Baseline e-waste status in EAC, Ghana and India and implications for Off-Grid Industry

Federico Magalini – Managing Director Sofies UK
Large benefits of off-grid solar products

- >76 million people worldwide benefited from improved energy access
- >3.4 billion USD savings on lighting and phone charging costs
- Enabling livelihoods, through electrical and electronic equipment (EEE), with outcomes in education, health…

…and, as any other product sooner or later reach End-of-Life (EOL)

What are the EOL implications?
Impacts Off-Grid products at EOL

• Impact on volume of e-waste generated
  • Direct (minor, up to 3-4% on total WEEE) Indirect (enabling more EEE)

• Impact on the environment
  • Few elements of environmental concerns
    – Mainly batteries
    – HG in CFL already substituted with LED
    – Plastics with Brominated flame retardants (?)

• Impact on finances for waste management

• Impact on policy and legislation
## WEEE flows & priority setting

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight / size</th>
<th>Environmental /health</th>
<th>Material value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cooling &amp; Freezing (CFCs)</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>2. Screen</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>3. Lamps (with mercury)</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>4. Large household appliances</td>
<td>High</td>
<td>Low</td>
<td>Medium / High</td>
</tr>
<tr>
<td>5. Small household appliances</td>
<td>Medium</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>6. IT and Consumer Equipment</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Off-Grid Solar</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
</tr>
</tbody>
</table>
Even within the same waste stream, NOT ALL PRODUCTS are equal:

- C&F: Fridges (negative) vs AirCon (positive)

- Mixed WEEE: Mobile phones (very positive) vs small appliances (slightly positive) vs Desktop (very positive) vs Laptop (slightly positive)

- Screens: CRT (negative) vs FPD (close to zero)

- Off-Gird: various…
Off-grid products < 0.5% POM EEE and WG. Can be up to 3% when considering Pb-Batteries.

<table>
<thead>
<tr>
<th>Product or Component</th>
<th>Presence of toxic/hazardous components</th>
<th>Relevant from resource management perspective</th>
<th>Relevant disposal costs</th>
<th>Main sources of potential revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPL</td>
<td>CFL (Hg), if present</td>
<td></td>
<td>Plastics, especially if containing BFR</td>
<td>Copper from cables, PWB from control panels</td>
</tr>
<tr>
<td>SHS</td>
<td></td>
<td></td>
<td>Plastics, especially if containing BFR</td>
<td></td>
</tr>
<tr>
<td>Lamps</td>
<td>Mercury in CFL</td>
<td>Rare Earth in LED (mainly Y, Lu)</td>
<td>CFLs containing mercury</td>
<td></td>
</tr>
<tr>
<td>PV modules</td>
<td>Cadmium and Tellurium</td>
<td>Gallium, Tellurium, Germanium and Indium</td>
<td>Eventually the Glass</td>
<td>Aluminium for larger frames</td>
</tr>
<tr>
<td>Batteries</td>
<td>Lead, Cadmium</td>
<td>Lead</td>
<td>Li-Phosphate, Ni-Cd</td>
<td>Lead, Li-Ion, Ni-MH</td>
</tr>
</tbody>
</table>
The market dynamics (€/t)

Main components Off grid products have negative value!!

Source: Magalini et Al, DFID Report 2016
## Overall financial impact

<table>
<thead>
<tr>
<th>€/product</th>
<th>Worst Case Scenario</th>
<th>Best Case Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EOL Stage</strong></td>
<td>PC1</td>
<td>PC2</td>
</tr>
<tr>
<td>Access to waste</td>
<td>-0.05 €</td>
<td>-0.05 €</td>
</tr>
<tr>
<td>Collection</td>
<td>-0.02 €</td>
<td>-0.12 €</td>
</tr>
<tr>
<td>Transport to plant</td>
<td>-0.01 €</td>
<td>-0.06 €</td>
</tr>
<tr>
<td>Treatment</td>
<td>-0.62 €</td>
<td>-0.88 €</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>-0.69 €</td>
<td>-1.16 €</td>
</tr>
<tr>
<td>Market price</td>
<td>30 €</td>
<td>135 €</td>
</tr>
<tr>
<td>Incidence EOL cost (%)</td>
<td>2.3%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

**Worst Case** = dedicated collection, CFL, lowest material values  
**Best Case** = shared collection, LED, highest material values

*Source: Magalini et Al, DFID Report 2016*
Action items

• Develop set of criteria to create competitive advantage for compliant producers
  • Create national focal groups with key stakeholders

• Develop toolkit for EOL management of Off grid solar products
  • Organize targeted events & integrate EOL management into energy-access programs
  • Develop campaigns targeting consumers and key players

• Carry out pilot projects
  • Map and leverage on existing infrastructures
  • Have baseline for take back cost based on operations
Background Sofies
Who are we?

500+ Projects

35 Employees

40 Countries

100 External technical and field experts

Offices:
Bangalore | Geneva | London
Paris | Zurich

12 December 2017

State of Play for End of Life Recycling for Off-Grid Solar E-Waste
Innovative, thought leadership, ahead of the curve

No militantsism, we listen and adapt

Provide professional service and technical expertise with added value

Create & develop project based on longlasting partnerships

Facilitator, speak the language of stakeholders

We believe in what we do and have pleasure in doing it

At Sofies everybody counts, holacracy & collective intelligence
Our Domains of Intervention

**Smart territories**
Making territories more sustainable through systemic and integrated approaches

**Secondary resource and urban mining**
Turning wastes into resources

**Sustainable industrial zones**
Making industrial areas more sustainable and attractive through industrial symbiosis

**Alternative Energy Systems**
Developing alternative to fossil fuels with climate positive and renewable energies

**Sustainable production and processing**
Ensuring competitive and long term business based on an optimal use of resources and energy

**Managing Sustainability**
Driving sustainability: Innovate, manage, monitor, assess and report
Thank you

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