Technical assistance study for the assessment of the feasibility of using "points system" methods in the implementation of Ecodesign Directive (2009/125/EC)

TASK 3
Method development

Draft report

This report has been prepared by a consortium comprising Waide Strategic Efficiency (technical leader of the study), VITO (contractual lead), Fraunhofer, Viegand Maagøe and VHK.

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Glossary

Term	Definition
Complex product	No single definition (see section 3.2) but may have any of the following characteristics: • does not provide a standard configuration / functional unit • may have multiple functions • may be modular • is often a customised product, adapted to a specific application • can be finally installed at the user's site, *and/or* • can have different performance levels dependent on the operating conditions at the user's site • can have functional parameters that are inherently difficult to measure
Components and sub-assemblies	parts intended to be incorporated into products which are not placed on the market and/or put into service as individual parts for end-users or the environmental performance of which cannot be assessed independently
DSD	data storage device
Duty profile	fraction of time a product, extended product or product system, spends spent at each operating point during the total operating time or a complete cycle of operation
Ecological profile	applicable to the product, of the inputs and outputs (such as materials, emissions and waste) associated with a product throughout its life cycle which are significant from the point of view of its environmental impact and are expressed in physical quantities that can be measured
Ecodesign requirement	any requirement in relation to a product, or the design of a product, intended to improve its environmental performance, or any requirement for the supply of information with regard to the environmental aspects of a product
Energy Efficiency Index (EEI)	a value describing the energy efficiency performance of a product, extended product or product system as used in a given application
Environmental impact	any change to the environment wholly or partially resulting from a product during its life cycle
Extended Product	within the MEErP an extended product is when the scope of the product or component boundary is extended to take into account the effect of related components and controls that influence real-life use: e.g. include part loads, misc. operating modes, frequency of use, and power management settings or controls
Extended Product Approach	methodology to determine the energy efficiency index (EEI) of the extended product (EP) using the duty profile

	of the application and taking into account the effect of power management or controls[1]
Generic Ecodesign requirement	any Ecodesign requirement based on the ecological profile as a whole of a product without set limit values for particular environmental aspects
Harmonised standard	a technical specification adopted by a recognised standards body under a mandate from the Commission, in accordance with the procedure laid down in Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations, for the purpose of establishing a European requirement, compliance with which is not compulsory
Implementing measure	measures adopted pursuant to the Ecodesign Directive (European Commission 2009) laying down Ecodesign requirements for defined products or for environmental aspects thereof
LCA	life cycle assessment
Life cycle	the consecutive and interlinked stages of a product from raw material use to final disposal
Material efficiency	material efficiency can be understood as "doing more with less". However, there are a number of aspects regarding material consumption and its environmental, economic and social impacts that it is difficult to give a single definition that would comprise all nuances
MEErP	Methodology for the Ecodesign of Energy-related Products
MT	machine tool
Placing on the market	making a product available for the first time on the Community market with a view to its distribution or use within the Community, whether for reward or free of charge and irrespective of the selling technique
Product design	the set of processes that transform legal, technical, safety, functional, market or other requirements to be met by a product into the technical specification for that product
Putting into service	the first use of a product for its intended purpose by an end-user in the Community
Product module	a module with a product or extended product
Product system	the product or extended product and its impact on the wider system it operates within
Strict product	within the MEErP the strict product, or component, scope considers a product is operated at a steady state, under a nominal load

[1] Note – the extended product approach has been used in at least one Ecodesign regulation e.g. for circulators, covered by Regulation 641/2009 (OJ L 23.7.2009, p. 35), amended by Regulation 622/2012 (OJ L 180, 12.7.2012, p. 4) and is proposed in the working document to amend the fan regulation (WORKING DOCUMENT - DRAFT ECODESIGN REGULATION Review of Regulation 327/2011). It is also covered in harmonised standards such as EN 50598-1:2014 Ecodesign for power drive systems, motor starters, power electronics & their driven applications - Part 1: General requirements for setting energy efficiency standards for power driven equipment using the extended product approach (EPA), and semi analytic model (SAM). See also Europump (2013).

Specific Ecodesign requirement	a quantified and measurable Ecodesign requirement relating to a particular environmental aspect of a product, such as energy consumption during use, calculated for a given unit of output performance

1. Introduction

This report sets out issues and considerations that should be taken into account when devising any proposed points-system methodology(ies) to be used for the Ecodesign assessment of complex products. Section 2 is a primer that provides some background to the project. Section 3 sets out a summary of findings from the stakeholder consultation efforts conducted in Task 2 (VITO *et al* 2016) and their implications for the methodology focus and development. Section 4 sets out the various factors that need to be considered when developing a points-system methodology. Section 5 presents the methodology to be followed to consider, and potentially derive, an Ecodesign points system based on the findings of section 3 and 4. Section 6 considers linkages between the proposed methodology and the MEErP and Ecodesign/labelling regulatory approaches. Section 7 provides observations on the implications of the methodology for conformity assessment and section 8 summarises and clarifies the rationale behind the proposed methodology.

Lastly, Task 4 of this study, which is addressed in a separate report, considers the application of this methodological approach to the development of a points system for two case studies: a) machine tools and b) data storage units. This is intended to test the applicability of the methodology in two concrete cases but is done for illustrative purposes only. Thus, these case studies are simply intended to explore to what extent it is viable to apply the proposed methodology to these illustrative product groups. The results are not intended to constitute a proposal for a specific points system for these products to be applied directly within Ecodesign regulatory requirements.

2. Background

This section provides background necessary to understand the context behind the development of this concept note.

The European Commission has instigated this technical assistance project to evaluate and derive a "points-system" methodology that could be applied to the development of Ecodesign requirements for complex products and/ or product systems. This need arises due to the increasingly common investigation of more complex energy-related products and systems for prospective Ecodesign and Energy Labelling implementing measures within the Ecodesign work plan, most notably since the advent of the 2012-2014 Ecodesign work plan. Some examples of such products are:

- machine tools
- data storage devices
- professional washing machines/ driers,

which are complex in that:

- they may have more than one functional unit (i.e. the quantified performance of a product system for use as a reference unit in a life cycle assessment study), due to the variety of functions the product is capable of performing,
- the functional units may be inherently difficult to assess due to measurement or methodological difficulties.

It is also common for the product groups concerned to have varying degrees of heterogeneity that complicate their assessment against common metrics and measurement methods. However, as savings potentials from the adoption of appropriate Ecodesign technologies can be significant, and these technologies are theoretically capable of being assessed on a modular basis, the European Commission is interested in evaluating whether it is feasible to devise an assessment methodology for product systems comprised of technology/design modules that considers the ensemble of modular technologies deployed.

This notion was first explored within the Ecodesign process in the case of machine tools within a working document put forward by the Commission at the May 2014 Consultation Forum which proposed one potential option based around a points systems approach (European Commission 2014). The resulting discussion highlighted the potential of this notion but also the need to explore options in greater depth and to produce a rationale that would allow the viable approaches to be identified and their strengths and limitations to be assessed. The present technical support services contract, under which the current work is conducted, aims to elucidate this issue via the conduct of analyses that will clarify the options, identify the most promising method(s) and then demonstrate their viability via some worked case studies.

To be able to fulfil the specific objectives of the project, the study approach and methodology is structured into five tasks as follows:

> Task 1 - Stakeholder consultation, including the compilation of a stakeholder list and a stakeholder survey.
>
> Task 2 - Review of state-of-the-art methods, in which relevant existing methodologies will be catalogued and reviewed, followed by a comparative analysis.
>
> Task 3 - Method development, which entails the derivation of a prospective method for establishing Ecodesign requirements for complex products. This is to be derived from consideration of at least: a) the fit with MEErP, b) the fit with the provisions of the Ecodesign Directive, c) suitability for addressing energy-related and resource efficiency aspects, d) modular build on existing Ecodesign implementing measures, e) measurability via standards.
>
> Task 4 - Case studies, where at least two product groups will be evaluated using the method proposed in Task 3. The Task 3 method may be iteratively revised and applied, as appropriate.
>
> Task 5 – Reporting

The study is being carried out by a consortium that spans a broad spectrum of expertise including technological know-how and environmental engineering, economic and environmental assessment, market and consumer analysis. It comprises Waide Strategic Efficiency as the technical leader of the study with the other involved project partners being VITO, Fraunhofer, Viegand Maagøe and VHK.

3. Findings from stakeholder consultation

The discussion with stakeholders both via the 1st Stakeholder meeting held in Brussels on 30th June 2016 and the Member State survey led to two sets of findings and conclusions, which will be discussed in the following sections.

3.1 Overall Comments on a "Points-System" Approach

The overview comments from the 1st Stakeholder Meeting, considered together with the previous Member States' feedback, may be summarised by the following representative bullet points:

- There is support for, or at least openness to, the use of a points-based approach to setting Ecodesign requirements for products that cannot otherwise be treated within a conventional Ecodesign framework.
- Clarifying the circumstances of when a conventional Ecodesign approach is no longer sufficient is likely to be necessary before a points-system approach would be considered for any specific product; however, this may not be straightforward. Stakeholders have indicated that guidelines of when it would, and when it would not be, appropriate to derive a point-system approach would be welcome i.e. to establish a non-binding set of considerations that would determine whether development of a points-based approach might be justifiable for a given product.
- Product complexity is not very straightforward to define but it is helpful to examine what it involves. Many stakeholders provided insights into this aspect which are further elaborated in the following section.
- Numerous stakeholders advised that the points-based approach considered in this study should limit the number of environmental impact parameters it attempts to address. Advice was given for either the project activities to be focused exclusively on energy in use, or alternatively to consider no more than one or two other environmental impact parameters, of which material efficiency was the most commonly cited additional parameter.
- Most stakeholders felt it was premature to attempt to devise weightings that are applicable across different types of environmental impact categories. This is because they felt there was unlikely to be any consensus on what the relative weightings to be given to different environmental impact categories should be.
- There was a clear preference for panel-based methods to determine weightings and weighting approach if these were to be attempted. However, stakeholders indicated that this needed to be manageable within an Ecodesign regulatory framework. Note these weightings could be applied to derive an overall score within an impact criterion (such as energy performance) and hence weightings per se are not inconsistent with the preceding point.
- There was a desire for a rational analytical framework to be established to help derive weightings and the points-structures.
- There was considerable scepticism about the current viability of methods that involved full life cycle assessments due to the immaturity of data, lack of practical means of verifying claims, lack of consensus on approaches and difficulty in comparing across inherently different impact parameters.
- Stakeholders indicated that points-system approaches could be suited to the establishment of both generic and specific Ecodesign requirements and

indeed could potentially provide a hybrid approach that spans both aspects i.e. a type of third approach.

- Pragmatic considerations will be paramount when determining the viability of any method.

The methodological framework proposed in this report is guided by the above responses, regarding the overall approach and with regard to product complexity considerations. It is important to reflect on the stakeholder feedback received, both when determining under what circumstances a points-system should be considered, and in assessing how it should be structured. It is also vitally important to appreciate that this guidance has strong implications for the methodology proposed, most notably in removing from consideration points systems approaches that aim to apply value judgements across inherently different parameters (such as the various environmental impact parameters).

3.2 Product complexity

Building on the above remarks, we also need to consider: In what way might a product be complex?

These are the comments received from the stakeholder consultation process that addressed this question:

"A complex product:

- does not provide a standard configuration / functional unit
- can have multiple functions,
- can be modular,
- is often a customised product, adapted to a specific application,
- can be finally installed at the user's site,

and/or

- can have different performance levels dependent on the operating conditions at the user's site
- can have functional parameters that are inherently difficult to measure.

The definition of a complex product needs to be clearly distinguished from an extended product."

"A product that has one or more of the following characteristics:

- Product / system with more than one function (machine tools, washer driers)
- The performance is too dependent on the duty cycle (pumps, motors)
- Heterogeneous types of products (machine tools)
- Custom-made products/systems/installations (machine tools, steam boilers, industrial ovens, large ventilation units, large boilers and heat-pumps, large chillers/heat-pumps)"

"Usually they are typically construction products that have to be installed, and products systems e.g. business to business and data centres (enterprise servers), consumer electronics, and large professional products and tertiary lighting products.

When products are not sold as packages but as components"

"A complex product is a collection of various parts (modules) that can be assessed separately, that allow for a large number of combinations where each combination of modules constitutes a product that has different functionalities/performances (to suit different needs of end-users).

Note: differentiation between modules could be done by software i.e. potentially diagnostic software could be applied to assess the functionalities and energy/resource efficiency of specific modules in each functional mode and to determine the apportionment of effort/time in each mode."

"Some further comments:

1. A product that can be used in various ways (for which different user profiles exist) need not be a complex product
2. A large product need not be a complex product. Transformers can be very large but they are not complex products in the above definition.
3. A points-system can be oriented on functionalities/performance/efficiency but also on savings options"

4. Factors to consider

This section sets out the factors that will need consideration in the design of points system approach(es).

4.1 Implications of product complexity and under what circumstance does complexity become the rationale to use a points approach?

The response to this question is not automatically self-evident. Just because a product is complex from an Ecodesign regulatory perspective it doesn't necessarily follow that it is more appropriate to use a points-system approach than a conventional regulatory approach.

It could be said that a points-system approach might be considered when there is a degree of doubt about the ecodesign performance assessment because:

a) there is a mix of quantifiable and more qualitative product ecodesign features yet it is necessary to also ascribe some value to the qualitative features because these are expected to bring ecodesign benefits
b) although the presence of specific ecodesign features is known to bring ecodesign benefits, the relative importance of the benefit to a given ecodesign performance parameter is difficult to determine in a reliable manner at the level at which the scope of a prospective regulation would apply (see cardinal and ordinal impact parameters discussion below)
c) it is too complex to apply a rigorous performance assessment method in practice but a points-based approach, which awards points depending on the ecodesign features used, could provide an acceptable compromise that allows requirements to be set that encourage progress in a positive direction without being overly constraining.

Responses from stakeholders have been synthesised in Table 1, together with comments on the implication of the complexity aspect to the development of

Ecodesign (ED) requirements which might be added. Note that the table also includes a provisional and incomplete assessment of whether each complexity feature applies to the two product case studies to be assessed in Task 4 (data storage devices (DSDs) and machine tools (MTs)) or not.

Table 1 also attempts to summarise the stakeholder feedback into types of complexity features, and describes the possible implications associated to each feature. In addition, the three aspects of (a), (b) and (c) referred to above are tentatively mapped across to each complexity feature.

Table 1: Implications of product complexity features and examples data storage devices (DSDs) and machine tools (MTs).

Complexity feature	Implication	DSDs	MTs	Type of uncertainty involved
Has a standard configuration	Likely to increase homogeneity and hence ability to normalise product performance for functionality. This increases prospect of being able to set ED requirements on products which are independent of application and hence can be applied at the factory gate.	Often	Only for some types	a
Has a clear functional unit	Increases viability of using a standard ED approach where product performance is normalised for functionality.	Often	Not always	b, c
Has multiple functions	Adds complexity when aiming to use a standard ED approach wherein product performance is normalised for functionality.	Partly	Often	b, c
May be modular	May permit module-level ED specifications	Y	Y	a, b, c
May be a customised product, adapted to a specific application	Affects heterogeneity and hence ability to normalise for functionality and set factory gate ED requirements that are independent of the ultimate application	Y	Sometimes	a, b, c
Installed (assembled) at the user's site	Affects ability to set ED factory gate requirements and may require ED installation level requirements. May also affect heterogeneity and hence ability to normalise for functionality and set requirements on products independent of application.	Y	Sometimes	a, b, c
May have different performance levels dependent on the operating conditions at the user's site	Site (application) dependency complicates ability to set factory gate ED requirements	Y	Y	a, b, c
Has functional parameters that are inherently difficult to measure	Reduces the certainty in the performance assessment	tbd	Sometimes	a, b, c
Performance is strongly dependent on the duty cycle	Ability to rank ED performance is sensitive to the reliability (stability) of the duty cycle assumption	tbd	Often	b, c
Duty cycle is strongly dependent on the application	Reduces ability to set specific ED factory-gate requirements. Would favour setting application dependent (installer level) requirements	tbd	Often	b, c

tbd = to be determined

From Table 1 it may be seen that whilst DSDs are complex, MTs are probably even more so.

The other rationale for using a points-based approach would be when there is a need to provide an overall assessment of a product’s ecodesign performance that balances the impact of optimising design options across different, and non-readily comparable, environmental impact parameters. In this latter case there is an unambiguous need to apply a common values framework (which a points system would represent), whenever trade-offs might be required between design options that could reduce one environmental impact while increasing another. An example could be a reduction of in-use energy consumption achieved by a design solution that increases noise emissions. Note that an alternative approach could be to set minimum or maximum permitted values for one impact parameter (e.g. maximum permitted noise levels) and then optimise for the other impact parameter. A points approach could still set limit values, but would allow the designer to optimise across both parameters and hence, in principle, would broaden the permitted solution sets that satisfy the combined requirements. Note: this rationale is not necessarily an issue exclusively pertaining to complex products. It should also be noted that the stakeholders consulted expressed doubt about the validity and feasibility of cross-impact parameter comparison approaches.

4.2 Cardinal and ordinal impact parameters

An ordinal parameter is one wherein the rank order is known but not the relative magnitude. A cardinal parameter is one where the magnitude is known in addition. As such, a standard energy efficiency metric is a cardinal parameter, whereas an ordinal parameter would be one where a ranking is known (1^{st}, 2^{nd}, 3^{rd} etc. but not the magnitude). A nominal parameter is one that can be defined by name but cannot be ordered in a ranking, nor ascribed a magnitude. The relevance of these notions to ecodesign assessment is that some impact parameters (such as an Energy Efficiency Index, EEI) have a clear magnitude, others can be ranked in order but have uncertain magnitudes, and still others can only be named but not ranked in a preferred order. In theory, a points system could be used to take all these parameters into account within a common framework, even if they all apply to the same environmental impact. For example, the efficiency of a power supply may be assessed in a cardinal manner, the presence of different levels of controllability in an ordinal manner and whether, or not, a product has the capability to make use of free cooling is nominal and binary. In principle, points could be awarded to each of these elements, based on an assessment panel’s notion of their likely importance to an overall energy performance score.

In going through this process it is first imperative to determine whether a product feature is cardinal, ordinal or nominal with respect to the impact parameter being considered. Note, some features may be deemed to be ordinal or nominal, solely due to a lack of sufficient data to enable them to be assessed in a cardinal (or ordinal) manner. Thus, the status of a product feature with regard to an impact parameter may be information-dependent, and subject to change in the future.

4.3 Modularity in product design

If a product is modular (i.e. comprised of modules) and if each module serves a function that can be clearly related to an environmental impact parameter, then it may be possible to assess the contribution each module makes to the function and equally its ecodesign impact. Points could then potentially be awarded on a module-by-module basis and aggregated upwards to attain an overall score; however, this could be greatly complicated in cases where the modules affect the performance (and hence assessment) of other modules, and in cases where there are trade-offs in functionality from one function to another (for modules having more than one function).

4.4 Modularity in points system design

A priori, a points system can be designed in such a manner that a first version aims to address a sub-set of impact parameters for which sufficient information is known to allow such an assessment. However, if the points system itself is designed to have a modular structure, then it will be possible for additional impact parameters to be included into future assessments (by the addition of a new assessment module) at a time when enough information is available to do so. It is therefore proposed that any generic points-system methodology is structured to allow such modules to be added in accordance with needs, to ensure that the methodology is pertinent and dynamic.

4.5 Treatment of limit values

A priori, a points system could be designed to permit the inclusion of limit values for specific parameters, or not. It may also be designed to ascribe an overall limit value (minimum number of total points) and/or to have a classification system wherein the product is classified depending upon its overall points score. Lastly, classification associated with points can also be permitted for any specific environmental impact parameter (e.g. an energy label could be classified from A to G depending on the points for energy performance attained by a product). Thus, in principle a points system could be classified to produce not only an overall ecodesign impact classification, but also one or more impact parameter-specific classifications. To the extent possible, the general points-system methodology described in this report will permit any of the above approaches (including having no limit values at all) and thus allow flexibility in this respect.

4.6 Considering how certainty affects the manner in which a single environmental impact performance metric should be assessed

In principle, any ecodesign methodology that aims to set specific ecodesign requirements should permit a rigorous cardinal performance metric to be derived and used whenever this is viable. In practice, sometimes this is not the case, such that it may be that none or only part of a product’s performance can be determined in this way and the remaining parts can only be considered via ordinal or nominal assessment parameters. Furthermore, there are always differing degrees of certainty about the assessment of performance metrics in general. When there is a mixture of cardinal, ordinal and nominal data, or alternatively when there is a set of modules whose individual performance can be assessed cardinally but whose collective performance cannot (because of uncertainty about the contribution each makes to the overall impact parameter budget and/or because of uncertainty about how they interact with each other) it may be appropriate to apply a points-based approach. The points-based approach should, to the extent that it is knowable, apply points which are weighted to be proportional to the impact that each ecodesign characteristic is expected to make to the overall environmental impact parameter. In practice the certainty about the impact will be highest for product features that can be assessed in a cardinal manner, lowest for those which are nominal, and intermediate for those which are ordinal. The weighting ascribed to the impact parameters could, and arguably should, be weighted to give higher importance to the more certain impact parameters.

Note, this certainty may also take into account the extent to which it is possible (or practical) to verify the impact parameter’s sub-elements. Thus aspects which are very hard to verify through market surveillance could be given less weight than those which are readily verifiable. The option of using Notified Bodies to assess compliance with generic design processes could also be considered here[2].

4.7 Factors that affect weighting within a complex impact parameter e.g. uncertain energy budgets and weighting of an energy performance index

For most energy-using products energy consumption in-use is the dominant environmental impact within a broader (EcoReport tool v 3.06) LCA. The energy in use is affected by:

- The energy use of each component which in turn is affected by the efficiency of each component (service delivered per unit energy consumed) and the usage (duty) profile of each component. The duty profile is affected not only by the underlying service need, but also by the capacity to control the component to minimise the extent it draws energy when not required to provide a service.
- The interactions between the components; this affects how they perform collectively as a product system.
- The scope of the product system boundary considered. For example, data storage devices draw energy to process data but also require energy to be used to keep them cool – the product energy consumption and efficiency (and hence Ecodesign optimisation) is sensitive to the scope of the product system boundary considered.
- User behaviour, which in turn may be influenced by the provision of information and guidance.

Whatever methodological system that is considered (whether for application in a conventional Ecodesign regulatory approach or for a points-system approach) has to aim to correctly characterise and treat these aspects to the extent it is possible and viable to do so. This means that the impact of each element on the overall energy budget and energy performance has to be assessed and weighted proportionally to its expected impact.

4.8 Compatibility with the MEErP process

Any proposed points-system methodology needs to be compatible with the MEErP process used to support implementation of Ecodesign Directive 2009/125/EC.

[2] Under Article 8.2 addressing conformity assessment in the Ecodesign Directive, the economic operator must choose between:

- Annex IV: internal design control; or
- Annex V: management system.

In addition, Art 8.2 states: "Where duly justified and proportionate to the risk", the conformity assessment procedure specified within an Ecodesign Implementing Measure (e.g., a Regulation) may be stipulated by choosing one of the modules specified in Decision No. 768/2008/EC. Some of these modules involve extensive actual product testing by the market surveillance authorities, and some encompass only a verification of the management system in place (i.e., a testing of the IT-based or paper-based management system, as opposed to taking product examples off the assembly line, and testing them in an external test laboratory).

4.9 Fit with regard to the way of setting Ecodesign requirements

Any proposed points-system methodology needs to be appropriate with and fit with the way of setting Ecodesign requirements specified within the provisions of the Ecodesign Directive 2009/125/EC. In particular this needs to address: the regulatory process followed (see section 6 for more details), the nature of implementing measures considered (generic or specific or both), designating the actors responsible (considered in section 5).

4.10 Extent to which the stated parameters are measurable via standards

Ideally, the parameters to be assessed using a points-based approach will be measurable via standards. In some cases there may be no existing standards but the development of such standards should be readily imaginable in the future. In principle, it is important that any proposed methodology does not rely on assessments that can only be done via subjective, poorly definable processes that are unlikely to be repeatable (i.e. consistent each time they are conducted) or reproducible (i.e. consistent from one assessor to another). The existence or potential for measurement and/or assessment standards will therefore need to be fully considered.

4.11 "Products-within-products" issues

Any points system method proposed needs to be appropriate with regard to how the stated parameters incorporate requirements that build upon existing Ecodesign requirements specified at the modular and component level (e.g. for motors and fans). Note that this products-within-products issue is not a unique concern for a points-system methodology.

4.12 Specific versus generic ecodesign requirements

Ecodesign requirements can be set to be specific (i.e. to set minimum performance limit values on certain impact parameters), to be generic (i.e. to prescribe a process that needs to be followed in the design or placing on the market of a product) or informational (i.e. specify information that needs to be made available prior to and after placing the product on the market).

Specific requirements are likely to have the most certain impact and hence are the most powerful regulatory tool; however, because they remove products with certain features from the market they also require the greatest certainty of net benefit prior to their introduction. In some cases there may be a high uncertainty regarding the point of least life cycle cost, or the circumstances in which a given limit value provides net benefits (depending on specific functionality and usage requirements). A points approach allows a more nuanced treatment where softer limit values could be set than the least life cycle cost average while other features or generic processes could be given value and encouraged. In theory, a parallel compliance pathway requirement could be specified wherein a product either has to meet minimum specific values regardless of where it is used, or has to demonstrably follow a design optimisation process (awarded points for the rigour of approach used and where a minimum points score is specified) tailored to the client needs (in terms of functionality and usage) but respecting broader Ecodesign principles such as energy performance levels that produce the least life cycle cost for the end-user. The first (and traditional) compliance pathway specifies performance limits which are verifiable at the factory gate but places obligations on the product system specifier and installer too; whereas the second compliance pathway imposes no limits on the product as it leaves the factory gate (except potentially informational requirements) but imposes constraints on the product system specification and installation phase. Note these product specification requirements could also occur in a factory for packaged products that are custom-made.

It is envisaged that a points-system methodology needs to be sufficiently flexible to address both of these cases and also hybrids combining elements of both.

4.13 Fairness and proportionality

Any points-system method proposed will need to be consistent with an approach that does not penalise SME's and that results in equal and proportional treatment of market actors.

5. Methodological framework for an Ecodesign points-system

This section applies the principles discussed in the section 4 within a methodological framework for the consideration and establishment of an Ecodesign points-system that could be applied to complex products. The first four assessment steps gather and organise data elements needed for the determination of whether a points-system approach is justified and feasible in principle. Step 5 assesses this, enabling the determination of appropriateness and feasibility to be determined. Steps 6 to 9 are conducted if a points-system approach is deemed appropriate, and as such has to be derived. Step 10 considers additional actions that would be needed to support the regulatory process.

The structure of the step-by-step methodology set out in this section is consciously designed to address the following requirements (i.e., the needs and constraints):

- To evaluate environmental impact parameters in isolation and not to combine them within an overall points scheme
- To ensure that the impact of design options are awarded points in proportion to their effect on the impact parameter in question
- To be as comprehensive and inclusive as possible, thereby allowing the option to extend the scheme's structure to include: the environmental impacts deemed appropriate, the product scope that is deemed most appropriate, and the intervention phases deemed appropriate
- To work at whatever application grouping levels are deemed to be appropriate
- To address product modularity
- To fit within the MEErP methodology
- To work with the Ecodesign and energy labelling regulatory process
- To respect the needs of conformity assessment
- To enable complexity to be addressed.

Step 1 Assessment of key lifecycle stages

This step entails assessing the various product lifecycle stages from a cradle–to-grave perspective to determine which of them are pertinent to be considered for potential Ecodesign measures. Basically, the MEErP Tasks 1 to 5 are conducted, utilising the MEErP methodology as it is presently formulated. Then, the findings from MEErP Task 5 are taken, i.e., dealing with the environmental impacts and associated LCA work (see Figure 1). At this point, one must screen the impact assessment parameters and product lifecycle stages for pertinence in the setting of prospective Ecodesign measures. As such, it is exactly the same process as would be undertaken for any product being assessed through the Ecodesign regulatory process. The findings of this assessment are noted and are then used to inform the boundaries of applicability of any prospective points-system approach.

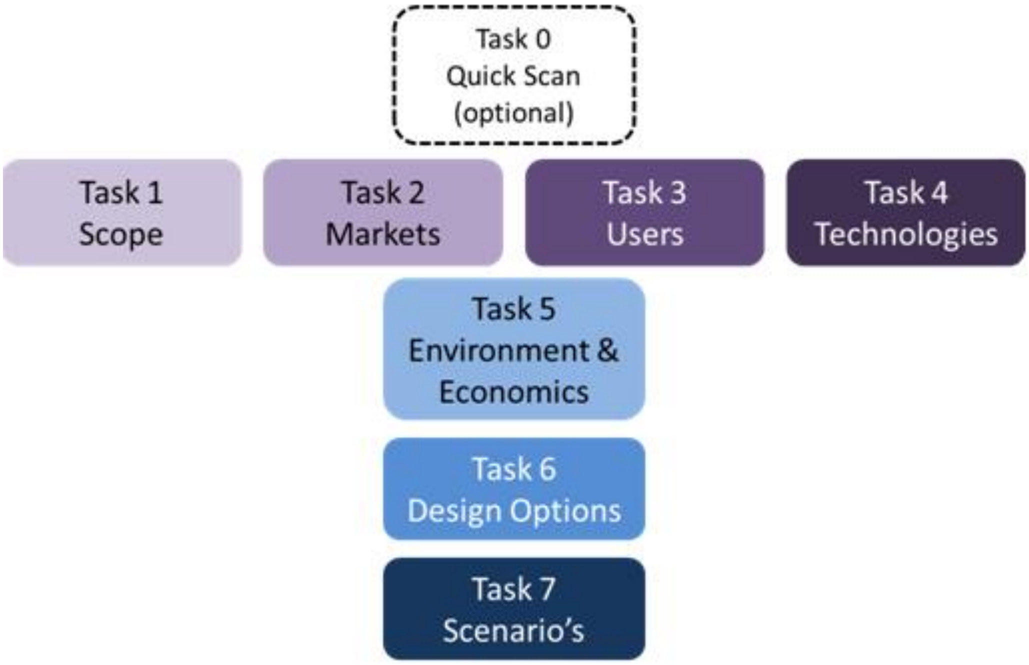

***Figure 1:** The MEErP Tasks*

The above results indicate the potential scope of a prospective points system, where ideally the points system would be designed to be comprehensive enough to apply to the most pertinent lifecycle stages for which Ecodesign improvements could be practically encouraged.

Step 2 Assessment of product scope boundaries and associated impacts at the wider (extended product or product-system) level

Conduct the following assessments:

a) Does the product have impacts only at the simple product level?
b) Does the product have impacts at an extended product level?
c) Does the product design have impacts at the wider product system level?

Noting the answers to the above questions indicates the potential scope of a prospective points system. The more negative answers that result means that the more likely it is that one is dealing with a complex product. As such, it may be that a "points system" approach could be applicable, and useful. Ideally, the points system would be designed to be comprehensive enough to apply to the largest product scope boundary for which Ecodesign improvements could be practically encouraged.

Step 3 Selection of environmental impact criteria

The treatment of environmental impact criteria discussed in this section takes as input the information derived from the MEErP. The MEErP was intentionally designed to evaluate the environmental impact of energy-related products and hence gives its principal focus to energy performance assessment and thus it is possible that in the future there may be a need to expand its capacity to be able to better take account of other environmental impacts such as material efficiency; however, the methodology set out in this report makes use of the MEErP as it currently is.

Treatment of environmental impact criteria

Independent treatment of impact criteria

As indicated in sections 3 and 4, stakeholders advised that any prospective environmental impact criteria should be considered separately within a points-system scheme and not combined within a common structure because of the contentiousness of trying to compare, or weigh, the relative importance of one type of environmental impact criterion against another. It is therefore proposed in this methodology that each impact criterion will be considered in isolation and if a points approach is to be used it would be established for each impact criterion independently of the others.

Number of impact criteria to be treated

While the case studies considered in this Task 4 report only consider one or two impact criteria the methodology set out here could in principle be used for as many impact criteria as are considered appropriate. Thus, if experience with using the methodology develops then potentially more than two impact criteria could be considered in future applications of this methodology.

Stakeholders advised that, for pragmatic reasons, only one or a maximum of two impact criteria should be considered for the application of points systems. This guidance was aimed at the current project and was intended to avoid the project, or subsequent applications of the work it produces, attempting to be too ambitious while the notion of using a points-system is relatively embryonic; in other words, it should first be developed and tested. In future, greater sophistication in dealing with numerous evaluation and/ or impact criteria could subsequently be added on, to build on the initial "proof of concept".

Selection of environmental impact criteria

The choice of the criterion, or the criteria, could be proposed by the consultants during the preparatory study process once the work of the MEErP Task 5 ("Environment & Economics") has been completed. It would be informed by the evidence from the EcoReport tool assessment on the criteria with the greatest environmental impact and highest improvement potential. The recommendation could be discussed at the subsequent stakeholder meeting prior to a decision being made by the Commission. In most cases the energy performance of the product during the use phase is likely to be the most important criterion. Material efficiency performance is another environmental impact criterion mentioned by several stakeholders.

Process to be followed following selection of environmental impact criteria

Once each environmental impact criterion has been selected Steps 4 to 9 below are followed independently for each of the impact criteria in turn.

Step 4 Determination of the phases at which product design may influence lifecycle impacts

This step entails assessing the various product lifecycle phases from the perspective of when there may be an opportunity to consider setting requirements that would influence the ecodesign performance of the product. The table below illustrates an example of this process. In this example, generic Ecodesign implementing measures could be conceivable for 6 of the product phases and specific implementing measures for 3.

Table 2: Example of the consideration of the phases at which product design may influence lifecycle impacts.

Lifecycle phase	Potential Ecodesign measure	
	Generic	Specific
Initial factory design phase	Y	N
Detailed factory design phase	Y	Y
Specification phase	Y	Y
Installation phase	Y	Y
Use phase	Y	N
End of life phase	Y	N

This assessment of phases which are potentially suitable for Ecodesign implementing measures helps to determine the boundary of applicability of a prospective points system.

<u>ACTION</u>

Take note of the findings, which indicate the potential generic and/ or specific scope of a prospective points system, where ideally the points system would be designed to be comprehensive enough to apply to all the product lifecycle phases for which Ecodesign improvements could be practically encouraged.

Step 5 Assessment of whether a points system approach is potentially merited or not

Answer the following question for ***<u>each</u>*** of the cases a) to c) ("Yes/No"). Is there a degree of doubt about the practicality and quality of the ecodesign performance assessment of the product because:

a) there are a mix of quantifiable (cardinal) and more qualitative product ecodesign features, yet it is appropriate to also ascribe some value to the qualitative features because these are expected to bring environmental benefits?
b) although the presence of specific ecodesign features is known to bring environmental benefits, the relative importance of the benefit to a given environmental impact parameter is difficult to determine in a reliable manner, at the level at which the scope of a prospective regulation would be expected to apply?

c) it is too complex to apply a rigorous performance assessment method in practice, but a points-based approach (which awards points depending on the ecodesign features used) could provide an acceptable compromise that allows requirements to be set that encourage progress in a positive direction without being overly constraining?

If the answer to any of these questions is "Yes", then a points-system approach may be appropriate, otherwise it is unlikely to be.

Step 6 Assessment of the implications of product modularity

If a product is modular (i.e. comprised of modules) and if each module serves a function that can be clearly related (i.e. mapped) to an environmental impact parameter then it may be possible to assess the contribution each module makes to the function and equally its environmental impact.

If this is the case then in principle points could be awarded on a module by module basis and aggregated upwards to attain an overall score.

Equally though it may be possible to simply apportion impacts to each module without requiring the application of points e.g. if module 1 is responsible for 30% of a given impact and module 2 is responsible for the remaining 70% then it could be possible to derive a conventional impact performance factor index (such as an EEI) by proportionately weighting the contribution from each module to the whole. Thus a points approach would not be needed.

Does each module fulfil a specific and unique function?

i) If Yes, then their performance impacts (such as an EEI) can be treated and assessed independently of each other. Move to Step 7.

ii) If No, and more than one module serves the same function then:

a) is it possible to quantify the proportion of the function provided by each module under a set of representative usage cases?

If Yes, then it should be possible to treat the modules as an extended product and to use a duty profile approach to proportionately weight the impact each module makes on a given performance and impact factor in order to develop a functional impact rating. Move to Step 7.

b) is it possible to partially quantify the proportion of the function provided by each module under a set of representative usage cases? (i.e. might a mix of cardinal and ordinal impact information be available?)

If Yes, then it should be possible to treat the modules as an extended product and to use an estimated impact budget approach to proportionately weight the impact each module makes on a given performance and impact factor in order to develop a functional impact rating. Move to Step 7.

c) is it impossible to quantify (even partially) the proportion of the function provided by each module under a set of representative usage cases?

If Yes, then is likely to impractical to try and apply a points-system approach to the product. Stop the process.

iii) If No, because the same module may perform more than one function then:

a) are the performance impacts for each function (such as an EEI) independent of each other?

If Yes, then consider whether either steps i) or ii) above may apply

If No then it may not be possible to derive a meaningful performance impact assessment for that specific function (even using a points-system approach). Stop the process.

Note: if a product is packaged and not modular then the above assessment can be omitted.

The findings of this assessment determine whether a points-system approach is likely to be viable for a modular product and also help inform the design of the points system if the answer is positive.

Step 7 Assessment of the implications of product performance sensitivity to the final application

The principal purpose of this step is to aim to identify the level(s) of stability at which a representative duty profile can be defined for the product in question.

Considering why the product performance may vary as a function of the application

The use made of a product is often different depending on the application it is being used for. This may systematically affect the typical duty profile that the product is operated under and/or may systematically affect the functional activity the product is being used for. For example, fluorescent lamps essentially always serve the same function (to provide illumination) but the characteristic duty profile that they are operated under varies systematically depending on the type of building they are installed in (e.g. residential usage profiles are quite different to those found in offices). Some products, such as some categories of machine tool, are capable of providing more than one function (e.g. cutting and forming), and the characteristic duty profile may also vary depending on the nature of the application (e.g. the nature of the business in the case of machine tools) the product is being used for. The normal analyses within a preparatory study will determine the extent to which a product's environmental impact performance is sensitive to the application it is being used for and this information would need to be fed into the following analytical step.

Analytical step

Answer the following question for the environmental impact criterion being considered.

Is the product's environmental performance sensitive to the final usage application?

a) If the answer to this question is No then move on to Step 8.

b) If the answer to this question is Yes, then consider whether these applications can be grouped into types with relatively consistent characteristics i.e. is the variation in performance within an application group[3] sufficiently limited[4] (e.g. the behaviour within the application group is relatively homogeneous) to enable a meaningful performance metric to be defined for each application group?

> b1) If the answer to b) is Yes, then it is appropriate to identify each relevant application group for which this is true and to follow Steps 8 and 9 for each of these in turn.
>
> b2) if the answer to b) is No then it implies it is inappropriate to set specific Ecodesign requirements for the performance of this product with respect to the environmental impact parameter in question and therefore only generic Ecodesign requirements should be considered for the performance of the product with respect to the environmental impact parameter in question. At this stage in the evaluation a decision would need to be taken as to whether:
>
> > a) only a points system based on an assessment of generic Ecodesign requirements[5] is appropriate, or
> >
> > b) one that might also include specific requirements to be imposed on the product specifier or installer may also be appropriate (see the following discussion).

Note that the need to make this assessment is not unique to products where a points system is being considered, and is true of all products considered for Ecodesign requirements. Nonetheless in both cases it is important to determine whether it is feasible and appropriate to consider imposing Ecodesign requirements:

a) at the point at which a product is first placed on the market, or
b) on the designer/specifier for products which are assembled on the site of usage, or
c) on the installer, or
d) not at all.

In practical terms, if specific Ecodesign requirements are to be applied from the point at which a product is first placed on a market then they should be appropriate for all the applications for which the product is likely to be subsequently used. If the requirements need to be different depending on the application then it should be practicable to either clearly define the application for which the product is intended and/or for the product to have different supply channels depending on the intended application (an example of this is the distinction between domestic and other types of lighting products, which enables specific Ecodesign requirements[6] to be set for lighting products likely to be used in domestic applications, but which could conceivably also be used in non-domestic applications).

[3] An application group is a sub-set of all the applications for which the product is likely to be used and is commonly defined by the type of user concerned (e.g. domestic, commercial or industrial), or the type of process the product is being used for (e.g. drilling or cutting), or the nature of duty profile required by the application (e.g. constant demand or variable demand).
[4] In other words, when the usage of the product within the application group is sufficiently homogeneous that its environmental impact performance can be adequately represented by a single representative duty profile.
[5] See Annex I of Ecodesign Directive 2009/125/EC (European Commission 2009)
[6] See Annex II of the Ecodesign Directive (European Commission 2009)

In principle, application-specific Ecodesign requirements could be imposed on products that are specified by a product system designer and/or installer because it can also be said this is when the product is placed on the market. This would allow greater differentiation in Ecodesign requirements to be specified depending on the nature of the final application for the product. In addition, product specifiers and installers could be required to follow generic Ecodesign requirements that would govern the process they are required to follow in specifying and installing products for any given application.

Naturally, while this determination is not unique to products for which a points-system approach is being considered it is informative to help decide what aspects of the product design and installation process might be suitable for the use of a points system. The potential outcomes of the assessment and relation to the type of Ecodesign requirements that could be considered are shown in the matrix below.

Table 3: Matrix illustrating the potential applicability of Ecodesign measures as a function of the sensitivity of the product's Ecodesign performance to the product application.

	Specific Ecodesign Requirements when first placed on market	Specific Ecodesign Requirements for product specifer/ designer	Specific Ecodesign Requirements for product installer	Generic Ecodesign Requirements for product specifer/ designer	Generic Ecodesign Requirements for product installer
Performance assessment is insensitive to the product application	Yes	Not needed	Not needed	Potentially	Potentially
Performance assessment is sensitive to the product application and the intended application can be specified at the time of first placing on the market	Yes	Not needed	Not needed	Potentially	Potentially
Performance assessment is sensitive to the product application and the intended application cannot be indicated at the time of first placing on the market but can be by a site-specific product designer or specifier	No	Potentially	Potentially	Potentially	Potentially

Step 8 Determination of environmental impact budgets

Note that if the answer to 7b is Yes then the process described in this step needs to be conducted for each application group in turn.

The determination of the environmental performance impact budget requires the derivation of a representative product duty profile. This profile needs to assess the product duty profiles while respecting the product boundary scope determined in Step 2. It also needs to be differentiated for each pertinent application group as determined in Step 7. Once the duty profile is known then the environmental impact performance can be assessed for each aspect of the duty profile. This can be done for the reference case product and successively for product designs employing design options that reduce the environmental impact at one or more of the phases of the duty profile. Assessment of each one of these product cases will entail the derivation of an environmental impact budget broken down by duty profile phase. E.g. consider energy consumption in use for a product with 4 duty profile phases (off, standby, part-load, and full capacity). Table 4 below indicates how the energy budget might be broken down by each of these use phases for a reference case product and a succession of products where Ecodesign measures are employed progressively. In this example the table applies to a simple product.

Table 4: Example of an energy budget by design option for a simple product.

	Off	Standby	Part-load	Full-Load	Total
Fraction of time	24%	42%	26%	8%	
Energy consumption for duty profile phase (kWh/year):					
Reference case	0.0	14.7	189.0	58.2	261.9
Design option 1	0.0	14.7	113.4	58.2	186.3
Design option 2	0.0	14.7	102.1	52.3	169.1
Design option 3	0.0	14.7	91.9	49.7	156.3
Design option 4	0.0	14.7	82.7	47.2	144.6
Design option 5	0.0	14.7	74.4	44.9	134.0
Design option 6	0.0	10.3	72.2	43.5	126.0
BAT	0.0	7.2	70.7	42.7	120.6

If an extended product with two modules is considered then Table 5 illustrates an example of an energy budget broken down by duty profile for the reference case and successive Ecodesign cases. The same principle could be applied to derive an environmental impact budget for a product comprised of any number of modules.

Table 5. Example on a modular or extended product energy budget by design option (for a product with 2 modules)

	Module A					**Module B**					**Combined**
	Off	Standby	Part-load	Full-Load	Total	Off	Standby	Part-load	Full-Load	Total	Total
Fraction of time	24%	42%	26%	8%		10%	27%	48%	15%		
Energy consumption for duty profile phase (kWh/year):											
Reference case	0.0	14.7	189.0	58.2	261.9	0.0	16.6	567.6	203.7	787.9	1049.8
Design option 1	0.0	14.7	113.4	58.2	186.3	0.0	16.6	454.1	203.7	674.3	860.7
Design option 2	0.0	14.7	102.1	52.3	169.1	0.0	16.6	372.4	203.7	592.6	761.8
Design option 3	0.0	14.7	91.9	49.7	156.3	0.0	16.6	327.7	179.2	523.5	679.8
Design option 4	0.0	14.7	82.7	47.2	144.6	0.0	16.6	294.9	170.3	481.7	626.4
Design option 5	0.0	14.7	74.4	44.9	134.0	0.0	16.6	265.4	161.8	443.7	577.8
Design option 6	0.0	10.3	72.2	43.5	126.0	0.0	11.6	257.5	156.9	426.0	552.0
BAT	0.0	7.2	70.7	42.7	120.6	0.0	8.1	252.3	153.8	414.2	534.8

Similarly, the energy budget can be extended to encompass the broader system and hence not just the energy used directly by the product itself but to include the impact it has on the broader system's energy use. Note in the example shown in Table 6 below Module A's performance is the same as the product above but in an extended product it is possible that its energy consumption will be affected by the interaction with the other elements of the extended product (Module B in this example).

Table 6. Example of an energy budget by design option for a product system

	Module A					**Module B**					**Impact on other system energy consumption**	**Combined**
	Off	Standby	Part-load	Full-load	Total	Off	Standby	Part-load	Full-Load	Total		Total
Fraction of time	24%	42%	26%	8%		10%	27%	48%	15%			
Energy consumption for duty profile phase (kWh/year):												
Reference case	0.0	14.7	189.0	58.2	261.9	0.0	16.6	567.6	203.7	787.9	393.9	1443.7
Design option 1	0.0	14.7	113.4	58.2	186.3	0.0	16.6	454.1	203.7	674.3	337.2	1197.8
Design option 2	0.0	14.7	102.1	52.3	169.1	0.0	16.6	372.4	203.7	592.6	296.3	1058.1
Design option 3	0.0	14.7	91.9	49.7	156.3	0.0	16.6	327.7	179.2	523.5	261.7	941.5
Design option 4	0.0	14.7	82.7	47.2	144.6	0.0	16.6	294.9	170.3	481.7	240.9	867.3
Design option 5	0.0	14.7	74.4	44.9	134.0	0.0	16.6	265.4	161.8	443.7	221.9	799.6
Design option 6	0.0	10.3	72.2	43.5	126.0	0.0	11.6	257.5	156.9	426.0	213.0	765.0
BAT product only	0.0	7.2	70.7	42.7	120.6	0.0	8.1	252.3	153.8	414.2	207.1	741.9
System DO1	0.0	15.1	74.3	46.8	136.3	0.0	17.0	254.3	157.7	429.0	145.0	710.2
BAT system	0.0	15.1	72.8	45.9	133.9	0.0	11.9	249.2	154.5	415.6	116.0	665.5

Lastly, in principle the environmental impact parameter budget can also be extended to cover different potential intervention phases if these are deemed to be important to encourage good ecodesign practices for the product (see discussion in Step 4). For example, if it is thought likely that the provision of user advice and/or in use feedback will bring about ecodesign benefits during the product use phase then the advice/feedback "design options" can be added to the environmental impact parameter table and ascribed expected benefits (i.e. in the case illustrated above ascribed reduced in-use energy consumption values compared with the reference case). This type of benefit estimation is generally uncertain (sometimes highly so) and hence needs to be managed accordingly. The text in the following sub-section explains how this can be done.

Managing uncertainty

The case above addresses cardinal data where the impact of the design option on the impact criterion is quantifiable and measurable; however, as previously discussed in Step 5 cardinal data is not always available, and this is especially the case when a points-system approach is being considered. Often the data will be a blend of cardinal and ordinal information, where for the ordinal data the rank order of the design option impact on the environmental criterion is known but not the precise magnitude. For these cases it is proposed that the consultants leading the preparatory study should derive estimates of the magnitude of the impact expected from the design option with the ordinal data and apply this in the parameter budget derivation process. To do this the consultants would need to assemble all the available information that might permit estimates to be derived, so that the estimation process is as fully informed as possible for each of the duty profile cases considered above.

When a blend of cardinal and ordinal data is used it will be important to keep track of which of the budget values are cardinal and which ordinal (and hence are estimates) as this may influence the weighting eventually given via the points-system (noting that there is a rationale behind giving greater weighting to cardinal data than ordinal).

In the event that the table includes ordinal data or a blend of cardinal and ordinal data then the normalisation process could:

a) either proceed exactly as set out above i.e. where no distinction is made between the quality of the cardinal and ordinal data, or
b) be done in such a way that the cardinal data is given a higher weighting than the ordinal data.

If only ordinal data is available then case a) above would apply. If a blend of cardinal and ordinal data is present and it is felt appropriate to give less weight to the ordinal data than the cardinal then the approach to be taken would be to discount (i.e. reduce) the estimated benefit expected from the design options using ordinal data in Step 8. For example, if the best estimate of the benefit from an ordinal design option is a 20% energy saving, but there is a significant uncertainty over this value, then it could be deemed to be appropriate to only ascribe 60% of this benefit in the energy budget evaluation i.e. a 12% energy saving. As there are many possible causes of uncertainty and the level of uncertainty is usually unknown too it is not really appropriate to prescribe a single method for treating this within an Ecodesign accounting framework; however, a simple approach might be as follows:

- Assess the uncertainty in the magnitude to be ascribed to the ordinal design option parameters (e.g. +/- 50%)
- Assess the uncertainty expected in the cardinal design option parameters (this could be the accepted measurement tolerance e.g. +/- 15%)
- Determine the net difference in uncertainty between the ordinal and cardinal values (e.g. 50%-15% = 35% in the example above)
- Then discount the magnitude of benefit allocated to the ordinal design option in the impact parameter budget tables by half this net difference (e.g. reduce the benefit ascribed by 17.5% in the above example).

Exactly the same process can be followed when dealing with environmental impact budget data that is associated with different potential intervention phases. For example, for the case of the provision of user advice and/or in use feedback the values ascribed in the table would be noted as being estimates and, if deemed appropriate, the expected benefits ascribed to these measures could be discounted to take account of the level of uncertainty in the manner just set out

Step 9 Normalisation and awarding of points

Once the environmental impact assessment budgets have been established in Step 8 as a function of the design options, then the next step is to normalise the values as a precursor to assigning a points scale.

If we consider the extended product case operating in a wider system as shown in Table 6 above the normalised consumption becomes as shown in Table 7 below when it is normalised against the energy consumption of the reference case product.

Table 7: Example of a normalised energy budget and points allocation for the extended product system example considered in Table 6

	Module A	Module B	Other system Energy use	Total Energy	Points Awarded
Reference case	100%	100%	100%	100%	0
Design option 1	71%	86%	86%	83%	17
Design option 2	65%	75%	75%	73%	27
Design option 3	60%	66%	66%	65%	35
Design option 4	55%	61%	61%	60%	40
Design option 5	51%	56%	56%	55%	45
Design option 6	48%	54%	54%	53%	47
BAT product only	46%	53%	53%	51%	49
System DO1	52%	54%	37%	49%	51
BAT system	51%	53%	29%	46%	54

Note, that this process is essentially the same as that which is followed to determine an energy efficiency index (EEI), as it involves normalising the product performance to a reference case. In principle, the same process can be followed for any quantifiable environmental impact parameter.

In the above example the points are awarded for energy performance on a scale of 0 to 100 and are allocated in proportion to how much less the product in question uses compared to the base case. Thus, a product which uses no energy as an extended product nor does it require system level energy use would have a score of 100. The maximum number of points that can be awarded is not important; however, it is important that the point allocation is proportional to the environmental benefit delivered to the extent by which this can be assessed.

Managing uncertainty
In the event that the table includes ordinal data or a blend of cardinal and ordinal data then the normalisation process could:

a) either proceed exactly as set out above i.e. where no distinction is made between the quality of the cardinal and ordinal data, or
b) be done in such a way that the cardinal data is given a higher weighting than the ordinal data.

However, this issue is addressed in Step 8 and the normalisation process would simply use the final impact parameter budget data that comes out of that stage.

Step 10 Support to regulatory decision making

Once a points-structure has been allocated for each of the (up to two) environmental impact criteria being considered then this information can be used to assess the distribution of products available on the market (and potentially available) against the points allocation for each impact parameter in turn. Combined with an economic analysis from the MEErP Task 5 and design option analysis from MEErP Task 6 it would be possible to construct policy impact scenarios associated with the market for new products progressing towards certain points score distributions in response to Ecodesign implementing measures and energy labelling (noting that the points scores will correlate with the environmental and economic impacts). The generic points methodology outlined above maps as neatly as is possible to a conventional MEErP approach using impact performance indicators such as EEIs; however, it enables less perfectly quantifiable data (associated with design options that have more uncertain impacts) to be treated within this framework. It also potentially allows for the uncertainty in the data to be reflected via a discounted impact assessment methodology. Thus it remains possible to use the same regulatory approach to set limit values as is already used in Ecodesign and labelling regulations, although in this case they would be for minimum permitted points-scores.

In the example of the points allocation shown in Table 7 the reference case product scores 0; however, it would be straightforward to adapt the scale so that 0 points is associated with say the worst product on the market or some other start point, if that were deemed to be an appropriate end-point. The decision regarding the lower end point is a regulatory one rather than a methodological one. Equally the decision regarding any proposed limit value is also a regulatory issue. In principle life cycle cost analysis could be utilised to determine the EEI and corresponding points score, just as is currently done to inform energy performance limit values.

Essentially the same approach could be used to establish a labelling classification based on the points-classification, exactly as would be done using a conventional EEI indicator. Lastly, the points approach set out above has the flexibility to recognise and award points for generic (i.e. process orientated) Ecodesign measures, such as for the quality of guidance and information provided. Thus in cases where there is a desire to blend points allocations for specific and generic design measures within one framework it is possible to do so; however, it imposes the analytical discipline of trying to estimate the expected benefits of the generic measures (even if these are very difficult to know and highly uncertain). Such an action would constitute a new analytical stage which is not currently expressed within the MEErP.

6. Linkage of the generic methodology to the MEErP and Ecodesign process

The 10 methodological steps outlined above are designed to work and complement the existing MEErP methodology and the overall Ecodesign regulatory process. Once a preparatory study is launched it would assess the scope (Task 0/1), the markets (Task 2), users (Task 3), and technologies (Task 4). LCA impacts are determined in Task 5 and ecodesign design options are assessed in Task 6, as shown in Figure 1.

Through this process clarity is gained regarding the following:

- The importance of the various environmental impact parameters via the EcoReport tool and LCA of Task 5
- The representative duty profiles (via Task 4)
- The representative reference case products and application groups (via Task 4)
- The ecodesign options and whether or not these entail a mix of cardinal, ordinal and qualitative data (via Task 6)

After the assessment of the design options in Task 6 it will be clear whether the design option impacts can be assessed with purely cardinal data, in which case a traditional Ecodesign approach will be valid, or whether it is necessary to include ordinal and/or qualitative data, in which case a points-system approach could be merited. Thus, the moment following on from the assessment of Task 6 would be the logical moment to conduct Steps 1 – 5 of this suggested analytical framework, to decide whether a points system approach is merited or not. If the conclusion is that it is, then the remaining Steps 6 to 10 of this framework should be conducted.

At this stage some iteration would be required compared with the standard MEErP process. While Steps 1-5 are relatively straightforward to conduct the subsequent Steps 6 to 10 are more involved and may require adjustment of the Preparatory Study's schedule and resources. These are:

- Step 6 Assessment of the implications of product modularity
- Step 7 Assessment of the implications of product performance sensitivity to the final application
- Step 8 Determination of environmental impact budgets
- Step 9 Normalisation and awarding of points
- Step 10 Support to regulatory decision making

Furthermore, stakeholder comment and regulatory development and decision making stages need to be built into the decision-making process. It could be envisaged that following Task 6 the consultants (with guidance from the Commission) present an assessment of the following:

a) The case of whether a points-system approach needs to be countenanced or is unnecessary or unhelpful (from Step 5)
b) In the event that they consider that it is logical to consider a points-system approach they would need to report their thinking with regard to:
    c) The environmental impact parameter or parameters to be assessed via a points approach (from Step 3)
    d) The product scope (i.e. simple product, extended or modular product, or product system) that the points system would aim to address (from Step 2)
    e) The life cycle stages that would be included in the assessment (from Step 1)
    f) The assessment of the product intervention phases (from Step 4).

This could be presented to the Consultation Forum for comment and based on the feedback received a decision could be made by the Commission regarding whether to proceed to the conduct of Steps 6 to 10 and/or whether to amend any of the thinking regarding the choice of impact parameters, product scope, lifecycle stages and product intervention phases.

In the event that the Commission deems it is still sensible to proceed, following this consultative step then the consultants would be tasked with conducting Steps 6 to 9. This would entail reaffirming that the product reference cases are appropriate for:

- the modularity of the product determined in Step 6, and
- each pertinent application group derived in Step 7.

It would be likely to necessitate undertaking a more thorough appraisal of the product reference cases than would have initially been performed in MEErP Tasks 1-4.
Once the reference cases are clarified then the impact budgets as a function of the set of design options can be conducted as per Step 8 and a normalisation process and points award process conducted as per Step 9. The results of these analyses could then be presented to a final Stakeholder group and amended as deemed appropriate.

The rest of the process to derive Ecodesign requirements would follow the same process as is normally undertaken. The Commission would take the findings from the stages above and use this to derive a Working Document with its initial regulatory proposal via the Regulatory Development process set out in Step 10. Note that the derivation of this working document is likely to require an additional assessment of the products on the market to establish the points that would be associated with the Least Life Cycle Cost and BAT levels, as well as the Reference Cases. If points-based energy labelling is envisaged it may also be valuable to see how current products are distributed in terms of their points allocations for energy performance.

Once the working document is developed it would undergo scrutiny and potential amendment via the Consultation Forum and the Regulatory Committee, in the usual manner for Ecodesign and Energy Labelling regulations.

7. Observations on conformity assessment

The generic methodology set out in section 5 does not pose any insurmountable problems for conformity assessment, but it is inherently more complex than simply submitting a product to a laboratory for an energy performance and associated impact parameter test. If a points system is being used it will be because of the presence of non-cardinal data necessary to evaluate one or more ecodesign impact criteria, or because some blend of generic and specific Ecodesign requirements is being considered within a single evaluation framework. Thus while there will be more types of aspects to assess and there will be a need to put them within a single accounting framework (the points system) to determine compliance, none of the individual elements that go into the foundation of the points system need present any greater challenge for conformity assessment than were they being assessed as ecodesign features that are measurable purely via cardinal data.

Checklist approaches are likely to be needed to determine whether products have ordinal or qualitative design features and in principle the process of doing this can be codified into standard assessment guidelines or standards. The precise route to follow would need to be assessed on a case by case basis and determined by the appropriate bodies (Commission, standards committees and MSAs and/or conformity assessment bodies). Although the process of determining the points scores adds a layer of complexity to a standard product conformity evaluation it is not inherently more complex than the process that would already be required to assess a domestic heating or hot water system for compliance with the energy label (European Commission 2013).

8. Clarification of the rationale for the proposed methodology

It should be recalled that the structure of the methodology that has been set out in Section 5 has been consciously designed to address the requirements:

- To evaluate environmental impact parameters in isolation and not to combine them within an overall points scheme
- To ensure that the impact of design options are awarded points in proportion to their effect on the impact parameter in question
- To be as comprehensive and inclusive as possible and thereby allowing the option to extend the scheme’s structure to include: the environmental impacts deemed appropriate, the product scope that is deemed most appropriate, the intervention phases deemed appropriate
- To work at whatever application grouping levels are deemed to be appropriate
- To address product modularity
- To fit within the MEErP methodology
- To work with the Ecodesign and energy labelling regulatory process
- To respect the needs of conformity assessment
- To enable complexity to be addressed.

As a consequence, the proposed methodology discards any of the impact parameter aggregation methods which have been discussed in the Task 2 report[7] of this project. However, the methodology used retains an equivalent approach to the derivation of impact parameter performance metrics, as is currently utilised in conventional Ecodesign determinations (e.g. for EEIs). It is designed to ensure that all relevant factors are considered and determined systematically, but still allows user freedom and discretion to reflect the inevitable need for flexibility. In particular, it is systematic in recognising when design options can be assessed via cardinal, ordinal or qualitative data and proposes a rigorous but fair method to assemble them within a single evaluation structure. This structure is also capable of incorporating the effect of uncertainty. The method is modular and supports modularity in all its aspects (modularity in: product scope[8]; product elements and functions; design and use intervention phases; specific, generic and information Ecodesign measures or hybrids thereof, and environmental impact parameters). This means that its boundaries can be consciously limited when there is insufficient clarity on some aspects but added to in later editions, as more information and clarity become available. It is flexible in allowing different product phases to be assessed and in allowing both generic and specific Ecodesign measures to be considered and addressed – potentially within the same points-framework at the user's discretion; it also allows the successive addition of environmental impact criteria – each treated distinctly from the others. Lastly it is as simple as can be managed to address the requirements set out above and is structured in a manner that is consistent with the needs of the MEErP, the regulatory process and conformity assessment.

It should be noted that given the rationale discussed above, none of the points-systems approaches considered in the Task 2 report (VITO et al, 2016) are directly applicable to the current need and hence they have only partially informed the development of the methodology proposed in this report. In particular, none of the impact parameter aggregation methods have been necessary, therefore. Instead, rather an amended approach was judged to be necessary, to enable the consultant/ MEErP practitioner/ policy-maker to address the degrees of (un)certainty found within successive individual impact parameter assessments.

There are some similarities with the methodologies to determine building energy performance, or heating system energy labelling, or pump energy performance (for example) but in none of these cases is there a direct corollary. In particular, the present methodology aims to be as explicit as possible in assessing the relative importance of different eco-design features towards the overall performance of a product for any given environmental impact parameters – even when this requires partially informed estimates to be derived and the impact of uncertainty to be taken into account.

[7] i.e. those methodologies that are intended to compare across different types of impact parameter and award points within a common framework

[8] i.e. component, simple packaged product, extended product or product system

9. References

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