Eco-design of PV technologies

Sabela Teixeira Taboada

Prof. Angélique Léonard

steixeirataboada@uliege.be

a.leonard@uliege.be

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Introduction

- **Ecodesign** definition:

The integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle.

- **Aim**: promoting the energy efficiency, more durable, reusable, reparable, upgradable, recyclable and generally less harmful to the environment photovoltaic modules, inverters and systems
- Current status of legislation:
  - Directive 2009/125/EC on Eco-design: requirements for energy-related products
  - Initiative: 'Ecodesign – European Commission to examine need for new rules on environmental impact of photovoltaics ': ongoing work on eco-design measures for solar panels, including possible requirements on carbon footprint

In preparation

Roadmap

Feedback period

30 September 2021 - 28 October 2021

FEEDBACK: CLOSED

Public consultation

Consultation period

23 September 2022 - 16 December 2022

FEEDBACK: CLOSED

UPCOMING

Draft act

FEEDBACK: UPCOMING

Commission adoption

Planned for

Second quarter 2023

Ecodesign requirements for energy-related products

Significant environmental aspects must be identified with reference to the **phases of the life cycle** of the product:	**Environmental aspects** that must be assessed where relevant:	**Parameters** for evaluating the potential for improving the environmental aspects referred to the previous category:
• **raw material** selection and use; • **manufacturing** • **packaging**, **transport**, and **distribution** • **installation** and **maintenance**; • **use** • **end-of-life**	• predicted **consumption of materials, of energy** and of other resources such as fresh water • **anticipated emissions** to air, water or soil • **anticipated pollution** through physical effects such as noise, vibration, radiation, electromagnetic fields • expected generation of **waste material** • possibilities for **reuse**, **recycling** and **recovery of materials** and/or of **energy**	• **weight** and **volume** of the product • use of **materials** issued **from recycling** activities • **consumption of energy, water** and other resources throughout the lifecycle

Directive 2009/125/EC

Eco-design assessment as starting point

PHASE 1 - DESIGN

Are the main functions of the product well defined and provided

Is the product easy to maintain?

Is it possible to access parts or modules for repair, refurbishmer and reuse in a non-destructable and reversible way?

Are parts of the product built in a standardized way (for compabtibility, upgrade, repair, ...)?

Is the product designed robust enough to withstand the intende use for the intended use time (material choice, construction, we and tear, ...)?

Does the design promote positive behaviour change or product attachement?

PHASE 2 -RESSOURCES

Is the product built lightweight?

Are recycled or renewable materials used instead of virgin materials?

Is the product build with recyclable materials?

Are materials with big environmental burden avoided? (alumini- um, concrete, precious metals, ...associated with climate change)

Are toxic or hazarodus materials avoided?

Is it composed of few different materials (e.g. just one type of plastic)?

PHASE 3 - MANUFACTURING

Is the procuduction optimized energy-efficiently?

Are auxiliaries and operational material usage optimized or even avoided (water, air, oil,...)?

Is waste avoided during manufacturing?

Are components assembled in removable ways (mono-material dismantling)

Are waste and by-products (also waste water or lost heat) used as a resource for other nearby companies (industrial symbiosis)?

PHASE 4 - DISTRIBUTION

Are long distances across logistics (between material extraction, within the supply chain and along distribution) avoided?

Are logistics organized climate neutrally?

Is a reverse logistics for end of life in place?

Does the packaging add value beyond product protection and marketing?

Is packaging material eco-friendly, reduced or even avoided?

Can the packing be reused (reverse logistics) or recycled?

PHASE 5 -USE

Is the product trying to reduce the energy consumption?

Can rapid wear and tear be avoided or can worn parts be replaced?

Does the product have a switch off button / energy saving mode?

Is the product trying to avoid or reduce the amount of consumables?

Does the product allow more eco-friendly (e.g. 3rd party) consumable

Is a minimum of waste generated during the use phase?

PHASE 6 -AFTER USE

Can the product be re-used for a different purpose?

Does the product provide information how to dispose of (for re- use, recycling)?

Are recycling processes established?

Can toxic materials be disposed of separately?

Is a safe disposal possible?

Based on EcoDesign Circle learning board

Link to online mural

Eco-design in Horizon Europe PV projects

Preliminary phase before the full LCA

Definition of the scenarios and the functional unit

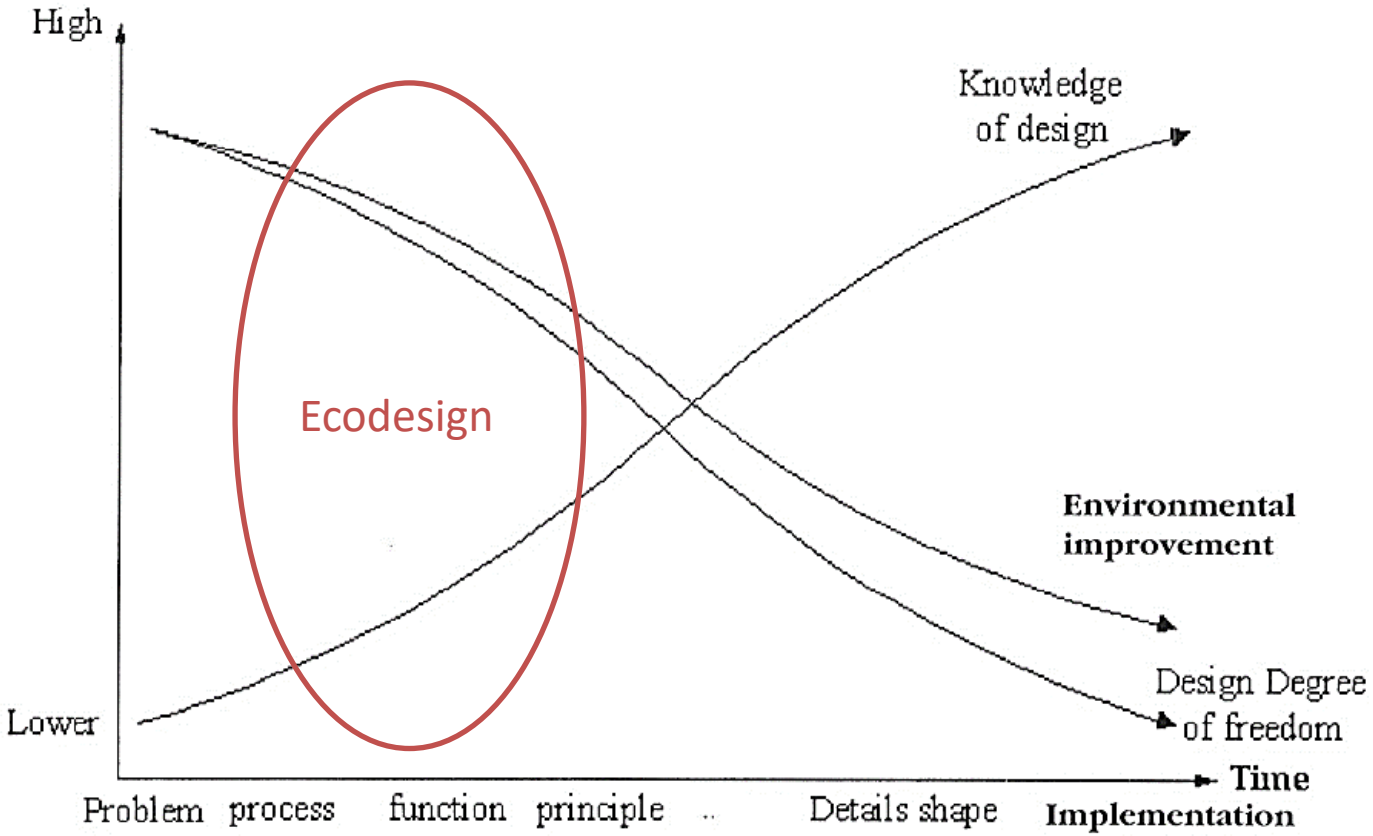
Analyzing manufacturing routes and constituting materials of cells and modules

Identifying and comparing alternatives to select best option to be implemented from an eco-design perspective

Concerns about toxicology

PILATUS
PEPPERONI
VALHALLA

Environmental-conscious design process paradox



Implementing Life Cycle Assessment in Product Development
Gurbakhash Singh Bhander;Hauschild, Michael;McAloone, Tim
Environmental Progress; Dec 2003; 22, 4; Agricultural & Environmental Science Collection, pg. 255

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