ENERGY EFFICIENT LIGHTING AND APPLIANCES
in East and Southern Africa

Energy Efficient Lighting and Appliances in East and Southern Africa (EELA)

Webinar Series 2021 – Pathways to Repair in the Global Off-grid Sector

May 18, 2021

ENERGY EFFICIENT LIGHTING AND APPLIANCES
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Webinar Agenda

Webinar Item	Name	Time (min)	Organisation
Opening and welcome remarks	Prof Mackay Okure	5	EACREEE
European overview and trends for repairability and ecodesign	Peter Bennich	15	Swedish Energy Agency
Why repairability is an important strategy to consider for off-grid appliances	Richa Goyal	15	Energy Saving Trust, Efficiency for Access Coalition
Product design and standards	Rowan Spear	15	University of Edinburgh
Questions to the presenters		10	All
Panel discussion (30min) **Moderator:** Readlay Makaliki, SACREEE **Panelists:** • Rowan Spear, Research Fellow, University of Edinburgh • Adrian Honey, Director of Marketing, LORENTZ • David Tusubira, Chief Technology Officer, Innovex • Peter Bennich, Senior Adviser, Swedish Energy Agency • Richa Goyal, Senior Insight Manager, Energy Saving Trust & Research Co-Lead, Efficiency for Access Coalition			
Discussion	All	10	
Wrap Up and Takeaways	Mr. Kuda Ndhlukula	5	SACREEE

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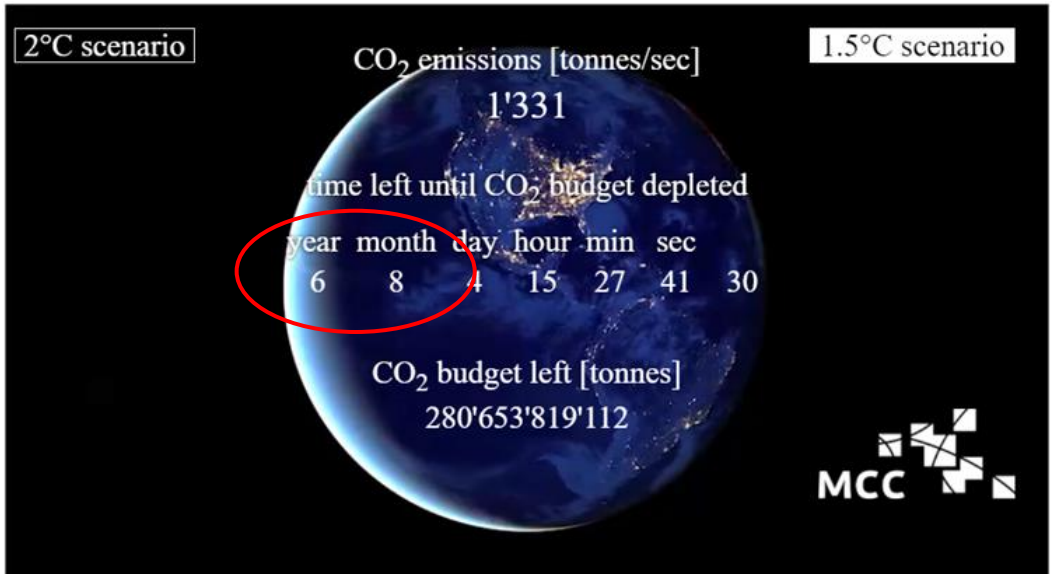
European overview and trends for repairability and eco-design

Peter Bennich, Senior Adviser, The Swedish Energy Agency

Presentation Outline

- Background for EU Climate and Energy policies
- EU goals for addressing climate change
- EU energy efficiency policies
- Now: Material use increase
- EU response: Circular Economy Action Plan
- Circular economy product policies – examples and ongoing work

Background for EU *climate and energy* policies



CO_2-budget: Only 280 Gt left… 35 ton/capita! Moreover: current emission rate ca 40 $GtCO_2$/yr -> ca 7 years left…

Source: Remaining carbon budget - Mercator Research Institute on Global Commons and Climate Change (MCC) (mcc-berlin.net) [Download: 20-04-26]

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EU goals for 2030 to address climate change

Supply of energy:

- At least 32% share for renewable energy of the Primary energy supply

End use:

- At least 32.5% improvement in energy efficiency

Reduction of CO_2-emissions

- At least 55% cuts in greenhouse gas emissions (from 1990 levels)
- And net-zero by 2050
- Important to consider a *Just transition*

*All this achieved by a wide range of policies on the EU level. The **Green deal** and the **Green recovery** emphasis and sustain this more than before.*

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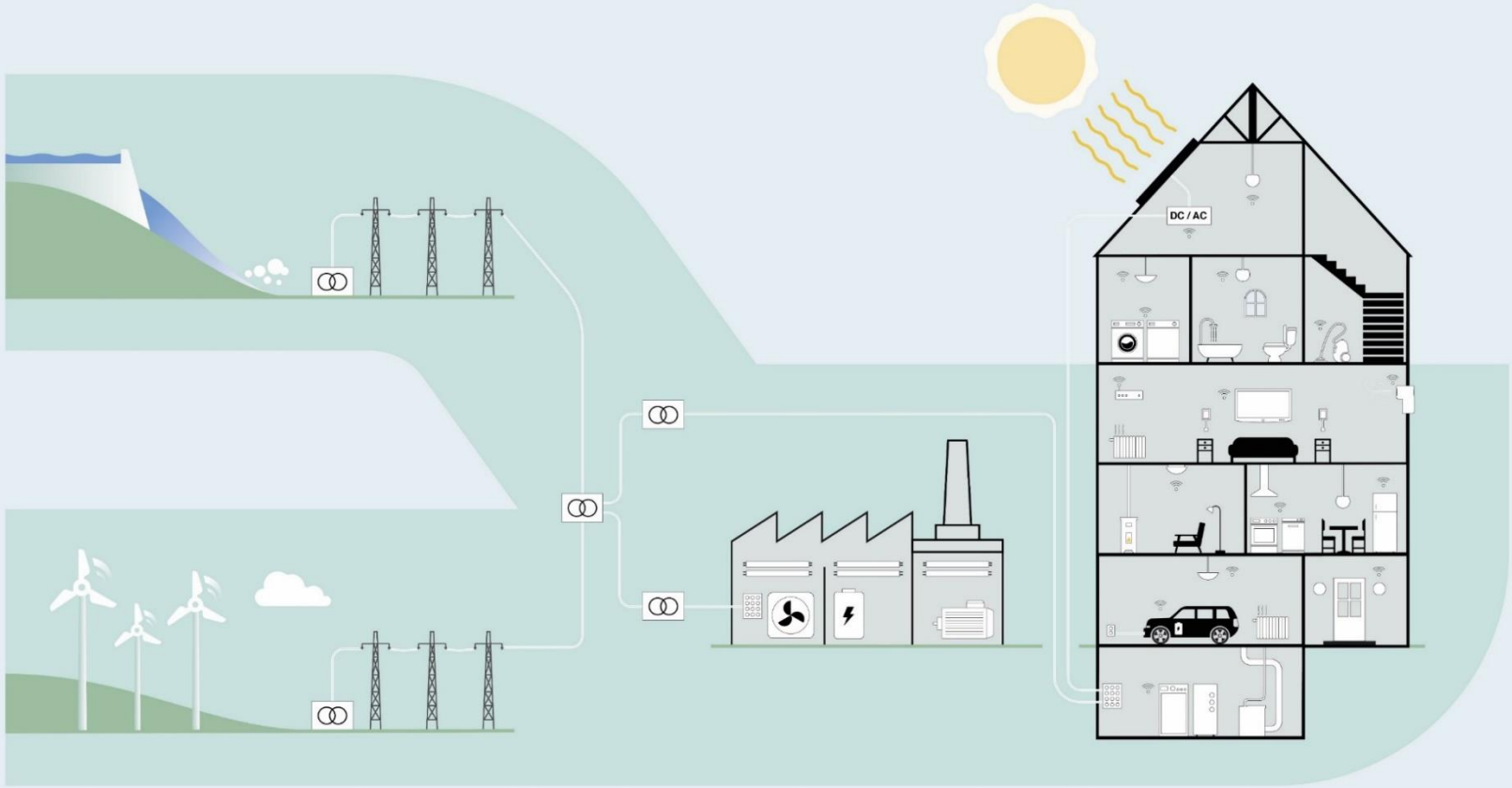
Energy efficiency policies:
Ca 30 products regulated by Ecodesign and Energy Labelling



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Ecodesign: So far the use phase has been the main focus

LCC = Purchase Price + Running cost

LLCC: Find the Least Life Cycle Cost -> Minimum Energy Performance requirement for the regulation of each product

Other parameters on functionality also considered: noise, performance, water use, etc

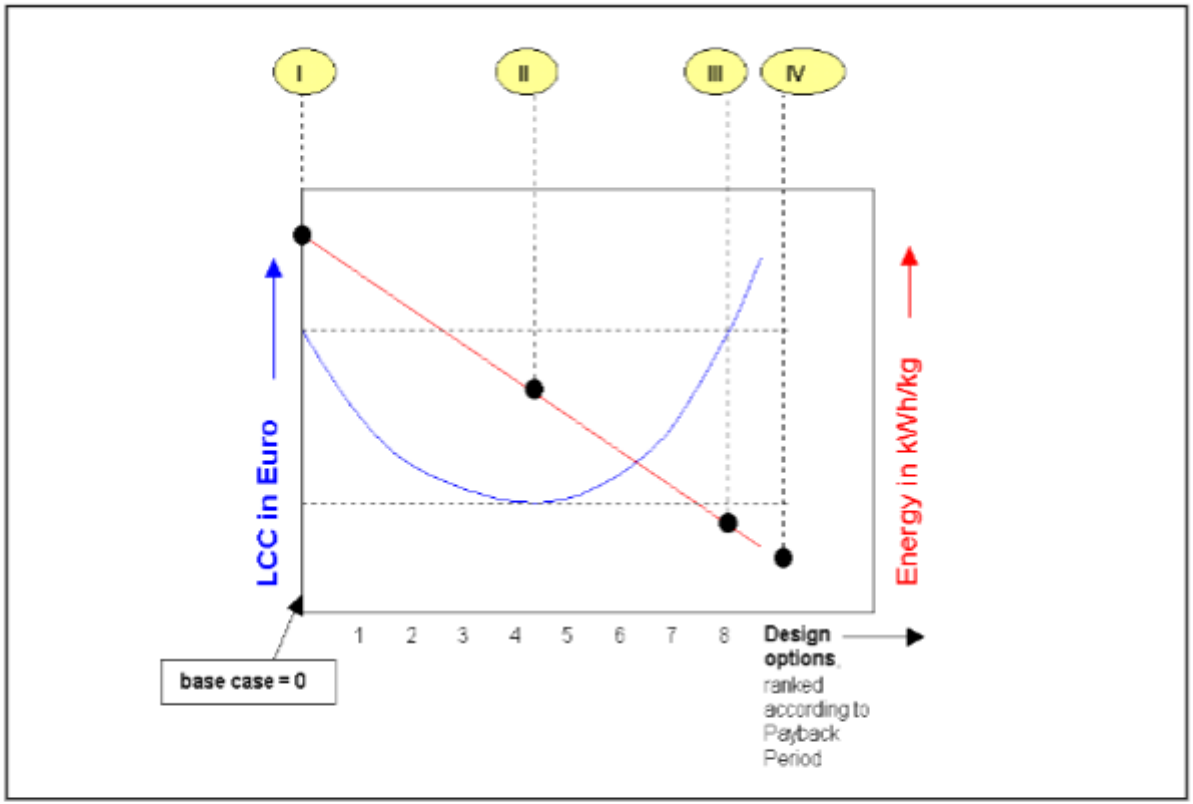

Figure 20: Archetype LCC curve

I = BaseCase; II = Least LCC; III = No financial loss (break-even point); IV = BAT point

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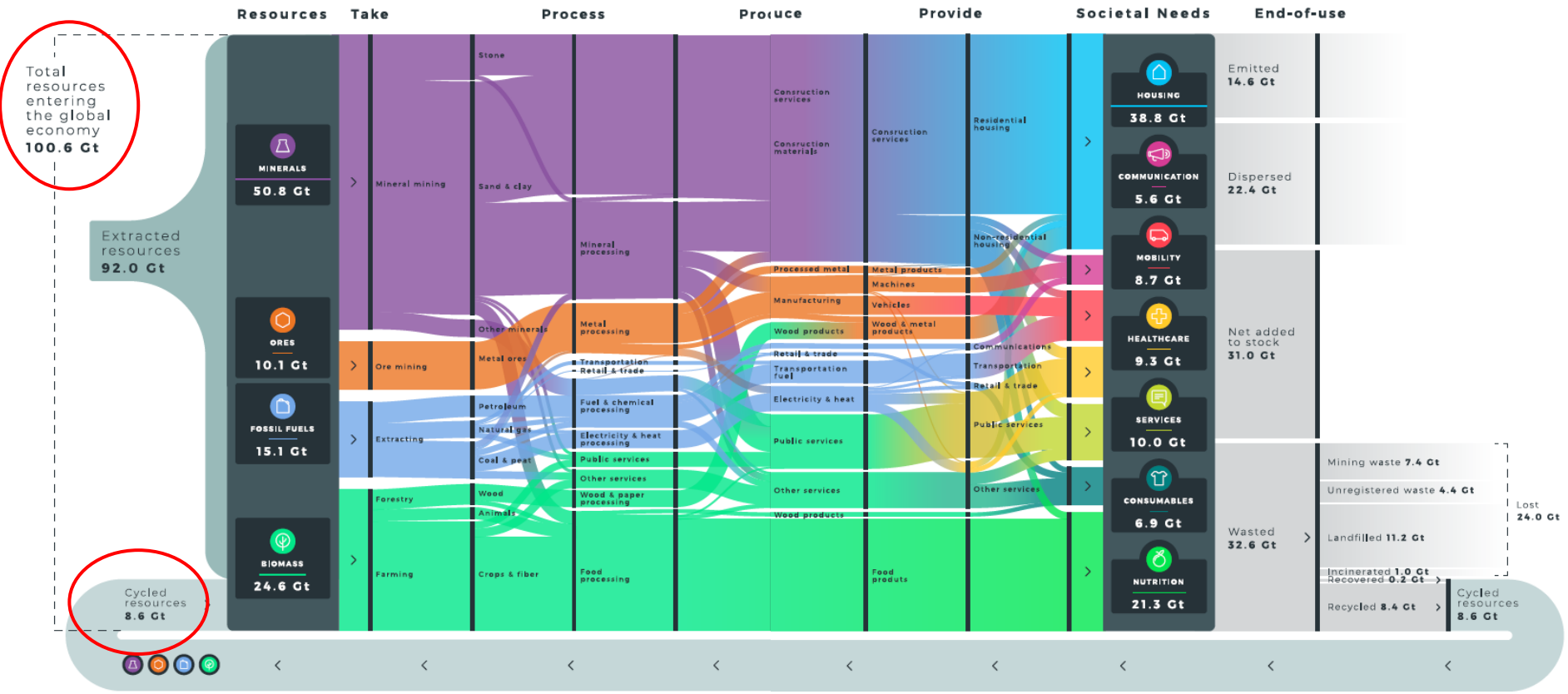
Now: material use increase, recycled material decrease



Ca 13 ton/capita, yr… Source: [The circularity gap report 2020]

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EU response:

- **The Circular Economy Action Plan:**
  - Overarching strategy for circular economy and resource efficiency
- **Sustainable Product Initiative (SPI)**
  - Number of policies involved, including ecodesign and labelling
- **Ecodesign:**
  - *Scope*: extend to more products than only energy using (white goods etc) and energy related (windows, water taps etc); could in principle be all products
  - *Requirements*: include more aspects such as durability, repairability, upgradeability, recyclability, etc
- **Energy labelling:**
  - Include more information on durability, repairability etc

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EU response (cont):

- **Production phase:**
  - Put requirements on and/or disclose information on
    - Material use
    - Share of recycled material
    - Energy mix and carbon footprint
  - Use product passport
- **Durability:**
  - Prolong life for products in general:
    - Cheaper for consumers, reduced carbon footprint
  - However, not strict for energy using or related products:
    - Could be better to replace before End-of-Life
  - Second life possibilites
- **Repairability**
  - Making it easier for consumers to make a choice

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Some products get resource efficiency requirements already this year (2021)

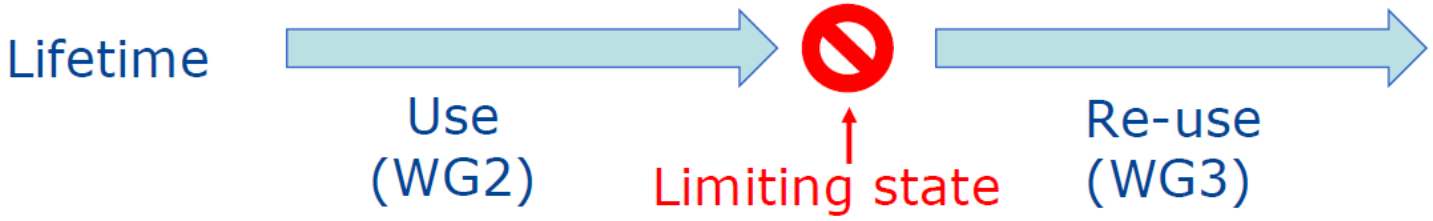
- **Products**
  - Fridge, freezers
  - Washing machines and dish washers
  - TVs
  - Lighting
- **Type of requirements**
  - Repairability
    - Spare parts should be available for typically 7 years
    - Information about repair should be available
    - Common tools
  - Upgradeability (when applicable)
    - Software updates
  - Recyclability
    - Easier to dismantle, information on how
    - Information on material

Example: Resource efficiency requirements on Dish washers

- **List of available spare parts**
  - For how long (7 – 10 years)
  - How fast you can get them (max 15 days)
- Professional repairers (7 years):
  - Motor
  - Circuit board
  - Thermostat
  - Permanent and possibly other software
- End user (10 years):
  - Hinge
  - Filters
  - Hatch
- **Information on maintenance and repair**
- **Critical components shall be easy to recycle**
- **Information about type of refrigerant**

Ongoing work on durability and repairability: Standard EN45554:2020 as a base

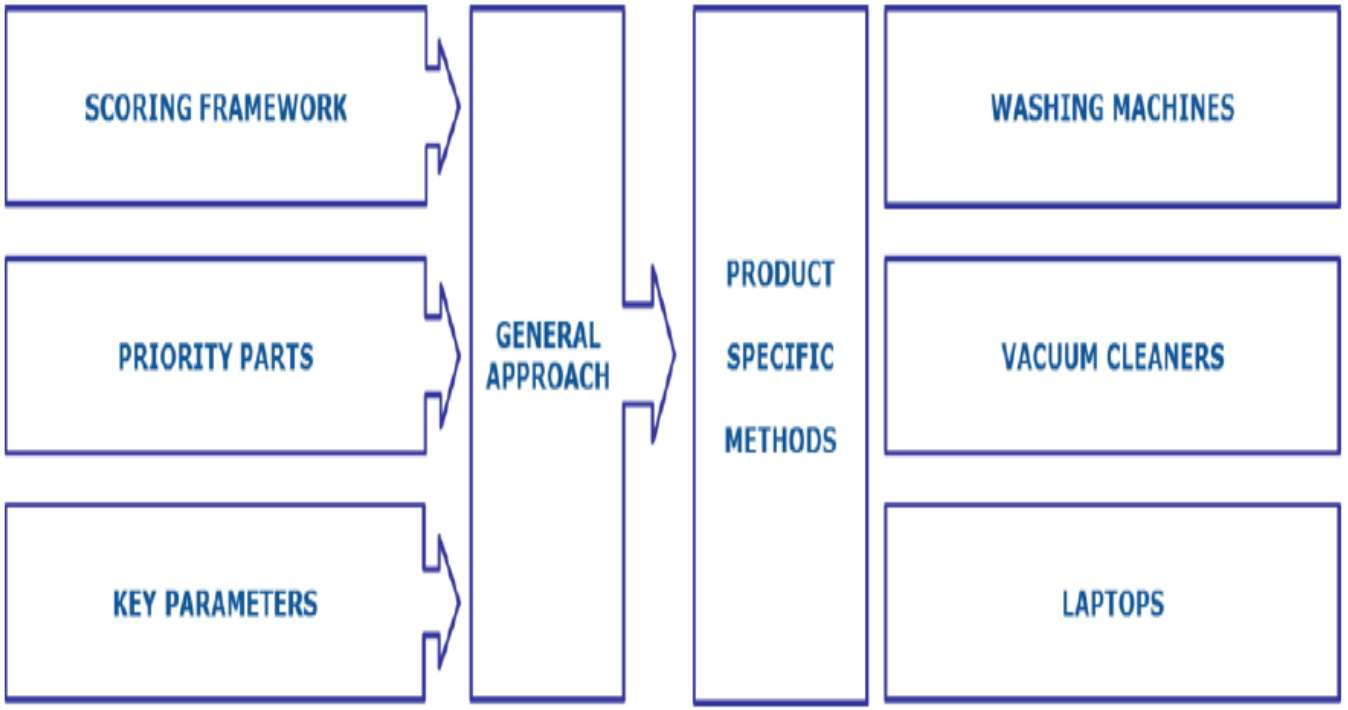
Extending the lifetime of products



To overcome technical and market barriers:

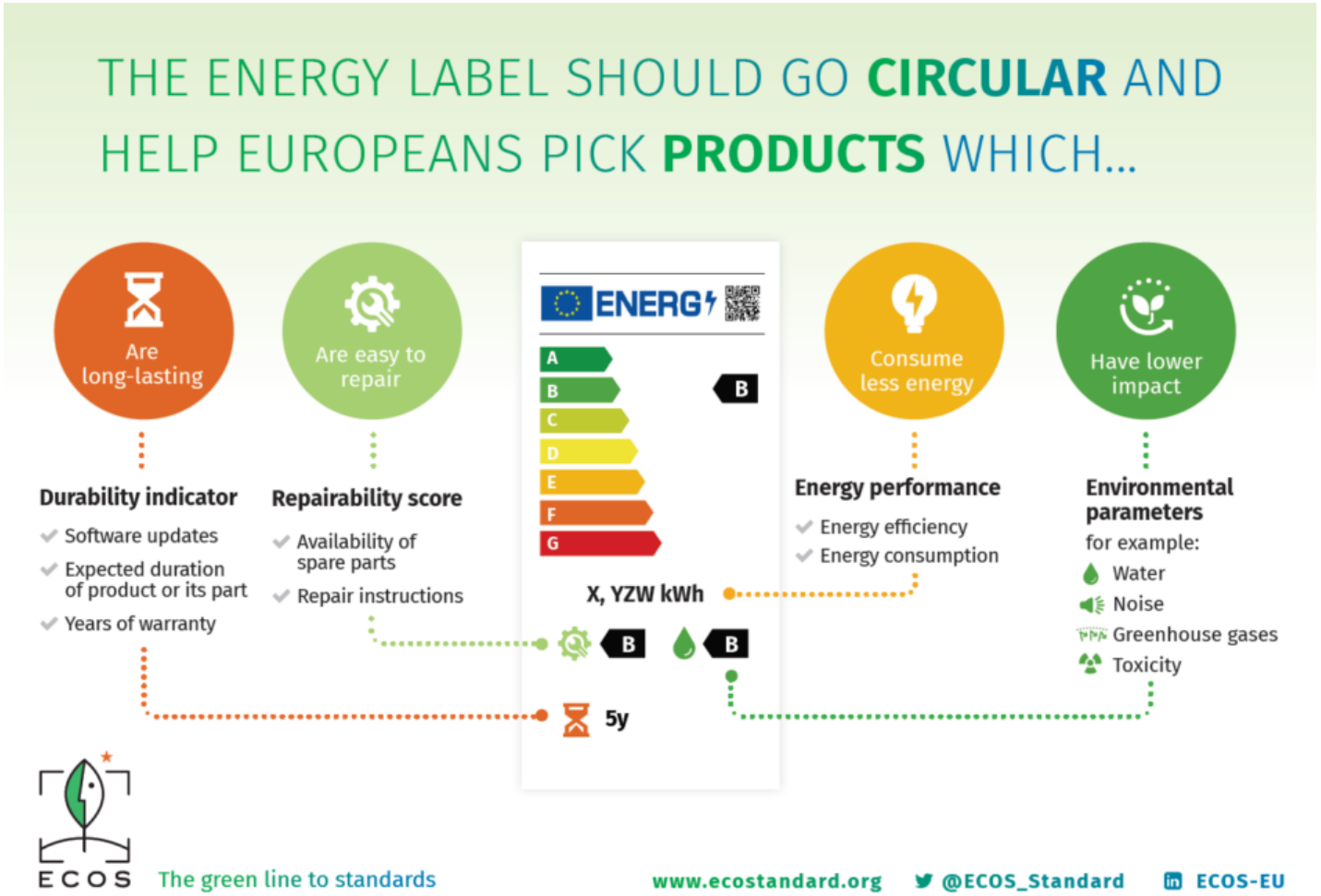
1. **Durability strategy**: postponing the limiting state
2. **Upgradability strategy**: enhancing the functionality of a product
3. **Reparability strategy**: restoring the functionality of a product after a fault

EU Joint Research Center (JRC) study of repairability score



Could be used in policy-making (e.g. Ecodesign, Energy Label, GPP, Ecolabel) or for the design of a new label/public guidance document.

How it could look like



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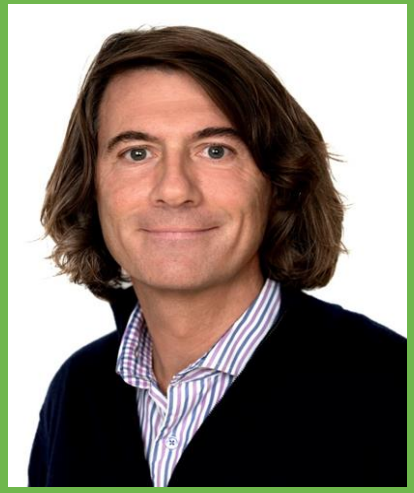

THANK YOU

Peter Bennich
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Peter Bennich received his PhD degree in physics at the University of Uppsala, Sweden, in 1996. After two years working as lecturer in electronics, optics etc at the Mid Sweden University, Östersund, he moved to the Royal Institute of Technology, Stockholm, where he worked as program manager, overseeing projects in Distributed generation and Power electronic based components in the electrical grid.

Since 2002, Dr Bennich has been working with energy policies within the Swedish government, focussing on energy efficiency. In his present position as senior adviser at the Swedish Energy Agency, he is working with the EU product regulations on ecodesign (minimum energy performance standards) and energy labelling. In particular, he is covering the work on the lighting regulations.

Dr Bennich represents Sweden in the IEA Technology Collaboration Programme on Energy Efficient End-use Equipment, the IEA TCP 4E, promoting global harmonisation of policies on lighting, power electronics, electric motor systems and connected devices.

He is also engaged in the recently restarted programme on Super-Efficient Equipment and Appliance and Deployment Initiative under the Clean Energy Ministerial, the CEM/SEAD initiative.

Finally, he (together with Christofer Silfvenius) is responsible for the engagement of the Swedish Energy Agency in the EELA project.

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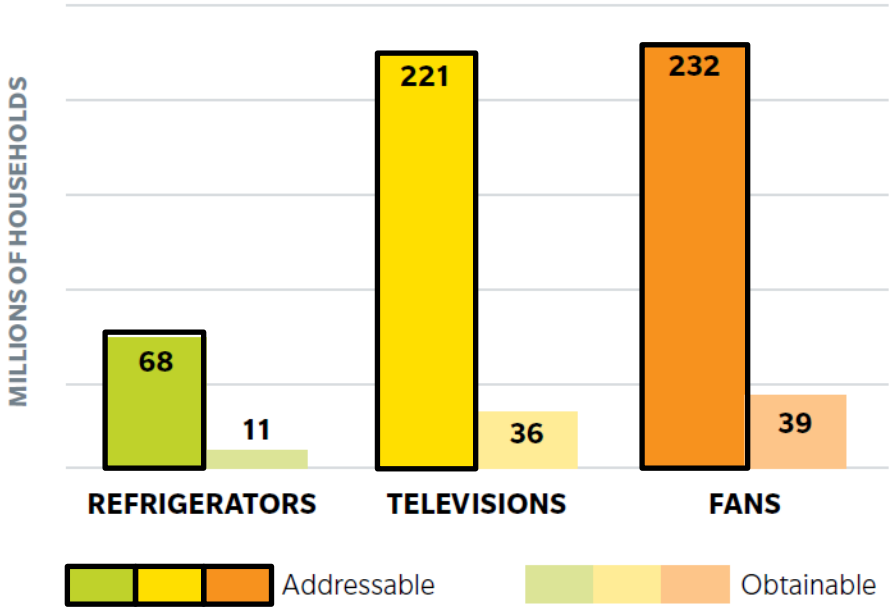
Why repairability is an important strategy to consider for off-grid appliances: Impacts and Business Models

Richa Goyal, Research Co-lead
Efficiency for Access Coalition & LEIA Programme |
Senior Insight Manager, Energy Saving Trust

Understand the Context

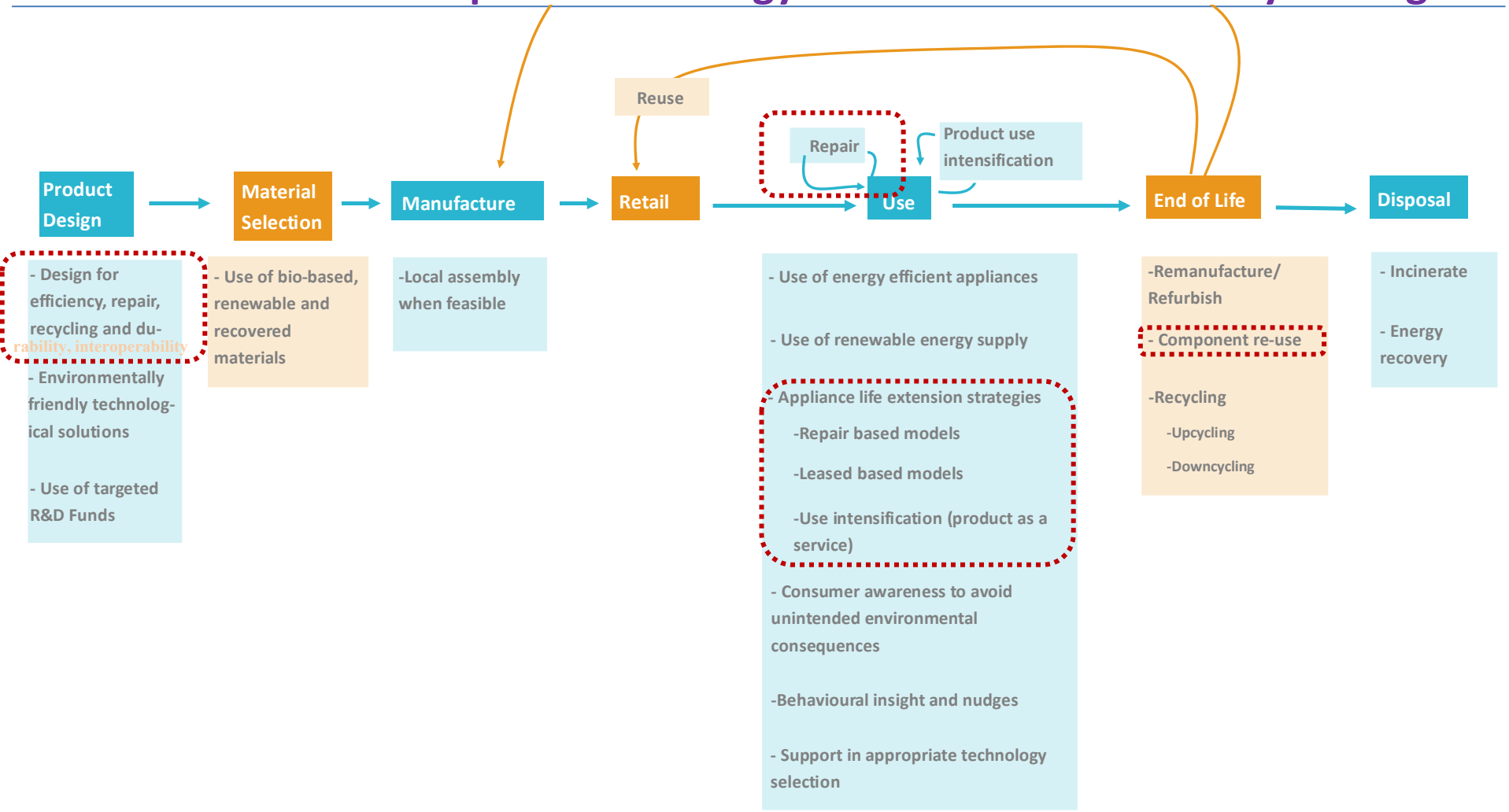
- Why should we care about appliance repairability in the off-grid sector
- Relationship of repair with other circularity strategies
- Impact of repair
- Pro-repair business models

Why should we care about repairability of off-grid appliances: Millions of HHs in rural global south will be purchasing appliances for the very first time



- A new report by World Economic Forum (WEF), published in 2019 notes that carbon emissions from production and use of electronics will reach 14% of total emissions, one half of the total emissions from the global transport sector.
- The off-grid sector where millions of households in rural regions in developing countries will be purchasing many appliance types for the first time in the run up to 2050 present ***a unique opportunity to leapfrog these populations to the lowest carbon and most inclusive technologies feasible***.

Where does repair as a strategy feature within circularity strategies



Expected impacts

- Helps build resilience: An essential part of the green recovery tools basket and crucial for pandemic preparedness
- Livelihood impacts as well as higher value components and materials for recyclers
- Contributes to product affordability
- Important to market building, helps with building consumer trust in technology and extended customer-manufacturer relationships
- Environmental impacts
  - Resource and material savings
  - Full realization of energy efficiency mitigation benefits
  - Reduction in e-waste streams
  - Reuse of valuable materials

Low carbon off-grid appliances: cradle to grave emissions analysis

Early result [Please note final numbers are subject to change as analyses mature]

: Early results from studying the SDD fridge using natural gases indicate that expanding the fridge's usage life for 20 and 30-years would contribute to 20% and 45% GHG reduction respectively on an annual basis compared to 10 years lifespan fridge.

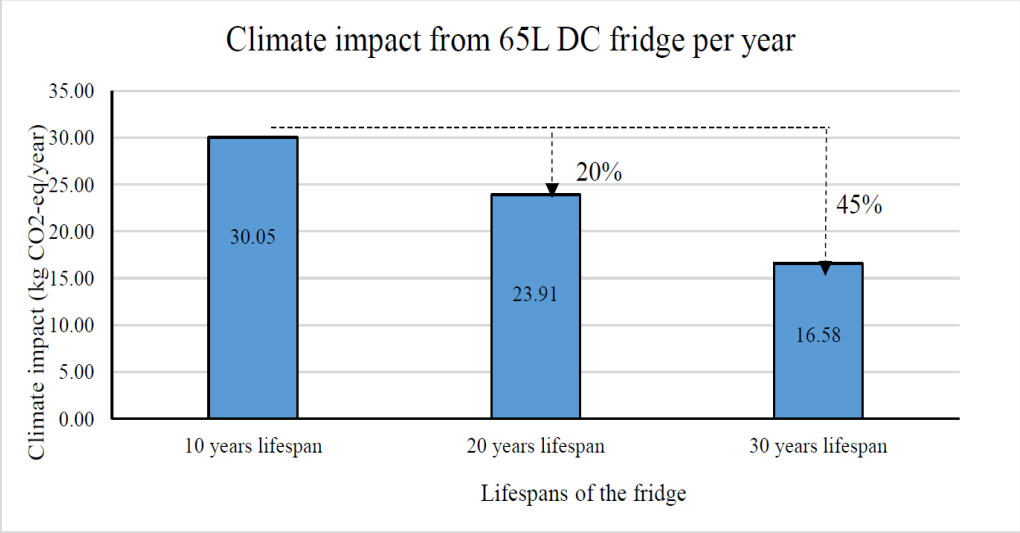


Figure 1: Comparison of life cycle GHGs emissions from SDD fridge using natural gases and baseline technology

Given the impressive mitigation results from extending product life, attention to product extension strategies is vital. A crucial strategy for ensuring that the appliance in question attains its maximum technical life in the field would be designing repairable appliances and adopting repair friendly business models and strategies.

Pro-repair business models

- Circular supply models. These models entail the use of bio- based, renewable, or recovered materials. Use of alternative, or low carbon materials can be beneficial from a repair perspective, especially if these materials are locally sourced thus helping with spare part availability and/or if they reduce the complexity of repair
- Local assembly can help with spare parts availability
- Interoperability and component compatibility
- Product service system models. There are four key variants of the Product Service System model:
  - Warranties or after sales service agreement
  - Renting or lease-based
  - Product as a service
  - Pay-As-You-Go
- Decentralized repairs
- Resource recovery models
  - Crucial for spare parts supply
  - Important synergies with e-waste management and interoperable/compatible components
- Role of smart products and IoT in preventative maintenance and remote trouble shooting

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Richa Goyal
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Richa Goyal serves as the research co-lead for the Efficiency for Access Coalition and as the Senior Insight Manager at the Energy Saving Trust. She is an energy access expert with more than 12 years of professional experience.

Her professional projects span the themes of SDG impacts, unintended environmental consequences, responsible and inclusive energy access, lifecycle impact assessment, business model innovations across Africa and India. Her skills include research grant management, evaluating social businesses, leading field work & development projects, implementing monitoring & evaluation research and big data analytics.

In the past she has worked across programmes such as Lighting Global Quality Assurance Framework, and mini-grids business models as part of the Lighting Asia India team. She also served as the Country Manager India for Alliance for Rural Electrification.

Ms. Goyal's background is in empirical development economics, climate change and energy policy. She has a master's degree in environmental change and management from University of Oxford and a master's degree in Economics from Anna University. In her free time, she loves to practice Hindustani classical music vocals and play the violin.

For further information please visit: https://efficiencyforaccess.org/

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Product Design and Standards

Rowan Spear, Research Fellow
University of Edinburgh

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Understand the Context

- Where will repairs take place?
- Who will be repairing the product?
- How are other items currently repaired in the same context?

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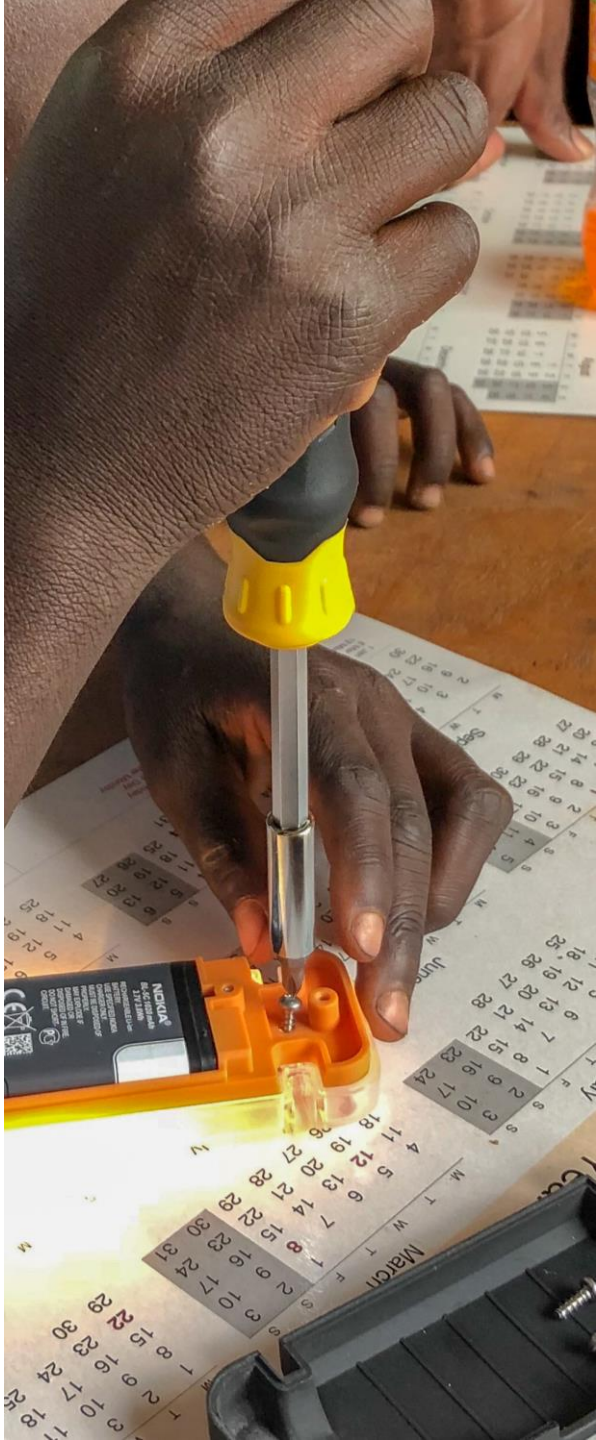
Design for Disassembly

- Screws > glues
  - Types of screws
  - Access to screws / clips
- What tools are available locally?
- What supporting documentation can you provide?
  - Physically
    - Booklets / leaflets
    - On the product itself
  - Digitally
- Intersection with improved recyclability



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Diagnosing Faults

- Make it as simple as possible to diagnose a fault
  - Clearly laid out and labelled components
  - Supporting documentation
  - Easy access with a multimeter
- Could a diagnosis be possible without full disassembly?

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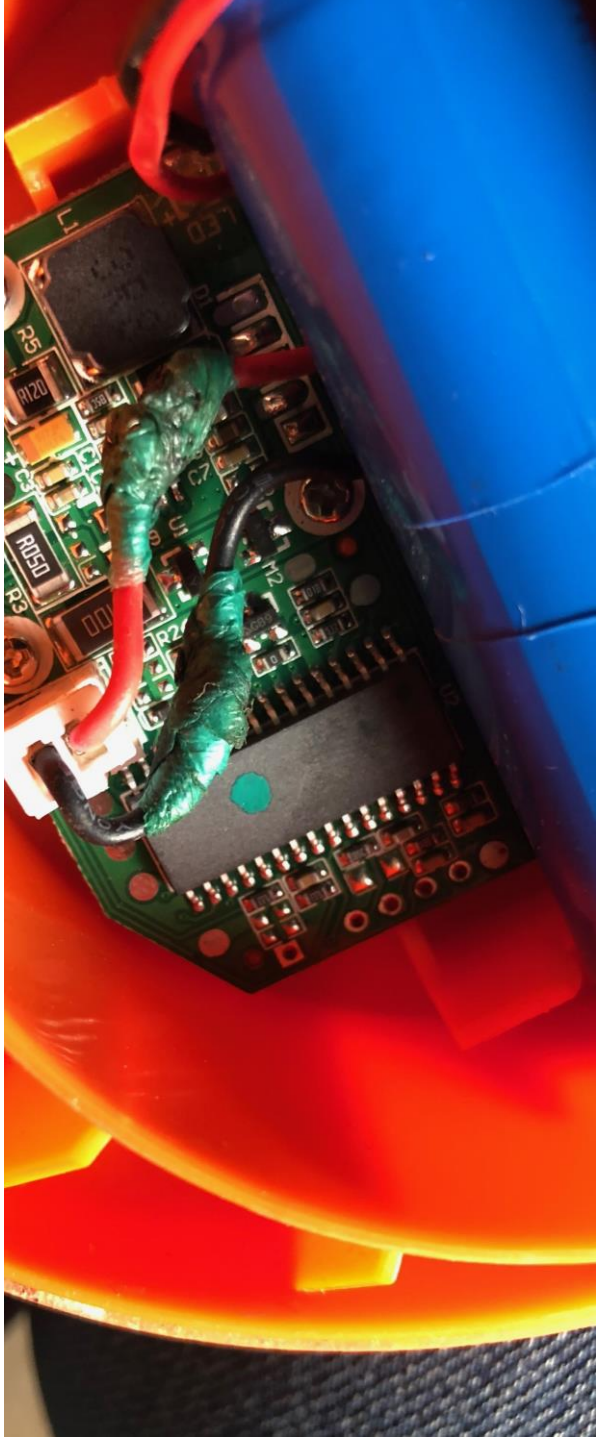
Components and Logistics

- Consider the availability of core components
  - Key components and common failure points
  - Where possible, use off-the-shelf components
- How do components reach the repairer?
  - Consider logistics (including any import taxes and storage issues)
- Modules
  - Complex components or subassemblies requiring specialist equipment or skills
  - Easy to swap out and return to a central location for repair



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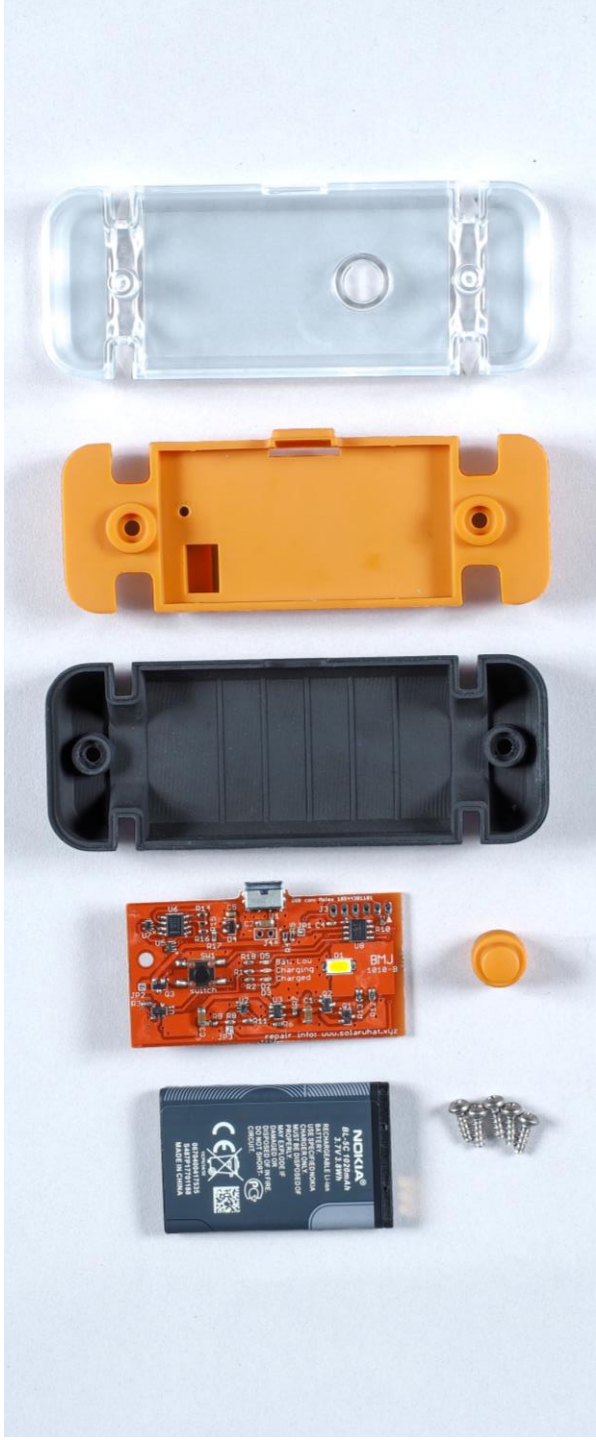
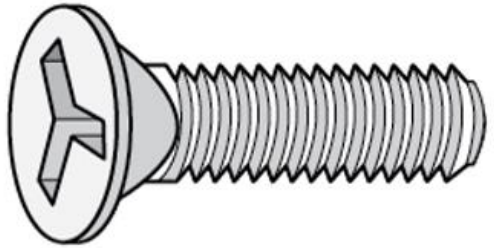
Reassembly

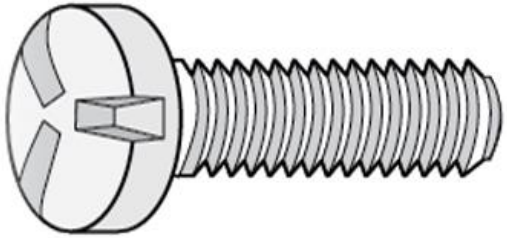
- Equally important as disassembly
- Consider frequency of repair / maintenance / inspection
  - Self tapping screws vs threaded metal inserts
- O-rings
  - If it comes off easily, it must go back on easily

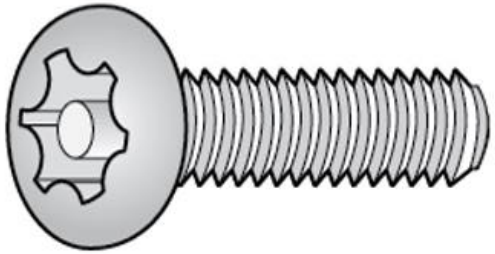


General Points

- Use only as many components as are necessary
- Design products that are durable (long-lasting)
  - Use durable components
  - Maximise the use periods before repair is necessary
  - Durability does not mean tamper proofing!







Repair Standards: European Standards

- What they are
  - EN-45554: General methods for the assessment of the ability to repair, reuse and upgrade energy-related products
  - Internationally recognised methodology framework for objectively assessing the repairability of household electrical appliances

- Why they are important
  - OEMs
    - Quantify the repairability of products
    - Design products and business models that clearly enable repairs
    - Compete fairly on repairability
  - Policy makers
    - Encourage repairs and repairability
    - Develop a consumer facing label
  - Buyers
    - Base purchasing decisions on level of product repairability

Standards in the Off-Grid Energy Sector

- Existing standards and processes
  - Lighting Global / Verasol- Intial Screening and Quality Testing Methods
- Future initiatives
  - Consortium to support sector specific standards
- Why they are important
  - Overcoming barriers
  - Providing incentives

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OFF GRID SOLAR SCORECARD

TRACKING SUSTAINABLE DESIGN IN THE GLOBAL SOLAR INDUSTRY

HOME | PRODUCTS | ABOUT | OUR GRADING SYSTEM | GLOSSARY

FILTER

BRAND

SELECT ALL | CLEAR ALL

- AIRSTAR
- AIWEI
- BAREFOOT
- BETALITE
- BPL
- CHAODELI
- CHENJIE
- D.LIGHT
- FENGOI
- GD LITE
- GOLBEN ROAD
- GREEN HORIZONS
- HIGH MOUNTAIN TIGER
- ILLUMATT
- JUNHENG
- JY SUPER
- KILLO
- LAGAZEL
- LAI TUO

PRODUCTS

SUBMIT A PRODUCT +

20 / 50 / ALL per page

Sort by Grade (best first)

LAGAZEL
KALO 3000

A

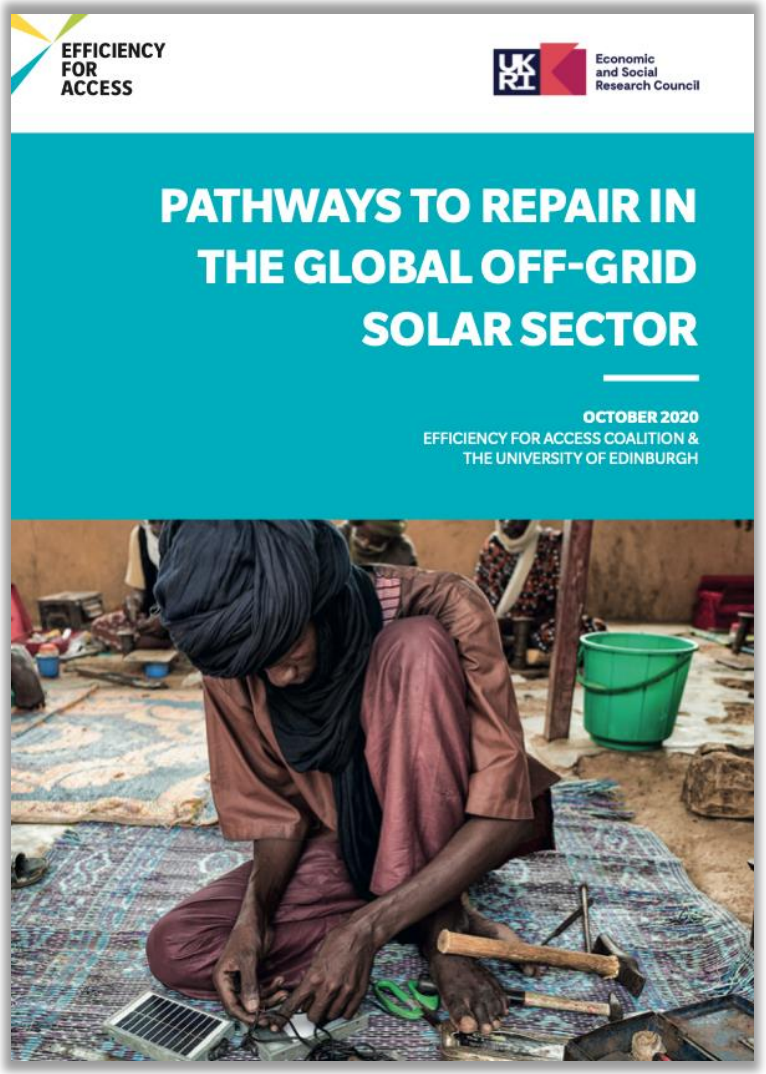
BREAKDOWN

Repairability	A
Recyclability	B
Service & Spares	A
Lighting global accredited?	YES

VIEW FULL PROFILE

Further Information

- Working paper 'Pathways to Repair in the Global Off-Grid Solar Sector' by Efficiency for Access and the University of Edinburgh available from: https://efficiencyforaccess.org/publications/pathways-to-repair-in-the-off-grid-solar-sector



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Rowan is a design researcher and practitioner at the University of Edinburgh, working to promote sustainable, off-grid energy access in the Global South.

His current work, in partnership with the UNHCR, seeks to highlight repair and repurposing activities in refugee camps around the world, identifying opportunities to improve sustainable procurement and support appropriate technologies.

Rowan was the lead researcher and author of “Pathways to Repair in the Off-Grid Solar Sector", published by Efficiency for Access in October 2020. He was the lead designer on the open source, repairable solar light project ‘Solar What?!’, winner of an iF Design Award 2020.

Rowan also has experience developing energy access products in the private sector.

For further information please visit:
https://efficiencyforaccess.org/publications/pathways-to-repair-in-the-off-grid-solar-sector

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