by up to 50%). In addition to what was already mentioned, the EC estimates do not systematically take into account rebound effects. Currently modelling work is being undertaken for the Commission that will produce more accurate estimates.

Discussions on the energy savings that can be achieved by the Directives inevitably turn to what the full potential of savings are and how well the energy labelling and Ecodesign implementing measures are managing to capture this potential. This is both a question of the ambition shown in the requirements of the implementing measures and the success of their implementation. Notwithstanding many comments on process and ambition, overall, stakeholders support ED and ELD, seeing them as successful, relatively low cost policies to achieve energy savings and contribute to achieving the 2020 energy savings target.

Ambition of measures

The survey asked stakeholders for their opinion on the ambition of ED and ELD measures adopted to date (Chapter 3.2 survey report). Most stakeholder groups agree that, across product groups, the implementing measures and labels have shown ambition that was too low compared to what is technically and economically feasible. Government bodies were divided between assessing the level of ambition as too low and correct[3]. Industry found the ambition of the measures to be about right. Ambition clearly varies by

[3] It should be noted that the government bodies' original opinion of the measures ambition level, expressed through qualified majority voting in the regulatory committee, is "correct" by default. It could be that (1) the survey responses do not represent the opinion of the Member States as a whole, (2) additional evidence has come forth that made Member States change their opinion.

product group. The consultation pointed out the following broad perceptions by stakeholders on the energy saving ambition of ED measures:

- **Correct ambition for all stakeholders**: boilers, standby and off-mode losses, external power supplies, circulators in buildings, simple set-top boxes;
- **Correct to too low for government bodies, mostly correct for other groups:** electric motors, vacuum cleaners;
- **Too high for industry, too low for environmental groups, correct for other groups**: non-directional lighting;
- **Correct or too high for industry, correct to too low for government bodies, too low for other groups**: water heaters, directional lighting;
- **Correct for industry, correct to too low for government bodies, too low for other groups:** tertiary lighting, room air conditioning, fans, domestic refrigerators, washing machines, dishwashers, laundry driers, water pumps;
- **Correct to too low for industry, correct to too low for government bodies, too low or much too low for other groups:** PC's and servers, complex set-top boxes, imaging equipment;
- **Correct for industry, too low to much too low for other groups:** televisions.

The study team has done its own investigation on the ambition of product groups. As already mentioned this analysis was limited in several ways. Nonetheless, we feel confident to say that the level of ambition on electric motors, standby and off-mode losses, external power supplies, circulators in buildings and non-directional lighting was correct. In addition, the level of ambition on domestic refrigerators, washing machines and dishwashers was too low and for televisions was much too low.

As the manufacturers of the products covered by the measures (thus the most directly affected by the requirements), industry are a principal data source for preparatory work, and follow the consultations during the decision-making process with great attention. They appear to be the most satisfied with the ambition level of the regulations.

Some respondents to the survey pointed out that Ecodesign requirements are not set at Least Life Cycle Costs, or that learning curves are not considered. Someone argued that LLCC should not relate to fossil fuel market prices, but should be evaluated at the cost of the most expensive form of large scale renewables to better appreciate the economic benefit. Also labelling classes, in particular the A class and above, are considered too generous by several stakeholders.

Present product selection considered appropriate, but could be changed

The survey showed that for the majority of product groups there is a strong consensus on the appropriateness of the product selections. For some products consensus was not that clear, including boilers, imaging equipment, complex set-top boxes, circulators in buildings and ventilation fans.
Some respondents to the survey argued that the exploitation of the savings potential is not well spread across product lots and technologies within them. Suggestions for changing the scope included an extension to energy-producing products, especially renewable power generating devices (e.g. PV), lifts (in Ecodesign rather than in Energy Labelling). Views on the need to include (building) systems diverge, with some pointing at the energy saving potential, and others to the risk of regulations becoming too complex.

Lengthy process typically a sign of low ambition outcomes
According to the survey, the length of the implementing process for measures is regarded as too long and is often associated with a reduced energy saving impact of the final outcomes. In many ways this is not unexpected, with more ambitious measures always likely to attract more discussion and resistance. This makes the process susceptible to delaying tactics, for example to become stuck in lengthy technical discussions on relatively minor issues, and for the original technical and preparatory work to become more outdated as technology learning effects are either not, or poorly, taken into account (chapter 5).

Weak enforcement by Member States is a concern for energy saving, industry and consumers
The actual level of ambition of the measures is undermined by weak enforcement, with a lack of market surveillance and testing of products leading to less efficient products reaching the market or more efficient products not supported by correct labelling. This leads to reduced energy saving overall and can also have negative knock-on impacts on industry innovation and consumer behaviour and trust. Market surveillance and associated issues are analysed further in chapter 6.

Energy savings reduced by A+++ labels and lack of integration with Ecodesign
The evolution of energy labels to the A+++ categories is one that has little support among stakeholders, and where there is an overwhelming recognition of the need for change. It is also becoming increasingly clear that the A+ categories are less effective at attracting consumers to the higher classes than the A class on an A-G scale.

The issue of labels including categories that are banned under Ecodesign is also identified as a key weakness of labelling that reduces potential energy savings. There is strong support for better integration of Labelling and Ecodesign in this area, potentially through removing, or otherwise identifying, banned classes on the label image (chapter 4).

Trend to larger, but more efficient products, can lead to higher consumption
The implementing measures focus on improved energy efficiency, which, all other things being the same, will result in energy savings. However, a trend towards larger products has emerged in particular product groups, i.e. refrigerators, washing machines and TV's. It is unclear if this is solely in response to consumer demand, with increasing concerns that manufacturers are 'gaming' the labelling classes, as it is typically easier to gain higher label classes with larger products. The result is that overall efficiency improvements, as measured by the average label class of the market, may not result in total energy savings.

There are concerns that all of these issues will erode the generally high consumer trust and support for labelling and therefore there is strong support among stakeholders for a more dynamic labelling system. Similarly, more regular review of Ecodesign is recommended to maintain and improve energy saving potential.

Concluding
In general, stakeholders believe the Energy Labelling and Ecodesign Directive have been successful, but there is missed potential as well. A smaller group, comprising industry interest groups in particular, believe that the Directives have met their potentials. Most other stakeholders think that the Ecodesign Directive needs to be changed to achieve energy savings that are closer to the full potential, and a larger group considers this be true for the Energy Labelling Directive. However, for Ecodesign the main changes that are called for are at the level of the implementing measures, which are believed to rarely achieve least life cycle cost levels, rather than in the framework itself. Both Directives could be more forward-looking and stimulate innovation.

2.3 Potential energy savings from possible future regulations

The savings discussed in the previous section relate to measures finalised by September 2013. These regulations should result in approximately 13% savings in electricity as well as heat (although the electricity savings on motors are questioned, see above). Irrek 2010 expected the total of electricity savings to be 14-17% and the total of heat savings 6-10% with respect to the BaU in 2020.

In addition to the existing measures, a number of measures are in development from the first working plan and are still to be finalised (e.g. solid fuel boilers, non-tertiairy coffee machines). This raises the question: What are the potential energy savings that can be achieved from possible future regulations? and where is the most untapped potential? In the 'Study on Amended Working Plan under the Ecodesign Directive' a top-down energy analysis was made to gain insight into the contribution to total energy consumption of various energy carriers (heat, electricity), split by product group (at various levels of aggregation) [Kemna 2011]. Figure 1 is adapted from this and clearly shows the relative contribution of various product groups to total electricity and heat consumption. In their analysis, they showed that on the order of 80-90% of final energy consumption came from products already dealt with by measures or covered by preparatory studies at that time. Some remaining EuP (e.g. steam boilers) were identified and added to their list. Iit was already clear from previous comments that the coverage of product groups by preparatory studies does not imply that this process ends up in the appropriate measures. Barriers in the process and potential improvements are discussed in Ch 5.
In obtaining more savings three additional routes are possible:

- Revision of measures. This will always have to take place, and probably sooner when measures with low ambition are in place. The second working plan foresees in some. The revision process for the first measures has started (e.g. televisions, white goods).
- Increased coverage of energy labelling. Though the ELD has been extended to ErP, including B2B products, in 2010, no B2B products have been labelled to date. This points to missed potential as information failure also occurs in the B2B applications and B2B products which have the largest share of energy consumption of most product functions shown in Figure 1. This is discussed further in Ch 4.
- Coverage of Energy related Products (ErP), discussed below.
- Coverage of 'product systems'. Discussed in more detail in the next section.

Tackling all these groups gives a structured and comprehensive approach to the ongoing tackling of product groups with potential energy savings.

ErP
Apart from the remaining EuP the study on the amended working plan was focussed on ErP. In this study a list of 36 new product groups with a total savings potential of 5800 PJ / year in 2030 (final energy, electricity and heat combined) was identified.
The largest product groups from this study were added to the second Ecodesign Working Plan. This plan distinguishes two groups:

- A priority list: Water-related products (e.g. showers and taps), windows, steam boilers, power cables, servers, smart meters. First estimates on savings potential is close to 3000 PJ / year in 2030 (final energy). All these product groups are currently under a contract for developing preparatory studies.

- A provisional list has been established, also with an estimated savings potential of 3000 PJ / year in 2030. The groups on this list are still to be checked in more detail for regulatory overlap with other instruments.

600 PJ / year of savings from Kemna 2011 (2) did not make it into the second working plan, yet the estimated savings from the Second Working Plan are larger. This is because a new group, smart meters, was added.

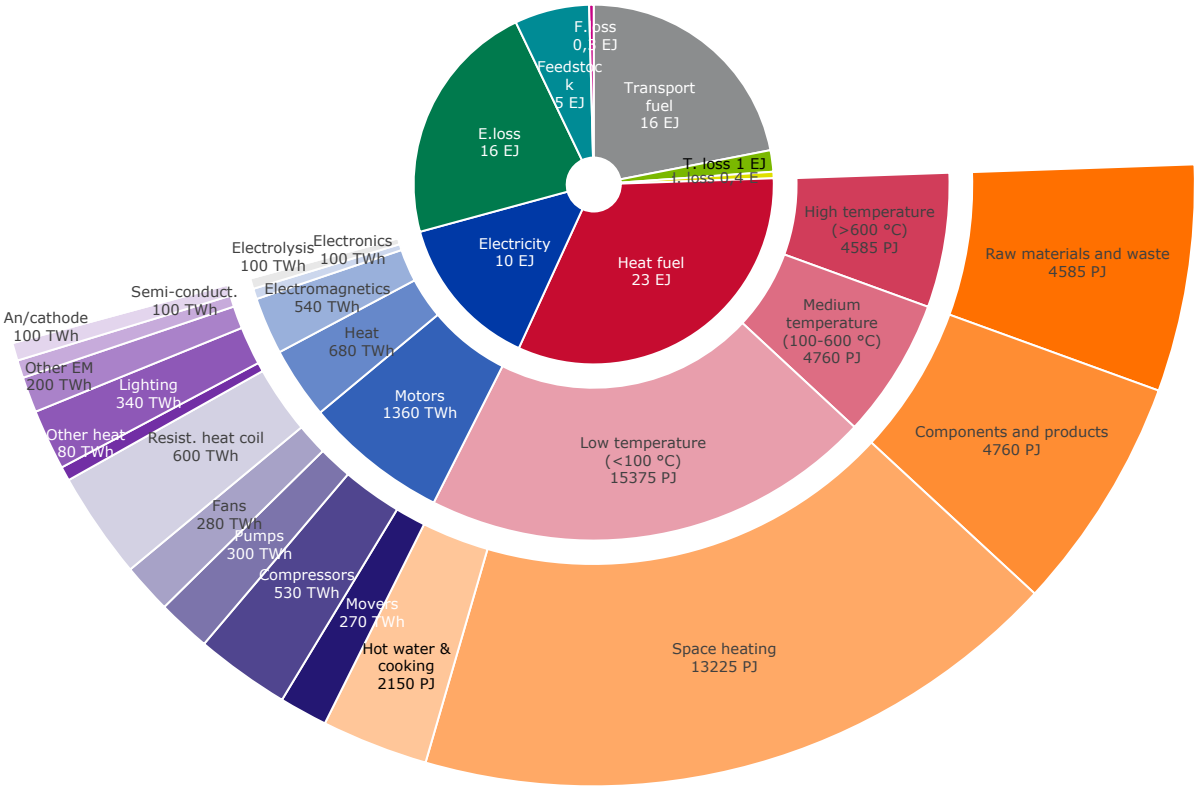

Figure 1 Energy consumption in the EU (2007), split into main function, 'conversion categories' and product functions. Adapted from Kemna 2011 (2).

2.4 Product systems

2.4.1 Introduction

By product systems, we understand a constellation where several individual products work together in order to perform (a) certain function(s). Examples are:

- Heating systems: one or several heat generator(s) such as boilers or solar thermal panels are combined with controls, a heat storage device, a circulator, ductwork, radiators, and valves, in order to heat an indoor space. The system involved in indoors space heating can also be understood in an even broader sense, including elements of the building shell such as insulation, doors, windows, and even the architecture and orientation of the building.
- Lighting systems: In order to light rooms according to the needs of the users, lamps and luminaires are combined with cables, switches, and in some cases, automation.

- Motor systems: Electrical motors are typically part of a larger system that include a motor, an electrical control system, a mechanical load, and may also include a variable-speed drive (VSD).

Product systems are a very relevant case for energy efficiency policies. First, the case of motors shows that some systems that are widely in use account for a very significant portion of energy consumption and regulating them can therefore deliver important savings: As motor systems consume between 43 and 46% of all global electricity consumption, cost-effective improvement of their energy efficiency by 20% to 30% would reduce total global electricity demand by about 10% (Waide, Brunner 2011). The same is true for space heating systems: space heating accounts for about 18% of EU primary energy consumption or 53% of all heating fuel consumption (Kemna 2011 (2) p.37 and 39; 2007 data).
Secondly, these potentials in general cannot be tapped by regulating the individual components of the system alone. For it is not uncommon that most savings potentials do not occur in the individual product but in the interaction of system components. For example in motors, the best available motors, on their own, will typically save about 4% to 5% of all electric motor energy consumption. By optimising the whole system (including correct sizing of the motor, pipes and ducts, efficient gears and transmissions, efficient end-use equipment, and variable speed drives where appropriate) in a way that is cost-optimised for the end-user, another 15% to 25% may be saved (Waide, Brunner, 2011).

The MEErP Methodology, in its task 3, already addresses product systems. The methodology foresees three levels for the analysis of the environmental and resources impacts during the use phase for ErP with a direct energy consumption effect:

- Individual product
- Extended product (e.g. product + controls)
- Technical systems (how the performance of the product influences the performance of the broader system it is included in) and functional system

In fact, at least three regulated product groups, two of them with largest projected ED/ELD savings to date, already have a systems aspect to it. They are discussed in the next paragraph.

2.4.2 Current approaches in Ecodesign and Energy Labelling

There are a few examples of tackling systems in Ecodesign and Labelling.
For circulators, the so-called "extended product approach" has explicitly been applied. The extended product approach is based on a methodology for an "extended product", that is a product plus components that are very closely linked to it and support its function in a system (e.g. a boiler and its controls, or a pump and its power drive system and controls). In an extended product approach for circulators, for example, the Energy Efficiency Index is calculated on the basis of operating a pump at different duty points of a load profile, thereby capturing the performance of the circulator-controls combination under realistic conditions. The same approach is now proposed to be applied for pumps under Lot 28 and 29 (Europump 2013).

For motors, a bonus has been introduced for including variable speed drives (VSDs). Ecodesign Regulation 640/2009 foresees that from 2015 on motors must meet only the IEC2 efficiency level and not the IEC3 efficiency level when equipped with a VSD[4]. On one hand this sounds like a sensible approach, as a choice between the two can then be made depending on the application, as VSD can be very useful in some

[4] A variable speed drive (VSD) is helpful if a motor drives a mechanical system with varying load requirements. It adapts the motor's power input to the load requirements of the mechanical system it drives, thereby helping to avoid energy losses by throttling devices or mechanical transmission

applications with variable loads but are an extra component with losses in other applications where motors need to be run at full load. On the other hand, as IE2+VSD tends to cost more than an IE3 motor only, chances are that those who procure motors systems choose the application with the lowest investment cost. In fact there are signs of this happening, as pointed out in 2.2.

An example for a creative way to take into account system properties is the so-called "installer label" for space and water heaters. This label addresses combinations of a space heaters or water heaters with temperature control and solar devices. When contacted by a prospective customer, the dealer is required to calculate the overall energy efficiency of a specific package of system components assembled for the customer's particular needs, using a standardised calculation methodology and based on the characteristics (labels) of the components. This "package label" is then shown as well as explained in a detailed product fiche.

2.4.3 Challenges capturing product-systems savings

One challenge in capturing product-systems savings under ED/ELD was already mentioned in the previous section: giving choices for system savings does not give sufficient guarantee that it will actually take place. Another challenge is how the market surveillance of product-systems will be effectuated. For ED market surveillance can generally be done at a high aggregation level, e.g. type testing, checking documentation from manufacturers and importers, etc. For ELD the work already extends into the distribution channels down to the shop level. Introducing system aspects introduces new market surveillance aspects. Checks needs to be done for correctness of the label and product fiche produced by dealers or suppliers. How to avoid IE2 motors from being sold without VSD? The large energy savings may very well warrant this extra effort in market surveillance. However, it will be important to ensure that this is actually done.

Thirdly, product policy alone is not capable of capturing all potential product savings. Product policy has certain ways of tackling systems; however, the array of instruments remains limited. For example, it is geared toward large numbers rather than a tailored approach.
In many cases, additional policies will be needed in order to ensure the optimal cooperation of system components. They can, for example, include overall performance requirements or evaluations for systems (such as energy performance requirements and certificates for buildings), they can target management processes (such as EMAS) or they can introduce training and incentives for the installers and engineers that assemble the system. Product policy can play an important role in a set of policies targeting a system. By ensuring that the individual components fulfil certain requirements, they provide a necessary, even if not sufficient condition for good performance of the system as a whole.
Good product policy must therefore

- take into account the context / system and mode in which a product is most likely to be applied (as already described in the MEErP, but quite likely more experience is necessary in order to further optimise this)
- be careful when restricting the choice of available products to a degree that optimal products for certain types of systems cannot be purchased any more (for example, electric hot water boilers are to date still necessary for certain building types where no alternative fuel exists. Completely banning them would rather result in the continued use of old and inefficient appliances in these cases. This effect that would have to be carefully balanced to the benefits a ban would bring in other cases where there is a broader choice available).
- on the other hand, be careful not to "water down" requirements by overly generous bonuses that are meant to account for system aspects (as discussed above).

2.4.4 Possible future approaches

The Ecodesign and Energy Labelling Directive do in principle allow for regulating certain aspects of systems by using instruments such as the Extended Product Approach, Installer Label, or bonuses, or by carefully considering the most likely application contexts of products. These possibilities definitely need to be explored more systematically as there are huge savings potentials in product systems.
On the other hand, there are intrinsic limitations to tackling system aspects via product policy. They occur when systems are too complex or too diverse to be covered by policies designed for relatively uniform products whose efficiency is determined by a few main parameters. Furthermore, product policy can only address manufacturers, importers and dealers, while in the case of complex systems, other actors such as installers, architects, maintenance personal or operators may be involved.
Therefore, our conclusion is to not expand the scope of Ecodesign and Energy Labelling, but to better explore existing potentials, coordinate them with other policy tools, and pay ample attention to market surveillance aspects.

2.5 Reduction of other environmental impact from finalised regulations

Because we are dealing with energy related products it does seem coherent that implementing measures mainly address the use-phase impacts, most importantly, energy use, as this represents, in varying degrees, the most important contribution to the environmental impacts of the covered products. Nevertheless, where identified, other relevant environmental impacts have been addressed both by Ecodesign regulatory measures and by Energy Labelling Implementing Measures or Delegated Acts. While Energy Labelling covers only resource consumption in the use phase, Ecodesign measures can address, and have addressed, also impacts in other life cycle phases.

Examples for **Ecodesign** are:

- For washing machines, limits are set on the water consumption.
- Regulations on lighting include requirements on survival factors, lumen maintenance and number of switching cycles before failure which have implications in the replacement rate and consequently on resource efficiency.
- The indication of mercury or lead content is also part of the information requirements for some products, such as lamps or televisions.
- Information relevant for non-destructive disassembly for maintenance purposes is mandatory for vacuum cleaners and for disassembly, recycling, or disposal at end-of-life for vacuum cleaners, circulators and imaging equipment.
- Durability requirements are introduced for vacuum cleaners (hose still useable after 40,000 oscillations under strain; motor lifetime at least 500 hours).

- For Room Air Conditioners, the preparatory study also identified possible refrigerant leakage as a significant environmental aspect in form of direct greenhouse gas emissions, representing on average 10-20 % of the combined direct and indirect greenhouse gas emissions. As refrigerants are addressed under Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases no specific requirements on refrigerants are set in this Regulation. However, a bonus is proposed under the ecodesign requirements to steer the market towards the use of refrigerants with reduced harmful impact on the environment. The bonus will lead to lower minimum energy efficiency requirements for appliances using low global warming potential (GWP) refrigerants.
- To help in guiding users on the best available technology for specific applications, indicative benchmarks are sometimes given on non-energy aspects. One example is for lighting products where benchmarks figures are given for a number of parameters such as lamp mercury content and light pollution from street luminaires. Another example is water consumption benchmarks for dishwashers.

Detailed quantitative assessments of the effects of these specific measures on environmental impact categories are not available (for washing machines, see next section).

Examples for **Energy Labelling** are:

- Information on water consumption in the labels for dishwashers and washing machines,
- Information on noise on the labels for refrigerators and freezers, dishwashers, washing machines, tumble driers, air conditioners, vacuum cleaners, and heat-pump driven boilers and water heaters.

However, these informations are always less prominent than the energy consumption and are given as absolute values only, without a scale for comparison purposes. They are therefore much less prominent and likely to guide consumer choice than the energy efficiency scale.

The respective impact assessments are not very specific on possible effects of the declaration of noise emissions. It is said that it may impact the purchasing decision, but no quantitative assessment is given. With regard to water consumption, the impact assessment for dishwashers show that the combined effect of Ecodesign and Labelling measures will reduce the water consumption in 2020 from 389 million m3 in the baseline scenario (+26% of 2005) to 325 million m3, or by 16%. (Commission Staff Working Document SEC(2010) 1356 final, section 6.3.2). The impact assessment for washing machines shows that by the combined effects of Ecodesign and Labelling, water consumption will be reduced, in 2020, to 1968 million m3 as compared to 2051 million m3/y in the baseline scenario, or by 4%. (Commission Staff Working Document SEC(20120) 1354 final, section 6.3.2). No individual assessments for either Ecodesign or Labelling are available.

2.6 Reduction of other environmental impact from possible future regulations

2.6.1 Ongoing efforts

The Ecodesign Directive, while in principle addressing all life cycle phases (as listed in its Annex 1), does emphasize the importance of improving energy-efficiency during the use-phase, and Implementing Measures so far had a strong focus on the latter. Still, some stakeholders have continuously been pointing out the relevance of other environmental impacts. Of all possible non-energy impacts, resource efficiency has received most attention lately, and has increasingly been considered in recent discussions of the Ecodesign Directive. This would also affect the Energy Labelling Directive insofar as common Preparatory

Studies are conducted, and the optimal combination of policy measures (Ecodesign and / or Energy Labelling) is chosen also in relation to the environmental impacts identified.
Several policy documents state the intention to focus more on resource efficiency:

- "The Commission will: … Address the environmental footprint of products, … including through setting requirements under the Ecodesign directive, to boost the material resource efficiency of products (e.g. reusability/recoverability/recyclability, recycled content, durability) …(" Roadmap to a Resource Efficient Europe, Communication COM(2011) 571)
- "The Commission will, if and when introducing new or reviewing the implementing measures adopted pursuant to Directive 2009/125/EC on products also covered by the WEEE Directive, take into account the parameters for re-use and recycling as set out in Annex 1 part 1 of the Directive 2009/125/EC, and assess the feasibility of introducing requirements on re-usability, easy dismantling and recyclability of such products." Commission Statement on WEEE COM(2012) 139
- "Increased attention will be paid to the identification of ecodesign requirements on material resource efficiency in forthcoming preparatory product studies and reviews, when these aspects are found to be significant, as foreseen in Annex I of the Directive." (Commission Staff Working Document (2012) 434).

Furthermore, several related studies have been conducted. One of the first steps was the JRC project "Integration of resource efficiency and waste management criteria in European product policies" which comprised two phases: from December 2009 to September 2011 , and from September 2011 to December 2012 . In the first phase, methodologies for the assessment of certain resource efficiency aspects (reusability / recyclability / recoverability; recycled content; use of priority materials; hazardous substances, and durability) were developed, based on a review of existing methodologies and policies, Furthermore, Ecodesign requirements were discussed for an exemplary product group (Hard Disk Drive). In the second phase, the methods and indices were further developed, tested on several product groups, and possible Ecodesign requirements were derived. Furthermore, this phase dealt with the development of verification procedures (Ardente et al. 2011, Ardente, Mathieux 2012).

From November 2012 to September 2013, a study "Technical assistance for a material-efficiency Ecodesign report and module to the Methodology for the Ecodesign of Energy-related Products (MEErP)" was conducted for DG. It assessed the possibility of strengthening Material Efficiency aspects in the Ecodesign methodology. The final report was published in December 2013 (Bio IS et al. 2013). In the project, a guidance document for analysing material efficiency in ErP was developed; the EcoReport Tool was updated; and the updated methodology was tested on two case studies.

Actual policies are currently beginning to address the issue, too. The Ecodesign Preparatory Study on taps and showers is being conducted, as the first preparatory study by the JRC.[5] It is to expect that non-energy aspects will play an important role here. Also, the Working Document on the review of the regulation on displays (TVs and computer displays), dating from September 2012, mentions in section 3.3.3 that resource efficiency aspects might be considered, but counsels to await the results of the JRC study .

In the meeting of the "CEN-CENELEC Ecodesign Coordination Group" on 6 Nov 2013, a task force on resource efficiency was set up. Its scope is still under discussion, but meant to include overall life cycle calculation rules except those for the energy aspects.

[5] Study website: http://susproc.jrc.ec.europa.eu/taps_and_showers/index.html

2.6.2 Outlook on further options

Ecodesign

As has been demonstrated, studies show that there is a case for strengthening the position of other environmental impacts, especially resource efficiency requirements, in future Ecodesign requirements, as large improvement potentials exist.

However, Art. 15 of the Ecodesign Directive introduces further conditions for defining Ecodesign Requirements. In addition to presenting a large improvement potential, Ecodesign measures shall also be cost-effective, and they shall only be implemented in the case of market failure and absence of other relevant Community legislation.. Cost-effectiveness, particularly to consumers, has been a major concern of the European Commission when introducing implementing measures and, in fact, addressing the energy consumption of products in the use-phase has presented itself as the most appropriate solution both economically and environmentally. Addressing other environmental impacts than resource use in the use phase is not always cost-effective to consumers in itself. Furthermore, other environmental impacts are partly already addressed by other regulations (e.g. WEEE, ROHS, REACH) (see for details chapter3.1). Also, some stakeholders point out that resource use is already a concern for manufacturers because of cost reduction reasons.

These arguments do not preclude a strengthening of non-energy aspects though. Even if not directly cost-effective to individual consumers, addressing other environmental aspects can be beneficial for society as a whole (not only in terms of terms of health and the environment, but also issues such as decreasing resource dependency) and may be realized in a way that is at least cost-neutral to the consumer. Other legislation usually does not cover exactly the same products, life cycle phases, or impacts. And while manufacturers may have an interest in decreasing material input, other resource efficiency aspects such as durability, repairability, or recyclability are not necessarily in their direct interest. Therefore, these arguments rather call for a careful case by case assessment. Such an assessment may lead,

- to the reconsideration of ErP that are currently not being addressed by Implementing Measures due to relatively small energy-related improvement potential, such as mobile phones or tablets,
- to the inclusion of non-energy aspects in future reviews of existing Implementing Measures, e.g. the case of magnets in motors
- to the consideration of non-ErP such as jewellery or wood and paper products (see Ch 6).

For properly including non-energy aspects (be it for ErP or non-ErP), modifications to the MEErP methodology and of data sourcing strategies are necessary, as many non-energy impacts are not properly reflected in current LCA methods (see also Ch3). With the studies described above, such efforts are already ongoing. Also, suitable Ecodesign requirements need to be developed that can also be verified in the course of conformity assessment and by market surveillance authorities.

Finally, this will imply even more careful scrutiny of possible interactions with other policies (see chapters 3.1 and 3.2). It will be a case by case decision whether the Ecodesign or Energy Labelling Directives are the best instruments to tap into these potentials.

[6] For reasons discussed below (lack of data), these impacts are not fully reflected in the current discussion of scope extension in chapter **Error! Reference source not found.**) Due to the large amount of product groups that had to be assessed in Task 3, no additional data could be researched on such impacts and the assessment had to rely on publicly available metastudies.

One example may show the issues involved:

The development of implementing measures of mobile phones or tablet computers is desired by various NGOs due to their resource consumption, even if improvement potential for energy consumption in the use phase is low.
This demand appears principally to be justified in the light of the impacts of resource extraction and end-of-life treatment of electronic products (see, for example, Prakash et al. 2012). Still, due to the relatively small amounts of resources contained in these products, potentials are small as compared to the energy-related impacts of other product groups such as motors. Furthermore, other instruments (e.g. the introduction of a workable collection system, better control of waste streams, introduction of a certificate system) can tackle many (but not all) issues better. However, the issue of electronics is highly symbolical for many NGOs and some consumers. Picking it up would help to raise public awareness. Conceivable Ecodesign requirements exist:

- measures for the extension of useful life (e.g. quality standards; requirements for data security (lack of which currently prevents users from selling or donating used phones))
- for mobile phones also: battery removability by the recycler[7]; standardized interfaces that reduce the consumption of different charging devices.[8]

We note that the Ecodesign Directive foresees (in its Annex I.3) the possibility for implementing measures to require manufacturers to establish an ecological profile (identification of significant environmental impact throughout the lifecycle) of their products, and to evaluate alternative design options on the basis of the profile. This type of generic ecodesign requirement is obviously an alternative to using specific ecodesign requirements that set harmonised measurable limits for particular parameters on all products. However, the instrument has been never used since the adoption of the first Ecodesign directive in 2005. The literature review and the public consultation did not identify relevant literature or stakeholder views on this topic.

Energy Labelling

The inclusion of other environmental impacts into the energy label is well established for noise and water consumption. However, no comparative scale has been used to date to convey this information even if this may well be possible (and is done for performance aspects such as dust pickup capacity in vacuum cleaners). Possible options for strengthening the information on other environmental aspects on the label include:

- inclusion of further aspects
- introduction of an aggregated environmental index, such as the Product Environmental Footprint
- introduction of comparative scales
- stronger visual highlighting of these non-energy aspects.

The benefits and preconditions of such options will be further discussed in chapter 4. Sound methodologies underlying the calculations, including harmonized standards and complete and updated databases, are important.

[7] Directive 2013/56/EU, amending the Battery Directive, already foresees easy removability of the battery during the lifetime of the product, in order to improve repairability. However, this would have to be complemented by a requirement for easy removability at the end opf life. The situation at the end of life is different in two respects from the situation during the use phase: first, recyclers can only invest a few seconds per product while, secondly, destruction of the appliance while removing the battery is not a problem.
[8] The respective standard EN 62684 is not yet respected by all manufacturers.

2.7 Primary energy factors

Primary energy factors are used as a means to compare energy efficiency across fuels, particularly gas and electricity, but also oil and other fuels. The PEF accounts for the total primary energy use of the appliance, i.e. including energy system, distribution and conversion losses, not just the final energy consumption. While irrelevant for most product groups, where appliances are almost exclusively electric, it is highly relevant for boilers and water heaters where gas and other fuels are common. The application of the EU-wide PEFs for gas and electricity result in the energy use of electric appliances increasing by an EU average factor of 2.5. In almost every case this makes gas heating appliances the favoured choice at this moment in time, despite the possibility, and reality in some countries e.g. Norway, that actual primary energy use related to the use of electricity could be much lower due to high shares of renewables in the energy mix.

Separate Ecodesign requirements and energy label criteria for products using different energy sources were advocated by some, while others highlight the need for a uniform label to allow comparison between different technologies. The use of the conversion coefficient in ED and ELD (2.5 as a default) is seen, especially by Norway and its industries, as contradicting the goals of the energy roadmap, ETS, and RES directive because it discriminates against electricity-driven (heating) products, and is in favour of natural gas. In the consultation supporting this review the largest group of respondents was in favour of using PEFs to enable comparison of products using different energy sources with the same functionality.

Using a PEF supports comparability and technology neutrality - Comparability across technologies is a key reason for using PEFs. Indeed, advocates argue for the use of PEFs on the basis that labels should enable consumers to fairly compare the energy performance and environmental impacts across all appliances with the same function, regardless of fuel or technology, i.e. that it is technology neutral. Others argue that the inherent differences between fuels and technologies, and the use of PEFs, leads to de-facto technology selection and discrimination against electric appliances, even though electric appliances require more primary energy and are characterized by a larger environmental impact. A technology-specific label, i.e. only for electric products, would not enable consumers to directly compare products with the same functionality that use different fuels, but may allow better differentiation within a technology. Such a distinction of technologies would avoid unduly promoting electric products over, currently, better alternatives. A pragmatic way forward for the energy label could be to introduce a 'scale within a scale' concept (see Figure 14 in section 4.6).

Use of PEF is in principle consistent with EPBD - A further argument against using PEF is that in the cases it is relevant there is often no consumer choice between fuels anyway, i.e. there is either a gas network that must be used, or there isn't and therefore electric appliances are more typical. A non-technology specific label makes consumers compare products that they can't consider as alternatives. Yet it may be considered important to inform consumers that better alternatives exist, and that they should not necessarily be satisfied with a restricted menu of less-efficient choices. A further aspect to this is that actual product choices are often made by builders and/or installers, rather than consumers. Note that the choices of these stakeholders are generally guided by the Energy Performance of Buildings Directive, which also uses the PEF in calculating the building system efficiency requirements. Under the EPBD all Member States can use their own national PEF to calculate building energy performance, as analysed in more detail by Molenbroek et al (2011). The PEF for individual pieces of equipment may be different from the national PEF established in national regulations based on the EPBD. This could lead to conflicts, if the product's average EU PEF is used in calculating the building's national energy certificate, or if Ecodesign legislation bans products that could be installed according to the country's building codes that apply the national PEF.

To resolve such conflicts, a case-by-case approach is recommended in the Ecodesign and Energy Labelling regulations, provided that a single PEF value for products on the internal market is maintained, as already done for the regulations on space and water heaters).

PEF multiplies innovation impact for electric products - Use of a PEF and a non-technology basis, could act as a disincentive for innovation in the less efficient products, as the PEF is something that product manufacturers cannot influence, so that they cannot innovate or improve to bring it down. At the same time, for producers of electric products, use of the PEF acts to multiply any final efficiency savings they make by the PEF factor (x2.5), increasing the incentive.

Regulations are for reduced energy consumption - use of PEF is most closely aligned to this - For the consumer, their final energy consumption is more important to them than the primary energy use of the appliance, as their final energy consumption is what they pay for in their energy bills. For society as a whole, the primary energy consumption is equally important as this will represent the actual energy requirement and its full environmental impacts and emissions. This comes back to the purpose of Ecodesign and Energy Labelling: is the primary goal to reduce energy use or to inform consumers? Considering the higher objective to reduce primary energy consumption in the EU by 20% in 2020, the former seems to be case. Consequently, in the light of the broader policy framework we conclude that the societal goal of reduced energy use would need to prevail.

A 'lock-in' in gas-based technology can be avoided - The long-term strategic policy goal of deep emissions reductions points to a danger in using a fixed PEF, i.e. that products bought now on the basis of a PEF, favouring gas-based over electricity based technology, will lead to a 'lock-in' of higher emissions in the medium-long term. This is a problem as achieving the scale of emissions reductions required by 2050 almost certainly mandates a switch to electric heating powered by renewables. Feedback from stakeholders suggests that this is an issue best addressed by other policy measures which target the overall energy mix and efficiency.

An EU wide PEF - while not perfect - is the best choice for cost, simplicity and legal reasons - A final question lies in the value used for the PEF. As noted above, the PEF value will change over time and needs to be reviewed and revised, but a further question arises given the large variation in PEF by Member State, or party to the regulations, of whether a national PEF should be used. This would make a significant difference to the labelled efficiency of electric products in countries with large shares of renewable energy in their energy mix. It was also suggested that the higher efficiency of cogeneration could be appreciated better. It could be more accurate and economically and environmentally efficient in these cases to use national values. In addition or alternatively, some stakeholders have suggested a switch to a marginal fossil fuel PEF as this is the change that greater energy efficiency induces. Yet the overarching EU regulation for the single market entails that requirements and labelling should be the same across the EU and non-discriminatory, because:

- it is impossible to guarantee that products labelled in one country are not then sold in another with a much different PEF;
- As energy markets are increasingly integrated there is no guarantee that renewable energy produced in one country is consumed there;
- PEFs can change rapidly with market and fuel switching, for example recent significant increases in the use of coal for electricity in some countries;
- The cost of maintaining 28 or more national product labels and keeping them up to date would be significant.

For simplicity, practicality and legal compliance a single PEF at EU level is recommended. Surveyed stakeholders overwhelmingly agreed with this position. It is recommended that future changes of the PEF are considered to ensure that EU-wide progress made on renewables is better reflected, i.e. in PEF values in the range of 2.0-2.2. This can be done through frequent reviews and revisions (e.g. every 3-5 years), linear reductions, or forward looking PEFs being used in the label calculations.

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3 Other EU policies and scope expansion

3.1 Coherence with other EU policies

3.1.1 Introduction

Products are covered by a host of different policy measures. In this section we provide an overview of applicable policies, and discuss incoherencies and conflicts between these, based on desk research and stakeholder inputs. Table 2 gives an impression of the variety of policies that covers products also covered by ED / ELD and could interact with the latter. In the scope of this study, it was not possible to examine all these policies in detail. Therefore, the analysis focused on the most important ones, chosen partly on the basis of team analyses, partly based on stakeholder input. Whenever a stakeholder mentioned an interaction with another policy, it was taken on board. Policies considered are marked in green in Table 2. Policies that were only partly considered are marked in light green.

Table 3 Policies interacting with Ecodesign and Energy Labelling

Policies interacting with Ecodesign and Energy Labelling
a) Environmental product policies
- Ecodesign (Dir 2009/125/EC)
- Energy Labelling (Dir 2010/30/EC)
- Ecolabel (Regulation No. 66/20120)
- Energy Star (Regulation No. 106/2008; Decision 2006/1005)
- Green Public Procurement (Energy Efficiency Directive Dir 2012/27/EC, Procurement Directive Dir 2004/18/EC)
- Commission Communication: Building the Single Market for Green Products - (COM(2013) 196 final); Commission recommendation on "the use of common methods to measure and communicate the life cycle environmental performance of products and organisations" (2013/179/EU) (Product Environmental Footprint)
b) General environmental policies
- WEEE (Dir 2012/19/EC)
- RoHs (Dir 2011/65/EU)
- Waste Framework Directive (Dir 2008 / 98 /EC)
- F-Gas (Regulation No. 842/2006)
- REACH (Regulation No. 1907/2006 and 1272/2008)
- IED (Industrial Emissions Directive, 2010/75/EU)
- Emissions trading system
- Air Quality Directive (2008/50/EC)
c) Environmental policies for means of transport[9]
- Tyre Labelling Regulation (Regulation (EC) No 1222/2009)
- Car Labelling Directive (Dir 1999/94/EC).
- EURO Emission Standards
- CO_2 fleet emission targets

[9] Considered in the context of scope expansion

Policies interacting with Ecodesign and Energy Labelling
d) Energy (efficiency)policies
- Energy Performance in Buildings Directive (Dir 2010/31/EC)
- Energy Efficiency Directive (2012/27/EC)
- RES Directive (2009/28/EC)
- Energy Roadmap (COM(2011) 885 final)
e) Health and safety and other product specific policies
- General Product Safety Directive (Dir. 2001/96/EC)
- Sector legislation on batteries (2006/66/EC), construction products (Dir 89/106, amended by Dir 93/68, and Regulation 305/2011), cosmetics (regulation 1223/2009), food (regulation 178/2002 and many more specific pieces of regulation), dangerous food imitations (Dir 87/357), low voltage electrical equipment (Dir 2006/95), machinery (Directive 2006/42), medical devices (Dir 90/385, 93/42, 98/79), medicinal products (Dir 2001/83 and various amendments), motor vehicles (Dir 70/156 and various amendments), personal protective equipment (Dir 89/686/EEC), recreational craft (directive 94/25 and proposal for recast), and toys (Dir 2009/48)
f) Single market policies
- The Marketing of Products Framework (Regulation (EC) 765/2008; Regulation (EC) 764 (2008), and Decision 768/2008/EC of the European Parliament and the Council)

3.1.2 Overlaps in product scope

Figure 1 shows for the most important policies which types of products are covered. Overlaps with ED and ELD can be derived from this figure. It is important to note that the figure shows the theoretical, not the actual product scope because several of these policies are framework policies that have to be implemented for actual products by other legal acts.

3.1.3 Relationships

The outcome of interviews and the online consultation point out that stakeholders tend to oppose overlaps in product scope because they fear double regulation. Furthermore, having to consider various pieces of legislation makes issues more complicated for them. From a regulatory perspective however, such overlaps do not automatically mean that there is double regulation or that the policies are necessarily incoherent. There are many ways in which policies that cover the same product group can be complementary, for example:

- They can be complementary in their coverage of life cycle phases (e.g. while RoHs covers the manufacturing phase and WEEE the end of life phase, Ecodesign also addresses the use phase.
- They can be complementary with respect to environmental aspects or other issues addressed (e.g. ED / ELD adding requirements on energy efficiency to the RoHS requirements on hazardous substances, and the , Low Voltage Directive requirements on safety)
- They can address different situations in which a product may be purchased or installed: (e.g. while the EPBD sets requirements for building's energy performance in case of new buildings or major renovations, and will thereby also affect the choice of the heating system; it does not cover cases where only a boiler is retrofitted in an old building. In these cases, ED and ELD support the choice of an efficient product.
- They can address different levels (e.g. ED for heating products: product level; EPBD: system level)
- They can employ different mechanisms (e.g. ED: minimum requirements, Energy label: mandatory classification, Ecolabel: voluntary label of excellence, CPR: declaration on product performance)

and therefore perform different functions (e.g. Ecodesign: push function; CPR and Energy Label: orientation function; Energy Label and Ecolabel: pull function)

- They can work on different levels of policymaking (e.g. EED: Member States vs. ED / ELD: EU)

Real conflicts do only occur in two cases: Firstly, when there are trade-offs between the objectives of different policies, so that the optimization of one objective may hurt the other. In this case, both policies need to be adjusted in order to represent a compromise. Secondly, when policies pursue similar objectives and use similar mechanisms but the concrete tools are not streamlined so that there is double regulation and maybe conflicting or incoherent requirements. Some of such examples, as have been brought forward by stakeholders, are presented in the next section.
Representatives from different DGs of the Commission report that in general potential conflicts between the objectives of different policies are taken well into account in the course of interservice consultations.

3.1.4 Conflicts and incoherencies

The following section focuses on concrete issues that were mainly brought forward by stakeholders in the survey, interviews, stakeholder meetings or position papers. In cases where the study authors disagree, the arguments for the disagreement are highlighted.

3.1.4.1 Overarching issues

This section deals with comments on the overall architecture of the policies, mostly independent from specific product groups. Some of the issues are:

- ED and ELD are not always well aligned with each other. Firstly, the timing of the tiers is not always identical. Furthermore, the lack of alignment in requirements leads to empty classes at the bottom of the label. Similar issues can be true for ED / ELD and Ecolabel. One clear example of failure is the case of TVs where the EU Ecolabel was provided to class B products because there was no effective sharing of information with the relevant preparatory study on market developments.

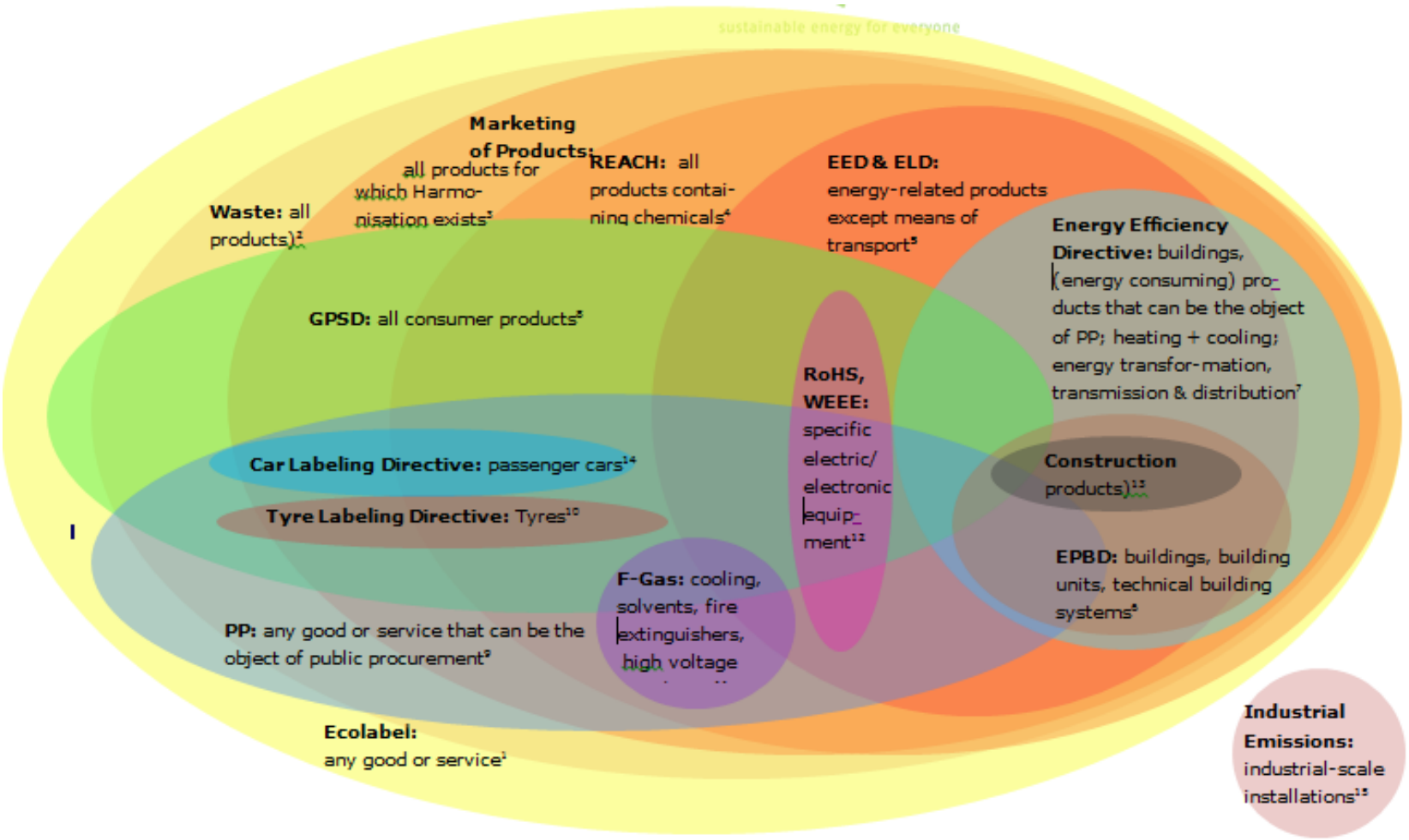

Figure 2: Product scope of various policies

- Some stakeholders point out that possible future material requirements under RoHS and REACH or possible future requirements on resource efficiency (reusability, dismantlability, recoverability, recyclability) might lead to the ban of certain materials which in turn might hamper energy efficiency. It is however not specified in which way and no concrete examples are given. In addition, it is pointed out that the correct implementation of the waste management requirements under WEEE should take precedence over new resource efficiency requirements because the latter cannot be effective without an effective waste collection and treatment system in place
- Also, some stakeholders have indicated that there is a risk that the PEF (Product Environmental Footprint) could potentially affect negatively the Energy Label because it could lead to a proliferation of labels (issue further discussed in section 4.3.3.4).
- One government body deplores that ED and ELD savings are not eligible for national savings targets under EED. Therefore, governments were discouraged from supporting ED / EL measures because it would diminish their own options to achieve energy savings and reach their target. The study authors doubt the validity of the argument, though. First, it hasn't been brought forward by any other government, and secondly, Member States do not have many options to regulate products on their own anyway due to the single market policy.
- There are also comments with respect to the compatibility of minimum requirements under EPBD and Ecodesign: in some Member States, such as Denmark and Germany, restrictions have been proposed under the EPBD for boilers that would otherwise comply with the Ecodesign requirements. Progress on this issue has been made by the adoption of the Energy Efficiency Directive, which amended the Ecodesign Directive (EED Art 27 amending ED Art 6.1). Under EPBD, Member States may now limit the installation of products that are in compliance with Ecodesign regulations. However, with products not covered by the EPBD, Ecodesign legislation could undermine the existence or the setting of more ambitious requirements in some Member States, as they are not allowed to set their own if Ecodesign requirements exist. . In practice, this has been observed when some Member States wanted to phase out incandescent bulbs ahead of the EU regulation, and were instead forced to use voluntary agreements with retailers to gain a year or two over the EU timing of the ban. Even if a Member State is forced to give up on more ambitious requirements, the fact that the Ecodesign requirements will be applicable across the EU is likely to lead to a net benefit to the EU as a whole.

3.1.4.2 Regulation of systems

An important issue related to the coherence of policies regards the regulation of systems, such as technical building systems (possibly including heating-ventilation and also lighting) or motor systems.

A major array of stakeholder comments deals particularly with the EPBD and the treatment of technical buildings systems.

- Several arguments are brought forward for its incoherence with ED / ELD. Most of the comments are not very specific and lack argumentation, only stating that product and systems approaches are conflicting. Some stakeholders have argued in a general way that

optimizing individual products could be to the detriment of system performance, but none has brought forward concrete examples proving the point.

- Some alluded to the fact that ED and ELD also address other environmental issues (air pollution, noise) which the EPBD does not cover. According to these stakeholders, this could be the added value of ED and ELD when energy-related products such as fossil or solid fuel heating products are targeted which have significant environmental impacts e.g. with respect to emissions to air.
- It has been suggested that calculation methods are not aligned between the policies.
- One more specific comment points to the incoherence of the label classes that have been introduced for the Buildings Certificates in some countries such as the UK with the label classes of the Energy Label. The Buildings Certificate uses the A-G scale while the Energy Label uses the "plus" classes, so there is a potential for confusing consumers.
- Some stakeholders also feel that the Energy Labelling for space and water heating systems is unnecessary because the buildings certificate already covers the most important impacts. The study authors do not consider this point valid though because, as has been shown, the Energy Label addresses consumers also in retrofit situations where no major renovation occurs and no new building is built.

Overall, the products and systems approach (under ED/ELD and EPBD respectively) may be considered compatible, and may complement each other to realize a large energy savings potential. The ED and ELD guarantee a good quality of the individual heating product, also if used for retrofit, while the EPBD addresses the performance of the whole building, mainly for new buildings. Also, with the installer label, a good option has been developed for showing the performance of heating products if integrated in a system.

3.1.4.3 Individual product groups

Many stakeholder comments focus not on the overall architecture of the policy but on individual product groups or issues. These are summarized below.

- With respect to **local room heating**, the calculation method for non-CO_2 emissions under Ecodesign was claimed to be incompatible with the method under the Air Quality Directive.
- The calculation method for avoided electricity generation in **micro CHP** under ED was claimed to be incoherent with the one proposed under EPBD and EED. The proposed methodology in the forthcoming Commission Communication on transitional measures and calculation methods is said to disregard part of the primary energy savings achieved by micro-CHPs as avoided electricity production in conventional power plants .
- The pre-charge ban for **heat pumps** foreseen under the F-Gas regulation might make it difficult to fulfil Ecodesign requirements and achieve the envisaged energy efficiency class because of leakages and bad practice that might occur when filling the heat pump on-site.
- **Construction products** are seen as sufficiently covered by CPR and should not be addressed by any other legislation. This point is currently not seen to be valid though: While CPR opens, in principle, the option for the Commission to set minimum requirements (Art. 3. (3)), this possibility is currently not being used. Furthermore, the declaration of performance, according to the model set out in Annex III, is aimed at

professional users and not easy to understand for consumers.. Even if the Commission did not decide in favour of setting minimum requirements or consumer information requirements as a general rule, it may make sense to introduce such requirements for selected products. If such minimum standards and labelling Requirements should be introduced for construction products, it needs to be verified whether the Ecodesign and Labelling Directive or the CPR would be the best instrument to do so. In any case, CPR requirements and procedures should be taken into account and streamlined with the assessment procedure and possibly the information requirements under Ecodesign to spare manufacturers the burden of providing different types of information in different formats.

- An incoherence of ED and ELD is stated in the case of **lifts** (not further specified)
- It is feared that Ecodesign requirements on **large power transformers** may hurt low-carbon power plants and therefore be in conflict with the ETS and climate policies, because the plants will have to be taken out of service for some time for the purpose of exchanging transformers. To check whether this claim is valid, a balance of the potential losses and gains would have to be calculated which is beyond the scope of this study.
- A potential conflict with health and safety issues is seen in the case of **mercury in CFLs**, but stakeholders admit that this has been largely taken care of in the course of interservice consultation.
- For **tyres**, it is highlighted that these products rely strongly on chemicals use. Therefore, additional bans under REACH may have strong impacts on design and also on fuel efficiency and safety features. More predictability of which substances will be targeted under REACH is desired.
- For **fans**, it is said that system aspects are not always taken into account correctly, e.g. fan efficiency requirements do not completely reflect the fan performance in real installations.

3.2 Potential for better synergies

Policies that are in principle complementary may be even better aligned in order to reduce cost, duration of procedures, and administrative burden, and to better exploit existing synergies. The following suggestions are based on stakeholder input as well as own considerations.

3.2.1 **Integrated workplan, evidence base, and decision procedures**

Currently, the Working Plan to be established under the Ecodesign Directive (Art. 16) is also used for the Energy Labelling Directive. Also, preparatory studies conducted according to Annex II of ED, include in their policy assessment the exploration of labelling options. This is already a good basis for synergies. This synergy might be strengthened even more if the Working Plan and Preparatory studies were officially and legally established as common instruments for both ED and ELD. This move could contribute to a stronger consideration of ELD-specific aspects in the choice of products (such as: wide variety of products on the market, lack of reliable information, possible impact of energy efficiency on cuonsumer choice). Going further and depending on the product, preparatory studies could be designed to provide a common evidence base not only for ED and ELD, but also for other policies such as Ecolabel, RoHs, the F-Gas regulation, or Construction Product Regulation. An integrated assessment could be made of which pieces of policy would be best work together for

this specific product and decisions taken accordingly (e.g. should, in the F-gas regulation, specific provisions be made for a product group, such as the pre-charge ban for heat pumps? Or should there be specific declaration requirements under the CPD? Or can existing certification systems for building products be used?).
The Product Environmental Footprint is seen by some stakeholders as a suitable methodology for performing such an integrated assessment. However, this is contested by others. As a precondition for such an integrated assessment, the revision cycles of different policies must be streamlined.

3.2.2 Clear task sharing

When conducting preparatory studies, it is important to consider even more the existing policies in order to arrive at a clear task sharing between policies that avoids gaps and a "passing the buck syndrome" on the one hand, and double legislation, on the other. Also calculation methods and documentation requirements should be aligned. One possibility would be to use a unified heuristic framework that maps all relevant policies with respect to several aspects:

- scope: product scope, life cycle phases and environmental aspects covered
- objectives
- levels of policymaking and actors addressed
- product or system level
- mechanisms used and functions performed
- definitions, measurement and calculation methods, documentation formats, and verification and assessment methods applied.

3.2.3 Working together to promote top performing products

The criteria and requirement levels of different pieces of legislation (GPP, ED, ELD, Ecolabel) should be better adjusted. This could be made possible if there were common preparation and decision procedures. For example, as a general rule, no label classes should be shown below Ecodesign minimum requirements.[10] The Ecolabel should always include the highest energy class as a requirement, especially as Green Public Procurement takes into account the Ecolabel. Another possibility would be to make Green Public Procurement mandatory (which would, as far as energy efficiency aspects are concerned, have to be regulated in the Energy Efficiency Directive,). Also, a mechanism updating public authorities on the products with highest energy class for procurement purposes is proposed (although its added value is contested). If the whole system is also regularly revisited, these elements would work together to promote top performing products more effectively.

3.2.4 Streamlined assessment and documentation requirements

Unified procedures and criteria for conformity assessment and market surveillance on the one hand, and for documentation / information requirements on the other, should be introduced across a number of instruments. For example, unified product fiches or "product passports" across

[10] There may be cases where a lower class might be needed for products that are exempted from Ecodesign requirements but still labeled. However, this should be envisaged only if there is a significant number of such products with significant market share, and should be restricted to one or maximum two classes. In general, the benefits of showing the poor performance of these products are limited compared to the negative effects of many (almost) empty classes at the bottom on consumer understanding – especially given the fact that these products would be in the lowest class anyway.

different could be introduced which integrate all the information required under those instruments (and possibly all the relevant life cycle information for a product such as material content, energy efficiency, feasibility of dismantling) and could be accessible via a QR code. Such documents could be developed for both market surveillance and consumer information purposes, the latter drawing as much as possible on the information of the former. However, as there is as yet little information on how product fiches are used, and their cost and administrative burden, further research would be needed, including a test of the use of QR codes in practice.
A somewhat less far-reaching demand is to develop a consumer information framework that allows consumers to overview all regulation and information for each product, and create links between different types of information.
Another option for streamlining would be the introduction of a conformity assessment procedure under ELD, analogous to ED. There is currently no clear stakeholder view on this issue. More on this in Chapter 6 on market surveillance.

3.2.5 Mergers

There are in principle various options for merging existing policies. ED and ELD could be merged on the grounds that (a) they are thematically closely related and complement each other, (b) this would ensure that definitions, measurement methods etc. are exactly the same (and need to be provided only once), and (c) this might lead to leaner and more transparent decision processes and even facilitate transposition into national law. More on this in Chapter 5.
Also, Tyre Labelling could be integrated into Energy Labelling because its logic as well as optical appearance is very similar. This is however opposed by stakeholders as tyres are seen to be very specific products, and stakeholders want an integrated approach, labelling not only energy efficiency but also safety and other environmental issues. From the point of view of the study authors these points are not particularly valid. First, any product is specific. Secondly, energy labelling allows for including other aspects. On the other hand, it is unclear whether a merger would bring real benefits apart from "cleaning" the regulatory landscape.

Also, more far-reaching mergers are in principle conceivable and suggested by some stakeholders: for example, merging of all product-related legislation (including energy, environment, health and safety issues) into a single product directive, so that all requirements for one product would be laid down in the same place, or on the other hand, merging all energy-efficiency related legislation (EPBD, ED, ELD, EED, and others) into a single "energy efficiency directive".

These examples, however, already show that mergers are not so self-evident. For example, what would be the logic that determines which pieces of legislation should be grouped together (all product-related or all energy efficiency-related?). More important, legislation differs a lot with respect to scope, objectives, mechanisms. Even the ED and ELD that are at first sight quite similar, partly follow different logics. For example, the Ecodesign Directive includes a conformity assessment and CE marking procedure while the Energy Labelling Directive does not. The Implementing Measures procedure differs from the Delegated Acts Procedure, and the scope is not identical with respect to life cycle phases and environmental aspects.
On the other hand, some stakeholders even propose the contrary: Other environmental aspects should be removed from ED and ELD and treated in a separate piece of legislation. This move, it is suggested, would make the procedures easier, facilitated implementation in national law (where

energy and environment are separate issues), and different measurement and verification methods might be appropriate for these different issues.

In the end, the question of mergers does not turn out to be decisive. What is important is that existing policies should be coherent, mutually supportive, streamline procedures and methods, and represent a clear task sharing, as outlined above. Whether or not this would in the end lead to integrated Directives, is rather a legal and practical question.

3.2.6 Conclusions and recommendations

The following conclusions can be derived.

The overall policy framework is coherent and mutually supportive. In general, different policies complement each other by addressing different life cycle stages, impacts, actors, or employing different mechanisms. Still, there can be incoherencies for specific products or issues, and there may be losses due to double work in misaligned procedures.

Check specific issues and products to achieve more coherence. For example, in the EPBD, it could be envisaged to develop a unified European Buildings Certificate that would be coherent with the Energy Label format.. The same is true for car labelling, which is currently in a different format in various Member states. An alignment with the EU Energy label format would avoid consumer confusion. The issue of the conversion factor is discussed in Chapter 2.

Merge if practical. Mergers of policies may be a result of working towards more coherence, but are not in themselves helpful. The question whether to merge or not should be a practical one.

When revising, scan existing Implementing Measures and Delegated Acts for specific products for inconsistencies. Building on the stakeholder input discussed above and further consultations in the course of the revision process, every product-specific regulation should be scanned for inconsistencies with other policies, including incoherent requirements, documentation rules, calculation methods etc. These can be remedied in the course of the revision.

Integrated workplan, evidence base, and decision procedures. The ED working plan, which is already now used for both ED and ELD, could be legally made the common ED and ELD working plan in order to better accommodate ELD specific product choice criteria. On this basis, common preparatory studies and / or consultation processes could be set up to create a unified evidence base including, depending on the product, also other policies such as Ecolabel, RoHs, F-Gas regulation or CPR. Integrated decision making processes for these policies may also be envisaged, covering, in one process, questions such as: Are further substance bans envisaged, or should a product be exempted from RoHs? Should specific provisions be made under the F-gas regulation for a product group, such as the pre-charge ban for heat pumps? Should the Commission, by a delegated act, set up more specific declaration requirements under CPR? How can information requirements under Ecodesign and CPRD be streamlined?).

Identify potential overlaps early in the process of setting product-related requirements and develop a clear task sharing. When conducting preparatory studies, the methodology for analysing existing policies currently conducted within task 1 and 7 of the MEErP could be refined. It

is currently required to describe existing "legislation on resources use and environmental impact, EU voluntary agreements, labels" as well as member state and third country legislation in task 1 (MEErP 2011, p. 34). Also in part 7.1.3 of task 7, it is required to "describe pro's and cons of (combinations of) Ecodesign measures and other policy instruments (e.g. self regulation, energy label, EPBD); identify and describe overlaps with existing legislation" (ibid.; p. 138). However, no detailed guidance is given how this analysis has to be conducted, how policies should be selected, which aspects of them should be considered or which framework should be used to analyse them. For better guidance, we suggest developing a heuristic framework for mapping policies that would, at a minimum, include: product scope, life cycle phases and environmental aspects covered, product or system level addressed, objectives, levels of policymaking, actors addressed, mechanisms used and functions performed, and calculation methods, documentation formats and verification mechanisms applied.[11] This may lead to arriving at a clear task sharing between policies that avoids gaps and a "passing the buck syndrome" on the one hand, and double legislation, on the other. Also calculation methods and documentation requirements should be aligned.

Identify issues not covered and consider scope extension on these grounds. In this same process, it should be identified whether there are, for a given product, significant issues not yet sufficiently covered by any legislation (e.g. certain life cycle phases or environmental impacts). If there are, this could be an argument for extending Ecodesign measures beyond their current focus to non-energy aspects or not-in-use-phase impacts in order to cover these issues.

Working together to promote top performing products. The criteria and requirement levels of different pieces of legislation (GPP, ED, ELD, Ecolabel) should be better adjusted. For example, as a general rule, the Energy Label should not show energy classes below the Ecodesign minimum requirements .. The Ecolabel should always set the highest energy class as a requirement), especially as Green Public Procurement takes into account the Ecolabel. Another possibility would be to make Green Public Procurement mandatory (which would, as far as energy efficiency requirements are concered, have to be regulated in the Energy Efficiency Directive ,). Also, a mechanism updating public authorities on the products with highest energy class for procurement purposes could be envisioned. If the whole system is also regularly revisited, these elements would work together to promote top performing products more effectively.

Streamlined conformity assessment and documentation requirements. Unified procedures for conformity assessment and market surveillance on the one hand, and for documentation / information requirements on the other, should be introduced across a number of instruments. For example, unified product fiches or "product passports" across different instruments could be introduced which integrate all the information required under those instruments (and possibly all the relevant life cycle information for a product such as material content, energy efficiency, dismantleability) and could be assembled in one database and accessible via a QR code. Such fiches could be introduced both for market surveillance and for consumer information purposes while the information from the former should be used as much as possible to create the latter. However, as there is as yet little information on how product fiches are used, and their cost and

[11] Currently, the MEErP Methodology Report gives some background information on relevant EU Policies (mainly Energy policies) but does not require a detailed product-specific analysis to be conducted in the preparatory study itself.

administrative burden, further research would be needed, including a test of the use of QR codes in practice.

United market surveillance procedures. In case *the Energy Label and Ecodesign directives are merged,* the conformity procedures would clearly have the same set of general requirements as well. This could contribute to an easier ability to perform surveillance activities towards both the Energy Label and Ecodesign requirements. However it would also have to correspond to the other market surveillance legislation (the Market Surveillance Package).

3.3 Scope expansion

Initially both the Ecodesign and the Energy Labelling Directives aimed at improving the environmental performance of only energy using products but have since been revised to cover also energy related products, which are defined as products which can directly or indirectly affect the energy consumption such as water using devices, building insulation products, windows, etc

The primary objective of Task3 is to evaluate the appropriateness and feasibility of laying down ecodesign and energy labelling requirements for non-energy-related products and means of transport under the EL and the ED Directives. Means of transport are energy using products but have to date been covered by different regulatory frameworks (they are explicitly excluded from the scope of the both Directives).

The need to extend the coverage of the Directives to product systems was assessed in section 2.4.

This section presents the methodology followed in this approach and the study first findings and recommendations.

3.3.1 Methodology

To access the appropriateness and feasibility of extending the product scope above the following methodology is followed:

1. Reduce the Prodcom list (see 3.4.2);
2. Aggregate the remaining product groups to form higher-level categories;
3. Refine / modify the list using other categorizations such as COICOP, or categorizations used in other studies (EIPRO, 2006, CSES, 2012);
4. For the resulting categories, develop a scoring system based on:
    a. an assessment of market size (especially if expressed in other terms than unit sales);
    b. a first rough (and, if necessary, qualitative) assessment of environmental impact and improvement potential, based on literature (EIPRO 2006, IMPRO, UNEP 2010, TNO 2011);
    c. a first rough assessment of suitability for Ecodesign and Labelling legislation (as opposed to alternative instruments or voluntary initiatives);
    d. a first rough assessment of the feasibility of Ecodesign and Labelling legislation (data availability, methodological and verification issues)

   e. a first rough assessment of the possible costs / risks and benefits of Ecodesign and Labelling legislation (bureaucratic / cost burden, risks to the existing process, consumer benefit / acceptance);
5. Based on the scoring system, develop a first tentative ranking;
6. Choose 5 case studies based on the criteria:
   a. coverage of different categories of products / systems / means of transport;
   b. rank high within their category;
   c. sufficiently different from those covered by the CSES study;
7. Conduct case studies;
8. Research additional information and data (on environmental impact and improvement potential, feasibility, appropriateness, stakeholder views etc.) for the top product groups in each category, all in all 20 product groups;
9. Refine ranking based on the insights from the case studies (as far as they can be extended to similar products from the same category) and the additional information and data;

Make recommendations on potential scope expansion based on the ranking and the product categories to be covered, and on the analysis of any theoretical or practical limitations to the possible scope expansions.

3.3.2 Selection of product groups for analysis

In a first step a list of non-energy related product groups was created. For that, the overall list of economic activities in the European Community, the Prodcom 2011 list, was reduced from 3900 product categories to 2872 categories by excluding the energy-related products. The remaining list of product categories was further reduced to 1215 categories by applying previously defined 'exclusion - rules'.

The following groups were excluded:

- Energy related products
- services
- product groups that are intrinsically not suitable for this type of legislation, such as raw materials or 'intermediate/semi-finished' products (e.g. because there are no design-related improvement options, they are not sold to the final customer, or the variation in environmental impact is very low)
- products clearly falling into the domain of some other legislation, such as chemicals, which are covered by REACH
- product groups that clearly do not fulfil one of the criteria "number of sales", "environmental impact" or "potential for improvement"

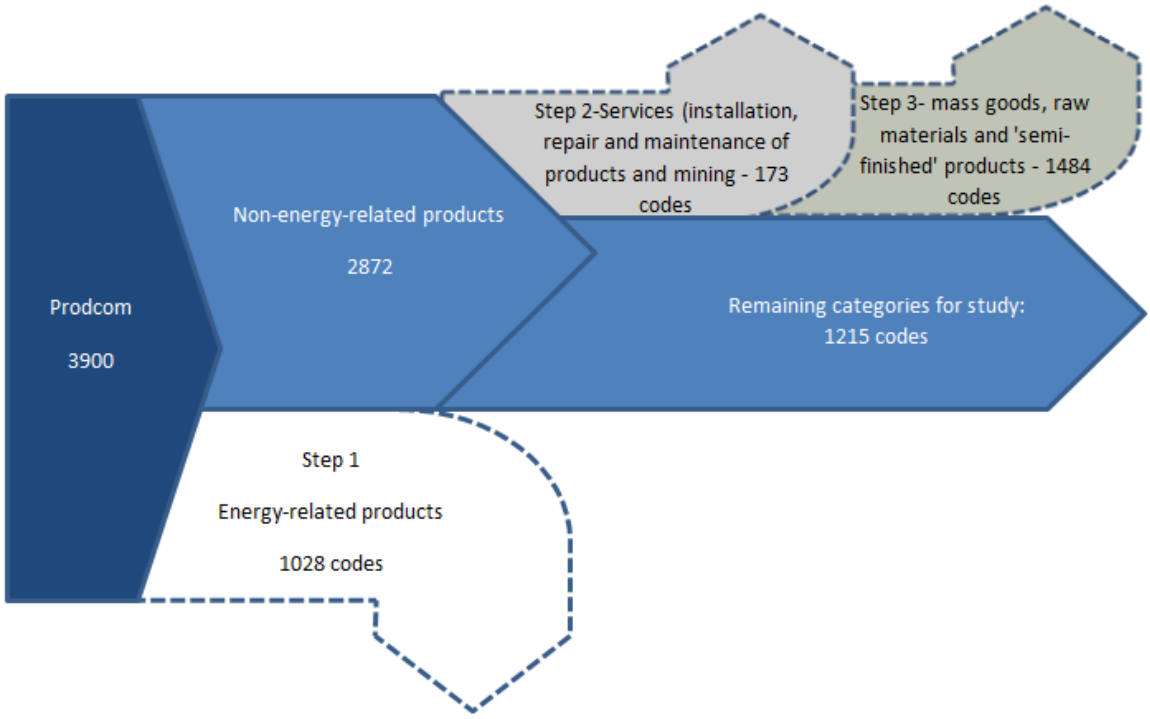

Figure 3. Selection of non-energy-related products

3.3.3 Evaluation of product groups, first ranking

The 1215 categories were then aggregated to form higher-level categories, based on primary product function and ranked through a scoring system based on:

a) an assessment of market size (especially if expressed in other terms than unit sales)
b) a first rough (and, if necessary, qualitative) assessment of environmental impact and improvement potential, based on literature (EIPRO 2006, IMPRO, UNEP 2010, TNO 2011);
c) a first rough assessment of suitability for Ecodesign and Labelling legislation (as opposed to alternative instruments or voluntary initiatives);
d) a first rough assessment of the feasibility of Ecodesign and Labelling legislation (data availability, methodological and verification issues);

e) a first rough assessment of the possible costs / risks and benefits of Ecodesign and Labelling legislation (bureaucratic / cost burden, risks to the existing process, consumer benefit / acceptance).

For each of the above criteria points were awarded (0, 1 or 2) and products ranked accordingly.

The highest scoring product groups are shown in

Table 4.

Scoring 9 points

- Motorized road transport
- Agricultural food products (dairy products; meat; fruit and vegetables and; bread and cereals)
- Materials for the maintenance and repair of the dwelling (ceramic tiles and flags; paints and varnishes; cement; wallpaper)
- Other appliances, articles and products for personal care (perfumes and toilet preparations; household and sanitary goods)

Scoring 8 points

- Mineral waters, soft drinks, fruit and vegetable juices
- Garments (textile)
- Shoes and other footwear
- Non-durable household goods/Adhesive and sealants
- Furniture and furnishings
- Oils and fats
- Coffee, tea and cocoa

Products with lower aggregate scoring include:

- Fish and seafood
- Stationery and drawing materials
- Household textiles
- Other articles of clothing and clothing accessories
- Glassware, tableware and household utensils
- Wine
- Carpets and other floor coverings
- Sugar, jam, honey, chocolate and confectionery
- Tobacco
- Miscellaneous printed matter
- Food products n.e.c.
- Beer
- Pets and related products
- Small tools and miscellaneous accessories
- Newspapers and periodicals
- Therapeutic appliances and equipment
- Spirits

- Games, toys and hobbies
- Jewellery, clocks and watches
- Equipment for sport, camping and open-air recreation
- Water transport
- Rail transport
- Air transport
- Non-motorized road transport

Table 4 Ranking of product groups (highest scoring)

Product group/category (COICOP)	PRODCOM categories	Score						
		Sold Volume	Main environmental impact areas	LCA relevant information available	Suitability for ED and ELD	Assessment of the possible costs / risks and benefits of Ecodesign	Assessment of the possible costs / risks and benefits of Labelling	Total
Milk, cheese and eggs	Operation of dairies and cheese making	2	2	2	2	1	0	9
Meat	Processing and preserving of meat	2	2	2	2	1	0	9
	Processing and preserving of poultry meat							
	Production of meat and poultry meat products							
Bread and cereals	Manufacture of grain mill products	2	2	2	2	1	0	9
	Manufacture of starches and starch products							
	Manufacture of bread; manufacture of fresh pastry goods and cakes							
	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes							
	Manufacture of macaroni, noodles, couscous and similar farinaceous products							

Fruit and Vegetables	Manufacture of fruit and vegetable juice	2	2	2	2	1	0	9
	Other processing and preserving of fruit and vegetables							
	Processing and preserving of potatoes							
Materials for the maintenance and repair of the dwelling	Manufacture of ceramic tiles and flags	2	0	2	2	2	1	9
	Manufacture of paints, varnishes and similar coatings, printing ink and mastics							
	Manufacture of cement							
	Manufacture of wallpaper							
Other appliances, articles and products for personal care	Manufacture of perfumes and toilet preparations	2	1	1	2	2	1	9
	Manufacture of household and sanitary goods and of toilet requisites							
Motorized road transport	Manufacture of agricultural and forestry machinery	0	2	2	0	2	2	89
	Manufacture of motorcycles							
	Manufacture of motor vehicles							
	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers							
Mineral waters, soft drinks,fruit and vegetable juices	Manufacture of soft drinks; production of mineral waters and other bottled waters	2	1	2	2	1	0	8

Garments	Manufacture of knitted and crocheted hosiery	2	2	2	2	0	0	8
	Manufacture of other knitted and crocheted apparel							
	Manufacture of workwear							
	Manufacture of other outerwear							
	Manufacture of underwear							
Shoes and other footwear	Manufacture of footwear	1	1	2	2	1	1	8
Non-durable household goods/Adhesive and sealants	Manufacture of essential oils	2	1	2	2	0	1	8
	Manufacture of soap and detergents, cleaning and polishing preparations							
	Manufacture of pesticides and other agrochemical products							
Furniture and furnishings	Manufacture of office and shop furniture	1	1	2	2	1	1	8
	Manufacture of kitchen furniture							
	Manufacture of mattresses							
	Manufacture of other furniture							
Oils and fats	Manufacture of oils and fats	2	1	2	2	1	0	8
	Manufacture of margarine and similar edible fats							
Coffee, tea and cocoa	Manufacture of cocoa, chocolate and sugar confectionery	2	1	2	2	1	0	8

3.3.4 Case studies

Based on the ranking, market-size of the individual product, coverage of different product groups data availability, competences and experiences in the consortium, and sufficient difference to case studies conducted in the CSES study. The rationales for choosing the case studies are the following:

- The product has a high market share, or high identified environmental impact, within the product group
- the product represents the product group as a whole in the sense that it poses similar issues than other products in this group
- The different products selected reflect different activities (transportation, farming (animal raising and crop raising) and industrially produced products)
- good data available
- not too close to the PG already dealt with by CSES
- existing expertise in the consortium.

The following 5 case-studies were selected which are thought to be representative of the entire product group they belong to:

1. Motorized road transport: **Trucking / Heavy-Duty Vehicles**;
2. Milk, cheese and eggs: **Dairy products**;
3. Bread and cereals: **Fresh bread**;
4. Materials for the maintenance and repair of the dwelling: Manufacture of **paints and varnishes**;
5. Garments: **T-Shirts**

The case studies are made available alongside this report. The learnings derived from them are incorporated into the conclusions below (see sections 3.4.6 onwards).

3.3.5 Final ranking

The evaluation carried out in the previous steps led to the conclusion that there is a need to consider three main issues in the selection of products to be covered: necessity, feasibility, and added value. As an aid to the final ranking of products and to the future evaluation of the possibility for scope expansion of individual products groups, a decision tree was developed (also taking into account lessons learned from the case-studies[12]). If a decision is made to expand the scope a decision tree similar to the one shown below should be used for the selection of products to be covered. Although there are considerable similarities for certain broad product groups (higher level),steps must, in principle, be followed for each lower level product group separately, as results can be very different for different products within the same broad categories.

[12] Please note that the decision tree was not applied to the case-studies

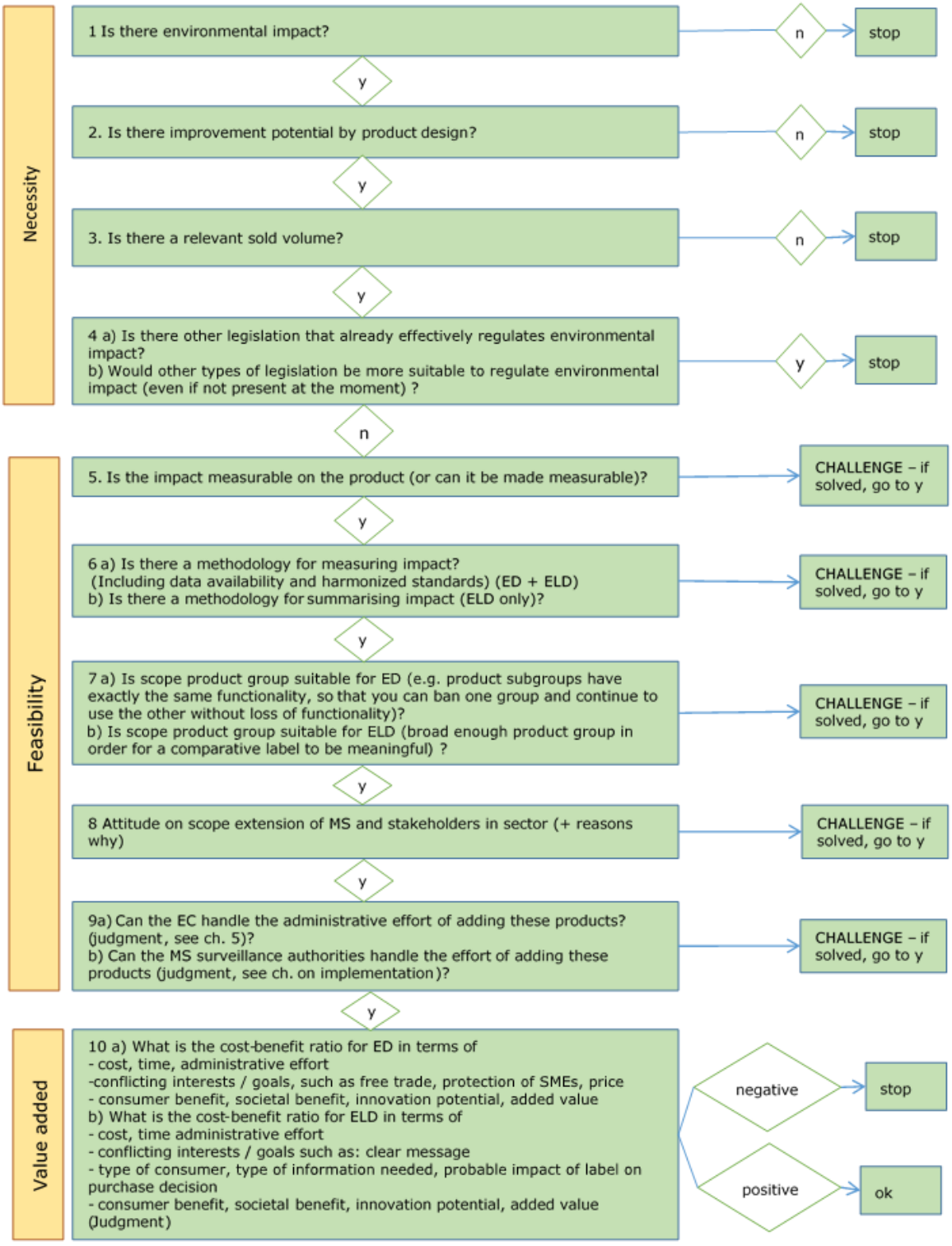

Figure 4. Decision tree for the selection of product groups

Although the questions are set in a Yes / No format, answers may not be straightforward and often need some kind of judgment, involving a balancing of pros and cons or the comparison against other known values. The balance between each of the issues - necessity, feasibility and added value - must also be considered carefully. For example, even if necessity is there for some

products, and feasibility can be assured, added value will have to be carefully considered, thinking about the suitability of the instrument and possible alternatives, and the available resources.

The main issues relating to the **necessity** of a regulation are the existence of an identified relevant environmental impact and a potential for improvement that has not been realized so far due to market failures. Both impact and improvement potential are also linked to sold volume. The fact that the main impacts may already be covered by other existing measures may also influence the decision on necessity.

Environmental impact and improvement potential have been identified for a number of product groups, particularly for food and drink products, private transportation and housing which were found to cause 70-80% of the various environmental impacts of total private consumption in the EU-25, based on a life cycle analysis. Food and drink account for 20-30% of those impacts. Within this consumption area, meat and meat products (including meat, poultry, sausages or similar) are the most important, followed by dairy products. For private transportation the total environmental impacts ranges from 15 to 35% of all private consumption impacts, depending on the impact category, and the largest contribution comes from passenger cars. The products under the heading of housing include buildings, furniture, domestic appliances, and energy for purposes such as room and water heating. Together they make up 20 to 35% of the impacts of all products for most impact categories (IPTS 2006).

If necessity is acknowledged, the question of **feasibility** then arises and a number of challenges may present themselves, such as:

- Methodologies for determining impacts of other use phases and aggregate them on a label (including harmonized standards, data availability)
- Enforceability: Measurability of impacts on the product; alternative methods of verification
- Priority setting in the face of limited resources (MS, Commission)
- Heterogeneity of product groups
- Impact of including life cycle impacts in energy label on manufacturers/importers

The **added value** of setting ecodesign requirements or labels is very dependent of factors that are not so straightforward to evaluate, such as:

- Are the impacts better tackled by other instruments?
- Will the introduction of new legislation impair existing regulation (e.g. by adding confusion)?
- Is the burden introduced to manufacturers manageable?

An evaluation of these three broad criteria was carried out for the product groups identified in the initial selection. This evaluation produced a final ranking of products which sorts products according to their suitability for the inclusion in the scope of the ED and the ELD. The ranking does not imply a judgement on whether or not scope expansion is recommended in general but highlights which products are most suitable in case a political decision for scope expansion should be taken.
It should be noted that the analysis carried out here is limited to readily available information and to the time constraints of a study of this nature and does not replace an in-depth analysis for each product group, based on the decision tree (or a similar approach) that is presented here, if and when there is a decision to expand the scope to non-ErPs. It should be noted that in the final

ranking, and apart from transportation, feasibility is considered relatively low (maximum score 4/10) mainly due to measurability and methodological limitations.

3.3.6 Assessment of scope expansion – ELD

Necessity on the basis of environmental impact and improvement potential has been identified for a number of product groups, particularly for food and drink products, private transportation and housing (see above, chapter 3.3.5).

With regard to **feasibility**, possible methodologies for the labelling of the environmental impact of non-ErPs include the Product Carbon Footprint (PCF) and the Product Environmental Footprint PEF.

Labelling of the Product Carbon Footprint (PCF)
The term 'carbon footprint' has become tremendously popular over the last few years. A variety of different CO_2 or climate protection labels partly tailored to certain product groups is meanwhile available at the international level – e.g. Carbon Reduction Label/UK; Carrefour Initiative (France), Stop Climate Change Label/Germany; KRAV Climate Marking Sweden (KRAV Sweden); Climatop-Migros Switzerland, Carbon Label Initiatives or programs in Japan (Japan Environmental Management Association for Industry), Korea (Korea Eco-Products Institute), Thailand (Thailand Greenhouse Gas Management Organization). Interestingly, the main focus lies on foods although individual foods are clearly less relevant to the climate than other product groups, i.e. household appliances or automobiles.

With climate change high up on the political and corporate agenda, carbon footprint calculations are in strong demand. Nevertheless the focus on CO_2-emissions does not only provide possibilities, but also bears some risks that might as well weaken environmental labelling approaches in the future. In a study conducted on behalf of ANEC, the European consumer voice in standardisation, Oeko-Institut has recently analysed *Requirements on Consumer Information about Product Carbon Footprint*[13]. The conclusions we drew in this study are, in our opinion, still valid and are presented below:

Other environmental effects should not be disregarded
The narrow approach to only focus on greenhouse gas emissions bears the risk to overlook other relevant environmental impacts or even lead to wrong conclusions that increase negative environmental effects in the worst case. Therefore screening analyses of other environmental impacts must be included in a PCF.

Drawing up of Product Category Rules for particularly relevant products is essential
The main challenge of PCF meant for communication is to define the whole framework in a way that all products belonging to one product group can be calculated as accurately as possible to assure the same approach even if the studies are performed by different experts. This requires e.g. the same goals, the same system boundaries, the same calculation rules and similar data quality for different studies. It is essential for the future that product category rules (PCRs) will be developed that ensure a comparable proceeding within one product group. Such PCRs would have to be defined and adopted at the European level.

[13] See: http://www.anec.eu/attachments/anec-r&t-2010-env-001final.pdf

It is currently not possible to perform product comparisons of multiple products based on PCFs carried out on behalf of different clients and by different practitioners, or public comparison with competing products in ways that are acceptable under competition law (e.g. through reporting of CO_{2e} values or use of CO_{2e} labels).

CO_2 labels would have to take into account consumer comprehensibility, benchmarks and indication of excellence

In order to be useful to consumers a CO_2 label would have to

- be comprehensible, e.g. by a well-structured display, aggregation of the information, concentration on the gist. Additionally, they would have to have a standardised look thus enabling consumers to quickly comprehend the information, compare different products and include the information on the climate impact in their purchasing decision.
- include a rating scheme, enabling consumers to recognise if the products' Carbon Footprint represents a relatively low greenhouse gas emission for the respective product group or a relatively high emission. It must be possible for consumers to recognise excellent products. Only then an effective reduction of the climate impact due to "the right" purchasing decision can be achieved. Consumers are already well acquainted with the A-G labelling scheme of the EU energy label, so this could be a promising starting point.
- be third party certified. As credibility is of high importance for consumers, it is crucial that a third party review should be requested for the PCF when used in product-related communication.
- be backed-up by easy to access and transparent documentation of the PCF study the label is based on. This includes the motivation for calculating a PCF and assumptions and quantifiers used in the calculations. Any publication of the data must be clear, understandable, conclusive and open to scrutiny. It should be noted to what extent PCF calculations are reliable and/or uncertain and whether other important environmental impacts have been taken into consideration.

Single number CO_2 labels make no sense

A static PCF stand-alone label providing a total CO_2 footprint on products does not make sense and is not very relevant for consumer decision making. Although consumers are increasingly aware of the relevance of climate impacts resulting from their purchasing behaviour and usage of products, the display of a total CO_{2e} footprint figure alone would not be of much help to them. It has to be stressed that a figure of this kind suggests a precision and conclusiveness which cannot be achieved using the current state of methodology. At the current state with only few products being labelled this even bears the risk that the sheer display of such a label makes consumers believe that the product might be better than another one without a label.

To conclude, labelling the Product Carbon Footprint is currently of little value to consumers because it disregards other environmental impacts, cannot be easily interpreted without some benchmark or comparative frame, and lacks harmonized methodology (PCRs) that would allow a comparison across products. Once the methodological problems are solved and if the PCF is presented within a comparative frame (e.g. a scale), it can be helpful tool for consumer information. It should be clearly communicated though that it is not a comprehensive environmental label and does not indicate, by its presence alone, that a product in environmentally superior or inferior to another.

Labelling of the Product Environmental Footprint (PEF)

Basing the labelling on the Product Environmental Footprint (PEF) would be another possible step which, unlike the PCF, would include other environmental impacts.

In its conclusion on the „Sustainable materials management and sustainable production and consumption" (December 2010), the European Council invited the Commission to „develop a common methodology on the quantitative assessment of environmental impacts of products, throughout their life-cycle, in order to support the assessment and labelling of products".[14]

On this basis, DG Environment together with the European Commission's Joint Research Centre (JRC IES) and other Commission services developed the environmental footprint methodology which is recommended to be used by Member States, companies, private organisations and the financial community.

According to DG Environment[15], a three-year testing period (EF European pilot phase) was launched with the following objectives:

- to set up and validate the process of the development of product group-specific rules in case of products (Product Environmental Footprint Category Rules – PEFCRs), including the development of performance benchmarks
- to test different compliance and verification systems, in order to set up and validate proportionate, effective and efficient compliance and verification systems
- to test different business-to-business and business-to-consumer communication vehicles for Product Environmental Footprint information in collaboration with stakeholders (individual companies, industrial associations or any other private, non-governmental or public organisation both from the EU and outside of the EU).

The PEFCRs resulting from the EF pilot phase will become the product rules valid under the PEF, to be used by all stakeholders in the sector in the EU or internationally who decide to measure the performance of their products based on PEF.

A second wave of pilots has recently been launched addressing food/feed/drink products[16].

The **added value** of a label which includes other environmental impacts other than energy (and resources) use in the use-phase is not consensual. Although it is clear that consumer choice can be influenced by the environmental performance of the product they are buying, uncertainty remains as to best way to convey this information in an effective and influential way (see section 4.3.3.3.1, and discussion of the PCF and PEF above). We consider the use of other policy instruments that tackle the impacts directly, as better options at this time, while efforts to further consolidate available information on the true impact of including additional environmental information, and in what form, on a label should continue. Once the PCF and PEF are more mature, after extensive consumer testing, and with the caveats listed above, they could be used for labelling purposes. However, it does not seem conclusive to us that integrating them into the framework of the Energy Labelling Directive would bring added value instead of complicating things. Furthermore, there is still untapped potential within the current product scope of the ELD:

[14] Source: http://www.pef-world-forum.org/eu-environmental-footprinting/
[15] Source: http://ec.europa.eu/environment/eussd/smgp/product_footprint.htm
[16] http://ec.europa.eu/environment/eussd/smgp/product_footprint.htm

First, the focus of the ELD's implementation has been kept on domestic products (direct to consumer) and there are no plans to develop labelling requirements for a range of product groups for which Ecodesign requirements were being produced, including almost all non-domestic equipment including (e.g. Motor systems, Commercial refrigeration, Transformers, etc.). The only exception being the labelling of lamps, where the new regulation 847/2012 has specific provisions on where and how to indicate the label classes of business-to-business lamps. Business-to business products are therefore an important area of untapped potential, one example being lifts (elevators) which already have a methodology for labelling in place in Germany (VDI 4707) and an ISO standard for measuring and classifying of lifts being developed (ISO 25747) that is in the final stages of publication.

Finally, including information on best-practices for sustainable product use, either in the product information or in a label on the product itself, can positively influence user-behaviour which has a significant impact on the environmental performance of some products. One example is clothing where small behavioural changes such as reducing washing temperature, washing at full load, avoiding tumble-drying whenever possible, purchasing eco-friendly fibres, and donating clothes not used anymore can be achieved by improving user awareness to this issues.

3.3.7 Assessment of scope expansion – ED

Similarly to what has been said above for the ELD, the scope expansion for the ED should be discussed around the issues of necessity, feasibility and added value.

Although the Ecodesign Directive already addresses impacts for the entire product lifecycle it currently only covers energy related products. The **necessity** for regulation of non ErP presents itself due the existence of relevant environmental impacts and improvement potential of these products that has been identified by previous studies (e.g. EIPRO 2011).
However, it remains unclear if it is **feasible** to tackle these environmental impacts through the ED. Because product groups are very heterogeneous, it is difficult to develop and apply a common methodology that adequately covers different product specificities similarly to what is done now for ErPs with the MEErP methodology. Additionally, due to the nature of the current scope of products covered, the MEErP methodology focuses mainly on technological aspects of the product itself, which in the case of non-ErPs are often not the cause for environmental impact or the basis for improvement (rather, impacts occur at the stage of resource extraction as side-effects of mining or agriculture, or at the end-of-life stage due to insufficient recycling and disposal practices). These impacts would have to be assessed by dealing with, for example, resource efficiency in more detail.

Currently, a limited number of material options is available in the EcoReport. For ErPs, this does not negatively impact the validity of the overall results of the assessment since the use-phase has by far the highest contribution to the environmental impact. This is not the case for non ErPs where the production phase is often the highest contributor to the environmental impact of the product. Although the option exists to manually introduce extra materials into the database, available Life Cycle Inventory (LCI) information on materials is scarce. Current LCAs tend to systematically underestimate impacts that occur at the resource extraction stage (mining) or at the end of life stage (such as land use, pollution to air, soil, and water and health hazards to workers, caused e.g. by using acids to win the raw materials, or by burning of waste in Third World countries). LCAs

tend to either cut off the end of life stage or assume that recycling takes place while, in fact, the products are often not recycled or not well recycled. The reason is generally a lack of data, or of suitable indicators. Other impacts that tend to be not properly reflected in LCAs are impacts on biodiversity, land use, or depletion of biotic resources. This would, for example, concern wood or paper products. This lack of information makes it difficult to estimate the real environmental impact from the material content of a product.

The EcoReport tool also does not take into account transportation issues specific to different product groups. The regional origin of the raw material should also be taken into account in EcoReport as some products are included in a global supply chain. These challenges are beginning to be tackled in current project such as JRC and Bio IS studies (Ardente et al. 2011, Ardente / Mathieux 2012, Bio IS 2013) but are still far from being resolved

In addition to methodological issues, there is the issue of the most appropriate instrument. Although measures could be implemented through the Ecodesign Directive, in some cases other existing instruments are better suited to tackle the environmental impacts of non-ErP which target these impacts directly and have fully developed and proven methodologies (e.g REACH, Regulation 1107/2009 on plant protection products, regulation on pesticide residues, IED Directive).
For each product where other legislation exists, the added value of treating them (additionally) under Ecodesign would have to be carefully evaluated, considering aspects such as the following:

- If products are already covered elsewhere, it would seem efficient to continue to deal with them coherently under that existing single framework.
- If environmental impacts are covered by horizontal regulations (e.g. RoHs, REACH, Water Framework Policy), uncertainty remains to the advantages of developing individual requirements for each product. Although a vertical approach could be slightly more effective due to the differences between product groups, which can lead to different levels of impacts, it would also require analysis of possible improvements –through in-depth product specific analysis-, development of new methodologies and verification procedures for each individual product group. This problem would be much more salient than in the current scope because non ErP are more heterogeneous.

Our current conclusion is that the significant extra costs for carrying out such a product-specific analysis would probably outweigh the added value of a vertical approach.

Additionally, since for most of non-ErPs the impact is not measurable on the product itself, conformity with any Ecodesign Directive requirements would have to rely on the provision of information by suppliers to ensure that products comply with set specifications. The information (and certification) requirements would have to be based on environmental impact analysis and assessment, continuous measurement, targets, and monitoring procedures for each step in the supply chain. The producers or importers of these products would need to be able to certify that the inputs used in their products have been produced by their supplier in certain ways so that the final product meets the minimum requirements set while ensuring traceability, possibly through chain of custody certification schemes.

For this purpose, for each process within the supply chain, all inputs, outputs, byproducts, and resources would have to be identified, as well as production methods and an environmental performance measurement system would have to be developed for each process. Given the

complexity of most supply chains, a methodology for calculating the composite performance of the entire supply chain would also have to be developed.

In the case of specific minimum requirements producers may also need to know the values of the relevant environmental impact indicators. Thus, unless there is direct control of the upstream production stages, it would require producing and exchanging more environmental information across the operators in the supply chain which would lead to increased bureaucratic burden. It would also require the use of declaration or certification programs and monitoring schemes to ensure that all parts of the supply chain are compliant to the set requirements. This would be particularly difficult for some products which have global supply chains. Therefore, market surveillance on such requirements would probably require considerable resources to be effective with a higher risk of non-compliance in comparison to current Ecodesign Directive requirements based on product testing. Market surveillance authorities are not experienced in this type of monitoring. This is also the reason why most existing schemes of this type (such as fair trade, sustainable palm oil, sustainable cotton etc.) are voluntary and are conducted by scheme owners that are specialized on the product or sector, passing the price premium for the monitoring efforts on to the consumer. There are only a few examples of mandatory schemes such as the Timber Regulation and the sustainability requirement for those biofuels that benefit from policy support. The latter, however, relies largely on existing voluntary schemes for monitoring compliance, too). Furthermore, most schemes and definitely all mandatory ones relate to primary products where the supply chain is relatively easy to monitor as compared to complex industrial products.

Therefore, we conclude that the monitoring and verification process would in most cases be too complicated and too different from current Ecodesign practice to include it in the ED. However, the experience on compliance systems gained through the ongoing PEF project (see previous section) should be monitored and taken into account.

However, this does not preclude other specialized product-specific policies (such as the Timber Regulation) from being developed. However, it casts doubt on the **added value** of using the Ecodesign Framework for this purpose. Product-specific frameworks may be in a better position for developing the complex institutional setup needed for this kind of monitoring.

3.3.8 Assessment of scope expansion to transport – ELD and ED

The case study for trucks shows there is an identified large potential for improvement of the environmental performance, with reasonable payback times. Both labelling and minimum performance requirements have been identified as possible policy options to improve the environmental performance of these vehicles. They have been implemented in other economies (e.g. Japan, USA). Because these are energy using products, the implementation of such policies could be done through the Energy Labelling Directive and the Ecodesign Directive or, alternatively, through another policy instrument as has been done with passenger cars. Below an overview of relevant legislation in force today is presented, followed by reflections on possible directions for improvements.

Existing legislation

Most important environmental impacts in the road transportation sector (including light vehicles) are already covered by existing legislation[17]. Passenger cars already have reusability, recyclability and recoverability requirements set by Directive 2009/1/EC and Directive 2000/53/EC on end-of life vehicles and also requirements on CO_2CO_2 emissions. Fleet average CO_2 targets have been laid down (in Regulation 443/2009 for passenger cars, and in Regulation 510/2011 for light commercial vehicles. At the end of 2013, the European Parliament and the Council of the EU reached an informal agreement on mandatory requirements for new vehicles by 2020. These targets relate to performance of new fleets and not to the performance of specific models. To set requirements for specific models, categories would have to be developed according to vehicle characteristics and use.

It is important to notice that the auxiliary equipment of vehicles (e.g. air conditioning, lighting, ventilators), which are a growing load in modern vehicles, are not taken into account in existing testing procedures. This equipment can have a significant impact on the fuel consumption and emissions of the vehicle and, therefore, should be addressed, by including them in the duty cycle.

The pollutant emissions from road vehicles (CO, THC, NMHC, NOx, HC+NOx, PM) are regulated separately for light-duty vehicles (cars and light vans) and for heavy-duty vehicles (trucks and buses). For light-duty vehicles, the emission standard currently in force is Euro 4, as defined by Directive 98/70/EC which is one of the Directives amending Directive 70/220/EEC. Following the CAFE programme and the resulting Thematic Strategy on air pollution, new Euro 5 and Euro 6 standards have already been agreed by Council and Parliament. The legislation currently in force for heavy-duty vehicles is Directive 2005/55/EC (agreed in co-decision), implemented by Directive 2005/78/EC as amended by 2006/51/EC and 2008/74/EC. This directive lays down limit values for emissions of gaseous and particulate pollutants and for the opacity of exhaust fumes. For heavy-duty vehicles (HDV) no greenhouse gas requirements are in place yet, but the Commission is currently working on a comprehensive strategy to reduce their CO_2 emissions.[18]

Including means of transport in ELD/ED

From the above it follows that the burden of including light and heavy duty vehicles in the scope of ELD and ED is probably greater than its added value. The environmental added value would be limited to aspects not currently covered, to avoid overlap or repetition, which seem to have a small improvement potential. Existing regulation could be completely integrated or absorbed by the ED or the ELD, which would have the advantage of having everything covered by a single regulatory framework, but it would entail extra-cost in preparatory work, studies, preparing information for manufacturers and consumers, and possible changes to existing structures. This would also mean an extra burden to manufacturers which would have to readjust current practices, which are well accepted, to the new regulatory framework. Furthermore, for the inclusion of trucks (or other road transportation vehicle) in the Ecodesign Directive some changes would have to be made to the MEErP Methodology to take into account the existing differences between these products and the products already covered, particularly in the EcoReport tool (e.g. vehicle energy use is calculated by kilometre covered instead of hours of use).

[17] See Case-Study: Trucks

[18] http://ec.europa.eu/clima/policies/transport/vehicles/heavy/index_en.htm

The option of merging Regulation 1222/009 on the labelling of tyres with the Energy Labelling Directive is discussed in section **Error! Reference source not found.**. Such a merger would in fact imply a scope expansion of the ELD to tyres.

Electric bicycles are a group that is not yet extensively regulated. However, their environmental impact is very small when compared to other means of transportation and its use is clearly beneficial when compared to other products that fulfil the same function. For comparison, while an electric bicycle consumes energy and releases emissions to manufacture and operate, the amount is the same order of magnitude as a human's breathing activities during a brisk walk[19]. Another concern would be the lead content of the batteries used in electric bicycles, but this is tackled by the Battery Directive (2006/66/EC). Therefore, the introduction of ecodesign or labelling requirements for these products would be an unnecessary burden to producers with very little improvements achievable.

The stakeholder consultation and literature review have not produced evidence pointing to the need of setting individual ecodesign or energy labelling requirements on transport product groups such as trains, boats, airplanes.

A label for cars based on existing information requirements

An EU harmonised comparative label for passenger cars would be very useful as a visual aid to increase consumer understanding of the existing information requirements under the CO_2CO_2 Labelling Directive[20], which is currently being revised. The numerical measure of grams of CO_2CO_2 per km without a basis for comparison is difficult to interpret as anything other than a random number. The same is also true, but to a lesser extent, for the measure of fuel consumption. Furthermore, such a label would result in easier handling and lower cost for car manufacturers. Such a measure should not pose any major problems, as existing standards are in place and similar labels have been established in e.g. UK, Japan, Australia, etc. For example, the label in the UK has a similar design as the Energy label or the tyre label. Instead of using the ELD for this purpose, this label could be set under the existing information requirement (in Directive 1999/94/EC) which would reduce the administrative burden to both the Commission and manufacturers.

This has not been realized yet because Member States may wish to calculate ratings based on their national average fleet performance, which varies across Europe; or they may wish to link the bands to national tax systems based on CO_2CO_2 emissions, which also vary across Europe.

An all-embracing label for all means of transport

A common label that would make all personal transportation methods comparable (e.g. bicycle: class A, train: class C, passenger car: G) would be difficult to develop, even if it did not take into account life-cycle considerations for which some data would be difficult to obtain (e.g. production phase of airplanes or trains) and it remained focused on the use-phase. One of the difficulties is the large number of variables would have to be taken into account, the extent of which could be more or less limited depending on the methodology developed. One could for instance only consider the fuel consumption per passenger km, or go as far as considering the energy spent on

[19] Shreya Dave, "Life Cycle Assessment of Transportation Options for Commuters" , Massachusetts Institute of Technology (MIT), February 2010

[20] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0094:EN:HTML

the maintenance and conservation of infrastructures such as airports, roads, etc. or of the vehicles themselves. The additional consideration of environmental impacts such as emissions to air (CO_2CO_2, NO_x, SO_x, PM, VOCs), acidification, land use, noise would also increase the number of variables involved. Variability between products within each mode of transport would also have to be taken into account (not all cars have the same environmental performance nor all trains, etc.). In addition, the impact of such a label on consumer choice would have to be evaluated as other factors, such as travel time, comfort, etc. might be more important in the decision making process. Furthermore, consumers are not used to labels that apply across different products, as would be this case, and therefore uncertainty exists as to how they would understand it if at all. Confusion might also be increased by the introduction of such a label, e.g. how it would be understood against the existing CO_2CO_2 car labelling scheme.

3.3.9 Conclusions on scope extension

The following conclusions have been derived, so far.

General issues

- Suitability should be evaluated based on three main issues: necessity, feasibility and added value.
- Significant environmental impact and improvement potential has already been identified by previous studies for some product groups.
- Most of the identified improvement options relate to production practices that cannot be verified in the final product and cannot easily be included in a ranking of environmental impacts. Other instruments based on best-practices regulation might be more effective. These include certification schemes (e.g. organic food products) and horizontal measures such as the IED Directive or the European Action Plan for Organic Food and Farming.
- For impacts that cannot be verified on the product itself, methodologies for certification covering the entire supply chain would have to be developed. Some product groups (e.g. garments) have very long supply chains covering different non-EU countries which would make it difficult to develop such methodologies. Furthermore, market surveillance on such requirements would probably require considerable resources to be effective with a higher risk of non-compliance in comparison to current Ecodesign Directive requirements based on product testing. However, the experience gained through the ongoing PEF project should be taken into account.
- Allocation of efforts on market surveillance of the existing regulated products would probably be more valuable.
- The use of electric bicycles is clearly beneficial when compared to other products that fulfil the same function and, therefore, the introduction of ecodesign or labelling requirements for these products would be an unnecessary burden to producers with very little improvements achievable.

Energy Labelling Directive

- There is still untapped potential for savings from labelling of ErPs within the current scope, such as the labelling of B2B products. One example are lifts (elevators) which already have a methodology for labelling in place in Germany (VDI 4707) and an ISO standard for

measuring and classifying of lifts being developed (ISO 25747) that is in the final stages of publication.

- Labelling schemes based on production best-practices and supply chain certification have, so far, been of voluntary nature due to the huge burden they impose on manufacturers and market surveillance authorities.
- Because much of the impact of non-ErPs are not related to energy consumption the possibility of labelling other impacts, aggregated into an index (e.g. carbon footprint, environmental footprint, water footprint, etc.) would have to be evaluated. However, an aggregated index can also means a loss of information and it is difficult to establish transparency and consumer trust. If methodology and communication issues are solved, such an index could be a consumer information tool, but the added value of introducing it under the Energy Labelling Framework is doubtful.
- For means of motorized transportation by road, because they are energy using products and because there are already standardized methodologies for measuring GHG emissions, fuel consumption and other emissions to air, which are already part of the information requirements for passenger cars, the introduction of an energy label or environmental label would not present itself as a major burden. However, the option of doing so through the already implemented legal framework (Emissions and CO_2 Regulations) presents itself as a better option.
- A single label for all transport modes would be difficult to develop due to the large amount of variables to consider and its impact would have to be evaluated particularly in what regards consumer understanding.
- The stakeholder consultation and literature review have not produced evidence pointing to the need of setting individual ecodesign or energy labelling requirements on transport product groups such as trains, boats, airplanes.

Ecodesign Directive

- There is still untapped potential for savings from setting ecodesign requirements to ErPs, as identified in the Ecodesign Working Plan (2012-2014), particularly relating to impacts in other phases than the use-phase (e.g. mobile phones).
- Although measures could be implemented through the Ecodesign Directive, in some cases other existing instruments are better suited to tackle the environmental impacts of non-ErP which target these impacts directly and have fully developed and proven methodologies (e.g REACH, Regulation 1107/2009 on plant protection products, regulation on pesticide residues). For example, since some products are already covered elsewhere, it would seem reasonable to continue to deal with them coherently under that existing single framework. Furthermore, since other impacts are covered by horizontal regulations (e.g. RoHs, REACH, Water Framework Policy), uncertainty remains to the advantages of developing individual requirements for each product.
- Due to the nature of the current scope of products covered, the MEErP methodology focuses mainly on technological aspects of the product itself, which in the case of non-ErPs are often not the cause for environmental impact or the basis for improvement but, for example, more relevance should be given to the way they are produced.. Furthermore, it also does not address other aspects such as toxicity, land-use, impact on biodiversity, or depletion of biotic resources.
- For ErPs, the limited number of material options available in the EcoReport tool does not negatively impact the validity of the overall results of the assessment since the use-phase

has by far the highest contribution to the environmental impact. This is not the case for non ErPs where the production phase is sometimes the highest contributor to the environmental impact of the product. Although the option exists to manually introduce extra materials into the database, available LCI information on materials is scarce: Current LCAs tend to systematically underestimate impacts that (a) occur at the resource extraction stage (mining) and (b) end of life stage (e.g. land use, pollution to air, soil, and water and health hazards to worker). Particularly, the recycling rate of products is most often overestimated, as a simplifying assumption, and in reality products are often not well recycled (or not at all). This lack of information makes it difficult to estimate the real environmental impact from the material content of a product.

- The EcoReport tool also does not take into account transportation issues specific to different product groups.
- The regional origin of the raw material should also be taken into account in EcoReport as some products are included in a global supply chain.
- Substantial resources would have to be allocated to the updating of the methodology for applicability to non-ErPs. The projects that have recently been finished have not yet been able to thoroughly solve the issues.
- To set minimum performance requirements for specific car models, further categories would have to be developed according to vehicle characteristics and use.

On the basis of the preconditions set out (necessity, feasibility and added value) it seems premature to expand the scope of the Directives particularly if limited resources are available.

Nevertheless, since conditions are constantly changing, and experience is gained through existing smaller scale schemes, the use of a decision tree such as the one developed and applied within Task 3 the study is recommended for the evaluation of future inclusion of product groups.

3.4 References

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4 Appropriateness of the energy label

The body of information gathered for this evaluation of the energy Labelling and Ecodesign Directives is in agreement on one fundamental issue: that these two directives form a unique set of policies which have led to substantial and concrete achievements that are contributing to the EU's broader energy policy goals. All the research literature[21] and stakeholder views assessed via the consultation process were in agreement that they should be maintained and reinforced regardless of the type of stakeholder considered. Where differences in views do occur it is with respect to specific aspects of how these instruments should be: designed, administered and implemented; as is discussed in the case of the energy label in the remainder of this section.

4.1 How energy labelling affects market transformation

The rationale behind energy labelling is to address information failures that prevent those procuring energy using or related equipment from accessing information needed to take account of energy performance in their procurement decisions. These information failures are well documented and it is widely demonstrated that without access to such information energy performance is overlooked and undervalued in equipment procurement decisions. Thus labelling is a necessary and valuable policy instrument to help overcome these barriers. Nor is there any doubt that the adoption of the labelling and Ecodesign Directives has stimulated market transformation. This is demonstrated by a series of responses to these tools: the sales-weighted energy efficiency of products subject to labelling and Ecodesign measures has consistently improved, consumers preferentially purchase more efficient equipment when the information is presented via an energy label, manufacturers produce and promote more efficient equipment, and the whole supply chain places a value on energy efficiency when it is made transparent to the market. This positive response is partly due to a successful label design, which from the very beginning of its implementation relied on key design elements that efficiently convey energy performance. The basic elements of the European label have been emulated in a great many economies not directly affected by EU legislation and this is largely due to the attractive aspects of the EU design. Nonetheless improvements can still be made and it is appropriate to review the aspects which work well, the challenges and the areas where labelling could be improved.

4.1.1 Stakeholder responses to the energy label

To help evaluate the areas where the label works successfully and less successfully it is appropriate to consider the different stakeholders affected by labelling and their responses to energy labels.

[21] See Chapter 5 of the literature Review report, "Progress report - Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive ENER/C3/2012-523", 2013.

4.1.1.1 Consumer response

There is strong evidence[22] that consumers respond positively to informative energy labels using a comparative scale with multiple performance thresholds showing that, for the same level of service, some products consume more energy than others. In Europe, the majority of consumers recognise, understand and use the energy label in their purchasing decisions – though probably to varying degrees depending on the characteristics of specific product labels and the implementation (or not) of complementary awareness raising programmes by governments, NGOs, industry and commerce. The EU energy label has raised the profile and importance of energy efficiency as a product feature and through successfully (for the most part) overcoming information barriers has made energy efficiency matter to consumers for the majority of labelled products. In so doing it has also become a very widely recognised brand for energy efficiency. The recipe for this success has been the universal application of a label design that is easy to understand at a glance, that presents information that is salient to and trusted by consumers and that can be retained throughout the procurement process so that it actively affects product purchase decisions. It is therefore a priority that the revision of the labelling Directive should continue to ensure that consumers recognise, comprehend, retain, value and trust the information conveyed in the label.

4.1.1.2 Manufacturer response

Most work that has been done to evaluate energy labels has focused on the response of consumers but it is important to appreciate that the response of manufacturers is equally important[23]. Although the application of the label is mandatory there is no obligation for manufacturers to improve the efficiency of their products in response to this requirement. While consumers will tend to preferentially purchase energy efficient products if assisted by a consumer friendly energy label, manufacturers will respond based on an analysis of the expected benefit to be accrued from the production and sale of more efficient products weighed against the cost of modifying their production and marketing materials. Happily, there is strong evidence that manufacturers have reacted positively to the EU energy labels and have voluntary embraced them as an important feature which can differentiate their products. In Europe, industries have developed higher efficiency products in anticipation of increased consumer demand whenever a new product energy label has been developed and have continued to move product ranges towards the higher efficiency end of the label spectrum over time. This suggests that the extra investment needed to achieve higher efficiency levels has generally been outweighed by the benefits in terms of increased sales value and volumes.

For many of the goods subject to energy labelling, and especially consumer products, there has been a tendency for sustained price erosion due to increased productivity gains over the last few decades. Energy labelling would appear to have helped slow this trend by enabling an otherwise unnoticed product feature to come to the fore and thereby help counter the trend towards product commoditisation. While manufacturers have generally anticipated market pull effects whenever new labels have been introduced it is important for the policy process to be aware of the impact of the product production cycle on the investments and rate of return expected from investing in higher efficiency products. If energy efficiency thresholds are revised too slowly there is a risk of

[22] See the literature review report, especially Chapter 5.1 and 5.3
[23] See the literature review report, especially Chapter 5.1 and 5.2

there being no benefit to be accrued from investing in higher efficiency products because there is insufficient differentiation available in the top efficiency class.
Equally, if the thresholds are revised too frequently there is a risk that manufacturers will be less inclined to make the initial investment in higher efficiency products as the instability in the thresholds of the classes delineating higher efficiency products will erode the efficiency premium and undermine the investment rate of return calculation. Equally, economy of scale is the principal reason why it is important to operate the labelling scheme over the entire European economic area and not just at a national level. With one harmonised EU label applying common efficiency thresholds across the European economy manufacturers have a single clear set of design targets to aim for which magnifies the weighted benefit from aiming for the top efficiency classes. Given these concerns it is unsurprising that manufacturers have expressed concern about the dynamism of the energy label, the pace of change and the impact on future investment strategies, especially in the event that the label scope were to be enlarged to cover topics other than energy and the other environmental aspects already covered. Accordingly, it is important that the revision of the labelling Directive should continue to ensure that manufacturers will benefit from investing in higher efficiency products and that the future label remains a stimulus for sustained innovation.

4.1.1.3 Supply chain responses

Lastly, the market transformational response from the implementation of energy labels is also influenced by the reaction of wholesalers, distributors and retailers. Each of these chooses the range of products they intend to vend and collectively these decisions affect the overall impact of the energy label. If the price increment of higher efficiency products is considered to be too high for the market demand the supply chain will not order the products, whereas conversely if the sales benefit is significant they will actively stock higher efficiency products. The different trends in such price differentials, which correlates with the underlying trends in technology production costs, explain why for some products like washing machines and refrigerators the market rapidly evolved towards higher efficiency levels while for others such as clothes dryers it took many years before high efficiency products became available at a price differential the market was prepared to sustain.

In addition, retailers are required to display the label in their stores, although it is an information tool that poses certain challenges to implement (especially for the pre 2010 EU energy labels which were split into two parts yet was usually introduced without training for retailers). The response to the survey indicates that some independent retailers would rather not have to display energy labels directly on products for sale although the evidence is that distance selling is the supply chain that has the lowest compliance levels. Nonetheless, there has been a trend towards a greater share of products correctly displaying labels at the point of sale and today the energy labels are generally correctly displayed. Furthermore, a lot of large retailer chains have dedicated staff training regarding the display and meaning of the energy label.

4.1.1.4 Information failures in business to business procurement

Despite the 2010 revision of the labelling Directive, which extended its scope to permit labelling of professional as well as consumer products at present energy labels have only been developed for consumer products, except in the case of lamps for which the regulation explicitly states professional lighting is included and for heating and cooling products as many of these would be procured by professional installers on behalf of consumers. There is ample evidence of energy performance information failures also applying in the procurement of professional energy using or related equipment and hence there is a significant opportunity to increase energy savings by addressing these informational failures through the mandatory provision of energy performance information[24]. Whether this information needs to be supplied through the form of a printed label affixed to a product is another matter. Showrooms displaying products are rarely used in professional equipment marketing and it is much more common to purchase equipment through catalogue and distance selling techniques. Thus it could be envisioned that for products destined for professional sales channels that energy labelling information requirements could be specified differently than for those destined for consumer sales channels.

4.1.2 Key elements of the label design affecting market transformation

The design of the label is clearly one of the key aspects that governs the overall market transformational effect of the energy label and hence it is appropriate to review some of the fundamental considerations that will need to be borne in mind when contemplating any revision to the existing design.

4.1.2.1 The value of mnemonics

One of the key reasons for the success of the EU energy label is that it uses mnemonics[25] to convey and reinforce the energy efficiency ranking of labelled products. The most obvious mnemonic used is the letter to indicate the energy efficiency class but this is reinforced by the colour scale of the arrows in the efficiency scale, another, complementary, set of mnemonics. Lastly, the arrows in the efficiency scale itself, which are stacked in order of length from short (denoting low energy consumption) to long (denoting high energy consumption) constitute a third and more subtle set of reinforcing mnemonics. Thus, the A to G of the letter scale reinforces the green to red colour scale that is reinforced by the length of the stacked arrows. Collectively, this set of reinforcing mnemonics enables the easy visual identification of the efficiency of the product in question and contextualises it against a broader efficiency scale, so it is clear where the highest and lowest part of the scale are and where the efficiency of the specific labelled product is positioned on the scale. Lastly, the mnemonics are essential in aiding memory so that consumers are readily able to remember the efficiency of products they've previously seen and keep that information in mind as they consider which product to purchase. All successful comparative information energy labels in use internationally make use of mnemonics, be it colours, arrows, letters, stars or numbers to convey a rather complex message in a simple way that allows people

[24] See for example the IEA support to the G8 Plan of Action "Mind the Gap – Quantifying Principal agent problems in energy efficiency", 2007

[25] A mnemonic (/nəˈmɒnɪk/,[1] the first "m" is silent), or mnemonic device, is any learning technique that aids information retention. Mnemonics aim to translate information into a form that the human brain can retain better than its original form.

to *understand* at a glance and *remember* both the information and the system used to convey this information.

4.1.2.2 Thresholds – the backbone of the label

While the use of mnemonics facilitates comprehension and retention of product efficiency they are underpinned by the delineation of efficiency thresholds that determine where each class falls on the efficiency scale. Setting thresholds within a closed scale is a successful fundamental of the EU energy label, for the purpose of product comparison. Correctly set thresholds create competition between manufacturers / products to reach the next better energy efficiency class. According to findings reported in research literature[26], products are actually designed to just meet the various thresholds and benefit from the publicity of the attached energy efficiency class. If a technical improvement is made, it is meant to reach the next upper threshold.

4.1.2.3 Trust in the integrity of the label

Energy labels were introduced to overcome market failures regarding information on products' energy efficiency. As mandatory informative labels apply to all products on a market and across a wide range of product types, it is crucial that consumers recognise who is the entity behind the label and trust this entity has appropriately organised the whole labelling system. Consumers should be able to trust that the goal of this entity is to provide clear and impartial information for the benefit of consumers and / or society. This in turn implies implicit trust that a viable system is in place to verify declared performance and to deter malpractice.

4.2 Challenges and opportunities with the current energy label

After 20 years of energy labelling in Europe the energy label still functions broadly as originally intended. It has a high rate of recognition in all European countries and is fulfilling a useful service. For many products, there is still a large potential for additional energy savings and there remain significant differences in energy consumption between products that consumers could not identify without the aid of the label. Furthermore, only 12 product groups are currently labelled and there is considerable potential to expand the labelling scheme to cover other product types. However, the effectiveness of the labelling scheme is not as high as it could be due to a number of imperfections. According to findings reported in published research and in particular those derived from consumer research, comprehension of the current label design is not as high as it could be and more importantly the design amendment that uses additional plusses to indicate higher efficiency classes beyond the A class is less effective in motivating the purchase of higher efficiency products than the original A to G scale.

4.2.1 Consumer understanding[27]

The literature shows without ambiguity that energy-related performance is a top-of-mind concern for consumers for labelled products and is often the most frequently mentioned purchasing

[26] See the literature review report, in particular Chapter 5.4

[27] This section is mainly based on the literature review report, Chapter 5, in particular 5.3, 5.4 and 5.5

consideration, along with price. European consumers recognise the EU energy label, with surveys confirming recognition rates up to 80 and 95%, and more importantly, they mostly trust the label with a large majority using it in their purchasing decisions.

The 2010 recast of the energy label has led to several significant changes from the original energy label format:

- The label's efficiency scale has been updated such that additional high efficiency classes up to the A+++ class were introduced for household refrigerators, washing machines, and dishwashers and are now being used on new labels too
- An important design change was introduced, to move from a two-part label with a language-specific background to a single, language-neutral label that is the same across the whole EU
- As a result of the decision above, illustrative icons (pictograms) were introduced in place of the former explanatory text presented in each national language.

Evaluation of the comprehension of the new label format is generally positive with most consumers being able to use the label to identify the most and least efficient products (though an important minority of around 25% are not) and most understanding that the objective of the label is to inform people about product energy performance. A recent study (London Economics, IPSOS, 2014) based on an on-line survey gathering over 5 000 participants from 7 European countries shows that 90% to 95% of the participants correctly identify the most energy efficient product when faced with different energy label framings[28]. This study tested an alphabetic closed scale (the most understood), a numeric closed scale and a reverse numeric closed scale. These very high percentages may be explained by the fact that only the scale was tested, without confronting participants with a full label and in particular with an information on absolute consumption at the same time, whereas this seems to be a source of confusion for consumers who have difficulties understanding the difference between relative consumption shown on the scale and the absolute consumption, hence the lower comprehension levels that are reported in other consumer research literature are not inconsistent with these findings.
Most consumers focus on the energy and energy efficiency information, which are the highest profile elements on the label. Furthermore a substantial proportion expresses a willingness to pay more for efficient models. However, comprehension and resulting positive attitude towards the label may be much less for some of the newer labels that have not so far been analysed in consumer research (e.g. the room air conditioner label presenting "SEER" and "SCOP" parameters without explanations, and introducing regional factors).
For all labels, there are a number of challenges that need to be addressed by the forthcoming revision of the Directive, as follows:

The mnemonics used on the label are highly effective. The letters on the energy efficiency scale, the colour coding and the stacked arrows are all clearly understood, reinforce each other and are motivating to consumers. This strongly suggests these elements and their associated use of a set of delineated efficiency thresholds should be maintained in any future revision of the label.

[28] Note, this test was for the most simplified comprehension test of the ability to correctly rank three products using only the label scale (i.e. not all the label was displayed – just the efficiency scale). More complex, real world, ranking tests would be likely to produce lower scores.

Use of pluses as a complementary efficiency mnemonic is less effective. Consumer research shows the label scale is well understood, whether A-G or A+++ -D, however:

- A+++ as the top of scale is less compelling (less motivating or appealing) than when A is at top.
- The difference between an A and a D is much faster for consumers to process than A+++ to A
- More importantly, the subdivision of the A class has reduced consumers motivation to buy efficient products. Consumers understand the scale but are not as motivated by differences in A+/++/+++ as by C/B/A. This change has weakened the market transformation impact of the label resulting in a lower willingness to pay for higher efficiency products.

Interpretation of colour in the efficiency scale and thresholds: Consumers understand and appreciate the label colour code; however, certain elements are less clear than others and some have stronger associations than others as follows:

- A significant minority of consumers imagine that the red part of the scale may denote products that are not permitted for sale – a belief that may be exacerbated by the failure to regularly rebase the label's efficiency scale. It should be noted that, a red classification is seen as a very negative property and hence this part of the scale has a strong market transformational impact
- Consumer research shows consumers do not always connect the ranking in the black arrow with the ranking of the specific product in question, nor do they always associate it with the alphabetical rankings in the efficiency scale on the left of the label. This dissociation may have been exacerbated by the revision to the recast label design where the letters in the left hand part of the scale were moved to be vertically aligned at the left of the arrow whereas in the original design they were at the right hand side of the arrow and more adjacent to the corresponding letter in the black arrow that points back to the stacked arrows
- The colour code is used to delineate the performance thresholds. While much attention has traditionally been focused on the threshold set for the highest efficiency class consumer research finds that most consumers are only willing to purchase a product in one of the green efficiency classes (i.e. the top three classes) and thus the efficiency threshold which delineates the boundary between the yellow and green classes is the most influential on the label. The choice of this threshold is thus critical to the overall market transformation impact that will result from the label. Therefore one design option could be to aim to fix this threshold at a significant key benchmark such as the energy efficiency level associated with the projected least life cycle cost level for the consumers some number of years after the time the label is designed.

Highest and lowest efficiency classes

- The current set of labels are inconsistent in the choice of end points used to rank the highest and lowest efficiency products, with some having A to G end points and others D to A+++. This may lead to confusion about what is the top and bottom of the scale for specific product groups as consumers may imagine that other efficiency classes could be applicable even if they haven't been introduced yet for the product in question.
- At the bottom of the scale consumers do not realise that products in lower efficiency classes may no longer be available on the market. They generally think that if a label class

is shown on the label, products in that class are still available for sale on the market. The fact that in some cases lower efficiency classes indicated on the label are prohibited for sale by Ecodesign regulations is not understood nor is it communicated to consumers.

The signification of the length of the arrows in the efficiency scale: There seems to be uncertainty about the signification of the arrows in the A-to-G scale. Most consumers appreciate that the shorter the arrow length the lower the product's energy consumption but some consumers believe the length of the arrows is in some way proportional to the product energy consumption.

Labels with regional variation in efficiency scales: Due to the increasing complexity of the products being labelled and their associated features, attempts have been made to communicate more complex information via the label; however, this may well be at the expense of consumer comprehension. Examples include the room air conditioner and space heater labels which have efficiency scales that vary depending upon the region of the EU the product is intended to be used in and which cite efficiency metric acronyms such as the SEER (seasonal energy efficiency rating) without any textual explanation. Consumer understanding could therefore be significantly lower than for the other labels; however, this has not yet been tested through any form of consumer research. Other new labels that have not been tested include those for water heaters, tumble driers and vacuum cleaners.

Comprehension of the other label elements. The majority of icons (pictograms) and language-neutral imagery that have been tested have generally been well understood, but several have been found to be problematic or not understood at all. The most problematic icons and units (among those used in the TV, refrigerator, washing machine and dishwasher labels – i.e. additional problematic ones may be found on more complex labels quoted above) appear to be:

- The dish-drying performance icon
- The on/off icon on the television label
- The television on-mode power demand icon
- Power expressed in Watts (W) and consumption expressed in kilowatt-hours (kWh) which are often mixed-up and hence are not clearly understood
- In word "annum" in the formulation "kWh/annum", is often not understood as "year"

Suitability of the other label elements. Though understood, the issue whether consumption values should be expressed per year (as in the recast labels), as opposed to per cycle (as in some of the old labels) is disconcerting for many consumers and can lead them to challenge the credibility of the information on the label. This is because for appliances that are used intermittently (such as washing machines, dish washers, TV, etc.) consumers are liable to think that those designing the label cannot possibly know how frequently they use the product leading many to doubt that average values could be of direct relevance to them. Hence on the one hand a long period seems more adapted to communicate understandable energy and water consumption orders of magnitude (over the year or over the product life time as opposed to per cycle) but on the other hand, there could be a serious credibility issue as consumers may not trust or identify with the standard use pattern chosen to measure energy consumption and, in addition, the standard habits of use chosen for the regulation. A recommendation would be to test this issue before continuing with the "per year" or reconsidering the "per cycle" approach, especially for products that are not used continuously.

The consequences of a language neutral label design Consumer research shows that the contextual information meant to assert the purpose, credentials and neutrality of the label, conveyed with the minimal use of language, is also not understood. This is the case for:

- The text across the top of the label which says "energy" in each national language (most consumers do not connect the prefixes to the suffixes and hence do not see that it sys Energy in their language)
- The pictogram of the EU flag, which is intended to signify that the label originates from the European Union yet the most common belief regarding the label's provenance is that it is a manufacturer initiative
- The number given at the bottom of the label which corresponds to a European Directive number

Given these difficulties to understand some icons, units and language neutral elements, it seems important to assess the loss in comprehension that has resulted and, if it is found to be important, look for solutions that would enable the reintroduction of national languages. It is not suggested to go back to a label supplied in two pieces (since a one piece label greatly improved the rate at which labels are correctly displayed in shops) but manufacturers could ship the products with various versions of the label to cover all languages of the European Union, or retailers could have the possibility to print or order labels in the appropriate local language.

These findings from the research literature are partially supported by the answers given by the consumers who completed the survey organised for this evaluation. Even though the numbers are not very significant (127 respondents not equally spread between European countries), when asked about possible improvement of the label in the future, a strong majority of respondents are against adding further +++ and are in favour of resetting all classes to an A-G scale.

Even though the new label design is generally understood, there is significant scope to increase the overall understanding (see section 4.4 and 4.5). Based on the findings from the research literature and on the survey and position papers received for this study, recommendations for future label revisions could include:

- Consider re-grading the A-to-G efficiency scale in preference to adding more plus signs;
- Maximise the impact of the demarcation between the green and yellow parts of the scale;
- Ensure that all efficiency classes indicated on the label are still permitted for sale;
- Review problematic icons;
- If an in-depth assessment shows there would be a net benefit, consider returning to the previous system of labelling energy consumption per cycle for products that are not used continuously;
- If an in-depth assessment shows there would be a net benefit, consider using national language to clarify units, icons or explain local elements;
- Raise awareness that labelling is an EU scheme operated by the European Commission with support from Member States; and
- Strengthen label comprehension through educational communication campaigns.

4.2.2 Rescaling the label

A key challenge to be addressed is how best to address the need to modify the label to take account of the concentration of products into the higher efficiency classes of the product groups that have been subject to labelling for a number of years. When such a concentration occurs it indicates that the label has had some success at transforming the market towards higher efficiency levels. It usually, but not necessarily, also indicates that there is a need to develop higher efficiency classes than are currently designated on the label because it is possible to attain higher efficiency levels than the highest threshold currently indicated on the label. Whenever either concentration in the top classes occurs and/or new products are potentially available that have a significantly higher efficiency than the current top efficiency threshold it is appropriate to revise the label so that the spread in product efficiency among label classes is increased and so the highest efficiency products are clearly differentiated from the rest on the efficiency scale. Historically the EU has addressed this difficulty by adding new classes above the A class (the A+, A++ and A+++ classes), however, these have been contentious (due to concerns that they weaken the label's effectiveness) and there is general agreement among all stakeholders that it is not possible to go beyond the current A+++ class by continuing to add more classes. Thus some form of redesign is required whenever the conditions mentioned in this paragraph arise. Issues related to this topic are discussed throughout the remaining sections of section 4 and specific design alternatives are analysed in section 4.4 with recommendations made in section 4.5.

4.2.3 Other challenges not relating to the label layout

Beyond consumers' understanding of the label layout, other issues have been noted by stakeholders as potentially weakening the label's impact[29]. These relate to the technical complexity that underpins the label. They are covered in detail in section 4.3 and include:

- The calculation of the energy efficiency index for which the following aspects have been questioned: the use of linear formulae that may favour large appliances resulting in better energy efficiency classifications than smaller products despite a higher absolute energy consumption; the bonuses for some specific services which also lead to higher permitted energy consumption for a given efficiency class without consumers being aware of this, and the amplitude of and inappropriate use of tolerance margins
- The number of energy efficiency classes to be shown on the scale, depending on the product technical maturity
- The measured energy consumption not necessarily reflecting real usage patterns (which has also been perceived by consumers themselves, and may not only lead to false efficiency rankings but may also potentially create mistrust regarding veracity of the label information)
- The number of parameters that a label can convey and still effectively fulfil its primary informative function
- The distinction to be made – or not – when labelling products using different technologies and/or different energy carriers to provide the same service

[29] See the literature review report, in particular Chapter 5.4, 5.5 and 5.6

4.2.4 Opportunities from the extension of product coverage and from technical developments

As mentioned in section 4.1.1.4 the scope of mandated energy performance information provision has yet to be properly extended to cover energy using and related products in the commercial and industrial sectors[30]. Equipment use in these sectors constitutes a large proportion of total equipment energy use and contrary to a common perception there are significant information failures and split incentives in the equipment procurement processes applied in these sectors, which mandatory information provision could partially address. It is therefore, recommended as a priority that efforts be made to extend energy performance information provision requirements to equipment used in these sectors. Though professional procurers generally have more capacity to analyse markets than consumers they generally are professionals in purchasing rather than in assessing the trade-offs associated with the energy performance of a given product. It is therefore important that they receive both absolute and relative performance information.
However foundational work should be conducted to determine how best such information provision requirements should be specified i.e. to address the choice of communication media for which specifications would be set, the presentational formats to be set, the information to be conveyed, the potential unification of the information requirements specified under the Ecodesign and Labelling regulations (product fiche, technical documentation), etc.

4.2.5 One energy performance scale or two?

For several energy end-uses there are more than one technological means of providing the same service that may or may not be associated with different energy sources. Examples include space and water heating where the service is identical (warmth or warm water) but the energy sources can differ and the technologies used to supply the service may differ too. In these cases not all end-users have a complete choice over what energy supply system they will use (i.e. gas, electric, oil, renewables) but many do.

Similarly, within the same fuel type it is possible to find products with very different technical characteristics; e.g. an electric resistance space heater may have much lower first costs compared to a ground source heat pump but may also be far less efficient and potentially more costly to operate over an extended period. In principle, all technologies that provide the same primary service should be evaluated and ranked on a common basis and the ranking on the principal energy label scale should reflect this, so that end-users can make informed choices between technologies and their associated fuels. However, it is also the case that many end-users may have more limited choices due to practical constraints (e.g. not having access to all energy sources, not having space to install some options, not being willing to undertake the extent of physical site disruption or system modification associated with some choices, not having the disposable capital to invest in more costly options with a longer term payback, etc.) and thus there would often also a benefit from a ranking scale that is adapted to better reflect distinctions in performance of similar technologies perhaps associated with a particular energy source.

Problems from using a single common scale arise most acutely when there is a very large spread in the efficiency of choices across technologies such that a single common label scale would not

[30] So far the lamp labelling regulation is the only labelling regulation that includes specific provisions for B2B products.

reflect important differences in energy performance within technology types were it also to encompass the differences across technology types. In such cases it is appropriate to consider whether the efficiency scale would be more effective were it to be adapted to include a sub scale within the main scale. Section 4.6 includes a set of label designs that show options for how this could be done (Figure 14).

In other cases products may perform more than one energy service, such as heating and cooling or printing and scanning. In these cases a label design using a dual scale where both energy services are ranked on a different performance scale might be appropriate.. Precedents exist for dual scales e.g. the Australian air conditioner label which has a dual scale for cooling and heating efficiency, the original EU washing machine label which ranked washing cycle energy efficiency on the primary scale but had secondary scales for spin drying efficiency and cleaning performance, the UK's building energy performance label which has a scale for primary energy and another for CO_2, etc.

4.3 Principal design needs to be addressed

The challenges and opportunities described in section 4.2 highlight some aspects of the current label that should be corrected and/or improved. This section summarises the findings from the literature and stakeholder consultation for each of these topics and provides analysis and recommendations on each.

Keeping in mind that not all informational needs can be met by a label, there are a variety of ways these principal design needs can be addressed. In any case, any proposed adjustments and changes should be guided by principles that most of the literature[31] and stakeholders agree upon so that the appeal, salience and comprehension of the label is maintained and enhanced. At their core these can be defined as follows:

- simplicity, continuity, clarity and comparability in the label design to convey information with maximum impact
- workability and veracity of parameters
- credibility, dynamism (responsiveness), flexibility and predictability of the approach used to design, set and revise labels.

Furthermore, the approach taken to label design should allow for case-by-case fine-tuning to: reflect product-specific market evolution and technology development, encourage innovation, ensure sufficient temporal stability in the structure applied in order to permit greater certainty in planning for investment (industry's response to the label is an investment orientated decision and some measure of certainty is needed if investment is to be maximised) and enough time for the correct implementation by the supply chain. At the same time rescaling or other changes should occur as infrequently as possible as they are perceived to increase administrative burden and costs and to potentially generate confusion for consumers. Last, but certainly not least, any new design element should be thoroughly tested with stakeholders and in particular consumers before definitive decisions regarding its adoption are made.

[31] See the literature review report, in particular Chapters 5.4, 5.5 and 5.6

4.3.1 The use of mnemonics should be maintained and improved, with the thresholds carefully addressed

The broad challenge is to revise the label to address the challenges and opportunities identified in section 4.2 while safeguarding the basic design principles characterised via the mnemonics that have made the label a success. This is necessary to ensure the label carries on fulfilling its primary purpose: i.e. that people should be able to understand the ranking at a glance, remember the main information conveyed by the label and be motivated to act upon it.

The most powerful label design elements identified in the research literature which are systematically applied across any type of labelled product are:

- A scale with thresholds.
- The use of names attached to these thresholds in order to aid memory and facilitate ranking. Preferably this will be done with letters for which there is minimal risk of confusion in Europe as A is always understood to be the highest ranking.
- The use of a red to green colour progression to denote and further rank these thresholds. The colour code and the energy class to which it is assigned is a determining factor for the impact of the label on energy savings. A lot of discussion has been focused on the top and bottom thresholds; however, the dividing line between the green part of the scale and the other colours is equally important. This is because consumer acceptance of products in the green part of the scale is significantly higher than for the other colours.
- For secondary information, the use of unambiguous icons (pictograms) and comprehensible units, if necessary backed with explanatory material in each national language.

4.3.2 The label scale should be revised to better encompass market response

Given time and without revision a successful categorical information energy label of the type used in the EU will inherently reach a stage where most products are in the best energy class and almost no products are in the lower classes and/or when the lowest classes are rendered ineligible through the introduction of MEPS. If left unaddressed this is misleading as consumers naturally assume that all classes displayed on the label are eligible and active. Furthermore, if too many products are in the top class the label ceases to provide information that allows consumers to distinguish between products based on their energy performance. In addition, the label needs to reflect the current technological state of the art for energy performance so that consumers are informed about the potential level of efficiency they could be offered and manufacturers are rewarded for sustained innovation. Consulted stakeholders agree that finding a way to make the European label a more dynamic tool is a key challenge of the ELD revision as, for many products, the scale already needs to be revised or will soon need to be revised, even taking into account the 2010 revision of earlier labels that enlarged the scale with the addition of 3 more classes. However, though all consulted stakeholders agree on the need to have an energy label, they disagree on how effective the energy label classes (A-G plus A+++, A++ and A+ classes) are today in providing a clear and useful differentiation of product energy efficiency. Generally speaking, industry groups and some government bodies hold the view that the system does provide this information even today, whereas consumer and environmental interest groups and some government bodies tend to hold the opposite view and would like to see it improve.

4.3.2.1 The classification scale

Section 4.4 and 4.5 consider specific proposals concerning design options for the future label. Below we indicate elements from the literature and stakeholders positions.

As mentioned in section 4.2.1, one of the most important challenges for the current label is that the introduction of the "+" in the label scale has been found to demotivate consumers interest in choosing energy efficient products.
In response to the consultation survey, most stakeholders actually advocate the adoption of a new meaningful and understandable scale and display a distinct preference against adoption of a scale using additional "+'s" to denote higher classes (or the adoption of related performance indicators such as A+++-20%). However, there is no obvious consensus on other issues, such as the re-setting of all classes to an A-G scale, or the moving towards an open ended scale or the introduction of a dynamic class rating system, which would automatically adjust over time.

Among these stakeholders manufacturers do not present a uniform block with similar preferences on all issues. As a stakeholder group, they cover a large diversity of products manufactured, from systems related to integrated plug-in products, targeting consumers or businesses, for which there is or may not be competition between different technologies or between technologies using different energy carriers.
Although many manufacturers do not necessary think the current classifications need to be changed, a variety of options are proposed for the details of the scale, sometimes conflicting, depending on the type of manufacturer:

- Continuing the 7-classes on the label scale or reducing the number of classes
- Continuing the A+, A++ and A+++ classes corresponding to the market evolution, or exploring adoption of a scale that goes towards the products' technical energy performance limits in order to create conditions for industry to invest in innovative technologies
- Using a label scale that significantly differentiates products both in terms of energy efficiency and other key functionalities of the product so that differences in terms of service provision is taken into account.

Nor are retailers a homogeneous group with differences being evident depending on the market chain they work in (from small independent shops, to large national networks, to European chains, from specialist retailers to generalist suppliers selling energy consuming products amongst other goods). Those who have participated in the survey organised for this evaluation generally expressed similar views, with no clear specific wishes on the future label. They point out that the current scale with the "+" does not seem adapted to future evolutions and that an open scale could be a solution.

Representatives of broader society from member state government institutions such as ministries, energy agencies and market surveillance authorities, or from NGOs or the private sector with interest groups representing consumers, environmental concerns, or test laboratories, have also expressed preferences on the label design. The most vocal groups are generally consumer and environmental interest groups because it is part of their mission to regularly take a position, whereas government bodies may undertake studies on specific aspects. However, the evaluation survey presented an opportunity for all groups to express preferences that are not necessarily

reported in the research literature. These groups do not present a uniform block either and do not always express similar preferences on all issues.

Regarding the label scale, a lot of stakeholders from boarder society seem to favour a uniform scale from A to G for all product groups and regular reclassification of products. Consumer interest groups ask for strong consumer based evidence to justify *not* returning to a closed A to G scale and demonstrating that a scale other than the closed A-G would be more effective in guiding consumers.

However there are variations in the details and potential solutions proposed as follows:

- The upper A+, A++, A+++ classes are generally perceived as having had a negative impact on consumers and the market. The fact that for several product groups these classes are the only populated ones confuses consumers and does not motivate them to buy most efficient products. Some government bodies would avoid adding "+" or signs to the already existing ones (e.g. A++++ or A4+ or A+++-20%), whereas consumer interest groups and energy agencies would prefer to eliminate the "+" classes and to return to an A-G scale. If re-setting all classes to an A-G scale was accepted, stakeholders expressed a preference for it to be accompanied by a date (year) reference on the label.
- Some stakeholders would like other routes to be explored, such as a forward-looking and stable energy labelling scale in which the top of the scale is hardly achievable by current products and corresponds to a "nearly zero energy consuming target" in order to ensure long term room for innovation and differentiation at the top.

4.3.2.2 Number of classes on the classification scale: choice could be given according to product energy efficiency maturity

No dominant view emerged in the survey, on whether a fixed number of classes should be displayed on the label *per se* – i.e. several comments were made concerning empty classes (at the top and the bottom of the scale – see below) but not many on the structure of the scale itself in terms of number of classes.

Presenting the same number of classes on the label works in favour of continuity of crucial design elements (scales, arrows, colours, letters) but may not be adapted to all products from the technical point of view. For example, maintaining seven classes may be difficult or pointless for products where this level of performance differentiation is not seen e.g. for electric motors or domestic washing machines (because products have encountered technical limits to higher efficiency combined with the need maintain minimum meaningful boundaries between thresholds due to market control problems given the bandwidth of test tolerances, etc.). In principle the scale could include less than seven classes for product groups with less potential for energy performance differentiation and could thus be designed to reflect the actual range of product efficiency available (while taking every effort to encourage future innovation). However, introducing a different number of classes depending on the product type would require some modification of the European energy label system and one of its distinctive features (the 7 bars with different colours). Nonetheless, this would not necessarily destabilise it as international experience shows co-existing labels with 3 and 5 classes depending on technical needs without any major difficulties in comprehension or implementation being reported.

Today, a number of products are covered by labels showing classes for which no product is present on the market, yet most consumers are unaware that some efficiency classes shown on the labels are empty. Empty classes at the top of the scale do not seem to be a problem because it leaves space for new innovative and more efficient products to come on the market without changing the whole system (this is perceived as being more in accordance with the aim of the label - though the interpretation of consumers confronted to different labels in a shop should be tested because they may assume the top class is always available). By contrast, empty classes at the bottom of the scale are strongly discussed with stakeholders disagreeing (even within similar types of stakeholders' groups) on whether they should be removed from the label, or the label should somehow indicate that some classes are empty of products (in order to inform end-users that there has been progress in product energy efficiency). This discussion underlines that interaction with the Ecodesign Directive is an area for improvement in any revision of the labelling Directive. This issue also relates to the potential rescaling of the energy label, where it is not uncommon for ED thresholds that are aligned with labelling class thresholds to be progressively introduced over time.

4.3.2.3 Factors to be considered when setting energy efficiency thresholds

Though the label conveys a simple message, it has a complex technical foundation. There are a variety of issues relating to the technical background of labels that are underlined in the research literature and that are relevant to all stakeholders.

The metric and calculations used to determine an Energy Efficiency Index (EEI) are common to both the ED and ELD and are used to set MEPS and define the label classes. In the case of the ELD no single systematic approach has been taken on how to set the gap in EEI between class thresholds. In some cases it is based on equal increments between classes, while in others manual fine-tuning is applied to take into account specific considerations. Nor is there consistency on whether the most efficient classes set at the moment the label is conceived are be reserved for energy performance levels that are only expected to be attained over the longer term or are already met.

In some cases the EEI calculations may also involuntarily promote relatively high energy consumption because of bonuses granted to appliances with certain feature types, or because use of overly simplified linear EEI formulae or poorly calibrated formulae practically favour large capacity appliances compared to smaller ones.

In theory, several paths could be explored to address this issue:

- Give more weight to absolute energy consumption in the derivation of the EEI
- Pay more attention to the derivation of the EEI formulae to avoid systematic bias and consider adoption of non-linear formulae when there is a sound physical basis for this
- Seek to eliminate bonuses from the EEI formulae for non-fundamental product features to indicate as far as is reasonable to consumers the consequences of the product choice on absolute energy consumption
- Provide bonuses in the EEI formulae to (smart) products that provide automatic corrections and/or informative advice to users on their correct/green/economical usage and the implications of usage behaviour on energy performance. Provided it is well framed in the regulation, bonuses could be given for example to washing machines able to recycle the rinsing water for the next wash, or to cold appliances with a thermostat able to override manual operation after some time when the user sets the temperature below the design temperature (e.g. the user sets the thermostat at -30°C and 48 hours later the thermostat goes back to -18°C).

This last aspect notes that the present EEI calculations are not always thought to be representative of actual product usage patterns. While the comparative function of the label can theoretically be based on normative use, many stakeholders argue it is necessary to make adjustments so the efficiency ranking under standard test conditions better represents the ranking under actual usage patterns if trust in the label is to continue. Another factor to consider with the EEI derivation is the degree to which it is appropriate for it to also include allowances or bonuses to encourage solutions that minimise environmental impacts, as opposed to just energy impacts and their indirect environmental impacts. At present environmental aspects have been embedded within the Ecodesign regulation of some product types e.g. as was done for the room air conditioners to take account of the direct greenhouse gas impact of refrigerants, or renewable energy in the space heating appliance label.

Another issue for the setting of labels concerns the ambition of the thresholds. There has been much discussion in the context of the ED evaluation regarding the setting of thresholds based on the LLCC methodology. The methodology used to do this currently does not take account of learning curves in energy efficiency and the cost of production and is invariably based on old information despite the fact that regulations usually take many years after the preparatory study phase before adoption and the coming into effect of requirements (staged or otherwise). In principle the EEI thresholds could be pegged to some aspect of this analysis e.g. with the threshold between the green and yellow classes being set at the projected EEI corresponding to the least life cycle cost efficiency level as would be expected in say 10 years from the time of the preparatory study were current learning rates to continue.

4.3.2.4 Should the scale distinguish between products according to the energy carriers and technologies used - dual energy performance scales

The response of stakeholders to this topic varies and is not constant among common stakeholder types. For example, depending on the type of product manufactured, some industry stakeholders consider that labels should apply to all products providing the same service, and others consider that there should be separate labels for different technologies.

Among other stakeholders there are diverging views on the need to have separate labels for different energy carriers and technologies because on the one hand this would allow scales to not become too long and to enable differentiation of products within carrier/technology types whereas or on the other hand having a uniform labelling format that encompass all product groups providing the same service allows informed choices across technology and energy carrier types.

As mentioned in section 4.2.5. both the need to compare energy performance across product type and energy carrier but also to compare against products of the same technology type and energy carrier are important and thus ideally two scales would be countenanced in this case, with the primacy being given to the comparison across product and carrier types. However, the viability of such a dual scale design should be verified through consumer testing prior to adoption.

4.3.2.5 Icons (pictograms)

Concerning **icons and units**, a review of existing labels could be undertaken with each icon tested and re-assessed (or assessed for the first time for the newer labels), in terms of the usefulness of the information and comprehension of the pictogram (in isolation and in context).

Comprehension of the other label elements. The majority of icons (pictograms) and language-neutral imagery that have been tested have generally been well understood, but several have been found to be problematic or not understood at all. The most problematic icons and units (among those used in the TV, refrigerator, washing machine and dishwasher labels – i.e. additional problematic ones may be found on more complex labels quoted above) appear to be:

- The dish-drying performance icon
- The on/off icon on the television label
- The television on-mode power demand icon
- Power expressed in Watts (W) and consumption expressed in kilowatt-hours (kWh) which are often mixed-up and hence are not clearly understood
- The word “annum” in the formulation "kWh/annum" is often not understood as "year”.

4.3.2.6 Language neutrality

Language neutrality was adopted amongst other reasons to solve an important implementation difficulty that occurred with the original label that came in two parts (one part as a language neutral slip with the model name, brand and figures relating to the specific labelled product and the other part being the generic label background for all products of the same type but with information in the local national language to explain each of the elements conveyed). The problem was that retailers would not always correctly assemble the two parts of the label and that they sometimes did not receive both parts in time to label the product correctly.
The move towards a single common language neutral label design that would be the same across all Europe was taken at the time of the 2010 recast of the ELD and was intended to address these problems and to reduce administrative costs; however, the viability of the solution adopted was not tested with consumers beforehand and appears to have certain negative consequences in terms of the degree to which information presented on the label is comprehensible and salient without then use of national languages.

This issue was not explicitly considered in the stakeholder survey, and very few stakeholders spontaneously commented on it. Of those that did some underlined its positive aspects, some were in favour of continuity with the present label, including its language neutrality, while others suggested that national language be re-introduced since research on consumer understanding has highlighted difficulties.

In principle were national languages explanations/translations to be re-introduced on the label – *provided a suitable practical solution on how to do this could be found* – it would be possible to add language that would explain the meaning of units, icons, climatic zones and energy performance measures and would therefore raise the comprehension and salience of the labels.

In the case of the product fiche, market surveillance authorities have also underlined lack of language as presenting a challenge for practical cooperation and have proposed that some documents should be provided in English (surveillance plans, document control reports) as a practical means of overcoming this limitation.

4.3.2.7 Consequences of changes in label characteristics on its implementation

The future label will necessarily be somewhat different from the one in use today. The differences in the design may impact implementation, at least during any transition period.

In the survey and position papers, stakeholders expressed agreement on the general idea that were a choice to be made to go back to an A to G scale, they would prefer not to use a numbered scale (1 to 7) during a transition period.
For products that are already available for sale on the market with a label, some manufacturers proposed that they should remain as such and should not be "relabelled".
Retailer respondents have been less vocal on this issue, despite the fact that they are responsible for the implementation of the label in their shops and also provide explanations and advice for consumers, whether in shops, catalogues or on-line, for most of the products labelled today. With the exception of the association of independent retailers, who may not have considered the findings of market barriers analysis, the fact that the label is placed directly on appliances retailed in shops in order to mitigate one of the most important market barriers concerning information provision, is widely accepted.
In the survey, retailers do not mention problems with an overlap between old and new labels but warn against reLabelling in shops that would be time consuming and potentially lead to errors.

Most stakeholders representing broader society seem to agree on the fact that consumer understanding should be tested to support the introduction of new and/or revised existing labels. Some underline that the process should include a feasible but predictable rescaling process. Others propose concrete actions, such as tightening energy label class threshold values at least every 3 years, or obliging older products to be "relabelled" for a transitional period of six months after tightening threshold values and have suggested that manufacturers and importers could, for example, provide valid labels to retailers at least via an internet download mechanism. In principle, such labels could be available for download on manufacturer websites in all EU languages.

Regarding the transition process itself it should be remembered that:

- Other countries have successfully redesigned and rescaled categorical information energy labels and have not reported major problems occurring during the transition period not afterwards
- There should be little difficulty in manufacturers printing and/or circulating a new label design for products that were previously labelled under the older design from a given cut-off date and that exceptions could be made for a limited amount of product that is already packaged on the site of production but not yet shipped
- Retailers are unlikely to present more than one model of the same type on the shop floor at any one time thus the same product will not be shown with two different label types simultaneously in the same retail outlet
- Wholesalers and retailers will only keep old stock for a limited period of time thus the length of the transitional phase when some products are labelled with the new label and some with the old are likely to be short
- We could go further and, in relation with the possible re-introduction of national languages test printing the label (in one part) in all languages and retailers chose the good language, or test labels available on-line (from producers / and or importers) and retailer download them (or order them because the graphic charter is difficult to respect if each independent retailer starts prints from his office…)

Beyond the question of the transition period, industry representatives also expressed some other preferences regarding aspects of implementation as follows:

- Manufacturers defending innovation would like to see a dynamic label revision system with sufficient flexibility to always differentiate best performers
- When a new or revised label is created and published in the EU OJ, one manufacturer association acknowledged that some of its members are likely to be ready to issue the new label before the specified deadline and would like to have the option to use these new labels prior to the application date

Recommendations for 4.3.2

While it is appropriate that many issues would be dealt with on a product by product basis, there would still be value were the European Commission to elaborate guidelines on how to approach these issues in principle in each of the delegated regulations for the labelling directive and implementing measures for the Ecodesign directive.

In generic terms it is recommended that:

- Label scales should cover the range of energy performance of appliances that are active on the market or that could reasonably be expected to be put on the market (i.e. cover the actual and potential spread in energy performance)
- Labels should not show empty or ineligible classes at the lower end of the scale without in some way indicating that they are no longer active
- The upper labels classes should be set at a level that encourages the development of more efficient products than are currently on the market unless it is unambiguously demonstrated that this is not technically feasible
- Ideally labels should have seven active classes, but a reduced number should be permissible when it is clearly shown that there is an insufficient spread in energy performance to permit seven full classes

- Label scales should be set with particular attention to the boundaries set between the green and the yellow classes (which are key in motivating consumers to purchase more energy efficient products)
- Labels should ensure larger capacity higher energy using appliances are not unfairly favoured in the energy performance classifications and perhaps should err towards scales that favour lower energy solutions
- Products that clearly promote and inform low energy consuming user behaviour should be eligible for ranking bonuses on the energy label scale
- It would be desirable to adopt a consistent approach across products on how environmental performance factors are treated within energy labelling and specifically the ranking scale
- Labels should ensure that promotion of low absolute energy consumption remains a guiding principle, even when renewable energy supply is considered, for the sake of consistency across labels and products. Not least because the generation of electricity and energy always entails competition with other issues (e.g. CO_2 emissions in the case of fossil fuels, land use issues and other factors in the case of solar energy or bio fuel production)
- The development of labels using dual energy performance scales should be considered and evaluated for products that provide a common service but have distinct technological and/or energy carrier characteristics

4.3.3 The choice of information to be conveyed

4.3.3.1 Hierarchy of presentation: level of detail and number of parameters shown on the label

A hierarchy is implicitly established between the various pieces of information to be conveyed on the label. This hierarchy shows through the label's design which promotes those elements most strongly meant to capture the public's attention. In general this hierarchy should be clear as it helps guide choices between the information to be conveyed and not all information can be conveyed equally. In case when information is aggregated too much or when too much information is presented in an equal manner, this hierarchy can be lost and with it the appeal of label.

Even when using mnemonics to convey complex information in a simple way, there is a limit to how much information of a given complexity can be effectively presented on a single label. Too much information kills the information. The findings from the literature[32] review and stakeholder consultation agree on the need to keep the label simple for elaboration, design, implementation, consumer comprehension and compliance control purposes.

There is also general agreement in the research literature and among stakeholders on the need to display a reasonable amount of information, clearly focusing on energy performance. If other information is added, it should not dilute the energy performance information and should be beneficial to consumers, while at the same time avoiding an overload of information. This is necessary for two main reasons: it might make it harder for consumers to understand the labels and it might slow down the regulatory process. Lastly, there is also broad agreement on the need for more consumer research in order to properly assess the effectiveness of the presentation of information and determine and optimise trade-offs. A majority of manufacturer stakeholders

[32] See the literature review report, in particular Chapter 5.4, 5.5 and 5.6

consulted agree on the need to limit *a priori* the total number of parameters present on the label, in order to avoid overloading consumers with information and confusing them. Most stakeholders consulted from broader society expressed a preference for there to be no explicit cap on the number of parameters to be presented on the label and would prefer to adopt a case by case approach to decision making on this issue.

Provided at a minimum the label conveys clear, energy performance focused information, this latter approach embracing flexibility seems to be best adapted to encompass future developments: products and markets may evolve quickly, the products covered by the label are likely to become more varied, consumers interest in and awareness of certain environmental issues may change, etc. Therefore it is appropriate that the labelling system should be able to adapt to evolving needs.

4.3.3.2 General agreement on the presentation of energy, water and noise and product performance parameters

Three types of information are already conveyed on the existing energy labels: energy performance (energy efficiency and energy consumption), environmental parameters related to the service provided during the use phase and product performance parameters. While there is discussion about how best these parameters can be displayed through scales and pictograms and according to which use pattern and testing methodologies, etc., there is no questioning either in the research literature or the stakeholder consultation process of the need to convey these product characteristics to consumers.

4.3.3.2.1 Energy performance

The original rationale behind the energy label was to be a vehicle to provide information on product energy performance to consumers. This remains the central goal and is therefore, the primary form of information that the label design should convey, via robust mnemonics to convey ranking in energy performance and absolute energy consumption values as at present. There is little discussion in the literature on how energy information should best be conveyed, but that which there is endorses the present approach of offering an absolute energy consumption value and a relative contextualised energy performance ranking. The absolute value informs consumers on the quantified impact of a specific product and the relative value enables consumers to compare this to alternative products providing a similar service. It can be concluded that both aspects should continue to be conveyed, focusing more on the absolute or the relative value depending on the product.

A number of stakeholders consulted from government and consumer and environmental interest groups propose that absolute energy consumption should be included more prominently within the energy efficiency index calculation and also represented more strongly in the label layout. It has also been suggested that the revised Directive offer the opportunity to base the energy label classifications on absolute energy consumption (leaving it up to the individual regulations to use this possibility) notably due to a concern that consumers are driven towards bigger, higher consumption equipment because of the current focus of the label classification ranking solely on efficiency. It is argued that this results in increasing energy consumption (or a less pronounced energy saving) whereas it is unclear whether the choice of larger capacity products is always necessary in practice. Similar approaches are starting to be implemented in other countries (e.g. in

the USA for TVs) to ensure that, the bigger the product, the more efficient it needs to be before it attains a high efficiency endorsement or passes a given MEPS level. Not all consulted stakeholders agree with this view, however, and it is possible that an energy label classification that completely decouples the ranking from the efficiency in favour of a pure energy consumption ranking would lose salience for consumers and may inadvertently reduce the label's energy saving impact.

Therefore it seems appropriate to adapt label rankings so that they give stronger weighting to absolute energy consumption, or at a minimum to avoid any risk of efficiency formulae that may be overly generous to large capacity products or products with increased consumption due to the presence of a feature that is of peripheral value compared to the primary service.

4.3.3.2.2 Environmental factors directly related to the service provided during the use phase

Other environmental factors and information are sometimes included on the label, mostly when they are readily evident and measurable, either as direct information (e.g. water consumption, or noise emissions) or incorporated in the Ecodesign regulation (e.g. refrigerant global warming potential for air conditioners or renewable energy for space heaters)

No positions were found in the literature or in the stakeholders' positions in favour of reconsidering this type of information to be displayed on the label when shown independently from the energy indicator. Their inclusion within the energy indicator is covered in the section below on enlarging the scope of information on the label to new environmental content.

4.3.3.2.3 Product service and performance factors

Energy performance relates to a specific service that needs to be characterised in order to make sense for consumers. Sometimes the service is rather inherent to the product, e.g. the energy performance of a refrigerator is a measure of the amount of energy needed to maintain a given volume of foodstuffs at a specified internal temperature. But for some products, the service level varies for a given capacity and hence may need to be characterised and displayed on the label. For example:

- lower energy consumption may be attained at the cost of lowering the quality of the service provided, e.g. a washing machine can use little energy but at the expense of a poor washing performance, hence there is a need to either inform consumers about the washing performance or regulate a minimum acceptable level of performance.
- a product may be able to deliver different services with different levels of energy consumption, e.g. most air conditioners can both heat and cool in accordance to the need, but have a different energy consumption and efficiency for each mode, hence there is a need to show this information on the label
- some services do not directly relate to energy consumption or are not taken into account in the figures or indicators conveying energy information, but are still very important product performance factors for consumers, e.g. the colour temperature and colour rendering performance of light sources.

Neither the literature nor any of the consulted stakeholders' positions were in favour of reconsidering whether or not this type of information should be displayed on the label (though how they should be expressed and presented is discussed).

4.3.3.3 Additional information that could be presented on the label

This section, considers the pros and cons of potential extension in the scope of the information to be presented to include[33]:

- Additional environmental information
- Monetised energy savings
- Whole life cycle impacts

In the first (2008) impact assessment for the 2010 recast of the Energy Labelling Directive, stakeholders concluded that the energy label should not be mixed with other environmental parameters occurring during the life-cycle of a product, yet kept the possibility to include also additional information relevant to consumers on the products' performance.
At a very general level, all the stakeholders consulted in the current evaluation seem to agree on the notion that any additional informational parameters to be included in the label should be relevant (both in terms of their environmental and consumer benefit), measurable, enforceable, supported by standards, and bring significant environment benefit without hampering industrial competitiveness; however, some are more open than others to working to fulfil these conditions if the additional parameter is evaluated as being important to cover.

4.3.3.3.1 Additional environmental information

The Ecodesign Directive explicitly covers environmental impacts, and so the question arises as to whether some environmental content should also be shown on the label beyond water and noise that are already included. Findings reported in the literature[34] indicate that environmental performance is an important decision factor for a substantial minority of consumers and that a label incorporating other environmental performance information could have a positive impact on consumer purchasing behaviour, although the rank of this factor among others (such as price, design, performance) is generally not prominent and also depends on the type of product. Of a range of potential environmental indicators the carbon footprint indicator is reported being the most mature. However, the literature also lists a number of prerequisites that would need to be met before these indicators could be considered to be viable for inclusion within an information label.

First it is necessary to be able to define these environmental parameters, to establish how to evaluate and quantify and calculate them, for example the need of a harmonised methodological framework and technical background information, adapted to SMEs' needs, harmonised specifications, complete and updated databases, automated impact calculation tools to avoid start-up costs for enterprises, verification procedures to build trust in the system and insure quality

[33] Potential addition of information on how to use the product in a correct/green/economical way is addressed in sections 4.3.2.3, 4.3.5 and 4.3.6
[34] See the literature review report, in particular Chapter 5.12.1

information to consumers (while the cost of these procedures should not constitute an economic obstacle to companies), a reasonable implementation timeframe, including the need of preparation and adaptation time, accompanying measures from public authorities such as information and communication campaigns, etc.

Then, based on studies and experiments conducted at the national level in France on environmental labelling, several issues have been highlighted concerning the communication of these parameters to consumers, including: the concept of multi-criteria environmental impacts across product life cycle is unfamiliar; too many environmental indicators confuse consumers and the level of aggregation is a key consideration, hence a recommendation to use an aggregated indicator, combined with up to three individual indicators; the quality and clarity of information is more important than the quantity of information as too much information inhibits decision-making; general terms for the indicators and simple units of measurement using an easy to understand rating system are preferred over technical descriptions (e.g. "climate change" is preferred over "CO_2- equivalent"); absolute values by themselves are not sufficient to communicate multi-criteria environmental information to consumers and a contextualised scale should be used.

However, a consumer study undertaken for specific industries in the field of food, hygiene and cosmetic products (Ministère de l'écologie, 2013)[35] shows that a very large majority of consumers signalled their interest in being given environmental information and indicated that, after receiving more information, they have learned a lot about the environmental impacts of products. Some declared that this new knowledge will influence their behaviour, especially if the information conveyed is linked to advice on simple actions to implement.

The stakeholders we consulted expressed a wide range of views on this issue. Environmental interest groups broadly favour including additional environmental information; manufacturers, retailers, and consumer interest groups mostly reject the idea of adding environmental content on the label, and public sector representatives are generally in favour of leaving the door open to the inclusion of such information provided it is justified, has a significant impact and is thought to be important and cost effective for end-users.

Given the relatively recent recast of the Labelling Directive, continuing uncertainties regarding the viability of available methodologies, the risk that requiring such information could dilute the impact of the energy performance information (especially for products for which the use phase is the highest impact phase in terms of energy consumption), and most importantly given the current experiment led by DG Environment on conveying environmental performance information through different communication vehicles as a part of its wider Environmental Footprint pilot phase, it seems too early to take a firm decision in favour of including additional environmental information on the energy label. If such information would still be included, the following preconditions need to be fulfilled:

- Maintenance of a limited number of items on the label and a clear hierarchy in order to avoid a reduction of the salience of the energy efficiency scale. Consumer testing is essential for this;
- Consumer understanding of icons, text, abbreviations etc., and the most effective form of presentation, including a format that is as homogeneous as possible. This is another issue for proper consumer testing;

[35] Etude BVA for ILEC, AFISE, ANIA, FEBEA presented in Appendix 26.

- Ranking scales are more helpful than absolute values alone, because consumers need a reference point;
- Trustworthiness of the label, which is dependent on its author, and also the credibility of the information in the light of the consumer's own experience, and on verification;
- Sound methodologies, including harmonized measurement standards, and complete and up-to-date databases.

Furthermore, on a case-by-case analysis it may be appropriate to continue to include bonuses to cover environmental parameters within the energy efficiency index[36], although it would be better were such factors to be derived in accordance with generic guidelines that could be developed by the Commission to support consistency in the approach taken across product groups.

4.3.3.3.2 Monetised energy savings

Information energy labels used in the USA provide monetised operating cost information, showing the operating cost for the product to provide a standardised service integrated over a year (note this could also be presented in principle over a cycle or the product lifespan). The intention is that this information will be evaluated with product price to make a better-informed purchasing decision.

While many consumers express an interest in monetised operating cost or savings information many have also said they would prefer not to have this information[37] and so consumer research in Europe presents mixed findings on the desirability of conveying this information.
The literature[38] also highlights several counter arguments to the display of monetary costs and/or savings on the energy label.

- There is a risk that the information be misunderstood: research in the USA showed that 30% of consumers misinterpreted the operating cost information presented on the energy label to be the annual cost savings from that product compared to the average i.e. leading to exactly the opposite of the intended effect from providing this information.
- Consumers sometimes imagine larger cost savings than there really are and hence presenting the information may demotivate them, unless, perhaps, the operating costs over the product's lifetime are presented.
- The correlation between price and efficiency is logical and acceptable as long as energy efficient features are included across product ranges and are not exclusively used, for marketing reasons, at the high-end of the range where the other attributes of high-end products may give a misleading impression of the incremental purchase price due to higher energy efficiency. If monetised savings are made explicit without addressing this issue, consumers may draw the false impression that the additional cost of the energy efficient features is the principal reason for the incremental price difference and further conclude that investing in higher energy efficiency is not cost effective.
- There is a risk of frustrating consumers because cost information will be based on standardised use measurements whereas consumers will expect to be informed on the exact savings on their bill.

[36] For example as the type of refrigerants is accounted for in the Ecodesign regulation for air conditioners
[37] In general, consumers that do not want this information consider the label to be complete i.e. that the information it presents is sufficient and that presenting additional information on running costs would be a distraction that would make them less likely to use the label
[38] See the literature review report, in particular Chapter 5.12.2

- There are practical problems concerning the feasibility of displaying energy operating costs across 28 different countries and many more different energy utilities offering different energy prices. While, in principle, ICT could help address this issue it has not been tested yet.

The stakeholders in the current consultation express different views on this issue from rejecting the idea (mostly manufacturers, who sometimes indicated there already tools available to calculate different costs or savings, for example for tyres) to being more receptive to the addition of monetised operating cost information as complementary information to the label classification scale (mostly consumer and environmental interest groups). However, even among favourable stakeholders, a distinction is made between the theory – i.e. that it would be good in principle to convey this information – and the practice – that it needs to be feasible to implement, properly understood and meaningful to consumers.

It is therefore recommended that no decision be made to include operating cost information unless its feasibility has been established and that research has demonstrated that it would be welcomed and motivating to consumers and that is also correctly interpreted by the broad majority. Lastly it is also important it does not dilute the impact of the energy performance message. Beyond considering whether this information should be put on the label itself, research could also look at the options to display this information on price tags, whether on printed onto paper or via ICT techniques[39] - an example is shown in the figure below. The potential for implementation at the point of sale and hence at the national level could potentially eliminate some of the difficulties cited above.

Figure 5 Example of how cost information could be displayed on a price tag

4.3.3.3.3 Whole life cycle impacts

The energy label displays information concerning the energy consumption and other environmental resources during the use phase only, disregarding other phases of the product life cycle, and their embodied energy and environmental impact.

[39] Regarding price tags and running costs information provided at the time of purchase, the YEACI project (Yearly Appliance Energy Costs Indication) will soon provide field data and an evaluation on its implementation in several countries (www.energy-indicator.eu)

The consulted stakeholder positions generally agree with findings from the literature[40] on the fact that the focus of the label should remain on the consumption of resources in use – at least for the coming years. Consumer research also points out that while a sizeable minority of consumers are motivated by environmental impacts, a larger proportion are mostly or exclusively motivated by their energy bills – which suggests that a switch to basing the principal energy performance classification on embodied energy information could dilute the label's appeal.
However, some environmental interest groups expressed a view that some information on the whole life cycle impacts could be presented as "a piece of information additional to the label class scale". A non-negligible part of those stakeholders who expressed opposition to having this type of information on the label, indicated a view that this information could be made available on product fiches, via QR codes or via other mechanisms than the printed label itself.

It is therefore recommended that whole life cycle impact information is not generally presented on the energy label. However, on a case-by-case basis, for those products for which the use phase has less impact than other lifecycle phases and depending on the conclusions of the Ecodesign preparatory studies, the possibility to include this information in the label, as part of the overall energy indicator should be left open.

4.3.3.4 How should additional information be conveyed?

The discussion in the sections above tends to show that extending the scope of the information displayed on the label is not supported in general though some stakeholders would like to keep the possibility to add new content in certain cases, should it be assessed as being justified.

In the event that additional content was to be displayed on the label, a majority of consulted stakeholders would prefer it to be provided on a mandatory basis. None of the stakeholder favoured the solution of having two separate labels to present different content mostly because this would dilute the information presented in the primary energy label. More stakeholders were willing to consider including an environmental mark, such as a footprint, within the energy label. Based on the results of the communication stage in the Environmental Footprint pilots, options could be considered for providing this further environmental information based on PEF. Some stakeholders suggest, as a compromise, that this new complex content could be conveyed to consumers via other means than the energy label, i.e. in the product technical documentation and product fiche, or accessible via QR codes on the label leading to a dedicated internet page presenting more information in the national language. No specific position was articulated on whether this environmental information should be conveyed in absolute or relative terms although previous research has found that relative information i.e. contextualised by comparison with peer products, is much more salient for consumers.

4.3.4 Information conveyed in distance selling

One of the fundamental aspects of a mandatory informative labelling scheme is that each product should have a label, which is systematically shown to consumers at the time of purchase to inform their purchase decision. However, the visual aspects of the label, the mnemonics of the colours and letters, have not generally been used in distance selling, which is the fastest growing proportion of

[40] See the literature review report, in particular chapter 5.12.3

the market. It is also the segment where the greatest level of non-compliance with the existing labelling requirements has occurred.

This source of information failure has been identified in the literature[41], and in order to address it, a proposal has been discussed in the EU labelling expert group and notified to the WTO[42] in June 2013 (but has not yet been adopted by the Commission) on a possible Delegated Regulation amending all relevant regulations so that the label, or at least a colour arrow with the energy class, should be mandatorily displayed on internet sales material and in cases when end-users cannot see the product (as opposed to the current situation in which the label information should be displayed in a specific order but not necessarily the whole coloured scale). Under this proposal the product fiche would also have to be displayed by distant selling supply chains in the future.

Among consulted stakeholders, one position paper from two press associations is opposed to having any mandatory information in advertisements because it is argued it would harm the advertising business, and therefore also the free press, and finally climate and environmental policy as a whole.

It is possible these stakeholders are unaware that the label was created to mitigate an important information failure in the market related to the access of all consumers to objective information on product energy performance. If the proposed Delegated Regulation is approved, consumers shopping through distance selling supply chains will benefit from the same mnemonics elements as consumers buying in physical shops. Some stakeholders would even go further and propose that the label scale and the product letter be mandatorily shown on all advertisements in a readable size.

4.3.5 Product fiches

Directive 2010/30/EU includes the provision by suppliers of a product fiche ("a standard table of information") with each appliance put on the market for sale, hire, hire-purchase or display to end-users. This fiche is product specific and must include detailed information in a specific order on the product energy related issues, depending on the delegated acts and products they cover.
The fiche should be included in product brochures or in other literature provided with the product. Suppliers are required to provide it, retailers are required to display them and insure they are in the products they sell and Member States are obligated to check compliance in terms of their content and display. The fiche supplies information, in national languages, that cannot be conveyed on the label.

In theory, the fiches are useful to consumers at the time of purchase and to regulators and market surveillance authorities that can find detailed information on the products that would otherwise not be declared and publically available. However, to our knowledge, no literature[43] is available that has evaluated whether fiches are indeed complete and correctly supplied/displayed, and how they are used by or understood by consumers.

[41] See the literature review report, in particular Chapter 5.11
[42] http://ec.europa.eu/enterprise/tbt/tbt_repository/EU113_EN_1_1.pdf
[43] See the literature review report, in particular Chapter 5.9

Some manufacturers would like to dematerialise the content of the fiche and suggest it should be displayed on the internet only. They claim the current situation presents a significant administrative burden and has a questionable positive effect on consumers. They therefore propose to use or at least try using ICT to provide the information or part of the information currently provided on the product fiche for labelled products. This could take the form of an online version possibly supported by a QR code on the label leading to the on-line version. Some manufacturers propose that the fiche be completely removed, while others have proposed having a digital version in addition to the printed version.

Consumer interest groups, on the contrary, insist product fiches should be kept in shops (and if on-line, should only be as a complement to the paper versions) and shown in distance selling supply chains. This is argued since their purpose is to facilitate the buying decision and information is still needed at the time of purchase.

Other stakeholders have underlined the usefulness of fiches for control purposes and for journalists. However in practice the problem does not seem to be so much whether the fiche should be mandatory or not, but that the information should indeed be available and correctly displayed (this may not depend on the means of communication).

The evidence base seems to be too thin to comment on whether the product fiche is an overall benefit or on how it is implemented and used by different sales channels. Unpublished work from European projects implementing shops' visits[44] show that product fiches are not often presented in shops and are not really known by consumers. The value of and the need for product fiches should be clarified – e.g. through a field study. If they are assessed as valuable, the wording of the Directive could be reinforced so that the mandatory character of having product fiches in shops is understood and implemented, and so awareness activities contribute to securing positive response from consumers. If consumers' attention could be gained, the fiche could also contain information on how to use the product in a green/economical way.
In addition, the information required to be displayed on the product fiche could be unified in its content and format with the informational requirements specified under the framework of the Ecodesign directive. This would simplify the task for manufacturers and market surveillance authorities as all mandatory information would be supplied in the same document and format (whether printed on paper or supplied via the internet – see below).

4.3.6 Use of ICT to convey information: a possibly important potential to be tested

Labels have to remain simple and self-explanatory, but the use of ICT could be an opportunity to convey more energy information, information on environmental issues related to the products, on annual and life cycle costs, on cycle costs, calculators, etc., information on the use of the products, information in national languages such as explanations of the label elements, etc.

The literature[45] indicates that there are locally specific problems which ICT could help to address in principle, through the use of internet and associated smartphone tools, and included in a "media

[44] E.g. ComeOnLabels, http://www.come-on-labels.eu/about-the-project/welcome-eu
[45] See the literature review report, especially Chapter 5.10

mix" at the point of sale. The attractiveness of ICT based solutions is also growing because its use would not require additional funding since it is developing anyway, or additional expense by consumers. It could also help to lower labelling implementation costs.
However, the literature also notes that since the technology is developing, not all consumers have access to it or are in a position to use it, so it could be better to limit the use of ICT to the provision of complementary information. Another recommendation from the literature is that policymakers should use ICT to support consumers in conducting their own research, by supplying easy to understand and objective information through consumer guides displayed on the Internet.

The Eco-Design directive has started to request the use of websites to display detailed information, notably in the case of lighting, for which product packaging is small and thus limits the amount of information that is possible to put on the label. To our knowledge, no evaluation of this requirement's implementation is available. Furthermore, no actual results or evaluation of the large-scale use of ICT in the field of energy and/or environmental labelling is available in the literature.

Stakeholders consulted in the current evaluation exercise have also proposed ideas on the potential use of ICT, as follows:

- ICT in shops could lead consumers to consult additional information on the web (while being in the shop at the time of a purchase decision). It could also be present via a smartphone application or via other means. The type of information made available, could, for example, include details of the best and worst performers on the market or in a particular shop
- ICT in shops, or via the product manual could lead to on-line fiches (instead of or in addition to having them on paper). However, other stakeholders have argued that QR codes should not be necessary because the label should be self-explanatory
- ICT could be explored as complementary vehicle to supply additional information, which cannot usefully be included within the label
- In the future, it may be possible for appliances to give feedback on user behaviour (though it is probably premature to reflect these options within delegated acts currently)
- Electronic labels could be displayed in shops or retailers could be able to download the newest labels from the internet in all languages. It could allow for quickly updated labels, and display of information adjusted to national or regional conditions
- The internet could be used as a storage space for manufacturers to display information on the energy class or the energy consumption and efficiency of their products for a long period of time. Consumers would then be able to easily identify the performance of the products they already possess and hence be motivated to switch to more efficient products (while users are likely to have lost the original product documentation).

Also in the home, whether embedded in the appliance itself, or through smart meters, ICT could advise users on how best to operate the product or enable them to compare real consumption to the value indicated on the label. There seem to be on-going research on this issue, which is not strictly related to the scope of this labelling Directive evaluation study.

Continuing progress in ICT potentially allows information provision requirements to be specified in media formats other than just via a physical printed label and product fiche and these may or may not be linked to the physical label itself. For example, QR codes could be added to the label to enable smart phone users to access additional product information.

Alternatively, electronic price tags could also be used to convey lifetime operating costs and payback periods. It is appropriate to consider these options in conjunction with broader label design issues as the interactions between electronic and printed media could affect decisions regarding what type of information is conveyed through which media format. Although technology evolves rapidly and consumer take-up seems to follow pace, field trials are needed to understand in detail the type of information it would be effective to convey and what proportion of the public would actually be ready to use ICT tools.

4.4 Provisional recommendations regarding future design evolution

4.4.1 Continuity of label design

The EU energy label is very well known among European consumers and as such is like a high profile brand. This brand has been built up over many years and has considerable recognition value in its current form. It is important therefore that any design changes should be evolutional rather than a completely new concept. It is therefore recommended that completely new design concepts are excluded and that only evolutional design concepts be entertained. This is so the brand recognition is clearly maintained and so the existing consumer knowledge of the label is maintained and built upon.

4.4.2 Rebasing the efficiency scale

In order to respect the principles that:

- the top efficiency class should always be possible to attain
- the top efficiency class is always challenging to attain;

it is recommended to establish a set of guiding rules that would indicate when a rebasing of the efficiency scale is appropriate. It is proposed that the following set of rules be considered:

- recast the efficiency scale whenever the top efficiency class is populated by more than 25%[46] of the models on the market
- recast the efficiency scale whenever products are marketed that have an efficiency that is X% higher than the minimum level needed to attain the top efficiency class and where X is equal to the difference in efficiency between the top efficiency class and the penultimate efficiency class
- recast the efficiency scale whenever a techno-economic energy engineering analysis demonstrates that a viable technology exists that could achieve the same performance gain

If anyone of these conditions is met it is recommended that a process to rebase the label scale be initiated.

It is also important that the efficiency scale should indicate the spread in efficiency of products currently found on the market and/or that could readily be designed and put on the market. Satisfying this condition implies that a minimum number of active or potentially active label classes have to be indicated on the label.

[46] to implement this would require on-going market monitoring

To achieve this it is recommended that not less than 3 and ideally many more label classes should always be active (i.e. be eligible for sale on the market). Thus, if Ecodesign requirements prohibit the sale of classes such that only two active efficiency classes remain it is recommended that the label should be rebased. If Ecodesign requirements prohibit the sale of more than two efficiency classes it is suggested that rebasing of the label should be considered.

4.4.3 The treatment of ineligible efficiency classes

When Ecodesign requirements are set that prohibit the sale of products in some label efficiency classes it is recommended that the label design be altered to make it apparent to label users that these efficiency classes can no longer enter the market.

Options for doing this include:

- Greying-out label classes that are no longer permitted due to Ecodesign limits
- Striking through label classes that are no longer permitted due to Ecodesign limits
- Making label classes that are no longer permitted due to Ecodesign limits transparent with a soft boarder

The options should be tested with consumers to determine the least ambiguous means of communicating this information before a final decision is made.

4.4.4 Design options for a rebased efficiency scale

The principal challenge facing the review of the labelling Directive is how best to revise the energy labelling efficiency scale to maintain market relevance. As will be shown in the text which follows, stakeholders need to be aware that there are no viable design options to achieve this that do not imply some kind of rebasing of the current energy-efficiency scale. What this means concretely is that there are no viable options to amend the scale such that a product that is currently in a specific class (as designated by the colour, length or arrow or letter) will retain all of these class identification characteristics after the scale has been amended. At least one of the class's name, colour or arrow-length will need to change for all conceivable functional designs.

In order to examine options the Commission has hired a consultancy to conduct tests of certain potential rebased efficiency design options.

The options proposed to be considered for testing as specified in the tender document were largely based on a previous paper jointly prepared by industry (CECED) and NGOs (EEB) and included the following options:

- the effectiveness of letters versus numbers (see the example in Figure 3) for the main element of the label
- the effectiveness of classes versus continuous scale (see the example in Figure 4)
- the effectiveness of an open-ended versus a closed-ended scale (see the example in Figure 5)
- the effectiveness of including the indication of where - in the ranking (continuous or class) - the best available technology of a certain year is (see the example in Figure 6).

Figure 6 Illustration of a potential way to use numbers rather than letters

Figure 7 Illustration of a potential continuous scale

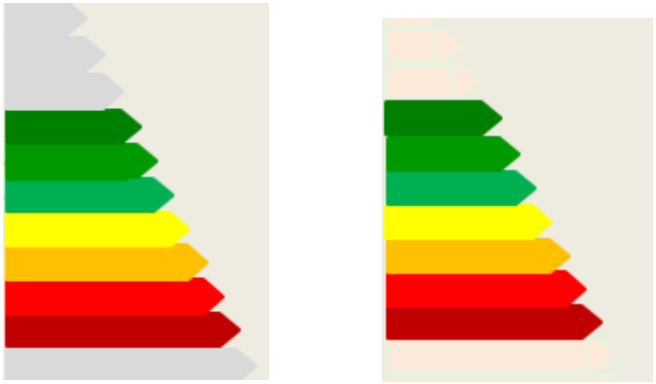


Figure 8 Illustration of an a) open-ended (left) versus a b) closed scale (right)

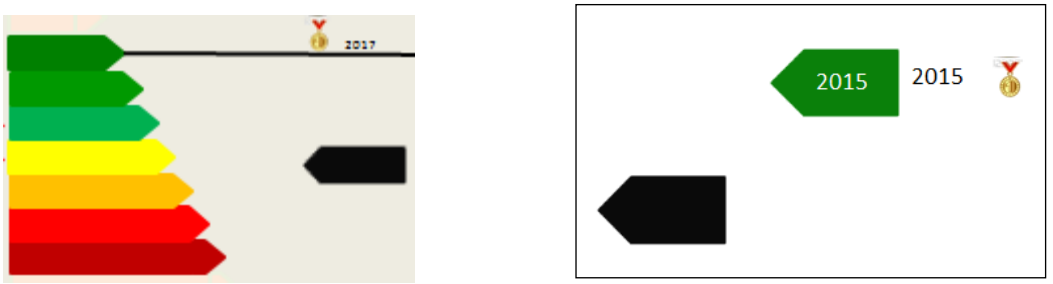


Figure 9 Illustrations of two ways of indicating where - in the ranking - the best available technology of a certain year is (line or green arrow plus symbol; the black arrow indicates the performance of the specific appliance as this is also indicated on the existing label)

Without wishing to prejudge the results of fresh consumer research our view of these label design options are as follows:

Label scales based on numbers rather than letters, as in Figure 6, have the advantage of allowing constant improvement but lose the principal benefit of a mnemonic which is to facilitate memory of ranking in order to aid selection. In our view, and we believe this is clearly supported by previous consumer research, a mnemonic approach (such as an A to G classification) is much more likely to be used and retained by consumers than a numerical measure of the efficiency. The design shown in the figure retains the colour classes but gives them no names so if they were being discussed one would have to describe the shade of green in question etc. The lack of name given to these classes is likely to weaken their impact, not just with consumers, but also with manufacturers, marketing departments and procurers and hence would be expected to dilute the overall market transformational impact of the label. Furthermore, such a design would still periodically require the colour classes to be upgraded or different colours to be used when the market evolves into the higher efficiency classes. Thus it does not avoid the need for periodic rebasing of the efficiency scale and thus a product which was once "green" would not always be classed in the same colour or that once was the second shortest arrow in the set would not be in the future.

Figure 7 shows a continuous efficiency scale. Such scales discard classes and mnemonics all together. We consider this to be the poorest of the four original design options as it will be extremely difficult for label users to remember where competing products reside on the efficiency scale. As a result it will be much less salient for label users and they will tend to ignore the information.

Figure 8a) shows an open-ended scale maintaining distinct colour classes. In the version shown in Figure 8a) there is no name given to the class but this is not inherent to an open-ended scale and class names could be allocated and retained in principle. By having grey arrows above and below the current scale it has the merit of reinforcing the message that the current active efficiency range are shown in colours but that in the future there could be higher efficiency products in the currently greyed out classes. In our view as the names of the efficiency classes are dropped this design suffers from the same weaknesses as label 1 – i.e. the value of a clearly defined mnemonic is lost and the label impact is therefore weakened. If this design were to use efficiency class names, as in the current label, it would be better than not using them for the same reasons as discussed previously. Would it, though, be any better than simply rebasing the classes used in the current label? In principle, class naming conventions for an open scale could be any of the following options:

1) Seven named classes as at present – with the names being moved up as the colour scale moves up after each label revision

2) A scale which works such that the top grey class is named at the top of the scale – say class A, and the others are named in order downwards, such that the currently active coloured classes would fall wherever they do on the alphabetical scale. This would imply that the active range might start at say G to M before eventually being rescaled upwards towards A to G

3) Something similar to option 2 but not using an alphabetical scale but another naming convention such as numbers (say from 1 to X)

Option 1) has the merit that class names are intuitive to the end user – e.g. so the top of the active scale is always an A for example. However, it is not obviously superior to simply periodically rebasing the current classes and is essentially the same solution.

Option 2) has the merit of allowing plenty of future improvement potential but it does not avoid the need to move the colour scale upwards (i.e. periodic rebasing of the colour scale), furthermore, it is to be questioned whether consumers would find the much lower letters used in and initial label scale as comprehensible or as motivating as an A to G scale.

Option 3) again has the benefit of allowing plenty of room for improvement but it is unclear whether the comprehension of the best and worst ends of the scale would be as well understood were the numbers to be used (is 1 the best or the worst?) in place of letters. It is also unclear whether consumers would find it as motivating, especially if it had to start at say 8 to 14 to allow sufficient future growth potential without rebasing the number scheme. Again, even if the number scheme would not need future rebasing the colour coding would i.e. a product classed green initially would not continue to be so in the future, thus once again it is not future proofed against rebasing.

Figure 9 shows a closed label scale with the current highest performer indicated on the scale (indicated by the line and gold medal with year of validity) as well as the level of the product in question (indicated by the counter-pointed black arrow). In the version shown the classes are not named and again we feel this weakens the mnemonic impact of the label – consumers/label users cannot easily remember the class of the product in question and hence will be liable to pay less attention to the information and make less use of it when shopping around for a product. Furthermore, while it could be desirable to show the highest efficiency product on the market in a given year on an open-ended scale – it is much less value on a closed scale. For a closed scale consumers will already tend to assume that products can be found at any one of the efficiency levels shown on the scale, so it only becomes useful to be able to indicate when there are products with an efficiency level that is off the scale (or at least beyond the colour coded parts). On the other hand there is scope for increased confusion though introducing an extra element. Some consumers may assume that the product in question has a gold medal and not appreciate that this simply refers to the best on the whole market. With its questionable added value and it's potential to dilute the label impact through confusion we doubt that this design option represents an improvement over the current design.

Table 4.1 shows a summary of these label design characteristics and compares them to the option of a simple rebasing of the historic A to G scale. Ideally a label design would:

- have an energy performance scale with a very strong mnemonic effect where the sense of direction of the scale and relative position of the product within it is evident at a glance
- never need to be rebased in the future
- have strong continuity with the current design
- have low design complexity
- successfully convey the spread (range) of efficiency of products currently on the market

The strong mnemonic effect is arguably the most important of these as it allows consumers to more easily compare and remember product efficiency.

A future-proof design with low rebasing needs that means that there is never a risk of having the same product type labelled one class will ever need to be labelled with a different class is desirable.

Continuity with the current design builds on the considerable strength of the existing label "brand" and the intellectual investment label users have made in understanding the scale and information conveyed.

A low design complexity is desirable as it facilitates consumer engagement with the label and aids comprehension of the information conveyed.

Successfully conveying the spread in efficiency of products on the market is also important as this helps consumers to understand the extent to which there are efficiency differences in products on the market and hence the overall value proposition of preferentially purchasing an efficient appliance.

When judged conceptually on these criteria none of the alternative label designs are superior overall to a rebased A to G scale. All of the alternative designs except label option 2 or 3 with an extended set of label classes (e.g. like Figure 5a) have exactly the same need to periodically rebase the label as does the rebased A to G option but they generally have a weaker mnemonic effect and/or weaker continuity and/or higher design complexity and thus perform less well overall. In the case of Figure 5a (or options 2 or 3) which would not necessarily need to be rebased once established they would either have a weaker colour class mnemonic effect (in the event the number of colours were to be extended to allow the additional classes to be included) or they would have no rebasing advantage because the whole colour scale would have to be rebased if only 7 classes were active at any one time. On top of this their design continuity is weaker than the A to G rebased option and their design complexity is higher (i.e. weaker).

Given these observations it is to be expected that a rebased A to G label would score more highly with consumers for the key factors of: comprehension, salience, appeal and recall.

The only area where a rebased A to G label is weaker than some of the alternative designs (i.e. Figure 5a or Option 2 or 3) is on the frequency of the need to be rebased. This is a concern as there is some potential for consumer confusion at the period when a rebasing of the label occurs due to the possibility of having old and new versions of the label displayed in a store simultaneously; however, we think the potential for confusion during this transition period:

a) should not be over exaggerated – especially given that other economies such as Australia, New Zealand, Korea and Thailand have all managed such a rebasing of their labels without excessive problems
b) will be time limited – it should be a matter of months before old stock has cleared
c) can be alleviated through the design of a rebased label that clearly indicates the date of its application or through some other differentiating factor that distinguishes it from the previous label design.

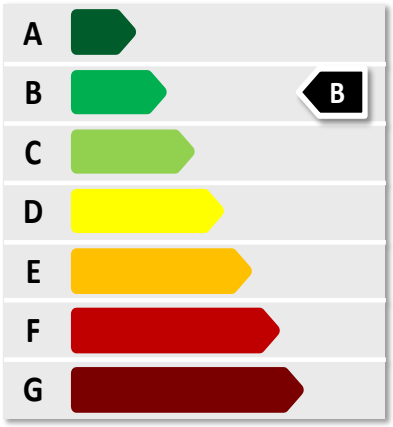
For these reasons it is recommend that any potential revised label designs be tested for comprehension, salience, appeal and recall and the designs with the highest scores adopted. It should be adopted regardless of its performance during the transition phase as the ability to correctly identify which is the most efficient appliance between a product labelled with the new label design and one labelled under the old label design when both are displayed side by side, is of a much lower importance, as this situation will only occur for a very limited period.

Table 5: Characteristics of potential label designs

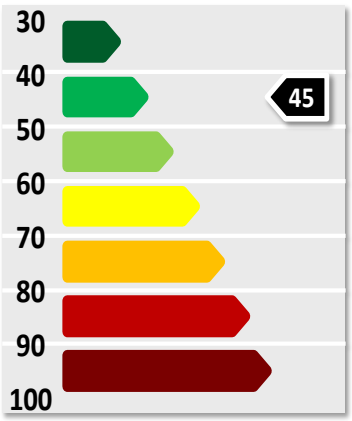
	Type		Strength of mnemonic effect		Need to rebase classes in the future	Design continuity	Design complexity
	Closed/Open	Categorical/continuous	Class name	Class colour			
Figure 3	Closed	Semi-categorical	Weak (none)	Strong	High	Medium	Medium/High
Figure 4	Closed (unless scale is stretched)	Continuous	Weak (none as indicated)	Weak (colour class not delineated)	High (unless scale is stretched)	Low	Medium
Figure 5	Open	Categorical	Weak (none as indicated)	Strong	Medium (colour class = high, name class = low (zero))	Medium	Low
a) option with named classes	"	"	Strong	"	High (colour class = high, name class = high)	High	Low
b) option with a large number of classes	"	"	Weak (none as indicated)	Medium (more than 7 classes would dilute the colour scale impact)	Low (or zero depending on number of extra classes added)	Low (extra classes and colours and no names)	Medium/High
c) option with a large number of named classes	"	"	Strong	"	Low (or zero depending on number of extra classes added)	Low/Medium (extra classes and colours and no names)	Medium/High
Figure 6	Closed	Categorical	Weak (none as indicated)	Strong	Medium (colour class = high, name class = zero)	Medium/High	Medium/High
Rebased A to G	Closed	Categorical	Strong	Strong	High	Very High	Low

4.5 Label design options tested in the first stage of the new consumer research study

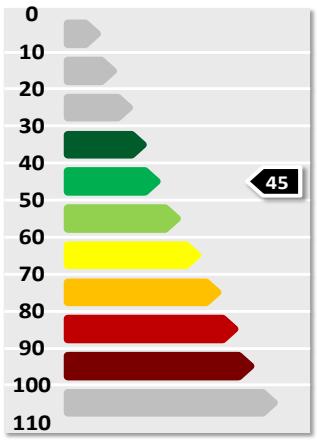
Following the issue of the tender discussed in section 4.4 IPSOS and London Economics were engaged by the Commission to do tests of candidate label designs with consumers. The results of initial tests were reported in January 2014. Four trial designs were selected for these tests as set out in Figure 7.



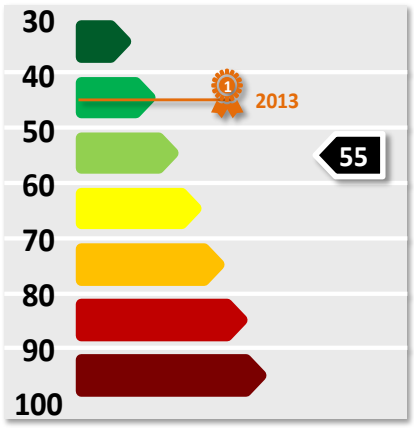
Closed alphabetic scale (Treatment 1/Baseline)



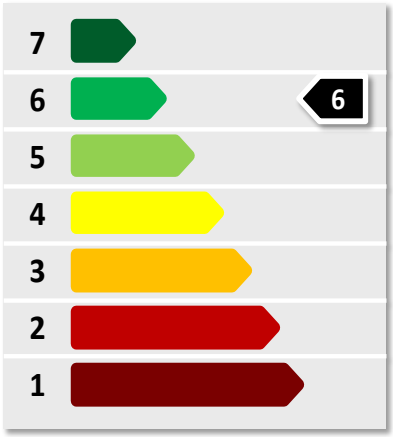
Closed numeric scale (Treatment 2)



Open numeric scale (Treatment 3)



Closed numeric scale with benchmark marker (Treatment 4)



Reverse numeric (Treatment 5)

Figure 7 Various energy label scale designs tested in the IPSOS/LE study (2014)

It was decided to dispense with the continuous energy labelling option (Figure 4) prior to testing these designs because such designs had been shown to be ineffective previously. Label efficacy tests were done with large numbers of consumers selected from across Europe. These tests examined comprehension (specifically, the ability to correctly rank the efficiency order of three label design executions using the same efficiency scale design concept) and the willingness to pay extra for each of the design options set out in treatment 1 to 5 (Figure 7). The full results are reported in the study but some summary findings are:

- The closed A to G test performed best both in terms of comprehension and in terms of consumer willingness to pay for higher efficiency

- Comprehension scores for all of the label treatments were high (around 90%) but this is most likely because the tests: a) considered the most straightforward comprehension test (the ability to rank the efficiency order of three products), b) they only showed the efficiency scale and not full label executions where the annual energy consumption and other numerical values are displayed. In more complex tests that are representative of real life shopping situations where: all this information is present, more than three products are shown at once and the rank order of energy consumption is not necessarily inverse to the rank order of efficiency (because of the effect of capacity and other features on the product efficiency class), it is likely the correct efficiency scale ranking scores will be lower (as low as 55% from previous research) and that the difference between different label designs will be accentuated.

- The willingness to pay extra for higher efficiency product scores showed that the closed A to G label performed better than all other designs no matter how big the difference in efficiency was between paired product choices or the product type considered (Figure 8). This confirms previous research findings that have found the same effect.

These provisional findings are fully consistent with the conceptual analysis set out in section 4.4 and show that label designs that maximise the mnemonic effect (the A to G has three powerful mnemonics), have an unambiguous efficiency class (the alphabetic scale is unambiguous and universally known in European culture) and draw most heavily on the traditional label design (maximise continuity and brand recognition) will perform better than those that do this less clearly.

Unfortunately, recall was not tested in this first study, but a priori it is our opinion that treatment 1 would perform best closely followed by treatment 5 because both have a limited number (seven) of class names (either A to G or 7 to 1). The alphabetic scale would probably do slightly better than the numeric on this test, not least because there is no potential to confuse the letter ranking with other letters on the label whereas this may not be the case for the numeric ranking with respect to other numbers presented on the label.

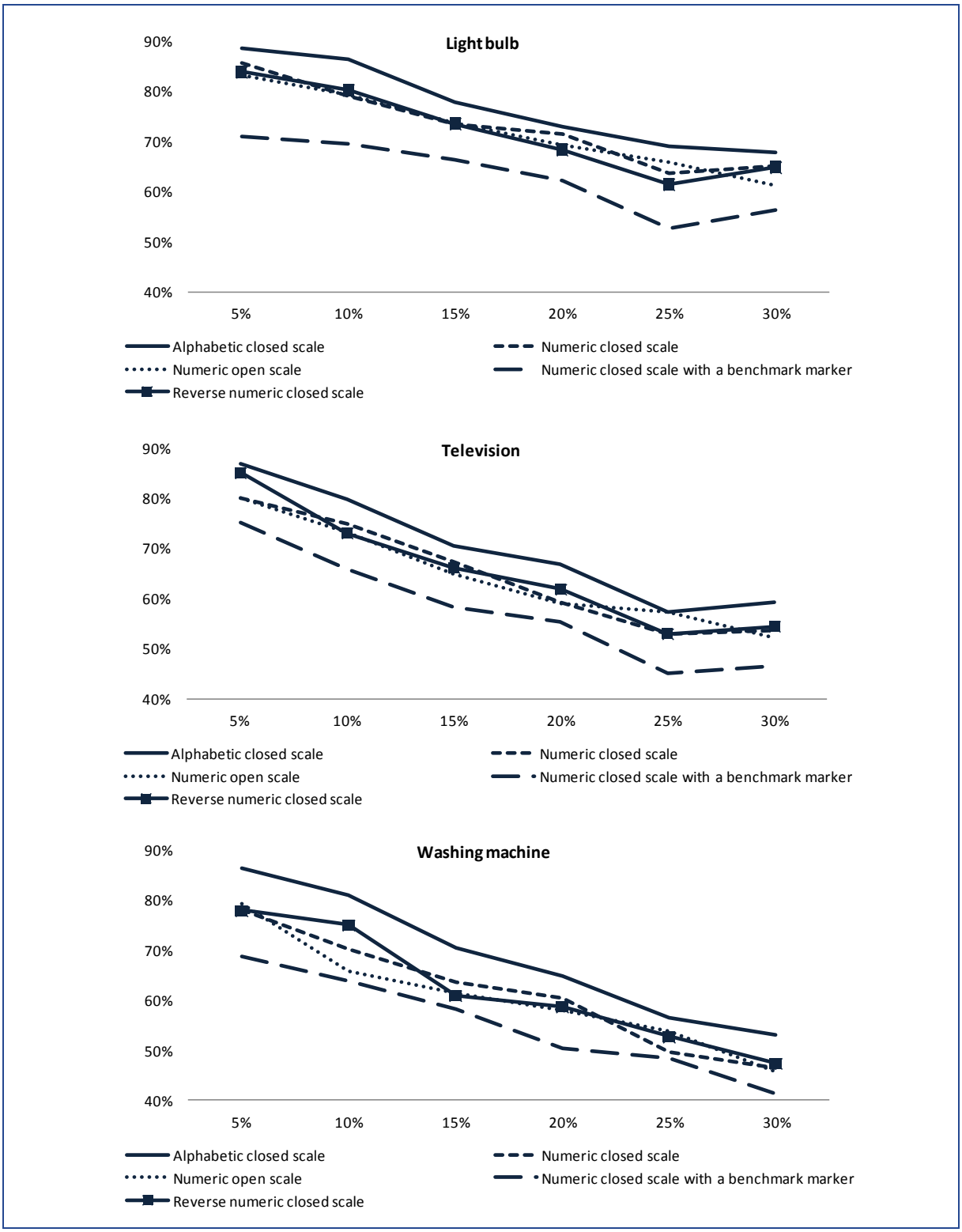
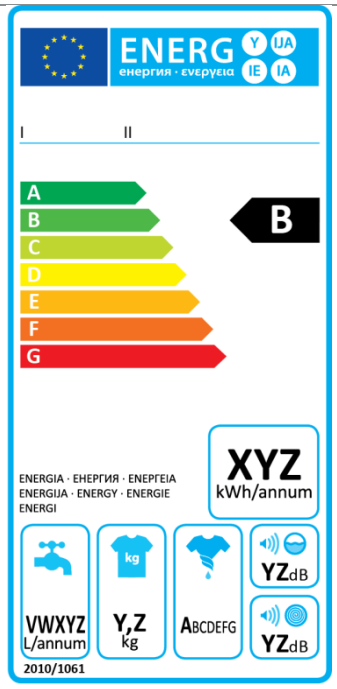


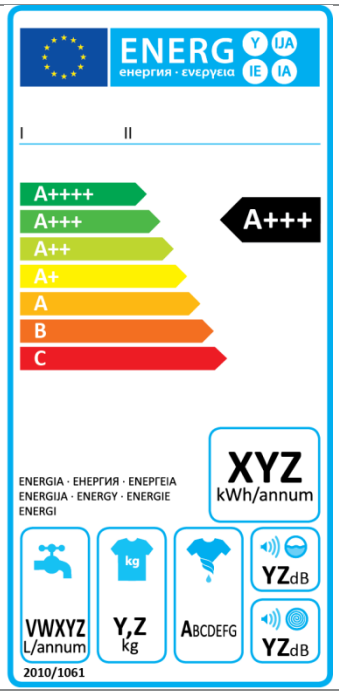
Figure 8 Share of participants willing to pay a higher price for more energy efficient products as the premium increased. Source: IPSOS/LE 2014.

4.6 Provisional proposals for trial designs and outline of next steps

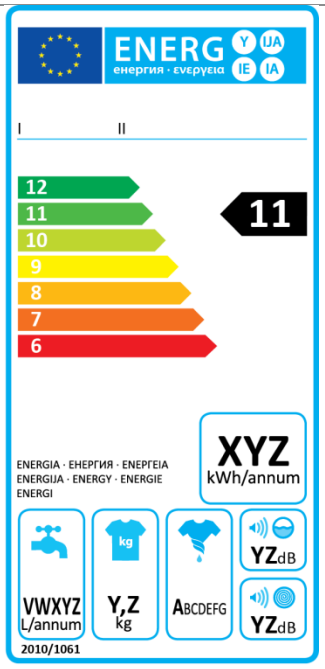
To support the Commission in evaluating the merits of different potential rebased label design options a graphic designer was engaged under the current project to develop a set of complete label designs to be considered for the next round of research to be conducted by IPSOS/LE. This research will take place in a shop setting, and for this exercise the Commission has proposed to test the label designs set out in Figure 9.



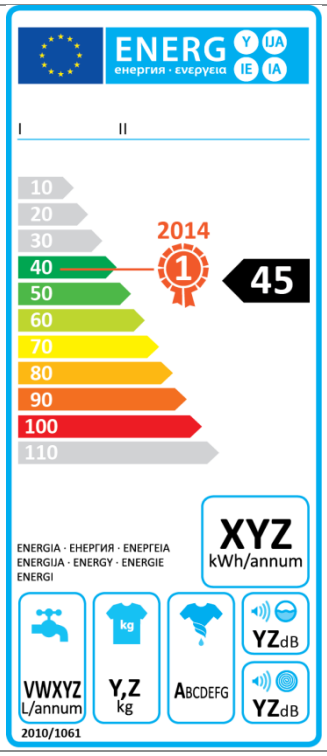
a) **Closed A to G label**



b) **Closed A++++ to C label**



c) **Closed reverse numeric label**

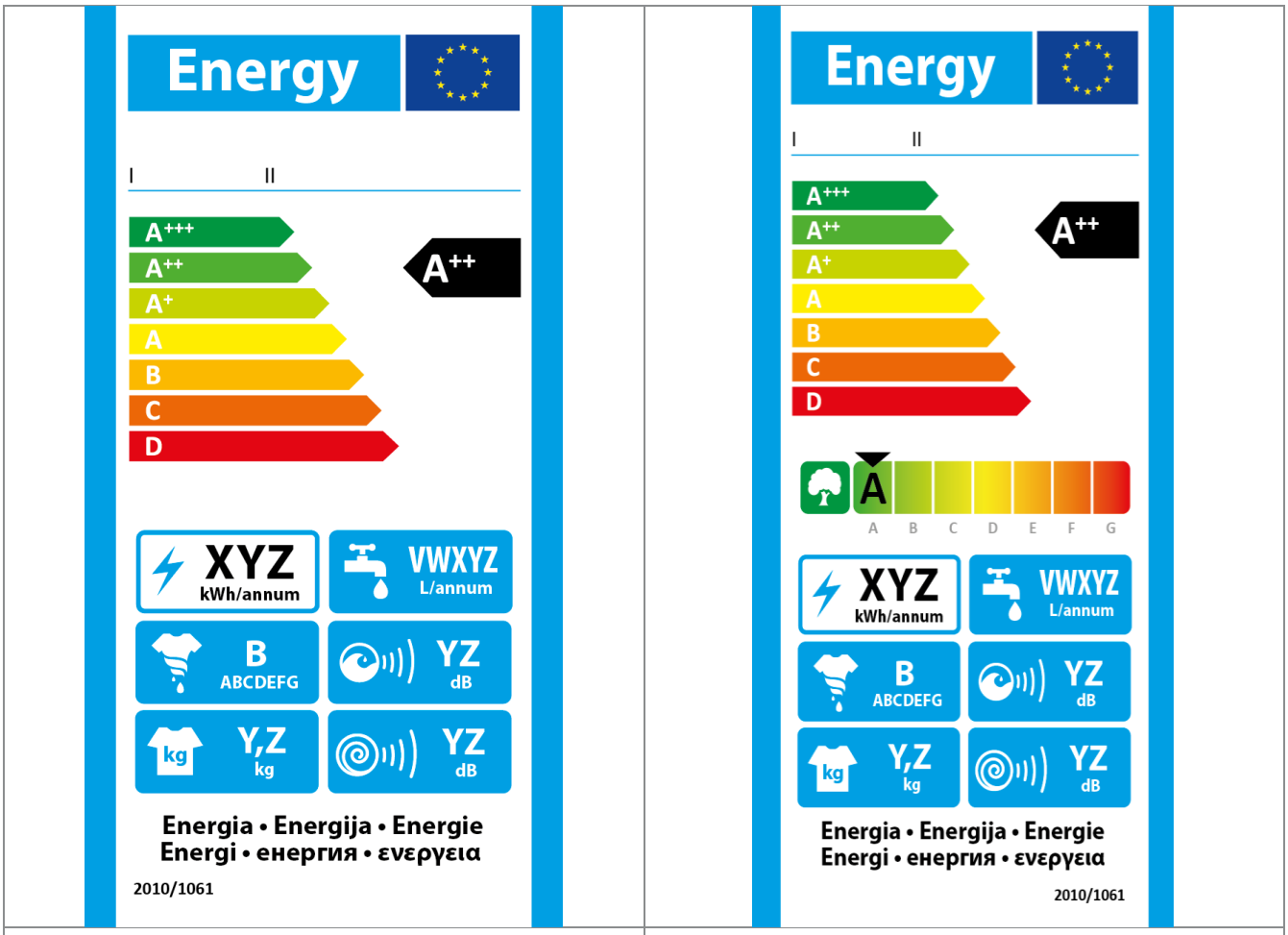


d) **Open numeric label with best on market benchmark**

Figure 9 Label design options to be tested in the next round of consumer research within the IPSOS/LE study.

These designs are identical to the current energy label except in how the efficiency scale is indicted and hence are solely intended to evaluate potential rescaling options.

In addition to these the present study team also considered other aspects of label designs that could be interesting to consider and that address different design opportunities with the energy label. A graphic designer was hired to help with this process and to develop example designs that reflected these considerations.



a) Label redesign (standard)

b) Label redesign with environmental performance indicator

Figure 10 Label redesign concepts addressing basic layout and second scale issues.

The modified label design shown in Figure 10 a) aims to look stronger than the current washing machine energy label design and is intended to be easier to read from a distance because the symbols stand out against a flat background colour and there is no distraction from the multiple frames. Upper and lower case are used for the different language versions of the word Energy, and the layout has been redone so that compressed fonts are not used; again to make it easier to read. The top of the label has space to show the make and model of the machine, as on the current energy label.

Note the prefix Energ with the various suffixes used on the current label is reported to not be understood by most consumers as saying Energy in different EU languages, therefore it is suggested that it could be

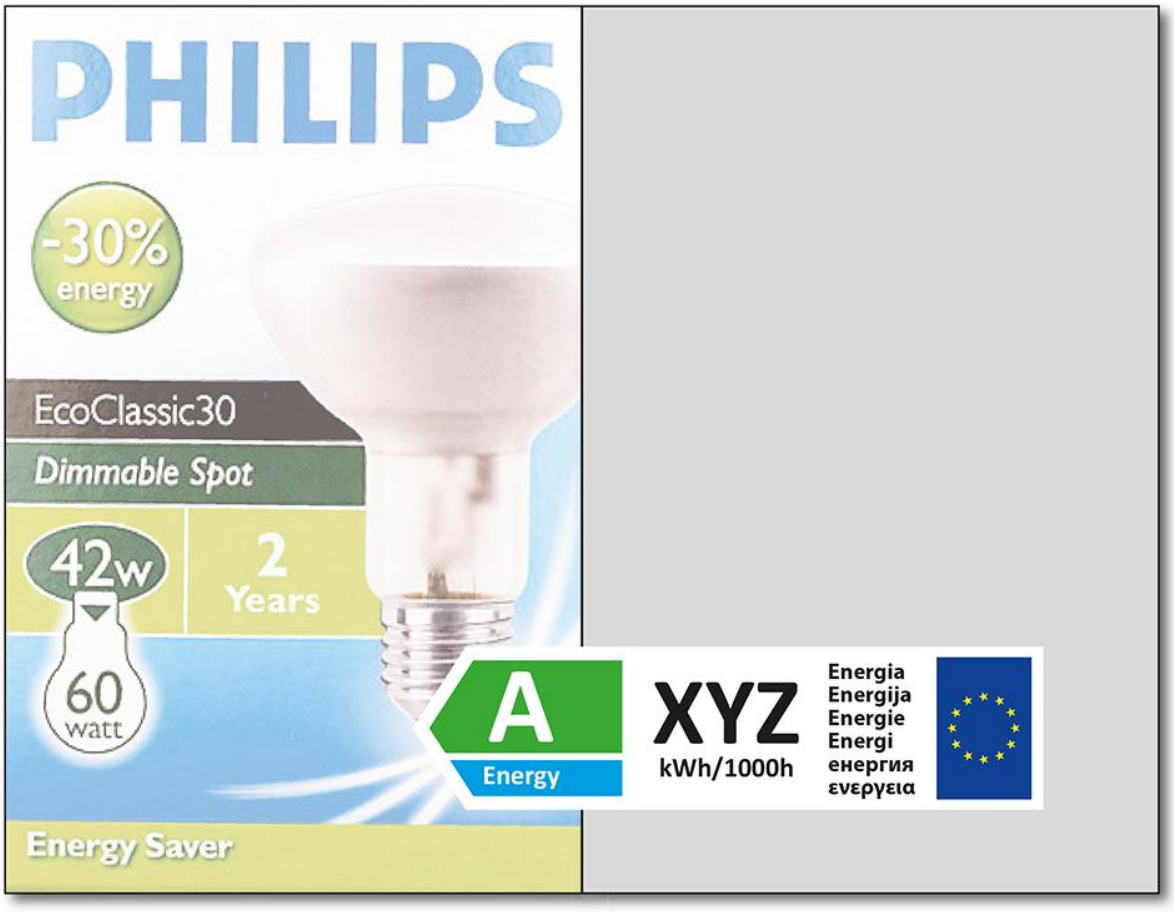
replaced with the word Energy as shown in the right hand label design. There are different options regarding how this could be implemented in practice:

A. The word Energy could be written in English at the top of the label for all labels used in Europe and in the other languages at the bottom of the label, as shown in the right hand design.
B. The word Energy could be written in the local language at the top of the label for all labels used in Europe and in the other languages at the bottom of the label (including in English). Again, the right hand design could be used for this option, by replacing 'Energy' at the top with the local language translation. To be implemented, each retailer could download and print the label in their local language version.
C. As B, but manufacturers are required to supply all language versions with the shipped product and the retailer has to find the one in the local language and display it on the product.

Figure 10 b) shows how it is possible to add a second scale to a label to present an efficiency scale for another product feature. In this case the environmental performance is shown, denoted by an "ecological" icon (a tree). Note: this scale could also use the A to G letters and highlight the actual letter rating or use some other approach as proposed by a graphic designer. However, the intention is that by having it run horizontally on a lower part of the label beneath the main vertical energy efficiency scale, it will be apparent that the scale is of secondary importance to the main scale but still conveys information on an important parameter. Although this example considers a general environmental performance indicator, in principle the same approach could be used for any parameter that is considered to be of secondary importance to the efficiency scale.

Many products (notably lamps) have very small packaging. In the case of lamps the packaging is currently required to show a simplified version of the coloured A to G scale; however, because this is quite large it is often not displayed on the front of the packaging and hence is not so evident to consumers. To increase effectiveness it is proposed to apply a greatly simplified design such as a large coloured (left pointing) arrow with the label class indicated; this would be displayed on the front of the package as a mandatory requirement (Figure 11). This would only be specified for use on products with very limited packaging sizes (e.g. lamps).

This design has the look of an over-sticker so it will stand out against the packaging graphics. The thick white border helps with this impression. Note: the colour will wrap around from the side to the front face of the box, so when the side of the box is viewed, it is clear that there is information on the front of the pack. Note: it would also be possible to include a much smaller coloured efficiency scale, displayed to the immediate left or right of the EU flag, to indicate the top and bottom efficiency classes (e.g. A or A+++ at the top and G or D at the bottom). It is interesting to note that while such a simplified design works perfectly well when the principal energy label uses an alphabetical efficiency scale (because it is sufficient to simply display the letter of the label class for most consumers to understand the efficiency of the product relative to others), the same is unlikely to be the case using any of the other ranking systems under consideration. For example, with a numerical ranking system it is not clear at a glance whether a high or low number is indicative of a higher or lower efficiency level.



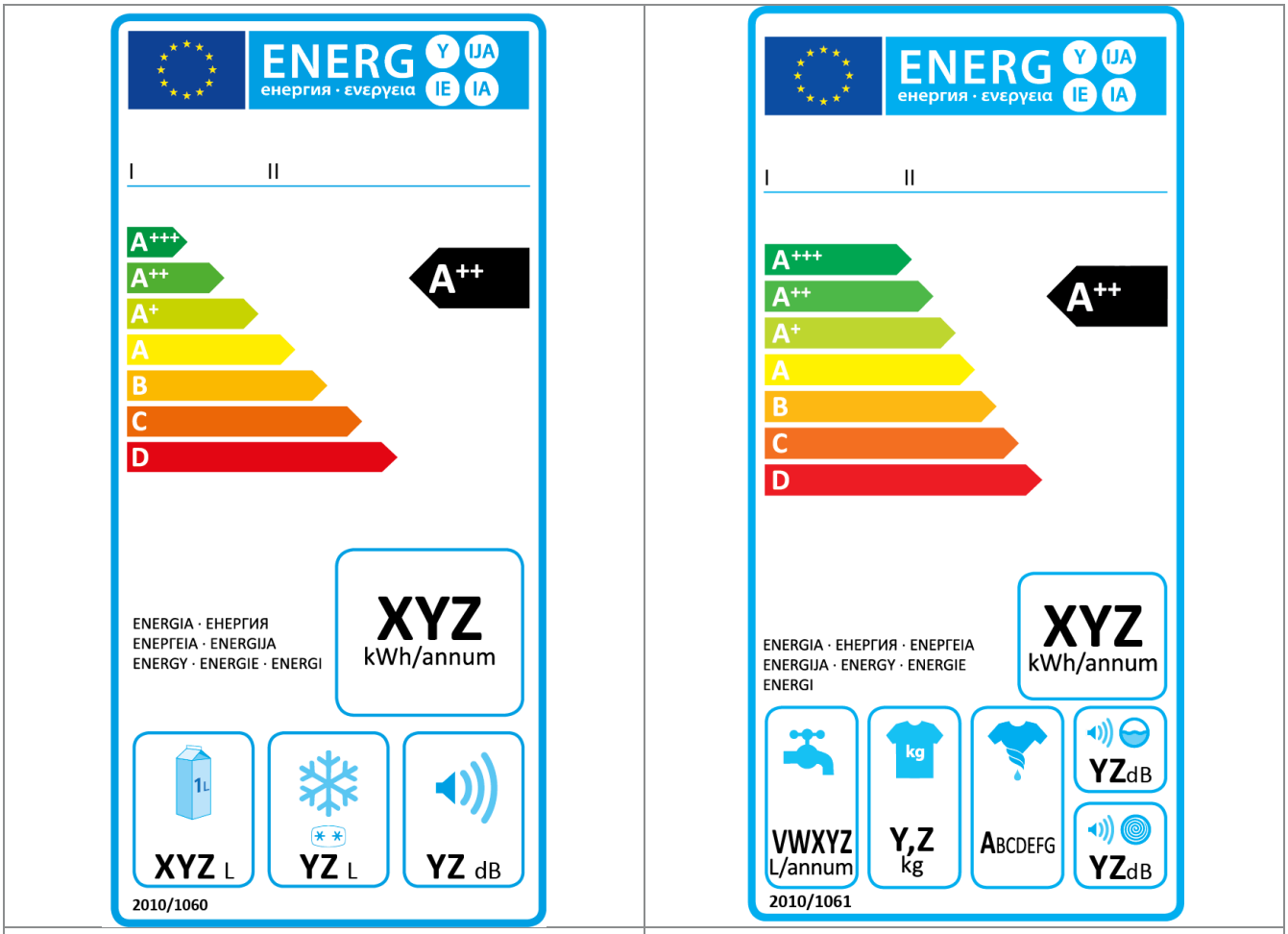
Front	Side

Figure 11 Simplified label design "sticker" concept for use on products with small packets

Previous consumer research has indicted that many consumers imagine the length of the arrows may e proportional to the difference in efficiency from one product to another. Figure 12 shows two designs where the length of the coloured arrows on the efficiency scale is proportional to the average efficiency difference across the scale i.e. the length of the D (red) arrow is left unchanged but the length of the other arrows is modified as:

Length = EEI/EEI_D x length arrow D. Where EEI_D is the efficiency index on the threshold of a class D product

This change is done because many consumers say they imagine the length of the arrows is proportional to the product's energy use (or efficiency); thus they are potentially going to be more motivated to buy a top efficiency class product if the difference in length and hence efficiency is greater. The right hand label shows how this would look for washing machines (and in fact there is almost no difference compared with the current design), while the left hand label shows how this would look for refrigerators (and here there is a significant change).



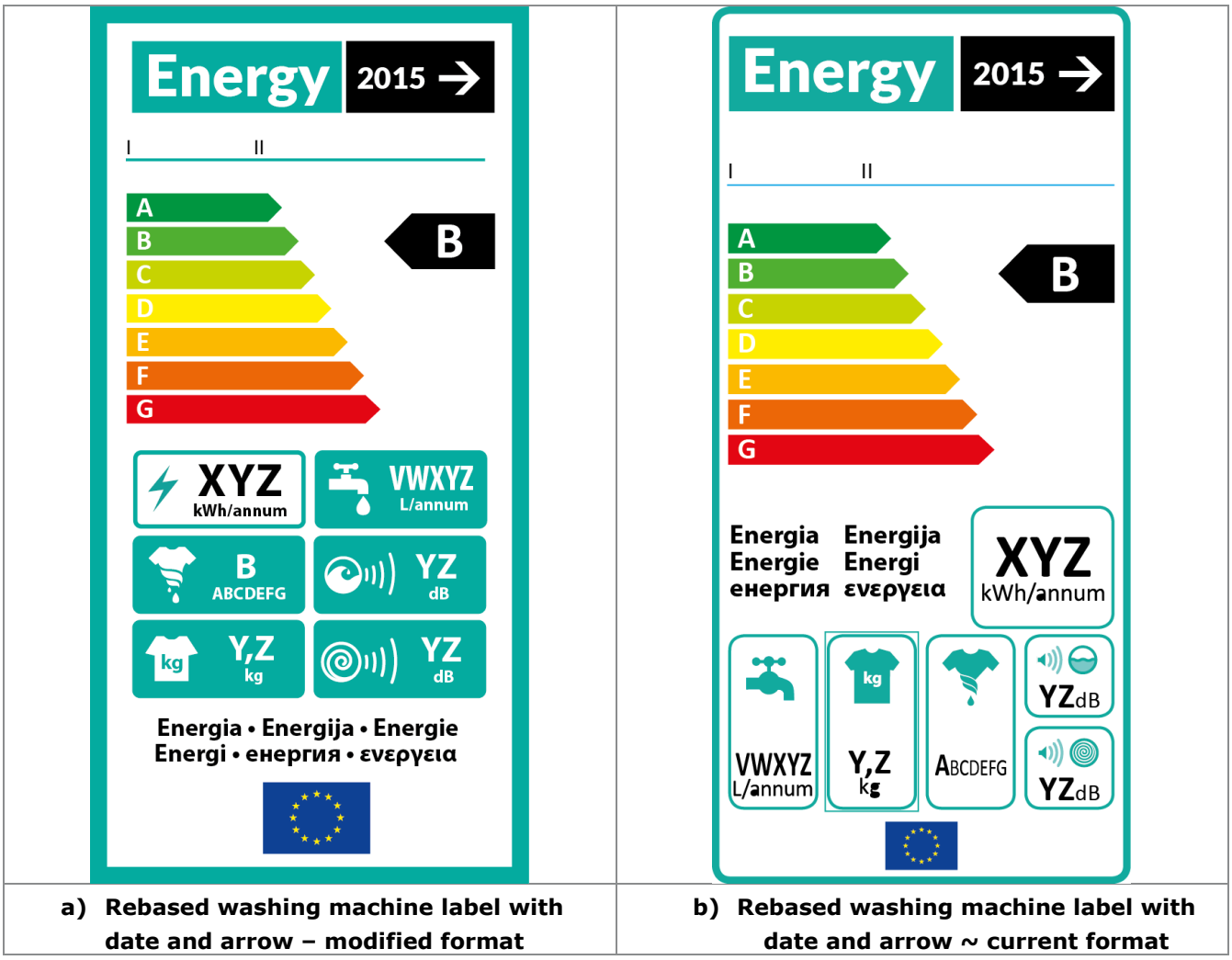
a) Refrigerator label with arrow lengths proportional to the efficiency difference

b) Washing machine label with arrow lengths proportional to the efficiency difference

Figure 12 Current energy label designs where the length of the arrows is proportional to the efficiency difference between the top and bottom of the scale

One concern expressed about rebasing the existing efficiency scale is that consumers may be confused during a transition phase and not appreciate that the label scale had been rebased and hence could not directly be compared between a product labelled under the old label format and the new. Figure 13 shows a design concept that illustrates one option of how this could be addressed for a new label using a rebased A to G scale. In Figure 13a) it is applied to the improved layout design presented in Figure 10 a), and in Figure 13b) the same concept is applied to the existing label design.

In order to make it clear that the rebased label is different from the current label design, it uses some distinct design differentiation from the current label. These include a different border, revised symbol layout, and a clearly indicated date showing from which year the design change came into effect. The arrow is intended to convey that it is from this year onwards and hence convey that the efficiency classes apply from the stated year onwards (but not before). If the label scale is ever rebased again in the future, the border and background colour could be changed (as in the green version on the right hand side) and a new date added.



a) Rebased washing machine label with date and arrow – modified format

b) Rebased washing machine label with date and arrow ~ current format

Figure 13 Rebased A to G label designs with date and arrow indicators to show the scale has changed from the year of the date onwards

Some products, such as ovens, water heaters and space heaters, can use more than one fuel type. (Typically, gas and electricity are the main options but oil and solar are also possible.) In this case it is desirable in principle to be able to compare their efficiency both among products of the same fuel and technology type but also across products with different fuel types. This is because while they provide the same service it is not always possible or viable to choose the technology using an alternative fuel or with a radically different cost (e.g. for heat pump space heaters compared with standard electric space heaters). In these cases it is necessary to see a sub-scale within a broader scale. The design concepts shown in Figure 14 present some options for how this could be achieved.

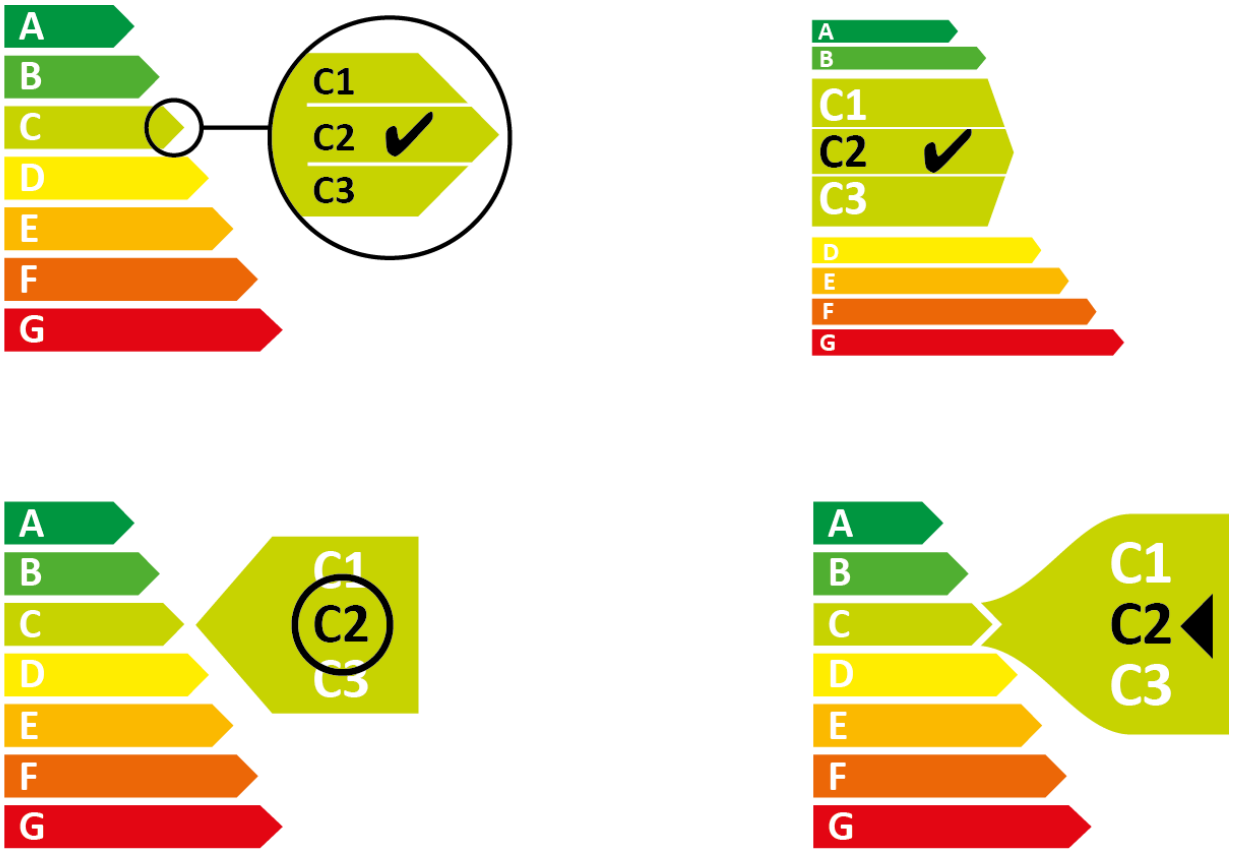


Figure 14 Scale within a scale concepts, for applications where the efficiency scale is too broad to reveal relevant differences within certain technology types that have a partially "captive" market

4.7 Conclusions and recommendations

Recommendations for future label revisions (sections 4.1-4.3)

- Consider re-grading the A-to-G efficiency scale in preference to adding more plus signs;
- Maximise the impact of the demarcation between the green and yellow parts of the scale;
- Ensure that all efficiency classes indicated on the label are still permitted for sale;
- Review problematic icons;
- If an in-depth assessment shows there would be a net benefit, consider returning to the previous system of labelling energy consumption per cycle for products that are not used continuously
- If an in-depth assessment shows there would be a net benefit, consider using national language to clarify units, icons or explain local elements
- Revisit the 'Energ[y]' text;
- Raise awareness that labelling is an EU scheme operated by the European Commission with support from Member States; and
- Strengthen label comprehension through educational communication campaigns.

Recommendations for the label scale (section 4.3.2)

While it is appropriate that many issues would be dealt with, on a product by product basis there would still be value were the European Commission to elaborate guidelines on how to approach these issues in principle in each of the delegated regulations for the labelling directive and implementing measures for the Ecodesign directive.

In generic terms it is recommended that:

- Label scales should cover the range of energy performance of appliances that are active on the market or that could reasonably be expected to be put on the market (i.e. cover the actual and potential spread in energy performance)
- Labels should not show empty or ineligible classes at the lower end of the scale without in some way indicating that they are no longer active
- The upper labels classes should be set at a level that encourages the development of more efficient products than are currently on the market unless it is unambiguously demonstrated that this is not technically feasible
- Ideally labels should have seven active classes, but a reduced number should be permissible when it is clearly shown that there is an insufficient spread in energy performance to permit seven full classes
- Label scales should be set with particular attention to the boundaries set between the green and the yellow classes (which are key in motivating consumers to purchase more energy efficient products)
- Labels should ensure larger capacity higher energy using appliances are not unfairly favoured in the energy performance classifications and perhaps should err towards scales that favour lower energy solutions
- Products that clearly promote and inform low energy consuming user behaviour should be eligible for ranking bonuses on the energy label scale
- It would be desirable to adopt a consistent approach across products on how environmental performance factors are treated within energy labelling and specifically the ranking scale
- Labels should ensure that promotion of low absolute energy consumption remains a guiding principle, even when renewable energy supply is considered, for the sake of consistency across labels and products. Not least because the generation of electricity and energy always entails competition with other issues (e.g. CO_2 emissions in the case of fossil fuels, land use issues and other factors in the case of solar energy or bio fuel production)
- The development of labels using dual energy performance scales should be considered and evaluated for products that provide more than one primary energy service (e.g. heating and cooling)
- The development of labels using a scale within a scale should be considered for services where there are distinct technology options that have very different energy performance but are not always viable in all circumstances

Recommendations for the inclusion of additional information (section 4.3.3 Error! Reference source not found.**)**

- Flexibility and adaptability as guiding principle regarding the number of parameters to be shown on the label.
- Absolute energy consumption could be included in the energy efficiency index defining the label's thresholds.
- Though the possibility to add new content information to the label should be maintained, currently it is suggested not to add new environmental information, monetary information or whole life cycle impacts information on the energy label. However, the opportunity to use bonuses in the energy efficiency index should be explored to include some environmental aspect or to ensure that the most impacting product life phase is taken into account.
- The evidence base seems too thin to comment on the product fiche in terms of burden or actual use by consumers in shops or at home. Both need to be investigated before decisions can be made.

- Although technology evolves rapidly and consumer up-take seems to follow the pace, field trials are needed to understand in detail the type of information to convey and what proportion of the public would actually be ready to use ICT tools.

Recommendations regarding alternative label designs (sections 4.4 - 4.6)

As settling on the design to be used for the efficiency scale in a revised label is the greatest need, the principal recommendation is to fine tune rescaling by testing the proposed label options informed by the IPSOS/LE consumer understanding study inserted in a contemporary label's context.

While it appears the rebased A to G design is performing most strongly from both previous consumer research and also the latest (IPSOS/LE) study, more work is needed to establish the merits of the alternative label scale design concepts.

Once this work is concluded it is also proposed that some of the complementary design concepts set out in section 4.6 be tested (perhaps after the formal review process is concluded) and if found to be appropriate, applied to the relevant products and principal label designs.

4.8 References

The references presented below are additional to the many references used for the Literature Review.

- IEA, 2007 – Mind the Gap: Quantifying Principal- Agent problems in Energy Efficiency, in support of the G8 plan of action.
- London Economics, IPSOS, 2014 – Study on the impact of the energy label – and potential changes to it – on consumer understanding and on purchase decisions, ENER/C3/2013-428 INTERIM REPORT
- Ministère de l'Ecologie, du Développement Durable et de l'Energie, 2013 – L'affichage environnemental des produits de grande consommation, Bilan au Parlement de l'expérimentation nationale, Rapport et Annexes.

5 Effectiveness regulatory process

This chapter discusses barriers and possible improvements in the regulation process of Ecodesign and Energy Labelling. Improvements concern:

- effectiveness: how can the regulatory process maximise its effectiveness in terms of impact (energy, other environmental aspects)
- efficiency: how can the resources required in the regulatory process, from all stakeholders including EU, be used most efficiently

Before doing so, a brief overview of the regulatory process is given in the next section.

5.1 Current procedure

The Ecodesign and Energy Labelling regulatory process is depicted in Figure 10.

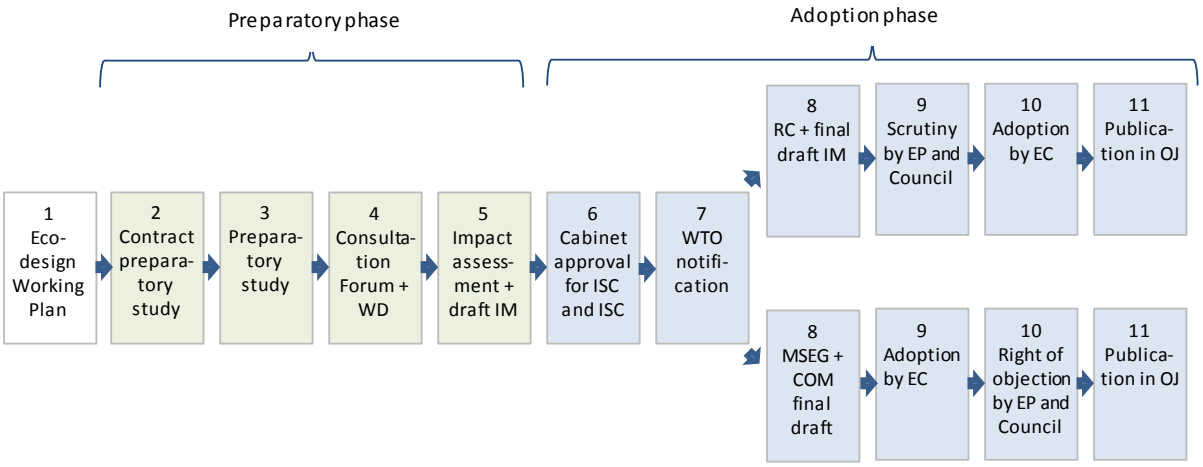


Figure 10: Ecodesign and Energy Labelling Regulation process. For ED the Regulatory Committee (RC) casts a vote. For ELD the Member States Experts Group (MSEG) gives advice.

Step 1: Ecodesign Working Plan

In accordance with the criteria set out in article 15 of the Ecodesign Directive[47] the European Commission develops a working plan. The working plan sets out for the following three years an indicative list of product groups that are considered priorities for the adoption of implementing measures. In December 2012 the second working plan of Ecodesign was established, covering the period 2012 - 2014[48].

Step 2 & 3: Preparatory study

Through a tendering procedure an external expert is hired to conduct a preparatory study for a product group targeted in the Working Plan. A preparatory study is a technical and financial analysis of the market of a product group. A preparatory study aims to capture the current and future technology and market

[47] Products groups that are targeted through the working plan must meet the following criteria: 1) have a significant volume of sales and trade, indicatively more than 200,000 units per year all over Europe, 2)have a significant impact on the environment and 3) have a high potential for improvements in terms of their environmental impact.

[48] SWD (2012) 434 final
SWD(2012) 434 final

developments of a product group. The analysis in the preparatory study serves as the quantitative basis on which the appropriate level of ambition for the implementing measure or voluntary agreement can be established. The study must be carried out in line with the Methodology for the Ecodesign of Energy-related Products (MEErP). Industry stakeholders and experts are heavily involved to contribute to a better understanding of the environmental impacts and the costs of technologies in detail.

Step 4: Consultation Forum
The Consultation Forum invites Member States' representatives and all interested parties (industry, including SMEs and craft industry, trade unions, traders, retailers, importers, environmental protection groups and consumer organisations) concerned to comment on the preparatory study's findings and proposed implementing measures. In this step the Commission takes over the responsibility for the documents from the external expert that carried out the preparatory study.

Step 5, 6, 7: Draft Implementing Measure, Impact Assessment, Interservice Consultation
Based on the feedback in the Consultation Forum phase as well as the findings from the preparatory study a draft implementing measure is proposed. The draft Implementing Measure will be subjected to an impact assessment. During the Interservice Consultation the draft implementing measure is sent to other relevant EU bodies to ensure that all aspects of the matter in question are taken into account. After the Interservice Consultation of the Draft Implementing Measure the World Trade Organisation (WTO) is notified of the proposed regulation as well.

Step 8 for Ecodesign: Regulatory Committee
The Regulatory Committee is an assembly of one representative for each EU Member State and is chaired by the European Commission. The Committee is consulted by the Commission during the periodic modifications of the Working Plan (step 1) and votes on draft implementing measures.

Step 9, 10, 11: Scrutiny, Adoption and Publication in Official Journal
After scrutiny by the European Parliament and the Council, the implementing measure can be adopted and published.

The preparatory phase (2 - 5) is the same for Ecodesign and Energy Labelling. The adoption phase differs, as there is no Regulatory Committee for Energy Labelling. The Energy Labelling Directive was recast in 2010. By that time, the Lisbon treaty had passed, requiring changes in the comitology process[49] and enabling a new legal framework including delegated and implementing acts. Currently, delegated acts are made under the Energy Labelling Directive. In this process, Member States are not asked for a formal vote. Instead, a Member States Experts Group (MSEG) advises on a proposed act, but the final decision is with the Commission. The European Parliament and the Council exercise a right of objection to the act after the Commission adopted it – it is only published if no objection is raised.

The process to come to Voluntary Agreements is different. A preparatory study is not required, although in practice preparatory studies have taken place for both product groups with recognised VAs. Step 4 – 6 (Consultation Forum, Impact Assessment, Interservice Consultation) are also done. This is followed by a decision by the Commission on acknowledgement of the VA. More on VAs in 5.4.

[49] i.e. the process of delegating powers from the legislative level to the executive level.

The entire Ecodesign/Labelling regulatory process should normally take 41 months from the start of the preparatory study [Hodson 2011]. In practice though, the Ecodesign regulatory process (steps 3 – 11) has taken on average 49 months until 2012, with a number of Regulations that had been in the process for years not finished yet by then. After the minimum of one Ecodesign Regulation in 2011 the numbers per year have picked up to 4 in 2012 to 5 in 2013, including a few difficult ones (e.g. heaters, water heaters, computers). These three regulations have taken 7 years or more to finish. In addition, two Voluntary Agreements under Ecodesign have been recognised, one in 2012 and one in 2013, respectively. Also, five Energy Labelling Regulations have been published over 2012-2013.

Stakeholder input and involvement is generally considered to be of great value to the process, for information, discussion and creation of a broad base of support for a measure. Official stakeholder involvement is scheduled to take place multiple times: surveys requesting information as well as stakeholder meetings are organised during the preparatory study. In addition, one or more Consultation Forum meetings are organised. Ideally there is only one, but in practice it can be more.
In practice there are many more moments of stakeholder involvement, such as through bilateral discussions between stakeholders or between stakeholders and the Commission or consultant, and through position papers from stakeholders. The adoption phase (steps 6-11) is a process principally involving the Commission (steps 6 – 11), the Member States (step 8 and 9) and the European Parliament (step 9), however, lobbying continues even then.

The above overview of the regulatory process concerns the process for new regulations and delegated acts. The review process of existing regulations is not well defined yet. Parallel to this evaluation, the first review preparatory study is taking place. In the discussion on barriers and possible improvements in the remainder of the chapter the discussion will be about the regulation process for new products as well as for products to be reviewed.

5.2 Barriers and possible improvements in the regulatory process

5.2.1 Various phases of the regulation process and stakeholder involvement

In the survey stakeholders rated the effectiveness of the various phases in the regulation process. Listed in order of decreasing efficiency, according to stakeholders[50]:

1. Consultation forum / Regulatory Committee Vote
2. Member State expert group on labelling
3. Impact assessment and draft regulation
4. Working Plan
5. Preparatory study.

In this section we discuss issues raised by stakeholders and in literature that concern specific phases, in descending order.
Some stakeholders regret that impact assessments are not available to them before the measure is published, and therefore they do not have a chance to react to it.
On the Working Plan, which is currently the Working plan *under the Ecodesign Directive*, all interviewees commented that they consider it to be a good idea to have a joint working plan for the Ecodesign and

[50] The WTO notification process and Scrutiny/Objection by European Parliament and Council were largely judged as 'neutral' or 'don't know' and are therefore left out.

Energy Labelling Directives. Even though in practice ELD seems to be taken into account in the planning this is not reflected in the title. One interviewee suggested to also consider the Ecolabel in the working plans. In Chapter 4 it was already recommended to create working plans that are better integrated with planning of other policies (Ecolabel, RoHS, CPR). It may stretch too far and involve too many DGs to make a combined planning for all Directives. However, the development in other areas should at least be considered.

Recommendation: to establish joint working plans under the Ecodesign and Energy Labelling Directives, and consider planning of other policies in the process.

The preparatory study is the stage where stakeholders are the least satisfied with. This coincides with our findings from literature. Therefore, several aspects of the preparatory study phase will be discussed in the sections on planning, resources and data.

Survey results indicate that a good majority of non-governmental stakeholders (industry, retailers/distributors, environmental and consumer organisations) in the Ecodesign and Energy Labelling process see no need for changing stakeholder involvement in the process. No clear pattern among type of stakeholder was found. One manufacturer remarked that there is a structural problem with the involvement of SME stakeholders in the process due to lack of resources. A suggestion was made ***to enable following Consultation Forum meetings through the internet. This would enable SMEs with low budgets and resources further away from Brussels to follow the process more closely.***

Survey results also indicate that a good majority of stakeholders sees no need for change in the involvement of Member States in the process of Ecodesign regulations. The main reason for those who do see a need for change is to ensure a better alignment with the procedures for Energy Labelling. This is different for the process of Energy Labelling delegated acts. Most government bodies have expressed a need for change. Industry group stakeholder have varying opinions. The main reason for dissatisfaction with the ELD process for Member State stakeholders is that they do not have a formal vote in the adoption process, as is currently the case for Ecodesign.
Reasons for more formal involvement of Member States in the ELD process would be:

- to ensure that national differences between Member States are properly discussed and reflected in the regulation
- to ensure Member State "buy-in" required for market surveillance and sufficient allocation of (Member State) expert resources
- to reduce susceptibility of the current ELD delegated acts procedure to lobbying,. And to increase its transparency. This procedure is more prone to lobbying than the ED procedure involving a Regulatory Committee. Interestingly, the comitology process has been revised in the Lisbon Treaty, supposedly to make the process more transparent and less prone to lobbying [EP 2010].

In addition, a NGO stakeholder objected to the possibility in the delegated act procedure for a single commissioner to not follow up on advice made by a broad number of stakeholders. This was mentioned to have taken place in the case of boilers and televisions, leading to delays in comparison to the Ecodesign process, although the delegated acts procedure is supposed to be quicker.
To summarize, the stakeholder consultation pointed out that

1. stakeholders are in favour of a procedure with more Member State involvement than the current delegated acts procedure,
2. transparency is desirable and
3. stakeholders see a need for better alignment of the ED and ELD process.

Some stakeholders have raised the issue of the possibility to merge the Ecodesign and Energy Labelling Directives. An overview of pro's and cons is provided below.

Table 6 Overview of pros and cons of merging ECodesign and Energy Labelling Directives

Arguments in favour of merging	Arguments against merging
• Should lead to efficiency in the process • Need to have one working plan for ED and ELD • Need to have one process for ED and ELD to align requirements and planning for a given product group • Would make sense to have common calculation methods and documentation requirements / formats • Will effect alignment in market surveillance procedure	• If this is the only reason for changing the ED, it would involve losing the current comitology procedure that is highly valued by most stakeholders. • Depending on the decision on scope extension the scope of both Directives could differ (ErPs vs all products) • Not all products require both ED and ELD. • Scope of product groups may vary between ED and ELD (for ED narrower scope to regulate products with the same functionality, for ELD broader scope in order to compare products).

The possibility that the current comitology process for Ecodesign may be lost is considered a possible decisive argument against a merger. The other arguments against are not very strong and can probably be accommodated in a merger. None of the arguments in favour are considered to dictate a merger, as they can all be realized without a merger as well. To what extent a merger leads to increased efficiency more than just better alignment of both processes is not clear but could be a decisive argument for merging the two Directives.

Some stakeholders have made remarks on the lack of clear communication by the EC on details of the process in general and the status of products in particular. Indeed, for this review the study team had to make extensive use of sources outside the EC (papers from H.P. Siderius, website from NGOs such as ECEE and CoolProducts) to obtain information on the process and the status of products in the regulatory process, whereas the websites of DG Energy and DG Enterprise might be considered obvious starting points for this. The Swedish Energy Agency suggests in its position paper that 'a well updated database for information, possibly via CircABC, and an "ecodesign/energy labelling platform" would be very helpful for generating an overview of Ecodesign and Energy Labelling regulatory processes (working plans, regulation drafts, regulations in force etc.) for manufacturers, importers and MSAs (Market Surveillance Authorities)'. One NGO stakeholder commented on the lack of clarity on the process of review and revision of measures, asking for more structure and an 'explicit approach'.The issue of communication is discussed further in 5.2.3.

5.2.2 Progress and planning in the regulatory process

In the beginning of this chapter it was pointed out that the number of regulations adopted per year is increasing again, and it included some difficult measures. Also, according to the position paper submitted by the Swedish Energy Agency, 'the process for new regulations has been moving at good speed lately and the timetables kept'. These are positive signs on the speed and timing of the regulation process. There are, however, also less positive signals about the progress of adopting regulations.

On 7 December2012 the Ecodesign Second Working Plan was published. By that time 16 Ecodesign regulations had been adopted in total. In this Working Plan, 19 newly adopted ED and 8 newly adopted ELD measures were foreseen for the remainder of 2012 and 2013. By January 2014 9 of the ED and 6 of the ELD measures had in fact been adopted. This indicates that progress and planning are still a reason for concern.

It is clear that the regulatory process generally takes longer, in some instances much longer, than desired. This requires all stakeholders to make resources available for a longer period than planned. In addition, it leads to lost savings as measures go into effect at a later stage, and are more and more based on outdated data. Furthermore, delays and the possibility to disregard deadlines without consequences make the process susceptible to delaying tactics [Siderius 2013].
Delays in the process have been connected with several issues [Siderius 2013]:

1. The quality of the preparatory study and presence of sufficient quality data (more on this in 5.2.4)
2. Too few staff available for the workload at hand at the Commission. In practice, the first Consultation Forum meeting on average takes place 10 months after the preparatory study has been completed.
3. Technical complexity of the product. Examples are (networked) standby and commercial refrigeration.
4. Contentiousness of the product. While stakeholder involvement is extremely valuable to and crucial to the process, it can in some cases lead to conflicts that practically grind the process to a halt. Examples are water heaters, tumble driers. An example product category where technical complexity and contentiousness is combined is boilers.
5. The last steps before adoption are straightforward, and should be fairly quick compared to the preparatory phase. However, experience shows that the adoption of a measure can sometimes take a long time as was the case for e.g. household air conditioners and boilers and water heaters.

The norm for the length of the regulatory process is 41 months from the start of the preparatory study until publication. This norm does not seem to be publicised widely.
In the USA the time allowed for a regulatory process to complete is also three years [US DOE 2006]. Also, there are clear timelines for stakeholder input in various phases of the process, usually 75 days [US DOE 2006]. It seems unlikely that regulatory processes of which timelines are not publicised widely and at the same time requiring extensive stakeholder consultation will be finalised in the desired timeframe, if the time frame is not clearly communicated.
It is recommended that the Commissions devises a planning of the regulation process, with a target date for publication, during the final stages of the preparatory study. At that time more is known about the technical complexity and the contentiousness of the product. Capacity within the Commission to meet the planning should be secured. Such a planning should also make clear until when or during which periods stakeholder comments can be received.

5.2.3 Resources: quantity and quality

There are two main aspects to the discussion on resources: (1) quantity: constraints in (financial and human) resources and (2) quality: people moving on to other positions. Both are discussed below.

Quantity: constraints in resources
In the previous Ecodesign evaluation it was already clearly noted that financial and human resources in Europe are absolutely a factor constraining the process [CSES 2012]. Waide (2013) estimated that the combined estimate of administrative and consultant person-hours available for EU product energy efficiency regulatory development and administration is less than a tenth of the comparable US figure and less than half of the comparable Chinese figure. This has been a challenge for the EC, and will be a challenge in the foreseeable future. With this in mind it may not be very surprising that the Commission has problems keeping up with the ambition set in its own planning. Also, unforeseen circumstances divert resources away from for the planned regulation processes:

- One source of distraction has been public affairs issues, where information on the rationale and background of already adopted measures need to be provided and explained, as was necessary when the incandescent light bulb was being banned. The EACI (Executive Agency for Competitiveness and Innovation) project 'Energy efficient products facility', that is now in development, intends to manage and promote an electronic multi-lingual and multi-disciplinary products facility. This facility consists of a website and a helpdesk, targeted at different stakeholders including consumers, retailers and manufacturers. It provides reliable information on EU energy efficient product policy, and assistance for implementing measures under the Ecodesign and Energy Labelling Directives, the Tyre Labelling Regulation and the Energy Star Programme. The project is contracted out to external parties and has been commissioned for three years.
- A second source of distraction is the need to make amendments to already adopted regulations. For example, the Regulation on circulators did not specify whether circulators placed on the market without pump housing are covered or not. Though thoroughness in the regulation process should minimise such issues, such events are likely to take place in the future as well.

One could also discuss to what extent the dissatisfaction of stakeholders with the preparatory study phase are related to constraints in resources. Given the fact that a preparatory study is the foundation for the whole process, the question rises whether resources put into the process are sufficient, and if increased resources on a preparatory study would reduce problems later on in the process, thereby making the whole process more efficient (and save resources later on in the process). One aspect to consider better during the preparatory study is the coherence with other EU policies. It is advised to better synchronise other legislative processes (namely Ecolabel) with ED and ELD and to make a more structured approach to examining interaction with other legislation and to avoid 'passing the buck' (see section **3.1**).
In 5.2.4 it is recommended to perform additional own analyses in case data is lacking in a preparatory study. ***Both recommendations call for more efforts and hence more resources in a preparatory study.***

Quality: People moving on to other positions
Some stakeholder comments suggest that more needs to be done to incorporate lessons learned during the regulatory process into the process structure, in order to keep up quality and work more efficiently even when people move on to other positions. This could be done for example through harmonised feedback forms for consultations. In fact, the whole procedure from working plan to preparatory studies to adopted regulations may benefit from a more 'explicit approach'. The process is not laid down in detail anywhere (not that the study team is aware of). Guidelines to Voluntary Agreements under Ecodesign are

being prepared, giving more detail and practical interpretation of articles in the Ecodesign Directive [VA draft Guidelines 2013].

It is recommended to prepare Guidelines for the preparation of ED and ELD measures, to give clarity to all stakeholders on the process, to collect stakeholder feedback on the process frequently and in a systematic way, and to include lessons learned in the regulatory process.

This could be one step in creating more institutional memory, but there is more action that can be considered. As resources in the EC are constrained and are likely to remain constrained, a NGO stakeholder made the suggestion to involve institutions close to the EC more to create more support for the policy process. The project already launched by EACI ('Energy efficient products facility') is a first step in the creation of this support. However, the fact that this project is outsourced and runs for a limited period of time also raises question on the extent to which this will be a continued support to the process.

Review process
The lack of clarity on the process of review and revision of measures, asking for more structure and an 'explicit approach' by a NGO stakeholder was already mentioned in section 5.2.1. Many survey respondents indicated that a fast track method for reviewing existing measures, where the level of the revised requirements would be determined through a partly automatic procedure based on technological progress achieved in the meantime, would lead to a lower administrative burden and faster development. Particularly environmental interest groups and consumer organisations favour this idea. It must be noted though that there are various stakeholders representing industry, governmental and research groups that see risks in shortening the process. They fear that fast track procedures will result in "quick and dirty" work that overlooks key issues that should have been considered.
Environmental interest groups, energy agencies and other stakeholders noted that the fast track approach would require to set up a robust and systematic market monitoring instrument. This will be discussed in the next section.

5.2.4 Data availability and quality

A preparatory study should make a very firm foundation for the regulatory process to come. In asking on their satisfaction with the process stakeholders have commented to be least satisfied with the preparatory study. Several authors have also discussed difficulties in the preparatory stage [e.g. Siderius 2013]. The difficulty is mostly related to availability and quality of data retrieved in the process. In fact, four out of seven tasks in a preparatory study involve data gathering, as is illustrated in Figure 11. Tasks 1 to 4 (product definitions, standards and legislation; economic and market analysis; consumer behaviour and local infrastructure; technical analysis) have a dual purpose. They have a clear focus on data retrieval and initial analysis, providing inputs for the modelling in Tasks 5 to 7. However they are also intended for capacity building [VHK 2011].

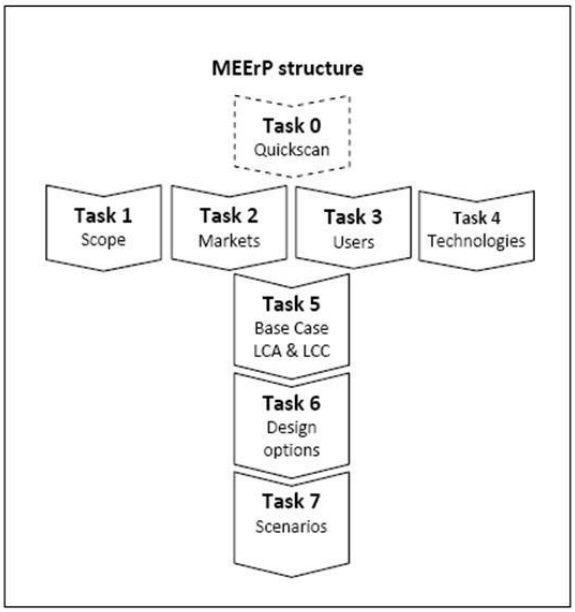


Figure 11 Tasks in a preparatory study according to the MEErP methodology [VHK 2011]

Lack of quality data may have two causes. Firstly, it may arise from a lack of standardisation. An example of this is walk-in cold rooms, where the regulation process was stopped in the impact assessment phase due to a lack of data. This should be avoided, and is discussed in section 5.3. Secondly, it may arise from industry may not being forthcoming with data [Siderius 2013]. In the current process the process is quite heavily dependent on the willingness of industry to supply data. Although it can be a quick and effective way of working if the industry involved is cooperative, it is a weakness in the process if the industry involved is not forthcoming. A preparatory study needs to be finished in a fixed timeframe and therefore continues either with or without good quality data. Without good quality data a weak preparatory study results. The real problems then arise in consecutive phases, often causing delays and possibly resulting in less ambitious measures.

In order to prevent problems in the later phases of the regulation process, it is recommended to build in an evaluation step after tasks 1 – 4 of a preparatory study to assess whether the data gathered is of sufficient quality to continue the study, perform the required analyses, and in the end formulate robust conclusions.
If the conclusion is that the data is not of sufficient quality the preparatory study should be suspended. Extra steps should then be taken to obtain the required data.

The legislation process in the USA (Appliance and Equipment Standards Program) could be of inspiration here. The process in the USA involves a screening analysis and engineering analysis [US DOE 2006]. In a screening analysis the product design options or efficiency levels are identified that will be analysed in detail. This process includes consultations with stakeholders and independent technical experts. The engineering analysis determines the BAT level among the technology and develops cost-efficiency relationships that show the manufacturers' cost of achieving increased efficiency. Based on the availability of data and analytical tools and public comments, DOE chooses the most appropriate means to establish the likely cost and performance improvement of each design option and the cost-efficiency curve. This engineering approach reduces the dependency on timely provision of quality data by industry.

The MEErP already comments on an engineering approach as a useful tool in a preparatory study to check some aspects. However, a warning is issued against a 'fully-fledged engineering approach', because, apart from budgetary consequences, (1) it requires skills that are hard to be found and (2) especially cost aspects of components are very hard to determine [Kemna 2011].
It is clear that this extra step for data gathering will require significantly more time and more resources and should not be taken lightly. However, if it is the only way to carry out a sufficiently thorough analysis, increasing the likelihood of proper setting of requirements and avoiding a lengthy regulation process with uncertain outcome it may be an option to consider .

In order to avoid that a lack of good quality data during the preparatory study slows down the remainder of the regulatory process, it is recommended to build in the possibility to add an extra phase of data gathering to the process, using screening analysis and engineering analysis.

A 'hybrid' approach could also be envisioned, where additional screening and engineering analysis is used in addition to data supplied by industry, to check certain aspects and increase the robustness of the preparatory study.

Review process
The above discussion concerns the process for regulating new products. As mentioned before, more emphasis should be put into structuring the revision process as well. As in the regulation process of new products, sufficient quality data will be necessary in the revision process. For most if not all products already regulated under Ecodesign and/or Energy Labelling, information requirements have been set. This requires characterisation of all new product types according to these Ecodesign information requirements (and Energy Labelling product fiche information and possible future QR-code information). As manufacturers already are obliged to collect and publish this information for their products, there should be no major obstacles to supply this information into a central registration database.
The Commission has already set steps to develop an 'Energy-Related Products Database' (the second EACI project, in addition to the Energy Efficient Products Facility already mentioned). This database intends to support future reviews of Ecodesign and Energy Labelling implementing measures and to support enforcement activities of national authorities. The scope of the collected data should reflect the 'manufacturers' information requirements' specified in Annexes to relevant ecodesign implementing measures. Data about each product should include information about which countries/markets the products are sold in [EACI 2013]. Currently only six products are to be incorporated into the database. There is no obligation for manufacturers to supply data, but as manufacturers are already required to publish information requirements, it should be feasible for them to supply the information to a central database. Such a database would support the revision process and market surveillance process.

It is recommended to establish a registration database with Ecodesign and Energy Labelling product specification based on information requirements from existing legislation for all regulated products, and make it mandatory for manufacturers to supply the required information.
What should be in the database in addition the the ED information requirements should be subject to further discussion and detailing. In Chapter 4 the need for market monitoring for the purpose of updating energy labels is mentioned. In Chapter 6 the need for a database for the purpose of market surveillance is discussed. All these considerations should be taken into account when formulating detailed requirements on the database.

5.2.5 Ambition level of requirements

In Chapter 2 the ambition levels of regulations developed to date were discussed From this it was concluded that the ambition level of Ecodesign regulations is sometimes correct, more often on the low side judged by all stakeholder groups except industry, but never considered to be 'too high' as judged by all stakeholder groups except for a few exceptions from industry stakeholders.
It should be pointed out that measures with low ambition do not only represent lost savings and a lot of administrative effort with low result. One a measure is set, Member States are prevented from setting their own standards with higher ambition. All this stresses the need for a process that is consistent in delivering such measures with appropriate ambition levels.

Low ambition levels may be a consequence of

a. a low quality preparatory study
b. long periods of time between the preparatory study and the implementation of the implementing measure
c. obstructive behaviour of stakeholders (Siderius 2013).

Several process issues relating to these causes have already been addressed in the previous sections. Instead, in this section, we focus on methodological ways to increase the quality of the preparatory study (a), and thus to improve the ambition level or requirements.

Methodological improvements for increasing ambition level of Ecodesign and Energy labelling requirements are:

a. to account for learning effects
b. to set requirements beyond LLCC (Lowest Life Cycle Cost)
c. to give benchmarks a more powerful role as targets (for ED as well as ELD)
d. to consider absolute energy consumption levels apart from energy efficiency

The four options are discussed below.

1. Learning effects

Even if improvement in the planning and timing of the regulation process is made and regulations are finalised in the time frame set (41 months from the start of the contract of the preparatory study to the published measure [Hodson 2011]), there will still be a 6.5 years' time lag in between the data collection and the time the requirements enter into force. This is the sum of 3.5 years for the regulatory process, usage of ±2 years old data in the preparatory study, and 1 year in between the publication of the regulation and the first requirements entering into force. Therefore, it would make sense to take this period of autonomous technological progress into account in the analysis and the standards setting. For many product groups literature is available on the magnitude of this effect.
Of those stakeholders with a firm opinion in favour of or against (excluding the 'don't know's) in the online consultation, a good two thirds majority of respondees were in favour of applying a learning curve approach. Of all stakeholder groups only manufacturers and industry interest groups are divided on the topic, with roughly half of the respondents being in favour and the other half against applying learning curves.
The MEErP already offers the possibility to account for learning effects, but only as a tool for performing sensitivity analysis. ***Therefore, for the Life Cycle cost analysis in a preparatory study it is recommended to account for price and efficiency effects of technological learning in the period between data recording and a regulation taking effect (±6 years).***

If a stakeholder disagrees with the assumptions used in the preparatory study, there will be an opportunity to contest the assumptions with new evidence brought forth.

2. Set requirements beyond LLCC (Lowest Life Cycle Cost)

The Ecodesign Directive, Art. 15, 5c) stipulates that 'there shall be no significant negative impact on consumers in particular as regards the affordability and the life cycle cost of the product'.
Annex II requires that 'Concerning energy consumption in use, the level of energy efficiency or consumption must be set aiming at the life cycle cost minimum to end-users for representative product models, taking into account the consequences on other environmental aspects'.
Practice until now for MEPS (Minimum Energy Performance Standards) therefore was to set Ecodesign standards at the point of least life cycle cost. The underlying assumption is that there is such a relationship between life cycle cost and energy efficiency as depicted in the figure below.
This assumes a trade-off between increased investment cost when buying a more efficient product and decreased cost of operation (namely energy cost), with the most efficient product being the newest products with a price premium.
In practice, however, it can be a challenge to stick to this principle for three reasons. Firstly, this relationship does not hold for all products, e.g. for electronic products there is not always a clear relationship between price and efficiency. Secondly, the life cycle cost curve is often very flat, giving only small differences in life cycle cost with large differences in efficiency and vice versa. This implies that the method is very sensitive to slight changes in life cycle costs. Thirdly, price figures that are input to the calculation have a large variation and large uncertainty makes this method far less straightforward and prone to discussion at first hand.

In a preparatory study based on the revised methodology MEErP the 'Break Even' point is identified (see again Figure 12). This is the point where efficiency has moved beyond the point of least life cycle costs to the efficiency where life cycle costs for products are the same as those for average products in a base case scenario. To this approach arguments in favour and against may be raised. These are listed below.

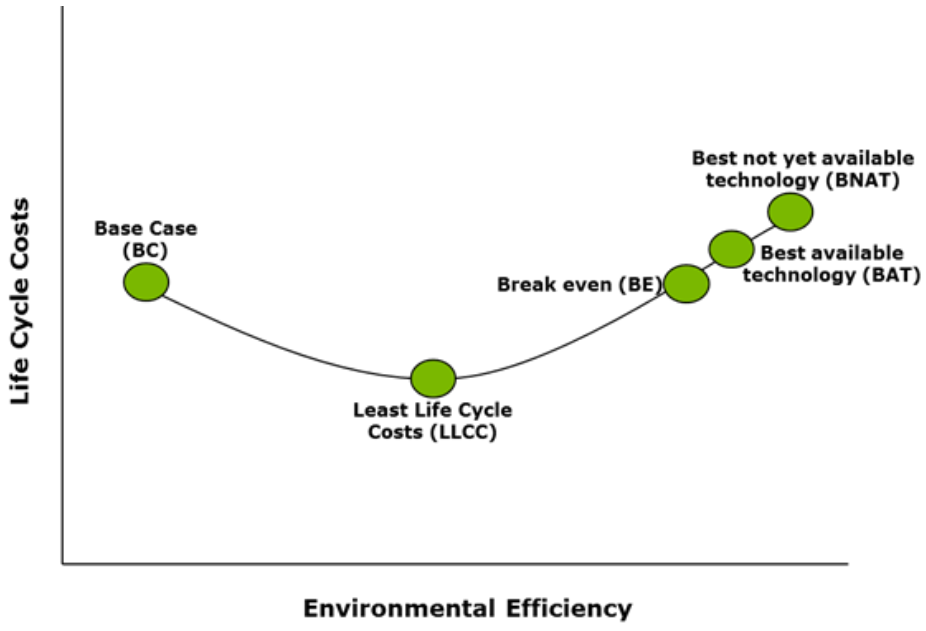


Figure 12 Illustration of the optimal level for environmental efficiency assessed against life cycle costs

Arguments in favour of moving toward the breakeven (BE) point:

- Aiming for the breakeven point enables increased effectiveness of the ED objective to improve the overall environmental performance of the products, while life cycle costs are not increased above base case levels.
- Moving toward the BE point is likely to make a regulation last longer before a regulation requires revision. The case with television illustrates that regulations with low ambition require a rapid review, which will require an increased administrative effort from all stakeholders in the process and is in nobody's interest in the long run.
- An independent stakeholder noted: 'In order to reduce its fossil energy consumption, Europe is rolling out renewable energy and is willing to pay the extra cost. As improved energy efficiency constitutes a parallel road that equally reduces fossil energy consumption, it is equally warranted to pay extra for any energy efficiency that goes beyond the private cost-optimum, namely up to the point that the extra cost per unit fossil energy saved (through energy efficiency) becomes equal to that of subsidised renewable energy. This will result in an overall societal cost-optimal mix of both[51]. Put differently, if certain energy efficiency measures don't pay for themselves at current energy market prices, while their extra cost per unit saved primary energy is lower than the extra cost of other solutions that are being applied, notably renewable energy, then it will be cheaper for society as a whole, and thus ultimately for all its citizens, to also implement these efficiency measures alongside the alternatives (RE, etc).

Arguments against moving toward the breakeven (BE) point:

- It matters whether Energy Labelling is considered for a particular product group. Energy Labelling of a product requires a considerable variation of energy efficiency of products. This could be in the way of setting Ecodesign requirements at the BE point.
- Even without Energy Labelling considerations it could be that moving toward the BE point limits the choice of products too much, especially if there is variation in functionality.
- Getting close to the BE point implies the risk that some consumers in Europe may start to experience negative impact on the life cycle costs, as life cycle costs are based on Europe wide averages [Coolproducts 2013 (2)].
- Issues may arise concerning the affordability (i.e. the investment cost rather than the lifetime cost) for some consumers in some Member States.
- As mentioned in Ch2, when setting measures at the LLCC point it is ensured that they have important benefits for consumers and for European economies. Moving toward the BE point would reduce these benefits.

Opinions of stakeholders to use the BE point to go beyond minimum life cycle costs varied. Most industry stakeholder groups and surveillance bodies were against. Consumer organisations were neutral. Energy agencies gave a mixed picture. Governmental, environmental and other stakeholders were quite strongly in favour. On the question whether a preparatory study should identify the Break Even Point and analyse implications of going beyond LLCC most stakeholders responded positively, including some industry stakeholders, although in this group a majority of respondents opposed the idea.

Weighing arguments pro and con and taking into account stakeholder views it is difficult to come to a generalised approach for all product groups. While arbitrariness should be avoided, flexibility is necessary to pay justice to all arguments. Coolproducts 2013 (2) provided a formulation for the life cycle criterion in

[51] Commission's Public Consultation Meeting on the review of the Energy Labelling and Ecodesign Directives, 14 October 2013, Brussels

the ED Directive that provides for the option to move towards breakeven without requiring this as a default.
It should be pointed out that the current LLCC criterion has led to measures that led to satisfaction of all stakeholders (e.g. circulators) and has led to dissatisfaction of most stakeholders (e.g. televisions). This suggests that, *if* corrections are being made to the process and the methodology to make it more robust, moving toward the BE-point should not be necessary. Nonetheless, for product groups that do not show a clear correlation between price and efficiency, such as electronic products, the LLCC principle will not work very well. For such groups a combination of arguments may be used: e.g. equal or lower LCC, taking into account affordability and banning a significant market share over time.

3. Long term targets

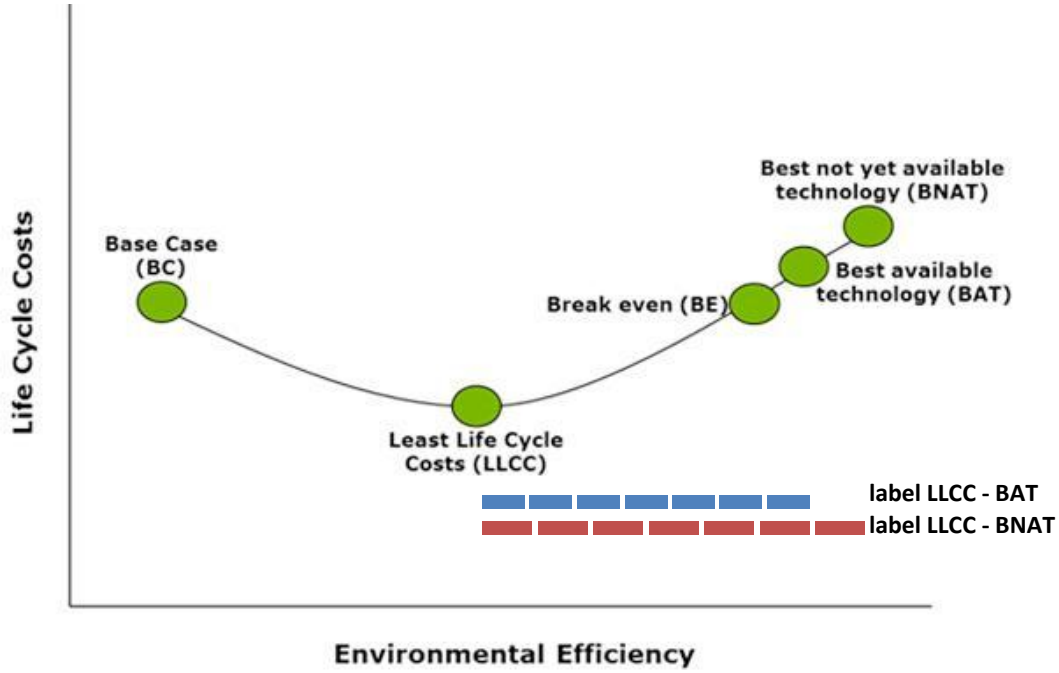
The Ecodesign Directive requires in Annex II that 'The technical, environmental and economic analysis must also identify, for the environmental aspects under consideration, the best-performing products and technology available on the market.' This is normally done in a preparatory study and laid down in an Annex of the specific regulation. In case E nergy Labelling delegated regulations are developed in addition to Ecodesign regulations, the BAT (Best Available Technology) often is placed in the top class of products. Apart from that, there is no formal role for the BAT. BMWi & BMU (2012) and Arditi and Toulouse (2012) state that the long term planning could be strengthened by strengthening the role of best available technology (BAT) and best not yet available technology (BNAT) benchmarks. The identification of these points can serve as a starting point for future revisions of the minimum energy performance standards. In fact, from the survey, most stakeholder groups are largely in favour of a stronger role for BAT as a long term target, except for industry stakeholders with a slight majority against. Some stakeholders refer to the Japanese Top Runner approach, which, in a nutshell identifies the BAT and then sets legislation to meet the BAT a number of years later [Lane 2013]. Market monitoring is done in the meantime to monitor this process.

On one hand, it seems logical to give the BAT a more formal role. It ensures continued progress in efficiency for a longer period of time. It also gives industry long term guidance on what is expected from them, giving input to decisions on development. On the other hand, it brings along the risk of too high standards (in case a majority of industry does not manage to reach the BAT level in time) or too low standards (in case technological progress is much faster than anticipated at the time of the preparatory study). Examples of the first risk (too ambitious standards) are not known to the study team. Examples of faster technological progress than anticipated in the preparatory study can be found. Such examples are televisions and non-directional lighting, where fluorescent lighting has been identified as BAT in 2009.
In fact, both risks can be mitigated by effective market monitoring. The database proposed in 5.2.4 based on Ecodesign information requirements and Energy Labelling product fiche information of regulated products will enable this market monitoring.
Therefore, it is recommended to make better use of benchmarks. This could be done in two ways:

- ***By defining a Tier 3 at the BAT level in the (first) regulatory process of a new product group, setting standards for the longer term. For example, this could be considered for product groups that have shown continued incremental efficiency progress and price decline over time in the past. Care will need to be taken that life cycle costs for consumers are not expected to increase through this Tier 3.***
- ***By making the BAT a starting point for the revision process. This may be the preferred option for product groups for which technological progress is less predictable.***

Further there need to be guidelines on how the BAT should related to the top end of the energy label scale. To date, normal practice seems to have been to have the BAT be the top of the label scale.
It could also be considered to have the BAT be the second best label scale. This has been discussed in Chapter 4. The top of the scale would then be the Best Nearly Available Technology (BNAT). This will be a powerful incentive for manufacturers to bring their BNAT, that in some cases is lying on the shelf because of (perceived) lack of demand, to the market. The case of tumble dryers, where labels have enabled widespread introduction of heat pump driers, has illustrated this. Some stakeholders argue against a role of BNAT as they consider it to be impossible to determine this BNAT as manufacturers will not disclose their next generation products.
Firstly, the fact that this may be the case for some products should not imply that it should not be done for other products.
Secondly, for the introduction of empty label classes it may not vital to already exactly know the BNAT. Instead, the BNAT level can be estimated either by a detailed techno-economic energy engineering analysis[52] or it can be estimated by applying a learning curve approach to the BAT and extending it for ±10 years.

When setting energy labelling classes, the value for adding empty classes should be considered for two reasons. Firstly, it will stimulate industry to develop products for the top class and thereby improve effectiveness. Secondly, it will enhance the lifespan of a label, once introduced, thereby reducing the need for frequent rescaling / revision and increasing efficiency. Empty classes should be set based on BNAT, if known, or based on own analysis if not known. Again, arguments pro and con should be examined on a product by product basis.



[52] as was done successfully in the Cold II study for refrigerators and original EU study for wet appliances

4. Energy consumption versus energy efficiency

To date, ED and ELD requirements have been based mainly on efficiency requirements. This enables large size products and products with increasing functionality to meet ED requirements as well as reaching the highest label classes. However, basing requirements only on efficiency has led to criticism:

- In some cases an energy efficiency metric artificially promotes larger products, as it is easier for large products to reach higher label classes and ED requirements. This has led to consumers buying large products that are not used at its full capacity (e.g. washing machines).
- In case of the energy label , it gives (at least some) consumers the wrong perception that an A label television with large screen diameter is equally 'good' as a television with a smaller screen size, whereas in fact it consumes considerably more energy.
- With the current trend of ever larger and ever more appliances imposing only efficiency requirements will not be sufficient to prevent absolute energy consumption from rising over time [Caldwell 2010].

An example of requirements that are a mix of efficiency and maximum energy consumption requirements are the US Energy Star 5.0 specifications for televisions. For televisions larger than a certain screen size the energy consumption is maximised, requiring them to be increasingly efficient with increasing size in order to qualify for Energy Star.

When it comes to setting of Ecodesign requirements, according to the survey, most stakeholder groups favour a focus on both energy efficiency and energy consumption. Consumer groups were in favour of a main focus on energy consumption. Industry associations were largely opposed. Individual manufacturers were split.

It is concluded that there are valid arguments to be made for basing requirements on a balanced mix of energy consumption and energy efficiency. Guiding principles on how to do this, based on physical principles as well as consumer understanding aspects for ELD, should be developed. The revision of measures of some white good appliances (washing machines, refrigerators) could be a starting point.

Two remaining remarks from individual stakeholders related to the setting of requirements are:

- One individual manufacturer suggested that the EU should require manufacturers to conduct an early stage design assessment. Such an assessment would aim to an optimisation of the design based on resource and cost efficiency together with durability and quality requirements of the specific product. This could apply to a broad range of products (not only those covered by implementing measures) primarily products already covered by a CE marking obligation.
- Another industry stakeholder believes that the EcoDesign process could be more efficient and accurate by explicitly excluding from its scope products or sub-group of products with less than 5000 units sold per year.

5.2.6 Regulating non-energy aspects

In the first round of regulation of products, the emphasis was on the energy aspects in the use-phase of products. This made sense for most product groups as it represented large impact and large improvement potential. Several stakeholder groups have mentioned that there should be more attention for non-energy aspects such as resources and recyclability.

For future new products it would make sense to have ***a thorough preparatory study including non-energy aspects*** (see Chapter 3 for more details on what should be done on top of the current methodology). If these aspects do not get regulated in one go, it ***should at least be considered to***

define general information requirements in the area and to define benchmarks on those aspects, as suggested by a consumer interest group.
Then, in the revision process, an increased effort can be made to actually regulate these aspects.
For reasons of verifiability it is considered most practical to only propose such requirements when they are measurable on the product (see discussion on this in the Scope extension section).

5.3 Standardisation

Proper technical standards are of great importance to a proper implementation of ED and ELD regulations. To support the ED and ELD regulations and in the absence of suitable existing technical standards, harmonised standards are necessary to provide amongst others methods to measure and test the environmental parameters of energy-related products. A harmonised standard is technical standard adopted by a recognised standards body under a mandate from the Commission.
Draft mandates are drawn up by the Commission services through a process of consultation with a wide group of interested parties (social partners, consumers, SMEs, relevant industry associations, etc.). Before being formally addressed to the ESOs ((European Standardisation Organisations), they are submitted for opinion to the Member States in the Standing Committee of Directive 98/34/EC[53].
The previous ED evaluation study concluded that 'there is a need for better synchronisation between the development process for Implementing Measures and that of measurement and test standards. The recent horizontal mandate to the standardisation bodies is a positive development in this direction' [CSES 2012].

The literature report to this evaluation study mentioned a number of important obstacles to the smooth drafting and adoption of standards:

a. An interdependency in the development of standards and regulation;
b. The development of technical standards lacks an assessment of environmental characteristics of products;
c. An overlap or even conflicts in the activities of the CEN-CENELEC Management Centre (CCMC), the relevant Technical Committees and the EC services;
d. Standardisation committees tend to be dominated by manufacturers with little representation upholding the integrity of the policy process. This results in overgenerous tolerances and retrospective changes to test procedures without corresponding changes in the regulation to maintain its integrity;
e. Complex and inflexible international and EU procedures, and lengthy procedures of mandating the European Standardization Organizations (ESOs);
f. Test methods are generally lab based and have not been designed to test actual use, a problem compounded by a lack of field data and a lack of resources to gather this data;
g. Limited involvement of market surveillance authorities. Greater involvement of these authorities could help improve market surveillance.

Below improvement options to the above obstacles are listed, some including comments and recommendations from the study team. Before doing so we report some stakeholder comments. There has been selected stakeholder consultation on the standardisation process in a number of interviews. The results from these interviews indicate that industry is in general fairly satisfied with the standardisation process, other than that the process takes rather long (2-5 years). According to an industry organisation the standardisation process should start earlier. Other organisations, among them NGO's and market

[53] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:204:0037:0048:en:PDF

surveillance organisations, are not as satisfied. This may not be a big surprise as industry organisations spend the most resources on the process and therefore have more influence than other stakeholders. Specific comments from other organisations (amongst other from market surveillance representatives) are:

- Standards are too complex, thereby increasing the cost for market surveillance
- Technical details in test procedures are too business oriented
- More involvement from governments in each member state and some surveillance authorities is needed
- More control from the EC is necessary; there should be no legislation without agreed standards in place.

Improvement options suggested in literature are (in italics):

a. *An earlier start of the process of standards development and a better integration with preparatory studies, including information on upcoming regulatory work to ESOs.* To our knowledge the regulation process foresees in involvement of standardisation organisations from the preparatory study phase on. In case appropriate standards turn out to be available for a certain product group, covering the right parameters, this is probably a good moment. However, if appropriate technical standards turn out not to be available, and if this is the cause of the lack of proper performance data in a preparatory study (see 5.2.4) it is in fact too late***. In order to avoid the stalling of the preparatory study process due to lack of standards and data based on these standards, it is recommended to perform a pre-screening of existence of standards for newly to be regulated products as early as possible (by the time the Working Plan is published).***
b. *Greater use of the relatively new development of environmental characteristics for products in line with CEN TC350 standards*.
c. *Set up of a 'CEN-CENELEC Ecodesign Coordination Group' to ensure proper communication between the CCMC, the Technical Committees and the EC services*. This group had its first meeting in April 2013 and its second meeting in November 2013. Biannual to annual meetings are foreseen. Taskforces have been set up on the topics of terminology, tolerances and uncertainty, coordination / harmonisation of EPBD/ErP and resource efficiency.
d. *Greater involvement of public policy representatives in the standardisation committees*. The EC has issued contracts to NGO's as well as consultants representing the EC interests to follow the standardisation work more closely. This is intended to ensure this greater involvement. It is too early to evaluate on whether this is effective as well as sufficient. Results from this effort should be monitored and evaluated. It should be noted that the process to come to standards in the USA is quite different. In the USA, most standards rulemakings are accompanied by a concurrent test procedure rulemaking [DOE BTO 2013]. In other words, the government is not only in the driving seat in the standards (i.e. requirements) setting process, but also in the development of the technical standards. If current efforts on increasing public involvement in the standardisation process turn out to be ineffective or insufficient, solutions including greater government involvement should be considered.
e. *Reform towards more efficient standardization procedures, as foreseen in the product safety and market surveillance activities package adopted by the EC in February 2013, and an alignment of provisions with the Regulation on European Standardization (1025/2012);*
f. *Better information regarding the user behaviour (including actual use field data) to which the labelled energy performance applies, and/or further harmonization of test standards with regard to testing conditions*. Concerning the user behaviour, it seems contradictory that in these times of increased use of ICT and large marketing organisations gathering immense amounts of data on consumers' behaviour no cost-effective improvements in this area could be made. This may warrant further study into the topic.

g. *Greater involvement of market surveillance authorities, to keep up to date with developments in scientific and technical knowledge, as well as consumer organizations*. In addition to industry, MSA's (and testing organisations commissioned by MSA's) are users of technical standards. For proper and efficient market surveillance technical standards need to be as efficient as possible and suitable for use for MSA's. This is very important as MSA's are extremely constrained in resources, as will be discussed in the next chapter. ***Given the importance of MSA's as users of technical standards, it is of utmost importance that they have a significant role in the process of development of technical standards. Further discussion should take place on what this role should be and how they should be enabled to perform this role.***

It should be noted that Member States already approve mandates in the 98/34 committee (Committee on standards and technical regulations). It is not clear to which extent MSA's are involved in this approval process. Instead of a formal process where all MSA's spend time to approve the same mandate, it would be more efficient to find a way to work together and divide tasks.

5.4 Voluntary agreements

The Ecodesign Directive allows for voluntary agreements replacing product regulation, provided certain conditions are met. The requirements listed in Annex VIII of the Ecodesign Directive concern

- Openness of participation
- Added value
- Representativeness
- Quantified and staged objectives
- Involvement of civil society
- Monitoring and reporting:
- Cost-effectiveness of administering a self-regulatory initiative:
- Sustainability
- Incentive compatibility

In the case that these requirements are fulfilled the Ecodesign Directive (recital 18) mentions that the Voluntary agreements can be recognized by the Commission and preference should be given to VAs. Currently, two VA have been recognized by the European Commission: Complex Set-Top Boxes (CSTBs) and imaging equipment. The VA on CSTBs is not restricted to manufacturers, but other important market players such as service providers, component manufacturers and software providers can subscribe as well. This is an important feature of this VA, as software is a very influential factor in the energy consumption of a VA and service providers determine the software on the box.

In the online consultation views on the need and added value voluntary agreements diverge. Industry groups mostly would prefer to keep voluntary agreements as the default option, while manufacturers would like to keep the voluntary agreements, but not prioritised over mandatory regulations. Most consumer organisations would prefer to eliminate the voluntary agreement options. Other stakeholder holders groups are divided. Advantages that are emphasized are that VAs are likely to deliver the policy objectives faster and in less costly manner than the mandatory requirements. VAs tend to be proposed with complex products with fast technological development, so that the technology and market change will be reflected in the different version of VA. However, in practice, VA processes are not necessarily fast (e.g. they also require an impact assessment, inter-service consultation and a formal decision from the Commission) which also puts the cost efficiency into question. According to some stakeholders VAs are not fully in line with the requirements of Annex VIII of the Ecodesign Directive.

On the other hand, stakeholders emphasize that a major challenge of VAs in industry lies in the fact that they concern highly innovative and complex products requiring rapid changes in the VA results stakeholders complain about the difficulties in the process. Most of the cases stakeholders mention that there is a lack of transparency in VA process and VAs lack clear level of ambition, or that ambition is even very difficult to determine. This is a significant challenge in itself given that the uncertainty in rapid technological development contradicts with requirements for clarity and adequacy in policy objectives and VA preparation process. There is a lack of single harmonized set of rules for all VAs, particularly for auditing, monitoring and reporting processes, which has been recognized by the European Commission. The Commission had developed draft Guidelines for Voluntary Agreements, but to date these have not been finalised.

In brief, the flexibility of a VA is a benefit and a challenge at the same time. It provides the ability to follow technological developments more quickly. However, it also reduces transparency of the VA process for stakeholders. ***We conclude that voluntary agreements could be maintained as a policy option, but transparency in monitoring is a key factor to evaluate the validity of recognition of the VAs compared to implementation measures. It is therefore recommended to finalise Guidelines for Voluntary Agreements and update it when necessary, based on ongoing experience made with the VAs to date.***

5.5 Conclusions and recommendations

Process phases:

- The suggestion is made to enable the following of Consultation Forum meetings through internet. This would enable SMEs with low budgets and people further away from Brussels to follow the process more closely.

Planning:

- Recommendation: to establish joint working plans under the Ecodesign and Energy Labelling Directives, and consider planning of other policies in the process.
- In order to gain more control on the planning of the regulation process yet to keep some flexibility in it, it is recommended that the Commissions devises a planning of the regulation process, with a target date for publication, during the final stages of the preparatory study. At that time more is known about the technical complexity and the contentiousness of the product. Capacity within the Commission to meet the planning should be secured. Such a planning should also make clear until when or during which periods stakeholder comments can be received.

Resources quantiy and quality:

- With recommendations made to pay more attention to obtaining good quality data and pay more careful attention to the interaction with other EU policies, more resources for a preparatory study may be necessary.
- It is recommended to prepare Guidelines for the preparation of ED and ELD measures, to give clarity to all stakeholders on the process and to lay down learning that has been done in the process. In addition, it is advised to create harmonised feedback forms for consultations.

Data collection:

- In order to prevent problems in the later phases of the regulation process, it is recommended to build in an evaluation step after tasks 1 – 4 of a preparatory study to assess whether the data

gathered is of sufficient quality to continue the study, perform the required analyses, and in the end formulate robust conclusions.

- In order to avoid that a lack of good quality data during the preparatory study slows down the remainder of the regulatory process , it is recommended to build in the possibility to add an extra phase of data gathering to the process, using screening analysis and engineering analysis.
- It is recommended to establish a registration database with Ecodesign and Energy Labelling product specification based on information requirements from existing legislation for all regulated products, and make it mandatory for manufacturers to supply the required information. Manufacturers are already required to publish information requirements, it should therefore be feasible for them to supply the information to a central database.

Ambition of measures:

- It is recommended to take into account the price (and efficiency) effects of technological learning in the Life Cycle cost analysis in a preparatory study, to take into account the time in between data recording and a regulation projected to enter into effect (±6 years).
- It is not recommended to consider moving beyond Least Life Cycle Cost toward the Break Even point in the process of setting Ecodesign requirements as a general principle. Improvements in the process and methodology should be sufficient to come to a consistent, sufficiently high ambition level for all product groups. Nonetheless, for product groups that do not show a clear correlation between price and efficiency other guiding principles may be necessary (e.g. equal or lower LCC, taking into account affordability and banning a significant market share over time).
- It is recommended to make better use of benchmarks. This could be done in 2 ways: (1) By defining a Tier 3 in the first regulation process of a new product group, setting standards for the longer term. For example, this could be considered for product groups that have shown continued incremental efficiency progress and price decline over time in the past. Care will need to be taken that life cycle costs for consumers are not expected to increase through this Tier 3. (2) Have the BAT be a starting point for the revision process. This may be the preferred option for product groups for which technological progress is less predictable.
- When setting energy labelling classes, the value for adding empty classes should be considered for two reasons. Firstly, it will stimulate industry to develop products for the top class and thereby improve effectiveness. Secondly, it will enhance the lifespan of a label, once introduced, thereby reducing the need for frequent rescaling / revision and increasing efficiency. Empty classes should be set based on BNAT, if known, or based on own analysis if not known. Again, arguments pro and con should be examined on a product by product basis.
- It is concluded that there are valid arguments to be made for basing requirements on a balanced mix of energy consumption and energy efficiency. Guiding principles on how to do this, based on physical principles as well as consumer understanding aspects for ELD, should be developed. The revision of measures of some white good appliances (washing machines, refrigerators) could be a starting point.

Regulating non-energy aspects:

- For future new products it would make sense to have preparatory study pay more attention to non-energy aspects (as discussed in Ch3). If these aspects do not get regulated in one go, it should at least be considered to define general information requirements in the area and to define benchmarks on those aspects.

Standardisation:

- In order to avoid the stalling of the preparatory study process due to lack of standards and data based on these standards, it is recommended to perform a pre-screening of existence of standards for newly to be regulated products as early as possible (by the time the Working Plan is published).
- Given the importance of MSA's as users of technical standards, it is of utmost importance that they have a role in the process of development of technical standards. They should at least be involved in approving mandates as well as designing and approving standards and be enabled to perform this role.

Voluntary Agreements:

- Voluntary Agreements can be maintained as a policy option, but transparency in monitoring is a key factor to evaluate the validity of recognition of the VAs compared to implementation measures. It is therefore recommended to finalise Guidelines for Voluntary Agreements and update it when necessary, based on ongoing experience made with the VAs to date.

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6 Market surveillance

6.1 Activities and compliance

6.1.1 Infrastructure and capacities

There is a general agreement that the level of market surveillance is low (eg. ATLETE 2010 b, Come On Labels 2013, European Commission 2013, Rambaldi 2011, Waide et.al. 2011 but in general also by Product Safety and Market Surveillance Package Impact Assessment), and should be increased as it is economically beneficial for society not to lose energy due to noncompliance and also for the industries to ensure a level playing field. Currently, estimates are that some 0.6% of the market is surveyed, with some 20 – 30 models for some product categories being tested by some MSAs annually. Across the EU member states, five members are considered to have an active surveillance policy, six countries report no activity, and the rest of the countries report ´moderate to low´ level of market surveillance activity (EC, 2012). Based on individual surveys, some ten EU Member States claim to perform product testing, ranging from 1-5 products to 20-100 products being tested per year in some cases. It is estimated that some seven million Euro represent the annual EU Member State expenditure in this area, with a typical staff of 0.5 to 3-4 full time equivalent, but in many cases without clear monitoring and sharing of investments made, activities undertaken and results achieved. **The investments made are estimated to be some 0.05% of the value of lost energy savings** (Waide, et.al., 2011).

6.1.2 Compliance with Energy Labelling and Ecodesign

Overall, the information about product testing and results on compliance is fragmented. It is available only for some product types, only in some countries, or only as once-in-a-time type of activity. It is therefore not possible to conclude on a general level of non-compliance with the energy label and ecodesign requirements in the EU. Expert estimates (see Table 4 in Background report I: Literature review[54]) that are used most often mention 10 to 25% of product noncompliance and some 10% of energy being lost due to noncompliance, estimated to be equal to 100 TWh/yr of lost energy savings by 2020-30 (MarketWatch, 2012) and roughly 14 billion €/yr.

Most of the **product testing** evidence is available from Sweden, Denmark, UK, Netherlands, Spain, but testing is not in all cases conducted by the surveillance authority. Some of these publish individual surveillance reports as soon as they are ready. Currently, the Intelligent Energy Europe program is funding several projects that focus on testing products for label and ecodesign compliance (refrigerators, washing machines, light sources, electric motors, televisions, etc.).

Individual level of non-compliance ranged virtually between 0 to 100%, depending on the product categories, parameters tested and documentation reviewed, and the product selection methodology. Some experience showed high technical compliance of specific product groups, but generally lower compliance with the ecodesign information requirements. One project (Atlete), testing 82 refrigerating appliances,

[54] http://www.energylabelevaluation.eu/tmce/Literature_report_Energy_Labelling_Ecodesign_2013-12-18_Ecofys.pdf

concluded (ATLETE, 2011) that overall the tendency for compliant products was improving for models in higher price and energy efficiency class segments and for products specifying the exact country of origin. Product categories that appear to be tested most often include lamps, refrigerators, and some other white goods (Come On Labels, 2013 b, Fraunhofer, 2009). Only recently, with the Ecodesign product related legislations entering force, some product testing for Ecodesign took place as well, but individual surveys indicated that even fewer products are tested for Ecodesign compliance then for Energy Label compliance, and some authorities have no plans to perform Ecodesign related compliance checks (Come On Labels, 2013, Ecopliant 2013).

Concerning the level of proper label **display in shops**, more national market surveillance authorities are active, and at least two projects (in 2009 and 2013, with 1478 and 926 shops respectively (Come On Labels, 2013 b, Fraunhofer, 2009)) have undertaken a higher number of shop visits to monitor the presence of labels in shops. In general, some 20% of products are estimated to be offered for sale without the energy labels properly displayed. In addition, some 15% of products are estimated to have the label displayed in an un-sufficient way (e.g. wrong placement, retailer made label, label hidden or covered, etc.).
With regard to checking the presence and proper display of labels at the points of sales, up to 15 countries report the organization of shop visits to verify the proper label display (ATLETE 2010, ATLETE II, 2013b, Come On Labels 2013). Some shops are visited due to consumer complains, at least 8 countries typically visit 50 to 100 shops annually. Some average information on the overall compliance of label display is available, but often little activities are undertaken to increase the general level of compliance e.g. by training, negotiation with chain headquarters, etc.
Kitchen studios, furniture shops and general hypermarkets are considered among the shop types with generally the lowest level of proper label display. Furthermore, internet shops, whose market shares are increasing, often do not display some of the required information and not in the right order.
As for the product types, wine storage appliances, air-conditioners, and electric ovens have the lowest degree of proper label display – the situation with ovens being surprising, as many are sold by specialized stores and many are in energy class A. Also, televisions are partly missing energy labels, but the situation has been improving during 2012 to 2013.
It is also believed that the new energy labels – being distributed in one piece, have improved the level of label display in shops (easier logistics and display in shops), eliminating the frequent cases of "partial display" when only the colourful background (without the figures) or only the strip (with figures without a legend) of the "old" label were displayed on appliances. (Come On Labels, 2013).

Very little, and only anecdotal evidence is available on the compliance with the requirement to publish the energy class in all **advertisements** showing the price of the product, as well as with the availability of **fiches**, which should accompany the product to supply additional information to the consumers. Anecdotal experience shows, however, that product groups using labels for shorter time periods, tend to be marked with an energy class in catalogues and advertisements less often, then "classic white goods". Also, there is no available evidence of surveillance authorities systematically checking the presence of the fiche, which should "accompany the product" at the points of sale.

6.2 Enhanced Member State surveillance

6.2.1 Opportunities for national authorities

From the individual interviews with market surveillance representatives, as well as the literature review, position papers received, etc., a general agreement emerges suggesting that authorities have sufficient

rights and opportunities in enforcing energy labels. However, a number of issues has been raised indicating the main administrative, legal and organisational challenges and opportunities in this area. Improvement opportunities have been identified (e.g. by interviewed stakeholders, position papers, literature - ATLETE 2011, ATLETE II 2013, Come On Labels 2013, Ecopliant 2013) towards both the member states and the European commission, with the aim to achieve higher level of market surveillance and, consequently, lower levels of non-compliance:

Administrative and legal opportunities

- *Staff resources*: Lack of staff is presented as a consequence of the lack of financial resources, and different policy priorities. One main obstacle in this area is the growing amount of legislation, as expressed in several stakeholder interviews, related to a growing number of product types, in which very specific expertise is required, not capable to be handled by the limited number of staff in individual authorities. The general proposed solutions to this are to increase the staff and expert capacities on national level (supported also by some industry position papers), if realistic in more than a few EU countries, and to enhance the EU level cooperation, e.g. by sharing the plans and adapting results of activities of individual authorities in other countries.
- *Unclear formulations in legal texts*: In some specific cases, concerning both the technical performance of products, and the format of information to be provided to consumers and authorities, is not clear or can be interpreted in different ways. Several stakeholder (ATLETE II, 2013) therefore suggested to make sure that legal texts are written as clearly as possible, leaving little or no room for misinterpretation. Secondly, only relevant requirements should be included in the legislation, leaving no formal requirements being unchecked by the authorities due to "lower priority". Finally, a network of international cooperation facilities, listed in more detail in the sections below, should ensure a common understanding and sharing of such clarifications among the authorities and other stakeholders (including EC clarifications, ADCO level discussions, stakeholder consultations, common projects, etc.).
- *Minimum level of surveillance activities*: Given the fact that the majority of the EU member states is considered to have a "moderate to low" level of market surveillance activities, one of the suggestions made was to define a required level of surveillance activities to be performed nationally as the authorities have to ensure the legislation enforcement. The MSA Package (European Commission, 2013, d) regulation formulates a general obligation that "market surveillance authorities shall perform appropriate checks on the characteristics of products on an adequate scale and with adequate frequency, by means of a documentary check and, where necessary, a physical and laboratory check on the basis of an adequate sample." Also, publication of concluded surveillance results could be made mandatory. While some authorities (as interviewed) did not want to "be told" what type and level of activities they should perform, others (also based on MSA interviews) seem to appreciate the required minimum to be defined and monitored centrally. A possible compromise (not forcing authorities e.g. to introduce or increase the level of product testing but ensuring national impacts) could be to have EU level "concerted" projects, where information on models tested would include the list of countries where these are available and to ensure that the joint activities planned under the MSA Package include this. The full test results (up to a possible ban from the market) would need to be applied to all markets concerned enforced by national authorities.

  If a country, however, would not participate in such projects, the level of national market surveillance should be shared among authorities and with the EC, planned and announced in advance, and monitored ex-post in publicly accessible reports.

- *Foreign manufacturers and non-EU websites*: One specific obstacle for authorities (as raised in interviews) concerns the ability to contact foreign entities. This includes the identification of the manufacturer (in both the Ecodesign and Energy Labelling Directives), placing the products on the EU markets. Some authorities may not feel confident about contacting market players established in other countries, in which case the contact would have to be made through the respective national authority.
    - Similarly, more and more internet shops, offering regulated products to EU customers, may be based outside of the EU, making it even more difficult for authorities to reach them. Such cross-border communication with foreign manufacturers and internet shops, possibly through industry associations, should be exercised, possibly (by ORGALIME 2012) including campaigns to inform consumers that there is a risk if they buy products from non-EU/EEA based web sites, which do not indicate whether or not such products comply with EU legislation. The MSA Package (European Commission, 2013, d) highlights that "there must be effective market surveillance along the entire length of the Union´s external borders" and that "Market surveillance authorities shall provide the authorities in charge of external border controls with information on product categories in which a risk has been identified" and plans to facilitate the implementation of "Guidelines for import controls in the area of product safety and compliance".
- *Third party certification*: (TPC) is required in some other policies and indeed for labelling requirements in some other parts of the world, intended as a tool to ensure an independent evaluation of manufacturer claims on product´s efficiency and other performance declarations. A mixed list of reactions (e.g. during the second stakeholder meeting and also in position papers issued) have been received regarding the need for third party certification, ranging from strong support to negative reactions. The main recommendation (as supported by some position papers) in this case therefore is to keep this option open in principle and evaluate it individually for individual product groups, when new, product specific legislation would be prepared and analysed, or, possibly, when a too high level of noncompliance would be identified. While some stakeholders would strongly support a TPC scheme, e.g. three member states (via position papers or interviews), an environmental NGO, and a heating industry association, risks and drawbacks that might undermine a full functionality of the scheme would need to be minimized. Recommendations in this regard are to keep the TPC opportunity open for individual product groups, but to ensure that some possible negative consequences are avoided:
    - To ensure that Authorities can keep up a sufficient level of surveillance, instead of relying fully on third party certification,
    - To consider the additional costs for the system administration on the manufacturer's side (in comparison to self-declaration),
    - To ensure that results of third party certification are sufficiently robust, for example if provided by non EU bodies,
    - To establish a system of laboratories, clarifying who could issue such certificates, and who would verify the quality of laboratories´ work,
    - To properly select samples for testing, avoiding biased sampling or differences in production sometime after the laboratory testing.

Procedural opportunities

- *Different priorities*: More "urgent" tasks within surveillance, such as product and food safety, are usually prioritised. Similarly to the lack of financial resources, the calculations on societal benefits should be conducted, to realise the appropriate level of public spending in this area, including the benefit of ensuring equal conditions for industry members.
- *Future label updates*: From a market surveillance perspective it is recommended to keep the energy label sufficiently practical to enforce (as expressed in interviews with MSA as well as some industry position papers), and to ensure that all parameters displayed are measurable and verifiable by both supporting documentation and laboratory testing activities.
- *Model families*: A clear non-balance is observed by the fact that manufacturers use the same energy label or ecodesign declarations for a range of "product family" models – both nationally, and internationally. However, the authorities are obliged to verify each of the models individually (Attali et.al. 2009, CEECAP 2008b). In this respect the following best practice is summarised and recommended by the study authors. Firstly, make sure that authorities ask for the full range of model names for which the manufacturer uses a particular label and/or ecodesign declaration, both from the respective national markets, and EU wide. Secondly, make sure that the results are then applied to the whole "family" of nationally, and shared internationally (possibly within the databases, international projects and structures, suggested below). Thirdly, confirm that national suppliers and/or EU-level manufacturers are indeed obliged to share such product documentation, in proper form and content, with the authorities. The European Commission (2013), within its MSA Package, plans to "improve the product traceability and provide up-to-date guidance in this matter".
- *Simplification of procedures and facilitating compliance*: One important recommendation (CSES, 2012), despite not mentioned often in the literature, is to negotiate the results of activities with the headquarters of the manufacturer or the supplier chain, asking to undertake remedy actions on a larger scale – for the family of products, for all shops involved, or internationally. Manufacturer associations (eg. ORGALIME 2012, ELC and CELMA 2011, CECED 2012, EPEE 2012, EHI position paper) are asking to be involved in surveillance activities, to provide intelligence, and could be asked to share results of negotiations, if applicable to more members.
    - The MSA Package (European Commission, 2013, d) asks that authorities "shall cooperate with economic operators to prevent or reduce risks caused by products made available by those operators. For this purpose, they shall encourage and promote voluntary action by economic operators including, where applicable, through the development of and adherence to codes of good practice.
    - An example concerning *shop visit* activities would include contact being made to a large retail head offices, trade associations and buying groups, encouraging the requirement to comply and stressing the likelihood of premise inspections to confirm compliance, followed by improvement notices when severe levels of missing labels are identified, including repeating shop visits.
    - *Unified legislation requirements*: for any future product groups to be included in the Energy Label and Ecodesign legislations, or the future legislation revisions, the market surveillance procedures should be considered to be identical, in order to be as much as possible able to verify product compliance with both set of requirements. Currently the conformity assessment procedures are not described the same way in both Directives. Even though the differences are not understood (by stakeholders interviewed) to be significant in terms of the

surveillance mechanisms and stakeholders did not raise that *specific* difference as a point of concern, the unification will contribute to further clarity.

- *Furthermore and more generally,* some stakeholders interviewed feel that the conformity assessment procedures for individual products under Ecodesign are too difficult to understand, because the annexes are very complicated and the provisions are scattered across different parts of the legislation (framework directive, annexes, implementing measures...). RoHS Art.7 is cited as a positive example of how to make requirements clear. This of course also relates to the currently negotiated Market Surveillance Package, where the details of market surveillance procedures shall also relate to Energy Label and Ecodesign legislations. Several industry groups, e.g. position papers of ORGALIME, VDMA, Federation of Finnish Technology Industries asked that the Package also applies to the Energy Label and Ecodesign legislations.

- *Involvement of MSAs in rulemaking processes and standardization:* to ensure that market surveillance authorities are fully capable of performing their duties for individual product groups and contribute to minimizing noncompliance, it is recommended by the study authors to ensure that market surveillance authorities have more capacity to participate in:
  - the *preparation of legislation* processes on EU or national level for individual product groups, to reflect experience on market surveillance activities,
  - the preparation of standards, as more complex standards make surveillance more complicated and costly, resulting in less compliance verification being performed, and
  - the development and circulation of product guidance to inform stakeholders and suppliers on (new) product specific regulations and to educate them on proper declarations, documentation, display and information provision, etc.

  While it is not expectable that all 28 Member State MSAs would participate to all standards preparation, etc., but a coordination of participation, resource allocation and continuous sharing of the processes and content related issues would be highly beneficial.

6.2.2 Opportunities for test laboratories

Product testing is the formal precondition for any decision of the technical compliance / non-compliance of a product. Several concerns have been raised within the interviews concerning the accuracy, effectiveness and reliability of information to be obtained from product tests, and it has been acknowledged that it is not possible for each EU member state to have laboratories capable of testing each product group covered by the legislation.

The lack of domestic laboratories capable to undertake testing of specific product groups is a very common argument (e.g. in surveys undertaken by ATLETE or Come On Labels projects) explaining the non-existence of surveillance tests for many product categories in many countries. It is, however, not practical and useful to have (accredited, high quality) laboratories for all product groups concerned in all EU Member States. Instead, four processes need to be ensured: 1) the use services of foreign laboratories by national authorities, despite possibly increased complexity of tendering process; 2) the acceptance of test results from foreign laboratories, if sufficiently presented by other surveillance authority, and 3) the ban of product across all EU Member States if it has been prohibited in one country, without further testing being needed; 4) consider to work with the equivalent model names of technically identical products on international level, enabling foreign laboratories to procure models from their own country, saving costs on travel logistics.

Consequently, the following points need to be considered to further increase efficient surveillance, and to ensure that a larger sample of the market is surveyed.

- *Selection of laboratories*: authorities should be able to use foreign laboratories. Some authorities have already done so (Come On Labels, 2013, interviews), but more could be done here so that authorities would be able to cover the full range of products for which market surveillance is required. Literature (Ecopliant 2013) claim that barriers to use foreign laboratories have not been specified in a number of countries and therefore the usage of foreign laboratories could improve quality and quantity of tests, enabling countries without specific laboratories to test products abroad. This does require, as specified in interviews, good tendering procedures, including communication in other languages.
    - The MSA Package (European Commission, 2013, d) notes that "where appropriate, reference laboratories should be established with a view to providing expert, impartial technical advice and conducting tests on products required in relation to market surveillance activities."
    - The reference laboratories could have the tasks of carrying product testing in relation to market surveillance activities and investigations, contribute to resolution of disputes, or providing independent technical or scientific advice.
- *Partial verification*: some compliance testing involves only selected parameters being tested, probably considered as more important or "visible". This could mean, if other parameters have much lower probability of being tested, that these could also have higher chance of noncompliance (ATLETE, 2011). Attention needs to be paid to this, e.g. at least within international level projects.
- *Recovering costs of testing*: since "investment costs" for market surveillance such as product testing are seen as one of the important barriers, several options are suggested (by individual stakeholders as summarised by the study authors) to ensure this barrier is limited as much as possible:
    - Ability to use test results from other MSAs, minimising the need for own testing
    - Ability to use foreign laboratories, organising tenders involving more laboratories to compete
    - Recover costs of tests from the manufacturers, if products are proven to be noncompliant. The MSA Package (European Commission, 2013, d) specifies that "Market surveillance should be financed at least in part by fees charged to economic operators where they are required by market surveillance authorities to take corrective action or where those authorities are obliged to take action themselves", and that "Market surveillance authorities may charge fees on economic operators which wholly or partly cover the costs of their activities, including testing carried out for the risk assessment".
    - Share cost of tests e.g. among authorities, within European projects, or possibly even with industry associations, in case the full independence e.g. in model selection is ensured
    - If the level of surveillance activities would be still considered insufficient, consider the introduction of a general funding mechanism involving manufacturers, reflecting the manufacturer obligations introduced and defined by the WEEE Directive.
- *Cooperation among laboratories*: there is a need to ensure that one model tested in several laboratories would be evaluated in the same way – based on the same set of information provided, based on the same set of measurements. The following steps can contribute to this:
    - *Templates for test reports:* evaluation of product test reports, if coming from different laboratories for a number of products, can have obstacles due to different formats of test

reports used by different laboratories. Some EU level projects (e.g. ATLETE and ATLETE II) have therefore developed templates for reports to be obtained from different laboratories, where the prescribed set of information to be given helps achieving common ground for compliance related decisions. Industry appreciates templates (AMDEA 2010) but also requires sufficient details in legislation (Rambaldi 2011).

- *Rounding of measurement figures*: as an example of a possible source of uncertainty in decision making, the same measurement result declared with one of two decimal places and rounded, if the measurement is close to the threshold of specific requirement, can give different results concerning product compliance, e.g, on energy class declaration. Therefore rounding rules have to be more specifically specified, not only for the declarations but also for calculations (ATLETE, 2011).

- *Round robin tests and communication meetings*: several projects testing products, where laboratories have been testing the same product categories in parallel (ATLETE, ATLETE II, ComplianTV, Ecopliant), have demonstrated that the communication among laboratories, e.g. on the format of test reports, or understanding of certain standard measurement requirements, can give positive results in achieving fully comparable results. In addition, organisation of round robin tests can further increase the overall quality of testing for specific product groups. Round robin testing is important as accreditation done by national institutions is sometimes not considered as a sufficient guarantee of quality testing.

6.3 A product database to support surveillance

Product databases are a very practical way of monitoring product specific surveillance activities undertaken by individual authorities. Most stakeholders acknowledged the need for the surveillance database to be available and running (Ecopliant 2013, EPEE b, MSC 2012, ORGALIME 2012), by the relevant literature (CSES 2012, CLASP 2011, IEA 2010, ATLETE 2010, Olesen 2013), as well as by two member state representatives interviewed, an environmental NGO, and a (heating) industry association´s position papers. In addition, over one half of the questionnaire survey respondents would consider such database as very effective or effective, mainly the environmental interest groups, but also the government and surveillance bodies and energy agencies and also one quarter of industry interest groups which have responded to this question.

Such database should serve as a tool for the authorities to be able to track models surveyed in other countries and share all the relevant documentation, decisions, etc. Over one half of the questionnaire survey respondents would consider such database as very effective or effective, mainly the environmental interest groups, but also the government and surveillance bodies and energy agencies and also one quarter of industry interest groups which have responded to this question. However, several obstacles and improvement opportunities have been identified and summarised by the study authors as well:

- *Legal requirement to use the database*: Clear instructions are needed, and supported by MSA stakeholders interviewed,whether, when, how, and which database should be used for the energy label and ecodesign compliance activities.
    - *The MSA Package regulation proposal (European Commission, 2013,d) notes that the ICSMS information and communication system, to be maintained by the EC, shall collect information also on "any non-compliance within Union harmonisation legislation other then measures or corrective action notified under RAPEX".. and that Member States shall enter into ICSMS any information at their disposal… about identification of risks, results of testing carried out, restrictive measures taken, contacts with the economic operators concerned and justification of action or inaction".*
        - *It has to be stated, however, that the Ecopliant (2013) project team has decided to develop its own database: the Ecopliant project is "developing an online information repository that will allow Ecodesign MSAs upload and search testing plans and communicate their results with each other. A tailor-made database, designed for use by all MSA's, will assist in developing a responsive framework for ecodesign market surveillance", noting that "ICSMS was reviewed for its suitability but was deemed to be more geared towards safety-based directives and its use in the Ecopliant project was limited in that it only holds information on products which have been found to be non-compliant (excludes products inspected or tested which were found to be compliant) and cannot facilitate coordination or sharing of activities between Member States. Also, as the Ecopliant database will contain classified and / or commercially sensitive information on testing plans of Member States and details of live enforcement cases, access must be restricted to EEA Ecodesign MSA's only."*
        - *The Commission (2013) plans the ICSMS to be "developed further to collect, store and exchange information and best practices among all the actors directly concerned. This will include eventually the publication of test results, results of joint actions, guidelines and guidance for training of market surveillance authorities, case studies, statistics and overall information on market surveillance of products."*
- *Cover all surveyed products*: the database should contain also list of products surveyed and found fully compliant in order to allow other authorities to avoid duplicities in their work.
- *Database to be well designed and user friendly*: the database should be professionally elaborated and user-friendly designed. For the authorities it should be easy to work with it, upload data and search for evidence concerning other products.
- *Appropriate usage,* e.g. no blocking of product posing risks to consumers. As some stakeholders interviewed raised a confusion on which database to use and a need to avoid priority conflicts with products surveyed for safety reasons, the organisation of the database should be made clear so that products posing a risk to the consumer should be highlighted and prioritised, or monitored separately.
- *To contain full product family names*: the products surveyed should automatically contain (based on authority request to the manufacturer) the list of the "family" model names, so that the results of compliance check would be adaptable to all models using the same manufacturer´s label or ecodesign declarations. This implies both to the national and international equivalent model names.

- *Clear content - Technical documentation to be available:* a specific part of the information available could be the technical documentation provided by the manufacturer / supplier, enabling other authorities to work with it for the models concerning their own national markets. If, as suggested in Chapter 5, a product registration database would be established, this could automatically contain the technical documentation, streamlining the surveillance activities on national and international level.
- *Public vs. restricted use:* Parts of the database could be decided to be publicly available, containing evidence on the number of product checks (e.g. per country, product category) and containing brief summary about the closed cases, and the other parts being protected only for the purpose of being used by the surveillance authorities.

Note that a product database is also discussed in Chapter 5, where it concerns the full product registration. While here the product database is intended to be adapted with the models surveyed for compliance reasons only, this could be, in case a product registration is introduced, interlinked in order to ensure that all technically identical models found noncompliant could be detected.

6.4 Enhanced Member State cooperation

Based on the information available, i.e. stakeholders viewpoints and suggestions, numerous activities have been identified as examples of key opportunities in increasing the impact of market surveillance, without increasing significantly the resources used for enforcement authorities on national level. The basic precondition is to make sure that the level of market surveillance is improved across the EU, not only in selected countries.

On the general level, one main recommendation is to ensure that the Market Surveillance Package, adopted by the EC and currently discussed in the European Parliament and in the Council, will be fully applicable to Energy Label and Ecodesign areas as well, as it defines in more detail specific surveillance procedures – with the specific surveillance provisions in the Energy Label and Ecodesign legislations naturally taking a precedence. Several industry associations (position papers of ORGALIME, VDMA, FFTI), noting the lack of market surveillance in energy efficiency field, have supported the full application of this new legislation also in this field.

The new Market Surveillance Regulation (European Commission, 2013, d) plans to get rid of overlaps, close gaps, … and assimilate as far as possible the rules and procedures applicable to all products. This will result in a more even application of market surveillance rules across the Member States, providing better protection for consumers and other users, more uniform trading conditions for economic operators, reduced administrative burdens and enhanced information- and work-sharing between market surveillance authorities.

More in particular, improved EU cooperation could consist of three elements, discussed in dedicated sections below.

While products fulfilling EU legislation can be distributed around the EU within the free market, market surveillance is a national activity of individual authorities. Efforts should be made to ensure that a product identified as non-compliant on a specific national market should be dealt with across the EU (as discussed at the 2nd stakeholder meeting and voiced by environmental NGOs). The following steps need to be taken to achieve this:

- *Frequent information exchange:* according to the Energy Labelling Directive, "in case of a withdrawal of the product from the market or prohibition on placing the product on the market, the Commission and the other Member States shall be immediately informed". The information exchange among the authorities and the Commission shall be regular and include not only the closed cases of noncompliance, but also sharing the plans and overall results of each other´s market surveillance. Some stakeholders, e.g. environmental NGOs, have suggested annual reports to be developed and shared.
    - One of the critical reactions from economic operators has been about the number of market surveillance authorities around the EU and even within individual countries and the fact that is not always straightforward to identify the appropriate authority. The MSA Package (European Commission, 2013, d) therefore specifies that "Each Member State shall inform the Commission about its market surveillance authorities and their areas of competence, providing the necessary contact details, and the Commission shall transmit this information to the other Member States and publish a list of market surveillance authorities."
    - The annual plans, as planned within the MSA Package (2013), should ensure "the pooling of resources wherever possible helps eliminate the duplication of tasks and facilitates exchanges of experience and information."
- *Adopting results from other countries*: Member States should identify and streamline opportunities to adapt results of surveillance from other countries. Research (e.g. by the Ecopliant project) shows that only in a few cases the use of foreign data for enforcement actions may be complicated by the legal system. Most countries indicate that there are no direct barriers in their legal system to use foreign information. However, on the other hand, there are also no points that facilitate the use of such foreign data. If the information meets requirements e.g. the foreign data are coming from an accredited laboratory and there is a good support from the country from where the data originate, no fundamental problems seem to prohibit the use of these data in an enforcement action. Countries that have data that are appropriate to use for an enforcement action against a manufacturer in another country, should give these to the authority in that country to stimulate enforcement abroad. (sharing results being also supported by NGOs (Arditi, Toulouse 2012) and stakeholders (ORGALIME 2012) and by ATLETE II (2013 b) and performed by the ATLETE II project, other examples by Presutto 2013b).

  It should be also noted that the Market Surveillance Package (European Commission, 2013, d) highlights that in the case of products which are subject to sector-specific Union harmonisation legislation, in the event of disagreement among Member States about action taken by one of their number, the (MSA Package) proposal would empower the Commission to decide whether the measures taken by the original notifying Member State are reasonable, necessary and proportionate and should be followed by all Member States in the interests of the single market. In this way, the market surveillance process may be brought to a definite close.

  The MSA Package regulation proposal also stipulates that if individual members do not object to measures taken by other authorities and when the Commission does not consider that the national measures are contrary to Union legislation, "the measures taken by the original notifying Member State shall be deemed justified and each Member State shall ensure that restrictive measures are taken without delay in respect of the product concerned."
- *Harmonizing penalties*: the size of penalties among countries varies substantially, and so does the methodology of determining its size, from the size of the company to the amount of energy lost. The MSA Package proposal (European Commission, 2013, d) states that Member States shall

notify the provisions on penalties to the Commission, including any amendments, and shall have regard to the size of the undertakings, and be possibly increased if the relevant economic operator has previously committed a similar infringement. The recommendation made by industry groups (CECED, DIGITALEUROPE, ORGALIME, TechAmerica Europe 2013) is not to define the penalty by the size of the company or its general turnover, but by the seriousness of the infringement, possibly, as other stakeholders put it, by the turnover of the specific product at stake, or the energy lost due to the sale of non-compliant product.

  - *Publishing*: some argue (position papers) that the size of penalties differs and is symbolic in some countries, and not prohibitive to larger companies. Some stakeholders interviewed (and Waide, 2013) therefore argue that the result of compliance activities should be made public, as a threat of being published with a non-compliant product is a larger threat to the manufacturers and suppliers. Some authorities publish results of selected closed cases, others don't as they are prohibited to do so by national regulations, or for the fear of damaging the goodwill of the company concerned. Further legal analysis could be made on the form of penalties, in particular concerning the definition of its size, and if, when and what form they could be made public, at least in aggregated format.

- *Technical documentation:* The need to make the technical documentation for individual products more accessible and easily identifiable by authority, in case of requests to the suppliers. Despite the ED and ELD legislation requires the technical documentation to be stored for 10 years and made available within 10 days of receipt of a request, experience indicated (e.g. Ecopliant project reports) that content and format of the documentation submitted may require further clarifications and improvements. It has to be therefore ensured that the suppliers / manufacturers would provide the right technical documentation, e.g. concerning the respective models which the authority asked about, containing all prescribed set of information, listing the "family" model names relevant nationally and EU-wide, and being available in language understandable to the authority, possibly English in general.
- *ADCO and MSA Forum:* Member States shall ensure to be properly represented at the ADCO Energy Labelling and Ecodesign groups, as the ideal opportunity to learn from each other activities, discuss any areas of uncertainty and benefit from common activities. The EC, as planned in general in the MSA Package, and the Member States would need to support countries understaffed and facing lack of resources, to participate actively to these meetings – e.g. not only a formal participation but with a clear motivation to define a minimum level of domestic activities and adapt results of foreign compliance checks. Specific recommendations expressed in interviews and summarised by the study authors of the increased effectiveness of ADCO work include:
  - *Frequency*: while ADCO meetings take place twice a year, the need for specific negotiations and discussions may arise more often to avoid keeping authorities from specific action. A consideration could be e.g. to make the meetings more frequent (while ensuring a high degree of participation), or continue the consultation process in electronic or other forms between the meetings.
  - *Involvement of other stakeholders*: relevant market actors, such as manufacturer´s and retailer associations, consumer´s and environmental NGOs, could be included in ADCO discussions during separate meetings, organised before or after the surveillance authority meetings, so that a general understanding of specific topics would be ensured.

- *Accessible conclusions*: it is important that individual conclusions or recommendations made within the ADCO meetings are also accessible to other authorities and individuals not participating in specific meetings, so that they may benefit from this intelligence.
- *Full participation*: it is important that as many authorities are actively represented to these meetings as possible, increasing a high level of cooperation among authorities.
- *EC contribution*: while all of the points above concern national authorities, these may have problems in inviting other agencies or ensuring the logistics and infrastructure for the meetings. The EC could be actively involved by supporting authority participation, providing conference rooms and administrative infrastructure, cooperating on the involvement of other stakeholders, providing clarifications on legal issues and a monitoring of such decisions or agreements, etc. – as planned in general within the MSA Package, but ensuring such services also within the ED and ELD legislation related activities.

- *Concerted projects:* An option for increasing the level of market surveillance, with an impact to numerous EU countries, are international projects. Since 2009, several projects within Intelligent Energy Europe programme have been supported, focusing on both Energy Label and Ecodesign legislations, and investigating detailed surveillance challenges and opportunities for numerous product groups. These projects have however only started based on an individual initiative of several active organisations, not even always the authorities, and have been a subject to approval by the programme evaluators. The study authors, supported by several interviews, therefore recommend that a higher level of international projects, more similar to the "Concerted actions" framework (joint enforcement activities) should be launched (see also the last point in the following chapter), to establish regular framework and increase capacities, featuring the following specific characteristics:
  - Be organized on a regular basis and involving all or majority of the EU member states
  - Ensure surveillance activities would lead to full adaption of results in all participating countries, including up to potential ban of products in case of specific noncompliance
  - Procedures, results and databases of models concerned would be all made public

6.5 A larger role for EU bodies

An (increased) role of the European Commission or bodies appointed by the EC in market surveillance is central, highly important, and widely appreciated by the stakeholders expressing their views on the market surveillance topic.

The role of the EC, as expressed by most of the stakeholders interviewed, in the public survey and the position papers, could be defined as: *ensuring infrastructure and platform for communication and cooperation, ensuring synergies in activities among authorities and other stakeholders, enabling capacity building and ensuring cooperation, providing funding to projects or programmes, facilitating individual requirements and experience, developing and providing systematic explanatory notes to individual technological or specific questions*.

This is in line with the planed role for the Union within the new market surveillance legislation (European Commission, 2013, d), specifying that "the Union should contribute to the financing of activities required to implement policies in the field of market surveillance such as the drawing-up and updating of guidelines, preliminary or ancillary activities in connection with the implementation of Union legislation and programmes of technical assistance and cooperation with third countries as well as the enhancement of policies at Union and international level." It also says that "in order to ensure uniform conditions for the implementation of this Regulation, **implementing powers should be conferred on the Commission as regards national measures taken** and notified by a Member State in relation to products subject to Union harmonisation legislation…"

There is limited outspoken demand from stakeholders to establish a formal EU-level authority or to instruct individual authorities formally to perform specific activities nationally. However, some stakeholders, speaking individually, could accept such role for the EC, but little formal support for this could be found in formal position statements on behalf of relevant stakeholders. Despite that, around half of the project´s questionnaire survey respondents consider such an authority to be very effective or effective, including industry representatives. Smaller groups of respondents would consider it was not very effective or not effective at all or did not know the answer.

Specific examples of activities undertaken directly by or with the strong role of the EC (either through a dedicated agency, e.g. the Market Surveillance Secretariat, or by existing institutions) could therefore include:

- *Providing lists of FAQs, templates and guidelines*: Numerous clarifications of specific legal requirements are needed, where the Commission is asked for explanation and guidance. Such clarifications could be stored and monitored in a searchable format (possibly within the surveillance database platform). The EC could thereby ensure both the legal explanations of the unclear legal texts, and at the same time ensure that they are available to all stakeholders in a user friendly way. To include the elaboration and provision of templates and guidelines for documents of central importance and usability, shared in the future possibly within the to-be-established European Market Surveillance Forum.
- *MSA Package*: With the new Market Surveillance Package being developed concerning all market surveillance areas of work, the place of Energy Labelling and Ecodesign here should be clarified and defined, as the "Product Safety and Market Surveillance Package" Regulation proposal (European Commission, 2013, d) mainly refers to product risks and safety, lacking specific links to and definitions of Ecodesign and Energy Label possible types of non-compliances (e.g. how much a product non-compliant to specific energy efficiency parameter poses a risk to the society – even though a plan to update a general risk assessment methodology was announced). In principle, if the MSA Package and its proposed Secretariat, are to bring clarity, unified approach, more effective processes, and better support, this would all be highly appreciated also within the Energy Labelling and Ecodesign area. Some stakeholders generally support the higher role of the EU in the coordination, ensuring increased level, benchmarking and quality of compliance verification done nationally, as well as some coordination activities. The EC therefore should make sure to fulfil the Market Surveillance Package´ plans to ensure improved cooperation between the MSAs and to:
  - Ensure improvement of the data collection
  - Establish organisational assistance (Secretariat to the MS Forum)
  - Provide financial support to joint enforcement activities
  - Speed up work to improve product traceability.

It needs to be ensured that these general surveillance goals are fully applied to the area of energy labelling and ecodesign.

- *Annual report on market surveillance:* The level of product testing, product categories covered, and compliance rates identified by individual Member States could become available as a result of the Energy Labelling Directive, which in Article 3(3) stipulates that "*Every four years, the Member States shall submit a report to the Commission including details about their enforcement activities and the level of compliance in their territory."* According to this Article, the Commission "may specify the details of the common content of these reports, and shall regularly provide a synthesis of these reports to the European Parliament and the Council for information. The role of the EC therefore could be in conducting and publishing the annual report, revealing the level of surveillance activities and market noncompliance. Within the Market Surveillance Package (European Commission, 2013), the Commission also plans to collect data on the results of the border controls from 2013 and publish an annual report from 2015.
- *Database and noncompliance registration:* the EC could be key in enabling the compliance database to be running, widely used by authorities and serving as reference tool to the level of individual models and their documentation, including the registry of all models found noncompliant, including the remedy or other action involved.
- *ADCO support*: similarly to the MSA Package, the support to ADCO energy labelling and ecodesign groups would be appreciated. Both in terms of organisation (logistics, travel support, administration or the meetings organisation, administrative secretariat, support to involvement of other stakeholders), and in terms of the content (explanations of legal requirements, searchable format of decisions and agreements made) – in the future possibly under the newly considered European Market Surveillance Forum, but ensuring sufficient capacity to ED and ELD related legislations.
- *Coordination and contacts:* The EC could also help in putting together appropriate contacts for specific surveillance areas. Some member states have different authority for the energy label and for ecodesign directives, and some have regional authorities. There are a number of contact points around the EU for similar tasks, where a central database of up-to-date contacts is appreciated. Similarly, another suggestions proposes to collect and update the list of laboratories capable of performing product testing for individual product groups.
- *Funding relevant programmes:* Last but not least, the role of EC should continue to be supporting specific projects – joint enforcement activities, to enable authorities and other stakeholders to perform and contribute to market surveillance. These programmes should include mainly the Authorities, to be able to help them to benefit from the international cooperation – possibly and probably under the newly considered European Market Surveillance Forum, which has a task to "organise joint market surveillance and joint testing projects" with the main objective to "enhance the efficiency and effectiveness of the surveillance system in Europe, as well as to improve the coordination of the practical enforcement work carried out.." (European Commission, 2013). , but also other stakeholders, to enable them to implement specific legal requirements. These programmes should be regular and covering wide range of products regulated, not only involving individual product testing, but mainly enabling to adapt the results and methodologies on an international level. Participation of all or the majority of EU Member states should be sought for. Such programmes could also support MSA participation in the standardisation processes, making sure that standards would fully support MSAs in enforcing individual product requirements.

6.6 Conclusions and recommendations

Overall recommendations compiled by the study authors to improve the effectiveness of market surveillance and reduce non-compliance regarding ED and ELD legislations include the following main areas and points:

1. *Resources:* make sure funding and expert capacities for market surveillance is not severely limited causing financial losses and environmental constraints to consumers and society. Find options to ensure market surveillance receives the necessary priority and funding to prevent energy losses due to noncompliance.
    - Conduct calculations, on national or EU level and based on standardized methodology, on societal benefits of market surveillance and avoiding energy loss due to noncompliance of products with the energy label and ecodesign regulations. Make sure national level policy and decision makers are aware of the societal benefits of market surveillance.
    - Concerted projects – ensure organization of joint / concerted EU projects, with the participation of all or a majority of Member States, resulting in the application of surveillance results to all relevant countries. Non-participating countries could be obliged to at least publish their specific surveillance results achieved.
    - Consider the definition of a minimum level of national market surveillance activities (especially in case of nonparticipation to the above mentioned types of projects), specify annual or periodic plans and reports on activities, and publish results of closed verification cases.
    - If funding within European projects or by national government would not be sufficient to ensure compliance, and if test cost recovery for noncompliant products from respective manufacturers would turn out as not sufficient, consider general funding mechanisms considering manufacturer obligations as defined in the WEEE Directive.

2. *Definition of national market surveillance:* Ensure market surveillance on national level has clear rules and precisely planned outcomes and strategies, with a defined and published minimum level of activities to be performed and monitored.
    - Streamline the compliance procedures, with possible simplification efforts – e.g. try to negotiate and adapt remedy actions after Step 1 (1 unit tested) with the manufacturer, if a specific noncompliance is suspected by the Authority.
    - Laboratories – make sure that foreign laboratories can be used by national MSAs, and that the reports from laboratories are either standardised or templated to contain all relevant, and directly comparable information.
    - Penalties – ensure the level and form of penalties are indeed dissuasive, possibly reflecting the amount of total value of energy lost due to noncompliance, and also including the publishing of closed cases of noncompliance, concerning both product testing and shop visits.
    - Third party certification - keep the option open for individual product groups, to be evaluated in individual product related legislation processes.

3. *Member State cooperation and EU support*: support as much as possible cooperation on European level to ensure synergies from individual activities, in terms of sharing the plans and adapting results.
    - Enhance EU level cooperation – share plans, share results, and adapt the results among individual countries.

- Ensure the Market Surveillance Package is fully applicable to the Energy Label and Ecodesign legislations.
- Make as much effort as possible that products identified as noncompliant on some national markets are also removed from other EU Member State markets, where they are available and define requirements to be able to compare and adapt results of tests between individual MSAs.
- ADCO Energy Label and Ecodesign groups – ensure the high level participation of individual authorities, and implement possibility to search negotiation results achieved, and to share individual conclusions with other relevant stakeholders.
- Product names and identification – streamline the identification of product families and equivalent models, to be able to adapt results of specific compliance checks to all equivalent products, nationally and on EU level.
- Practice the ability to contact the EU level manufacturers by individual MSAs, if their headquarter is in a different country, or work closely with the respective MSA.
- Product database – make sure individual cases of products surveyed are listed in EU wide database, to be well formatted, helping to identify equivalent models and technical documentation. If a general registration database is implemented, make sure the surveillance parameters are included in it.

4. *Enforceable requirements*: When preparing new legislation or revising existing one for some of the product groups concerned, concerning both the Energy Label and Ecodesign Directives, make sure that market surveillance and enforceability is fully reflected in the new requirements specified.
   - Clear legislation – make sure that the formulation of legal text, including the official translations, leaves little room for misinterpretation and that it contains relevant requirements, which are of consumer interest and will be enforced by Authorities.
   - New energy labels and ecodesign requirements – make sure that all (new) parameters required to be displayed or documented are reasonably practical to measure and verify for Authorities and possible to enforce.

6.7 References

The references presented below are additional to the many references used for the Literature Review.

- ATLETE II, 2013, c, Presentations from the International Advisory Group meeting, 27.11.2013 Vienna, http://www.atlete.eu/2/project-resources/category/5-meetings-with-target-groups#
- Ecopliant, 2013, Work Package 2: Overcoming Barriers and Establishing Best Practices - D2.2 Draft Best Practice Guidelines, http://www.ecopliant.eu/wp-content/uploads/2013/10/Draft-Best-Practice-Guidelines.pdf
- European Commission, 13.2.2013, d, Product Safety and Market Surveillance Package –A proposal for a regulation on market surveillance of products…, Brussels, COM(2013) 75 final, http://ec.europa.eu/consumers/safety/psmsp/docs/psmsp-surveillance_en.pdf

7 Market effects

7.1 Markets and product choice

The Energy Labelling and Ecodesign Directives together apply to many billions of products that are sold in the EU each year and markets whose total value can be measured in tens of billions of euros. There is no discernible impact of Energy Labelling and Ecodesign on overall *market size* as changes in market size and import-export positions are driven by much more powerful economic forces, such as the financial crisis.

Evidence of the impact of ELD/ED on *market structure* is unclear. On the issue of market concentration there is a mix of opinion on the impact of the regulations, with suggestions they lead to both dilution and concentration. Analysis in 2012 by DG SANCO and ENTR[55] found that for electrical and electronic appliances there was evidence of slowly increasing market concentration in these markets, as much at regional or national level, than EU level. It is difficult to analyse more precisely given the data limitations and short time for which many measures, particularly Ecodesign, have actually been active. One finding was that more concentrated markets often, but not always, resulted in lower prices, these somewhat counter-intuitive results are understood to stem from economy of scale effects exceeding diminishing competition effects. ELD and ED promote more efficient products and can lead to self-selection by manufacturers to remove products in the lowest label classes. The most notable example of this change is for lighting and the phase-out of incandescent light bulbs, which changed the market significantly and highlighted problems for regulators in forecasting these changes, as consumers leap-frogged from incandescents to LEDs, skipping CFLs.

When asked whether ELD/ED unduly restricts *product choice* on the market, the majority of respondents to the online disagreed, notably the consumers.

7.2 Costs and benefits

When asked about the *costs and benefits* resulting from Energy Labelling and Ecodesign, most respondents to the online survey answered that benefits outweigh cost, both for their own organization, and for society as a whole. Key benefits that were mentioned include cost savings and environmental benefits, including a limitation of GHG emissions. In general, industry was more undecided on this topic.

In the literature the impact of Energy Labelling and Ecodesign on *prices* is understood to be low, and the long term downward trend in prices has not been affected. Evidence in the literature also suggests that Ecodesign implementing measures are often out of date when they are implemented due to the delay in the process and failure to fully account for learning, process and innovation improvements over time, which would limit the impact measures can have on prices. In the online consultation the majority of stakeholders were undecided on the impact of ELD/ED on prices, while those with an opinion mostly thought ED and ELD have not impacted prices. The only exception regards lighting and circulators, where stakeholders reported price increases following the introduction of Ecodesign and Energy Labelling.

[55] DG SANCO, DG ENTR (2012) Functioning of the market for electric and electronic consumer goods

Regarding the level of production costs and the improvement of *profit margins* stakeholders were mostly undecided. In particular industrial stakeholders sometimes disagreed that Ecodesign has lowered production costs and improved profit margins. One interviewee suggested that for some industries costs relate more to the additional cost for marketing involved in promotion of the label, than to the cost of production.

7.3 Competitiveness and innovation

As all operators must comply with the same requirements on the EU market. The competitiveness effect of Energy Labelling and Ecodesign is broadly neutral, but is likely to favour the firms that are able to most cost-effectively produce more energy efficient products. The biggest impact will be felt by firms with products that are banned, or forced to change, by Ecodesign regulation, and that do not have a more efficient product range that is compliant.

In the online consultation the majority of stakeholders turned out undecided on the impact of ELD/ED on *competitiveness of manufacturers, SMEs and importers*. Most of the more opinionated stakeholders believed Energy Labelling has a positive impact on competitiveness, but for Ecodesign this tendency was not clear. Some expect a competitive advantage for manufacturers compared to importers, with air conditioners and lighting as two main exceptions, but others express a concern and foresee unfair competition if enforcement turns out insufficient. In general, it may be assumed that EU manufacturers and retailers pass the bulk of any cost related to Ecodesign and Energy Labelling increase onto consumers. For SMEs some stakeholders pointed to the risk that resources to ensure compliance with ELD/ED are limited, notably for producers of circulators. Larger firms would have greater staff and technical and financial capacity to manage and adapt to any changes.

The literature review suggests that in international markets the impacts of EU Energy Labelling and Ecodesign are negligible, as other market trends and effects dominate. These over-arching trends point to a slow decline in EU firms market share within the EU as global competition and imports increase. EU exports are increasing across most labelled product groups, but this is thought to be a result of growing global consumer markets rather than a direct labelling or efficiency effect. Both Directives are also anticipated to provide indirect cost benefits to industry through its impact on energy prices and emissions trading markets.

The EU regulations do have an impact on international product policy and markets, with Energy Labelling in particular being widely emulated in other countries. The level of emulation can vary from simple adaptation of the label visuals, through to direct and literal replication of requirements. These issues are being explored in a separate study currently underway. In general the process and institutions for international harmonisation is relatively young, but the EU is playing an important role.

Evidence from another study running alongside this project shows that Ecodesign and Energy Labelling has an impact on innovation but that this it difficult to attribute and quantify as it doesn't show up clearly in patent statistics and firms don't strongly attribute their innovation activities to the implementing measures. What is clear it that the regulations are one of the main drivers for innovation, alongside consumer demand and competitive position. The strength of the innovation impact of the regulations at product level is very closely related to their ambition and the potential it gives firms to positively differentiate their products, with, in general, stricter/more ambitious requirements stimulating more innovation. Although this is sometimes at the expense of both a more difficult regulatory adoption process as associations and

less innovative firms will contest measures that bring requirements that go further and faster than they wish, or are able, to go.

The survey carried out as part of this study tended to support these findings, with the majority of stakeholders, in particular consumer organizations and environmental NGOs, positive about the impacts of ELD/ED on *innovation*. It identifies that SMEs may benefit from new niche markets. LEDs were repeatedly mentioned as a good example. Although feedback from the other study also suggests that SMEs are also disproportionately vulnerable to the regulations relative to the bigger firms as they do not have the same resources to track, understand, influence and adapt to them. Industry and governments were more often undecided, but never negative. Some industry groups consider the Energy Label a driver for innovation, rather than Ecodesign. For a number of product groups respondents were more undecided on the impacts of ELD/ED on innovation, notably complex set-top boxes, imaging equipment, dishwashers, vacuum cleaners, and washing machines. This illustrates the contrast that exists between relatively fast moving electronics sectors, that are driven by consumer demand and functionality for innovation, rather than energy, and the slower moving appliance and white goods sectors which can see innovation driven by the regulations, the impact of which slows over time, to the example of washing machines and dishwashers, where the top classes are increasingly filled and the regulation provides little further innovation stimulus.

7.4 Conclusions

Overall, Energy Labelling and Ecodesign have had little perceived impact on overall market sizes, market structure, or product choices. Only for lighting some manufacturers believe that regulations have unduly banned products from the market, although this is also noted to have stimulated innovation and created niche markets and competitive potential for more innovative firms. In general, benefits from Energy Labelling and Ecodesign are perceived to outweigh costs, both for organizations and for society as a whole. Benefits relate both to environmental gains, including greenhouse gas reductions, and to cost savings for consumers and businesses. ELD/ED have not affected the long-term downward trend of prices, with the exception of lighting and circulators. Some industrial stakeholders report that profit margins have been put under pressure though following increased production costs.

The impact of ELD/ED on competitiveness was perceived positive for Energy Labelling more often than for Ecodesign. Views on the comparative advantage of manufacturers vs. importers diverge. Some anticipate unfair competition, in particular if enforcement in the EU is limited, while others expect that manufacturers will benefit from their own production of high quality products. The EU regulations are influential internationally and the EU has an important role in international standardisation and harmonisation efforts. SMEs may have more limited technical and financial capacity to comply with ELD/ED regulations, which is a risk. In general, ELD/ED is expected to positively impact innovation, and especially SMEs may benefit from new niche markets (e.g. for LEDs). The regulations can positively impact innovation, but the balance between requirements being set at an ambitious but not too ambitious level needs to be kept, to stretch but not overstretch firms.

Annex A List of abbreviations

AC	Air Conditioner
ACEA	European Automobile Manufacturers' Association
AD	Abiotic Depletion
ADCO	Administrative Cooperation for Market Surveillance group
AISE	International Association for Soaps, Detergents and Maintenance Products
ANEC	European Association for the Coordination of Consumer Representation in Standardisation
AT	Austria
ATLETE	Appliance Testing for Energy Label Evaluation
AUSD	Australian Dollar
BAT	Best Available Technology
BaU	Business as Usual
BC	Battery Chargers
BE	Belgium
BG	Bulgaria
BIO IS	BIO Intelligence Service
BNAT	Best Not (yet) Available Technology
CAP	Common Agricultural Policy
CECED	European Committee of Domestic Equipment Manufacturers
CECIMO	European Association of the Machine Tool Industries
CELMA	Federation of National Manufacturers Associations for Luminaires and Electro-technical
CEMEP	European Committee of Manufacturers of Electrical Machines and Power Electronics
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CF	Consultation Forum
CFL	Compact Fluorescent Lamp
CHP	Central Heating Products
CLASP	Collaborative Labelling and Appliance Standards Program
CLP	Classification, Labelling and Packaging of Substances and Mixtures
CO_2	Carbon Dioxide
COICOP	Classification of Individual Consumption According to Purpose
COM	European Commission
COTANCE	Confederation of National Associations of Tanners and Dressers of the European Community
CPA	Classification of Products by Activity
CPR	Construction Products Regulation
CRT	Cathode Ray Tube
CSES	Centre for Strategy and Evaluation Services
CZ	Czech Republic
DE	Germany
DEFRA	Department for Environment, Food and Rural Affairs
DG	Directorate General

Dir	Directive
DK	Denmark
DOE	Department of Energy
EACI	Executive Agency for Competitiveness and Innovation
EC	European Commission
ECEEE	European Council for Energy Efficient Economy
ED	Ecodesign Directive
EE	Estonia
EEA	European Economic Area
EEB	European Environmental Bureau
EEC	European Economic Community
EED	Energy Efficiency Directive
EEDAL	Energy Efficiency in Domestic Appliances and Lighting
EEI	Energy Efficiency Index
EFTA	European Free Trade Association
EIRPO	Environmental Impact of Products
ELD	Energy Labelling Directive
EMAS	Community Eco-management and Audit Scheme
EOL	End-of-Life
EPBD	Energy Performance of Buildings Directive
EPS	External Power Supply
ERM	Environmental Resources Management Limited
ErP	Energy-related Product
ES	Spain
ESO	European Standardisation Organisation
ETS	Emissions Trading System
EU	European Union
EUEB	European Union Eco-labelling Board
EUOJ	European Union Official Journal
EuP	Energy-using Product
EUROPUMP	European pump industry
FAQ	Frequently Asked Questions
F-Gas	Fluorinated Greenhouse Gas
FI	Finland
FR	France
FSC	Forest Stewardship Council
FTE	Full-Time Equivalent
GHG	Greenhouse Gas
GLS	General Lighting Service
GPP	Green Public Procurement
GPP	Green Public Procurement
GPSD	General Product Safety Directive
GR	Greece
GWP	Global Warming Potential
GWP	Global Warming Potential

HD	High Definition
HFC	Hard Floor Coverings
HID	High-intensity discharge
HT	Herbicide Tolerant
HU	Hungary
HVACR	Heating, Ventilation, Air Conditioning & Refrigeration
IA	Impact Assessment
ICT	Information and Communication Technology
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IED	Industrial Emissions Directive
IEE	Intelligent Energy Europe Programme
IES	Institute for Environment and Sustainability
IIIEE	International Institute for Industrial Environmental Economics
ILCD	The International Reference Life Cycle Data System
IM	Implementing Measure
IPPC	Integrated Pollution Prevention and Control Directive 2008/1/EC
IPTS	Institute for Prospective Technological Studies
ISO	International Organisation for Standardisation
IT	Italy
JRC	Joint Research Centre
LBNL	Lawrence Berkeley National Laboratory
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
LCD	Liquid Crystal Display
LCIA	Life Cycle Impact Assessment
LEDs	Light-Emitting Diodes
LFL	Linear Fluorescent Lamps
LLCC	Least Life Cycle Cost
LPG	Liquefied Petroleum Gas
LT	Lithuania
LV	Latvia
MEErP	Methodology for Ecodesign of Energy-related Products
MEPS	Minimum Energy Performance Standard
microCHP	Micro Combined Heat and Power Generation
MS	Member States
MSA	Market Surveillance Authorities
NF	Environment mark
NGO	Non-governmental Organisation
NL	Netherlands
NMO	National Measurement Office
NRDC	Natural Resources Defence Council
ODYSSEE	ODYSSEE IEE project
OEM	Original Equipment Manufacturer
PEF	1. Primary Energy Factor; 2. Product Environmental Footprint

PFEC	Programme for the Endorsement of Forest Certification
PJ	Petajoule
PL	Poland
PM	Particulate Matter
PO	Power Output
PRODCOM	Production Communautaire
PR-PPM	Product-Related Production Processing Methods
PT	Portugal
PVC	Polyvinyl chloride
QR code	Quick Response Code
REACH	Registration, Evaluation, Authorisation and Restriction of Chemical substances
REMODECE	Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe
RES	1. Renewable Energy Source 2. Directive Electricity Production Renewable Energy Sources
RO	Romania
RoHS	Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
RoHS	Restriction of Hazardous Substances Directive
SCOP	Seasonal Coeficient of Performance
SCP/SIP	Sustainable Consumption and Production/ Sustainable Industrial Policy
SDS	EU Sustainable Development Strategy
SE	Sweden
SEAD	Super-efficient Equipment and Appliance Deployment
SEC	Commission Staff Working Paper (abbreviation used before 2012)
SEER	Seasonal Energy Efficiency Ratio
SELINA	Standby and Off-Mode Energy Losses in New Appliances
SFC	Soft Coverings
SI	Slovenia
SME	Small and Medium Enterprise
STB	Set-Top-box
SWD	Commission Staff Working Paper (abbreviation used since 2012)
TP	Transitional Period
TPC	Third party certification
TV	Television
TWh	Terawatt-hour
UEAPME	European Association of Craft, Small and Medium-sized Enterprises
UK	United Kingdom
UNEP	United Nation Environment Programme
USA	United States of America
USEPA	United States Environmental Protection Agency
VA	Voluntary Agreement
VOC	Volatile Organic Compounds
VSD	Variable Speed Drive
WEEE	Waste Electrical and Electronic Equipment Directive
WMO	World Meteorological Organisation
WTO	World Trade Organisation

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