The Future of the MEErP – Reinforcement Of Circular Economy Aspects In The Methodology

The focus of regulatory activities under the Ecodesign Directive 2009/125/EC has so far mainly been on the energy efficiency of energy related products (ErP). However, there is now an urgent need for a shift in focus to better account for wider products impacts due to a number of trends, including:

- **Product-level shift in impacts towards material efficiency**
  The relevance of ErP in terms of the environmental impact of the raw material extraction and manufacturing stages is expected to grow as electricity in-use decreases with improvements on energy efficiency. Further, there are several products such as smartphones, notebooks and printers where the environmental footprint is already dominated by the manufacturing stage, and therefore the key opportunity for ecodesign is to prioritise material efficiency over energy efficiency aspects.

- **Continued impacts in embodied energy in products**
  Whilst the transition to a greater share of renewable energy has potential to reduce the impacts of electricity consumption, extractive industries and manufacturing are unlikely to experience this transition at the same pace, especially when upstream activities take place outside of the EU as is often the case for raw materials used in ErP.

- **Increasing material density**
  A transition towards connected, cordless and “smart” products, requiring batteries and processors, is likely to increase the material footprint of high power-demand ErPs (fridges, vacuum cleaners and washing machines) compared to previous generations.

The development of robust metrics, under the methodological framework behind Ecodesign (MEErP), to quantify the benefits of a transition to a circular economy (e.g. material, embodied emissions, energy and additional environmental impacts savings) is, thus, essential in order to stimulate timely actions from policy makers and stakeholders. It would also incentivize more durable, repairable, and circular products and foster high-level political support for ecodesign. Further, macro level environmental and socio-economic benefits can be delivered. The improved method should also be integrated into Ecodesign Impact Accounting, including status reports.

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1 When including their consumables
2 Methods and modelling of “circular economy” policies were identified as lacking when the EC’s Long-Term Strategy was presented by DG Clima to the Commission’s Expert Group on Sustainable Consumption and Production [http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=31869](http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=31869)
Inadequacy of the current MEErP approach and EcoReport tool

The current MEErP and EcoReport tool is insufficient to properly tackle circular economy / material efficiency elements and trends in product design. Repair, reuse, upgrade (RRU) and other operations such as recycling need to be more systematically considered in the methodology’s application in conjunction with a common approach for the identification of priority parts.

In particular, the following improvements are necessary to the MEErP EcoReport tool:

- Modelling flexibility for lifetime variation in relation to repair scores and RRU operation impacts.
- Ability to harmonise with Product Environmental Footprint (PEF)
- Improvements in material aspects
- Externalities in cost analysis (societal costs that may not be reflected immediately on consumers’ bill)

In general, the methodology would benefit from developing the following aspects:

- Establishment of product information database and acquisition of data to improve market knowledge and make it more timely.
- Taxonomy of material efficiency ecodesign characteristics as a guide for regulation
- Evaluation of complexities and trade-offs

Modelling flexibility

The MEErP EcoReport tool is currently incapable of modelling the majority of potential ecodesign material efficiency requirements (see Error! Reference source not found. Error! Reference source not found.). In order to reach circular economy goals, it is important that the ability for a product to be repaired/upgraded/recycled is included in the MEErP assessment using probability assumptions linked (for example) to a repair score and to the potential for lifetime extension as a result.

Improved functionality should address the following:

1. Comparison of the impact of different lifetimes of products, for instance by enhancing stock modelling based on sales data and changes to the distribution of product lifetimes.
2. Linking lifetimes to RRU scoring [via a probability of lifetime extension of X years per scoring category]
3. Calculation of average RRU operation impacts via mini impact models for key RRU operations (varying by priority part and operation type) addressing:
   - inputs: probability of failure, type of failure, at what point in the lifetime the failure is expected, production and transport impacts of spare parts, transport impacts of product to repair location, probability of repair, cost of repair etc.
   - outputs: average failure cost/impacts, additional years lifetime gained, total product impacts per year life.
4. Flexibility in assumptions of % spare part composition of products with clear specification of what parts qualify to be included in this categorisation.

5. Allocation of “credits” for reused/remanufactured parts as well as recycled content.

6. Time/operation-based material efficiency indicators: to take into account the impact of lifetime extension and product vs product-service systems, output indicators should be provided as follows:
   - Impacts and cost per year of use.
   - Impacts and cost per significant user operation as applicable (i.e. per washing machine wash, taking into account that lifetime extension will result in more washes for the same material impacts).

7. Wider impact indicators: These should go beyond energy and Global Warming Potential (e.g. Abiotic resources depletion, eco toxicity, etc.) and include a means of addressing scarcity of resources – for example using the approach of Vogtländer, et al.\(^5\).

### Ability to harmonise with Product Environmental Footprinting (PEF)

As presented at the stakeholder event on 28th May 2019, it is clear that it would be beneficial to link the PEF data and approach (i.e. weightings) with the MEErP EcoReport tool wherever possible. Furthermore, inconsistencies between MEErP EcoReport and PEF should be addressed. For example, for environmental impact categories such as acidification and eutrophication, where the PEF units are mol H+ eq and mol N eq, rather than g SO2-eq and g PO4-eq respectively.

### Improvements in material aspects

The EcoReport Tool data on materials should be expanded to better address the following:
   - critical materials and related improvement/substitution options
   - improvement/substitution options for hazardous materials
   - recycled materials
   - new materials (bio-based, etc.)

Clear guidance should be provided on how to handle variations in recycled content for materials.

The following standards being developed in response to M/543 may assist in developing the material aspects of MEErP and their systematic application:
   - prEN 45555 Recyclability & recoverability
   - prEN 45557 Recycled material content
   - prEN 45558 CRM declaration

### Externalities in cost analysis / prioritisation of design options / inclusion of cost criteria

**Externalities and LLCC**

The principle of least life cycle cost (LLCC) as a means of evaluating design options within MEErP needs to be re-examined in the context of circular economy goals. As detailed in various presentations at the stakeholder workshop on 28th May 2019, it is necessary to take into account externalities in order to consolidate economic analysis and LLCC if it is to be retained in the method.

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Therefore, a more holistic approach should be taken to life cycle costing that encompasses the costs to society as a whole:

- User (including the cost of repair i.e. spare parts)
- Manufacturer
- Overall environmental impact (material scarcity, pollution...)
- Societal/social impact (notably health and pollution of ecosystems, but also, where possible, labour conditions, EU dependency on imports etc.)

Permitted thresholds or minimum conditions should be defined. Further, it is necessary to ensure that lifetime extension is accounted for in any LLCC ranking of design options.

**Timing of LLCC levels**

The regulatory process is relatively slow in its nature, and fast track approaches have failed to materialise. Taking into account the urgent need to reduce the impact of products and shift towards a circular economy, measures are necessary to reduce the delay in implementing ambitious requirements. The principle of ambition should be clearly defined in relation to regulatory tiers by establishing that the identified LLCC should be targeted in the first tier of requirements (instead of Tier 2 as today), with the second tier being defined on the basis of learning curves expected from developments to reach Tier 1. In other words:

- Tier 1: LLCC at time t
- Tier 2: LLCC plus learning curve at time t + x years (x being the time between entry into force of Tier 1 and entry into force of Tier 2).

**Inclusion of cost aspects**

The price of spare parts is often a major barrier to repair\(^6\). Few consumers are willing to spend more on a repair than 30% of the price of a new appliance. However, as mentioned at the Workshop of 28\(^{th}\) May 2019, a single spare part may sometimes be more expensive than the entire product\(^7\). The likelihood of product repair, and therefore the actual impact on the product’s footprint, cannot be evaluated without taking into account such economic factors.

While spare parts prices may be subject to fluctuations, the MEErP methodology already offers options to establish realistic market prices based on either list prices minus discount (top-down) or cost plus margin (bottom-up)\(^8\), and it is therefore possible to refine the approach to include spare parts price as a parameter for assessing the repairability of products.

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**Establishment of product information database**

A platform to facilitate a data gathering and recording system, combining automated web crawling, exploitation of energy labelling data (where available), possible self-reporting by connected appliances and manufacturer data would greatly facilitate the analysis process, especially for new product groups.

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The Commission could reduce the data mining efforts of those carrying out the studies by providing such a platform - enabling more effort to be spent on exploration of improvement options on energy, material and societal aspects. Material efficiency aspects such as the compliance with repair scoring parameters could be included in this database. In addition, provision of the data to the public on an openly available website would facilitate transparency.

**Taxonomy of material efficiency ecodesign characteristics as a guide for regulation**

As a basis for deciding which circular economy aspects should be regulated under Ecodesign, the approach taken in the paper by Tecchio et al. can be used. This establishes a schematic for linking policy goals and material efficiency topics, as presented in *Figure 1* below:

![Figure 1 - Connection of policy goals, product life cycle phases and material efficiency topics](http://www.sciencedirect.com/science/article/pii/S0959652617311502)

Once policy goals are clear, groups of potential requirements can be determined using for example the matrix presented in *Figure 2* below. This matrix approach can be combined with the Joint Research Centre’s GAME (guide for the assessment of material efficiency of products) approach within a revised MEERp to enable the relevance of a range of RRU aspects to be evaluated for a product group in order that potential requirements can be developed for each material efficiency aspect. The above approach should be formalised in the methodology to accelerate the achievement of savings.

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9 For example, see the table on page 3 of the “Discussion note on the possible implementation of a Reparability Scoring” distributed by the European Commission for the July Ecodesign and Energy Labelling Consultation Forum


**Evaluation of complexities and trade-offs**

It is important to provide guidance on how to handle the trade-offs and complexities of addressing each material efficiency aspect. For example:

- **Lightweighting vs durability:** If a restriction on total product mass is being considered it is necessary to ensure that durability and reparationability are not impaired\(^\text{12}\).

- **Lifetime extension vs new efficient products:** Trade-offs between energy and material aspects should be taken into account using a common evaluation approach. For example building upon the method developed by the European Commission’s Joint Research Centre\(^\text{13}\).

- **Improved durability vs reparability:** Approaches can be devised to find a balance between durability and reparationability where these imply different design approaches (i.e. integrated vs modular design). For example, should a manufacturer decide to integrate a battery to improve the durability of the battery connection this would mean that the battery will not be easily repairable, so requirements on battery cycle life for products with integrated batteries should be more demanding than for those that have an easily replaceable battery.

- **Recycled / reused content requirements vs supply:** When specifying requirements on material content, an approach is needed to take into account the potential availability of such content on the market or to link content requirements with recyclability requirements.

- **Testing overheads:** Durability requirements for parts should take into account the practicalities of accelerated testing and ensure tests that are practical whilst at the same time being representative of real world usage\(^\text{14}\).

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\(^\text{12}\) for this reason, lightweighting is not considered in the matrix

\(^\text{13}\) Environmental assessment of the durability of energy-using products: method and application, F. Ardente, F. Mathieux, J. Clean. Prod., 74 (2014), pp. 62-73, [https://doi.org/10.1016/j.jclepro.2014.03.049](https://doi.org/10.1016/j.jclepro.2014.03.049)