Ambition to exceed legal requirements – getting more eco-design into the DTAG device portfolio

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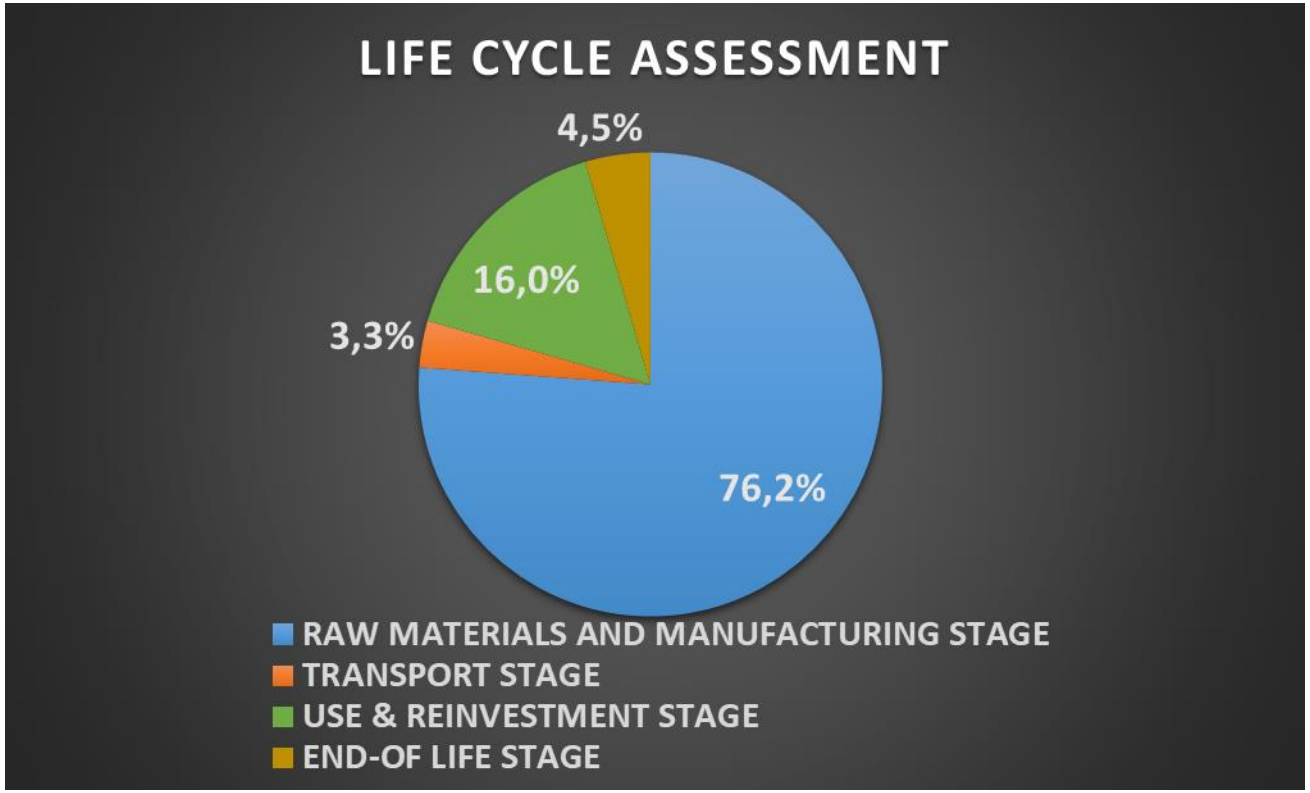
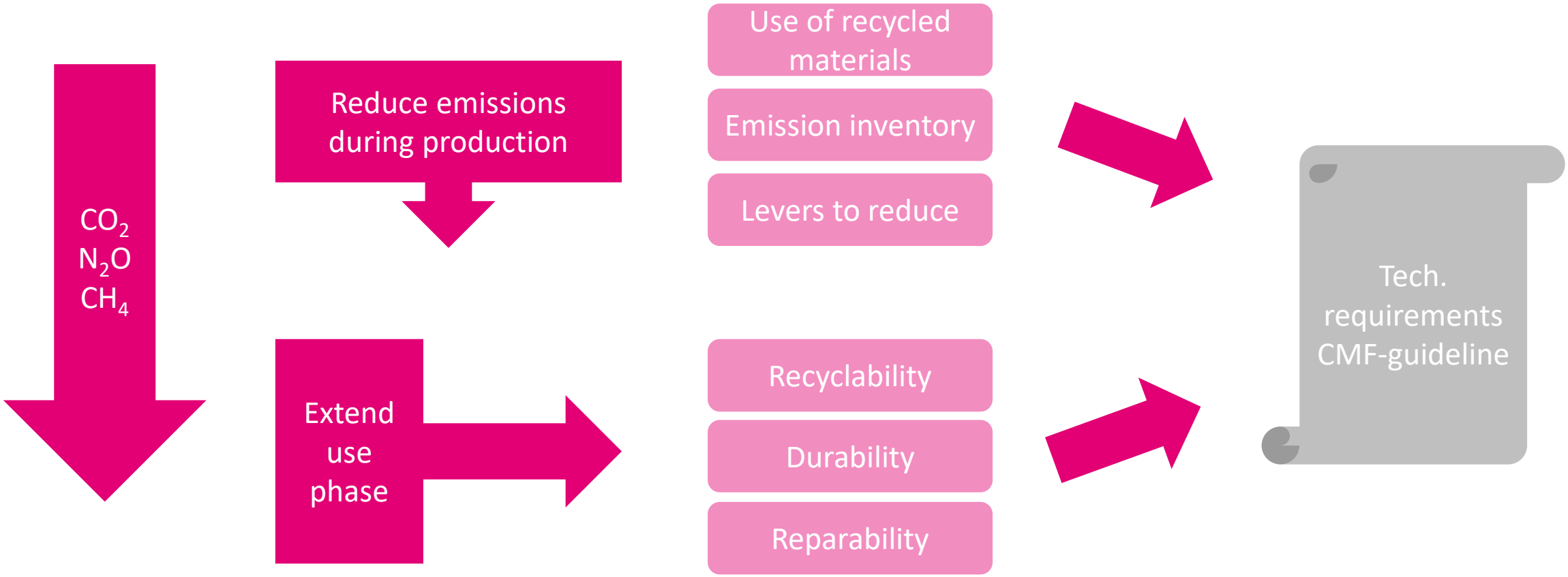
Why – significant ecological footprint of communication devices



Example: typical Smartphone

- 1.2 Bill. annual Smartphone production worldwide (2022, source: Statista)
- 100kg CO_2eq emissions for one Smartphone (source: https://blog.oeko.de/digitaler-co2-fussabdruck/)
- This is a very large amount of Greenhouse Gases (GHG) each year
- Consumption of large amounts of raw materials is also connected to it
- At least for Smartphones, ca. 80% is allotted to the manufacturing phase
- Even risk of growing emissions due to a trend towards larger memory sizes
- Climate protection constitutes an urgent need to reduce the emissions and resource consumption

How – two supplemental strategies to reduce emissions



Objectives of DTAG technical sustainability requirements

Motivate partners in the supply chain to design devices conscious of emissions and ecology helping DT to fulfill its own sustainability targets

Preempt the requirements of the directive 2023/1670, and even exceed those in parts

Guide partners in the supply chain to fulfill those legal requirements

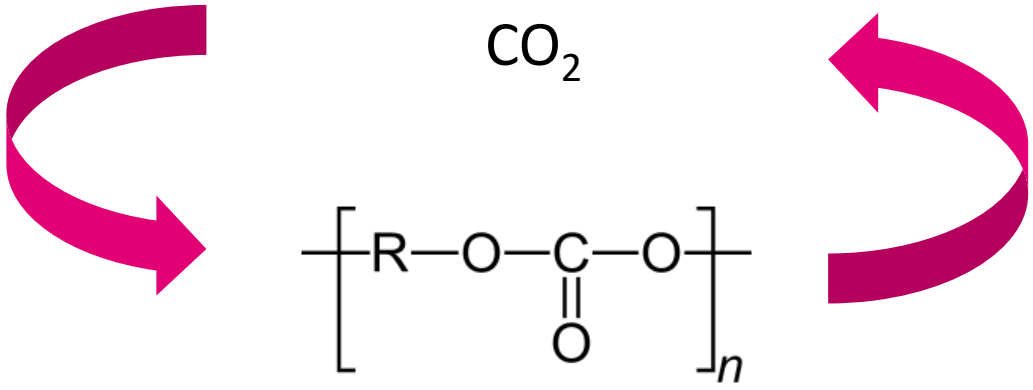
Reduce the amount and hazard potential of hazardous substances used to produce communication devices – establish a hazardous substance management system at our partners (insofar as not yet existing)

Think circularity from both ends

- Secondary raw materials need a market otherwise there is no incentive to recycle
- Secondary raw materials need to substitute primary ones to reduce emissions and resource consumption
- Secondary raw materials are also increasingly needed to secure supply against growing demand

- Recyclability is governed by the WEEE directive
- Recyclability and recoverability targets therein are not very ambitious
- Aspiration should be to exceed the WEEE targets considerably
- The balance to 100% is waste to landfill or to combustion which should be avoided

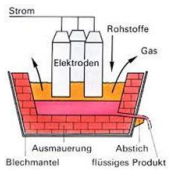
Quick win – circular plastic solutions

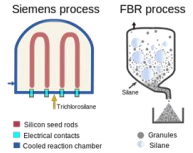


Cycle carbon that is already in the atmosphere or on the earth surface, avoid tapping fossil carbon sources

- A large mass percentage of communication devices consists of plastics (20-50% in case of a Smartphone depending on design)
- Think circularity here not only from a material perspective, but also on a molecular level, i. e., use carbon atoms that are already in the atmosphere or on the earth surface
- Compliant solutions already on the market
  - Mechanically recycled plastic
  - Biobased plastic
  - Chemcycled plastic (in test-size scale)
- Challenges
  - Limitations in mechanics and cosmetics (but true only for mechanically recycled plastic)
  - Lack of knowledge of availability
  - Price

Semiconductors – big lever, but a challenge to tackle





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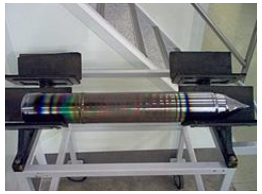
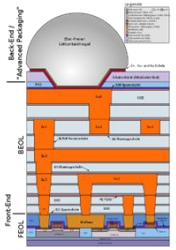
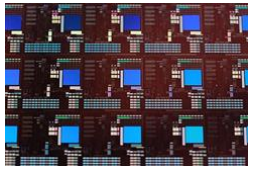






- Semiconductors (integrated circuits) are the largest single contributor to emissions (at least for Smartphones)
- Emission reductions in this area require a controlled use of integrated circuits in the device design and efforts in emission reductions during semiconductor production
- The latter requires a concerted effort along the supply chain
- We would like to learn more about concepts in the semiconductor industry starting from the reduction of quartz to elementary silicon

Longer use – a sure-fire success if operators only change their business model?

①

Stays intact over lifetime

- Robustness to tolerate rough handling
- Reliability against defects
- Long software update periods
- High IP ratings

②

If nevertheless defect, repair is preferred over new purchase

- Easy to repair
- Long availability of spare parts
- Attractive repair conditions

③

After a very long life……

- Recyclability (exceeding WEEE quotas)
- Recycling needs to be economically viable

⇒Longer use has technical prerequisites

What is needed from the supply chain – longevity and durability

Design goals

- Very low propensity to defects
- Able to absorb a certain degree of rough handling
- Avoid premature obsolescence

Consequential specs and proof for accomplishment

- MTBF calculation to select components for reliability
- Drop and tumble tests acc. to IEC 60068
- Scratch resistance acc. to EN 15771 (to Mohs hardness 4 as in 2023/1670)
- IP55 or better to avoid water damages
- Battery cycling robustness acc. to EN 61960: 800 cycles until 80% of the original capacity
- Software updates until at least 5 years after the latest placement on the market (as in 2023/1670)

Challenges

- MTBF calculations not mastered by everybody
- Passing drop and tumble tests is difficult when not mastering the FE simulation of mechanical properties

What is needed from the supply chain – reparability

Design goals

- Low labor cost by short repair duration
- Spare parts availability
- Some parts consumer serviceable

Consequential specs and proof for accomplishment

- Reusable fasteners of ideally uniform size to reduce change of tools, no gluing joints
- Plug and sockets instead of soldering joints
- Low disassembly depth to exchange components
- Battery replaceable by end consumers
- Spare parts availability minimum 5 years (to be set to 7 years in the 1. h. of 2025 to conform to 2023/1670)

Challenges

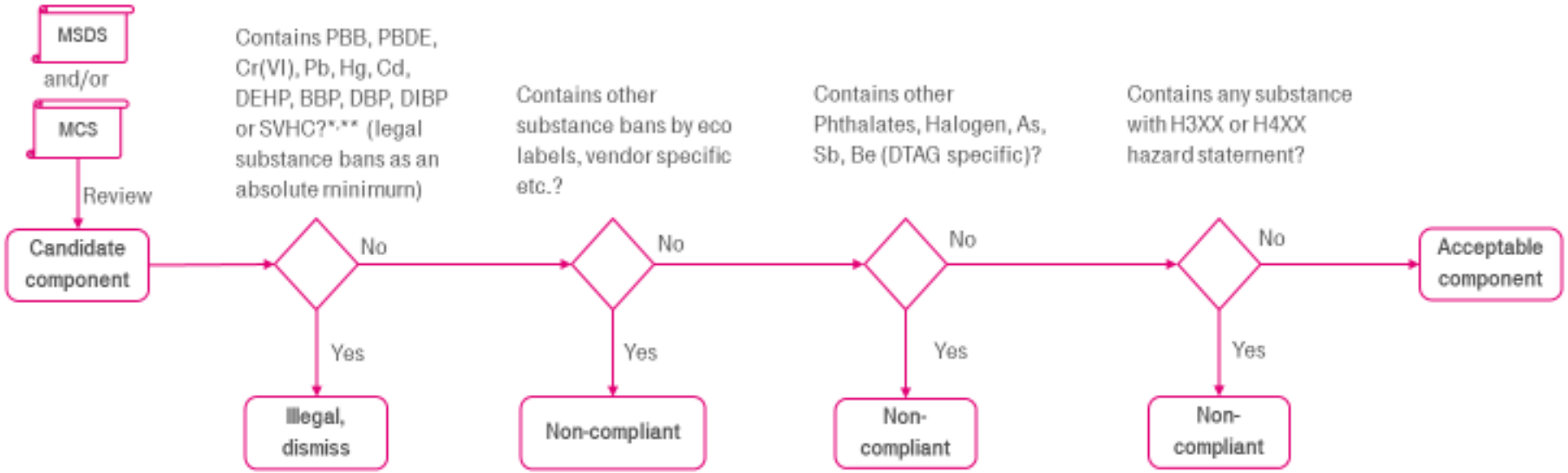
- Reparability in conflict with high IP rating for some design approaches
- Spare part availability currently 2-4 years only

Harmful substances in devices – a problem in the supply chain

- It is too short-sighted to think harmful substances just from their danger potential when inside devices
- These need to be handled along a long supply chain before getting into devices which starts with mining and implies the risk of pollution causing harm to the health and the environment
- The same risk applies when devices are finally recycled at end-of-life
- If harmful substances are limited from the end of the supply chain, the need to handle those is reduced or removed along its entire length
- The legislator already regulates some of these harmful substances (RoHS, REACH, POP) but by far not all that may occur
- An active harmful management system is required to avoid harmful substances or, if technically not feasible, select constituents in way that the risk potential is reduced to the inevitable minimum
- This is now of relevance to the German Supply Chain Act (LkSG) as handling of harmful substances requires adequate worker protection measures

Required process how to control harmful substances in components

MTR 33796 & 33798: AVOIDANCE OF HARMFUL SUBSTANCES



*SVHC: Substances of Very High Concern according to REACH

**save exemptions according to Annex III RoHS but DTAG strongly discourages from their use

Walking the talk with own branded devices

Routers and repeaters should do one thing first and foremost: ensure good WLAN reception. Our Speedport Smart 4 and Speed Home WLAN do just that – and protect the environment at the same time. Because both are consistently planned and developed with a focus on sustainability. This protects our environment by using significantly fewer resources, saving CO_2 emissions, and avoiding plastic waste.

In concrete terms, this means that the housing of the devices itself is made of at least 90% fully recycled plastic. After use in the rental model, Telekom refurbishes the devices and uses them again.

The packaging is not only completely plastic-free and compostable, but also uses 30% less cardboard. Environmentally friendly, plant-based ink is used for printing. Environmentally friendly, plant-based ink is used for printing.

#GREEN MAGENTA
GEHÄUSE AUS 90% RECYCLING-KUNSTSTOFF

#GREEN MAGENTA
MÜLL VERMEIDEN DURCH PLASTIKFREIE VERPACKUNG

#GreenMagenta claim supported by an independent Ecolabel

Thank You!