Beyond Carbon Footprints: The Holistic View of Sustainability in ICT

Jonmichael Hands, Chia Network

Agenda

- New OCP whitepaper on sustainability
- Transparency, Metrics, and Reporting
- Circularity
- Efficiency, Interoperability

New OCP Whitepaper!

WHITE PAPER:
SUSTAINABILITY AS THE FIFTH
TENET

A PRACTICAL GUIDE TO SUSTAINABILITY FOR THE OCP COMMUNITY

Version 1.0

OCP Sustainability creates new opportunities for operating responsibly and positively impacting the world. This involves collaboration and sharing of best practices and leveraging the other strengths of OCP in openness and efficiency.
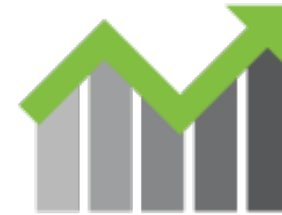
https://www.opencompute.org/documents/ocp-sustainability-pdf

Sustainability in the ICT Industry

Transparency, Reporting and Metrics

Circularity

**Efficiency & Interoperability**

...both have an impact.

EQUIPMENT
MANUFACTURED

GHG CO_2

DATA CENTER
OPERATIONS

SCOPE 3*

SCOPE 2*

From the perspective of data center operators

OCP GLOBAL SUMMIT | 2022

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Transparency, Reporting, and Metrics

Data Center Operators

- Energy - Total energy consumption (Wh), Power usage effectiveness (PUE), renewable energy use
- GHG Emissions (carbon footprint) - Scope 1, Scope 2, Scope 3 (mtCO2e), Carbon Usage Effectiveness (CUE), carbon offsets
- Water - water usage (m3) and effectiveness
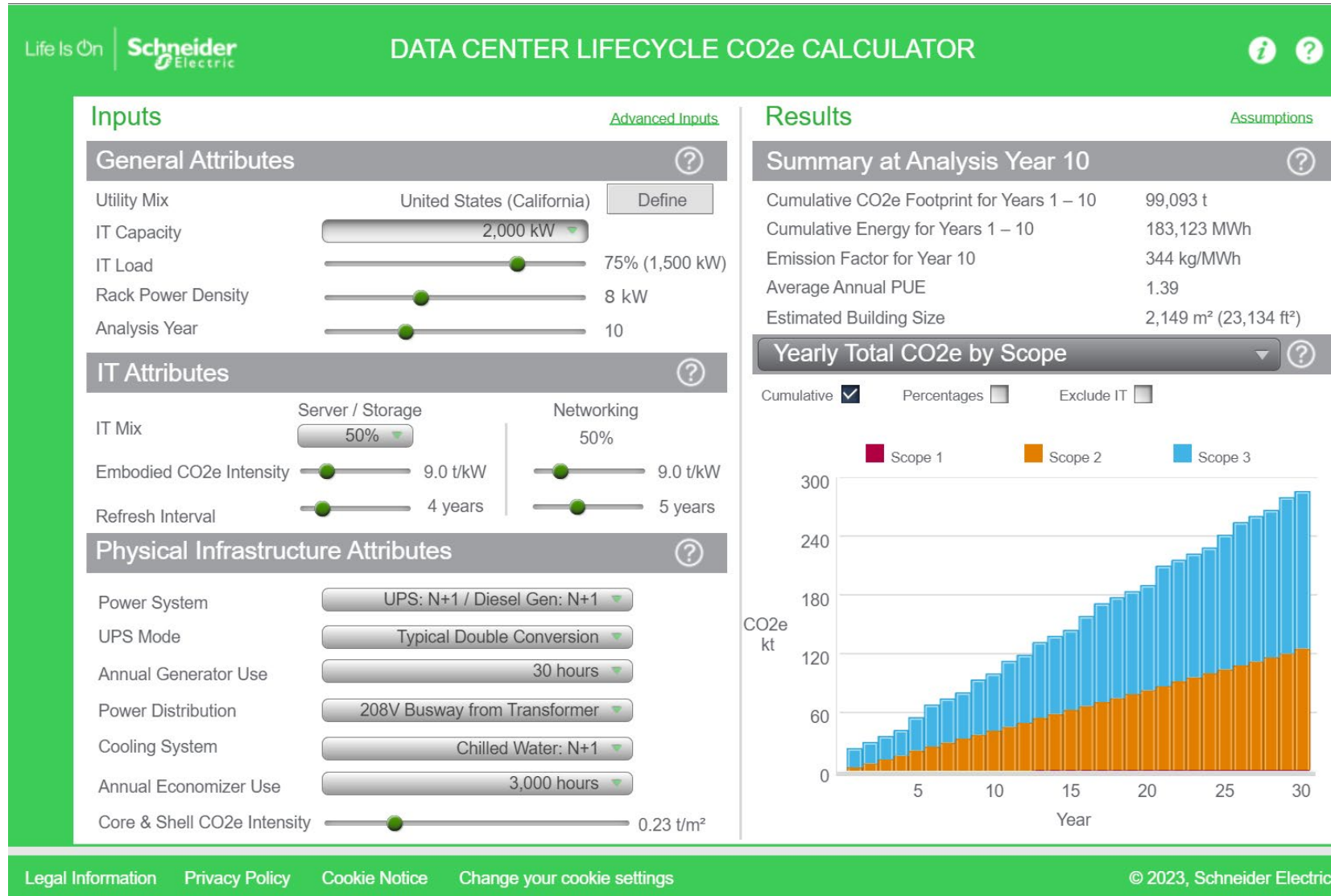- Waste - waste generated (tons), diverted
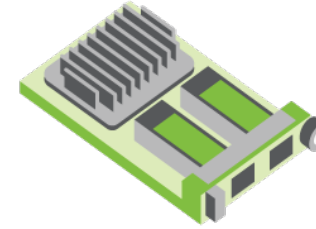
Equipment Manufacturers, vendors, and suppliers
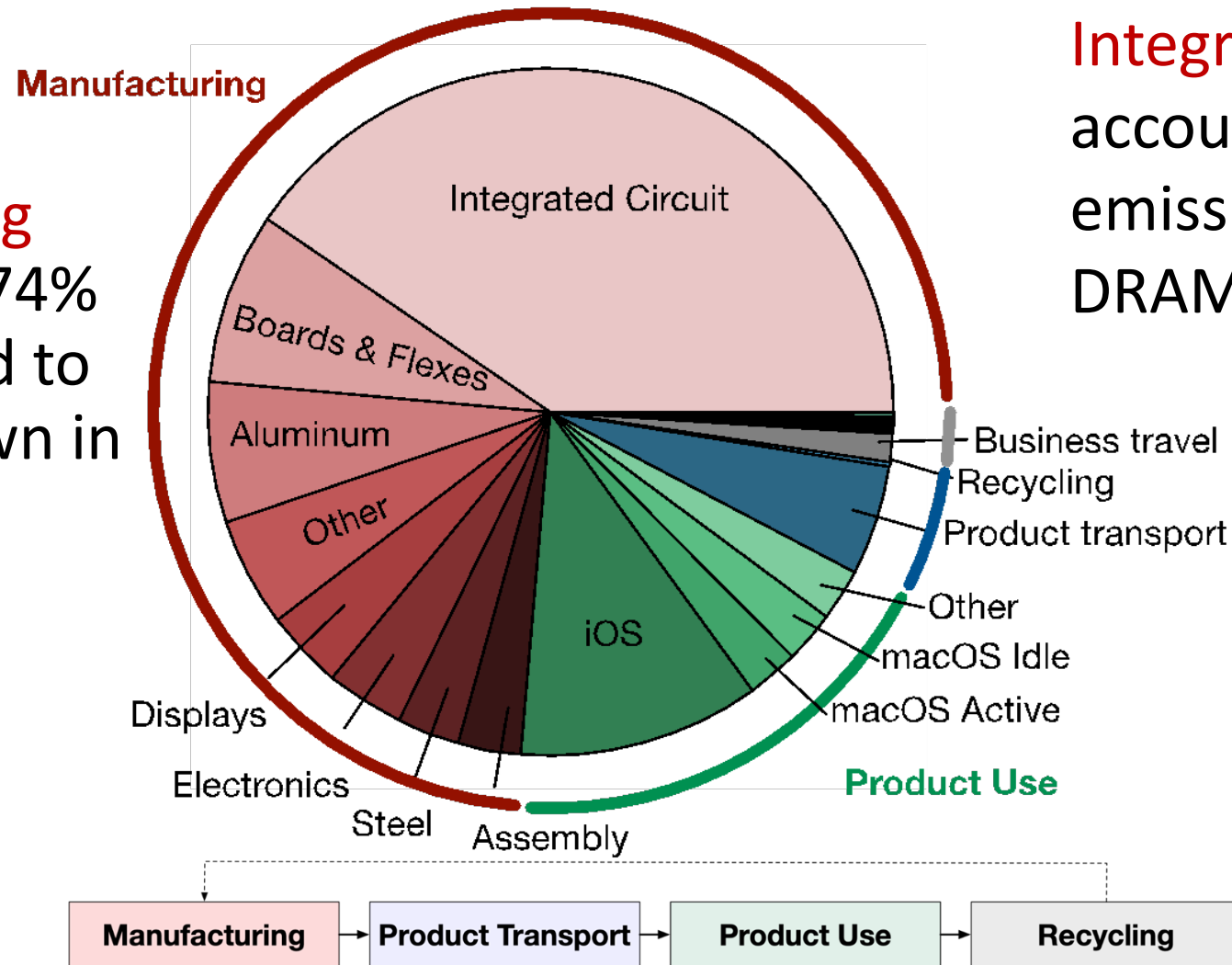

LCA (Life Cycle Assessment)
- Raw materials
- Manufacturing (energy, water)
- Packaging, distribution
- Transportation
- Use phase, energy efficiency, customer workloads
- End of use (life)

Emissions example, small data center

https://www.se.com/ww/en/work/solutions/system/s1/data-center-and-network-systems/trade-off-tools/data-center-lifecycle-co2e-calculator/
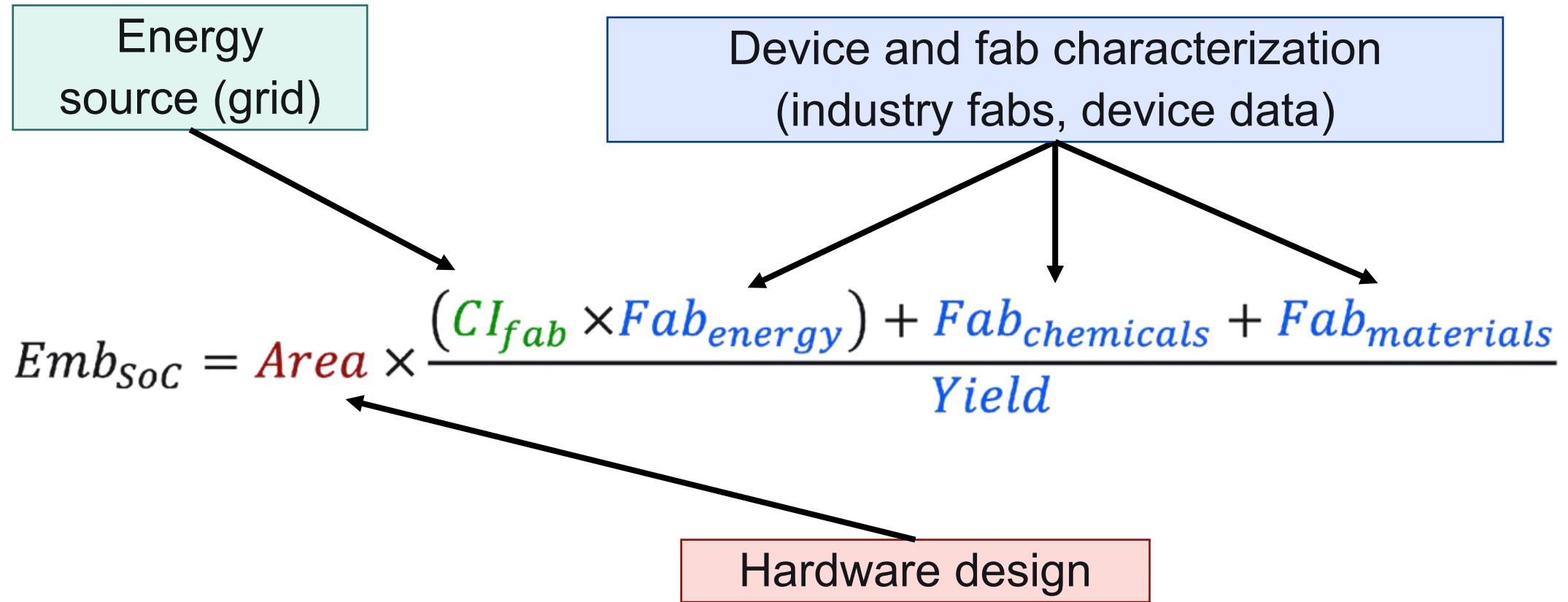
Apple - Embodied Carbon of ICs dominate Scope 3

Manufacturing accounts for 74% of Apple's end to end breakdown in 2019

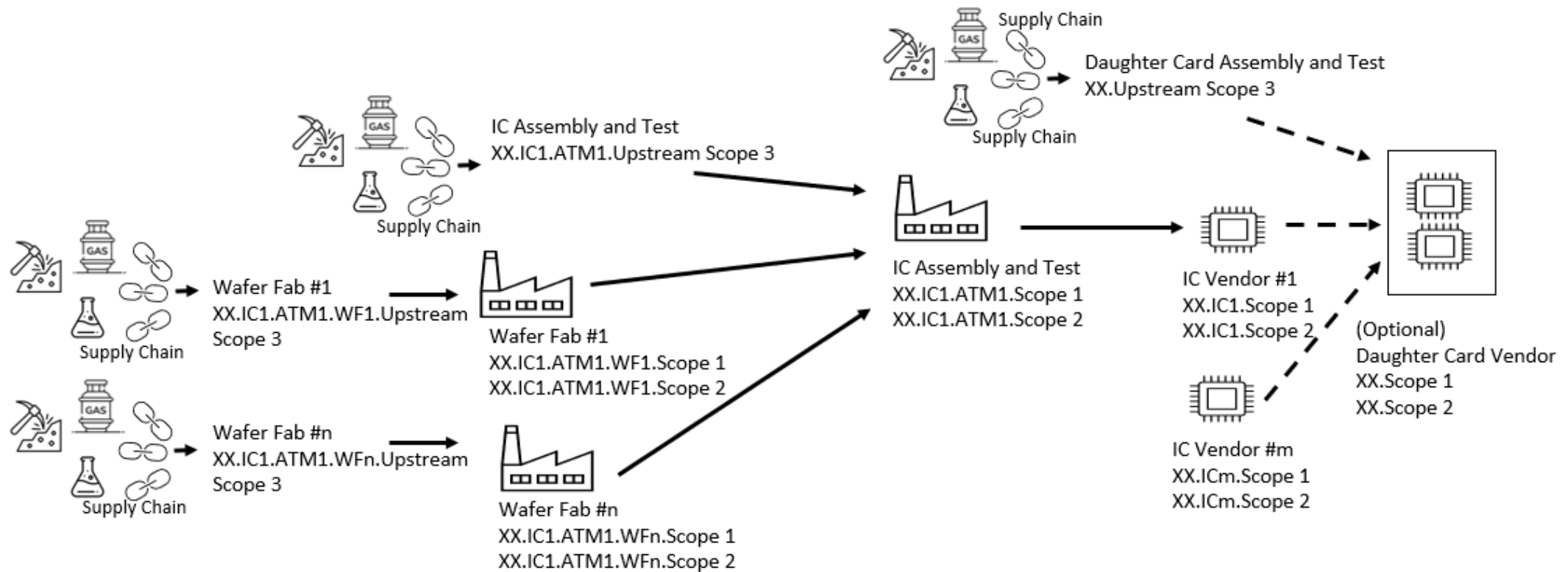Integrated circuits account for 33% of emissions (SoCs, DRAMs, NAND Flash)

"Chasing Carbon: The Elusive Environmental Footprint of Computing" Gupta et. al. (HPCA 2021) https://arxiv.org/abs/2011.02839

Embodied carbon of application processors (SoC's)

Energy source (grid)

Device and fab characterization (industry fabs, device data)

$$Emb_{SoC} = Area \times \frac{(CI_{fab} \times Fab_{energy}) + Fab_{chemicals} + Fab_{materials}}{Yield}$$

Hardware design

OCP Carbon Modeling - API

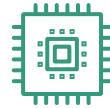# Circular Economy Principles

Use (life) extension

Reuse

Sharing

Repair

Refurbish

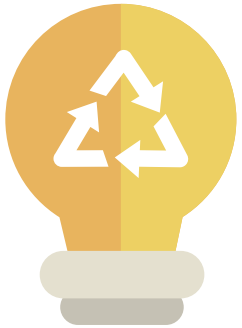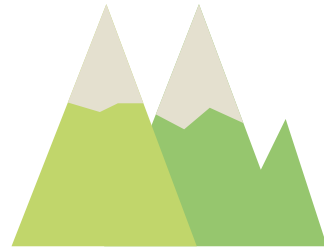Remanufacture

Disassembly

Recycle

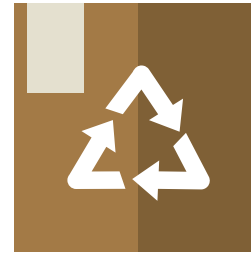Disposal

Design for Circularity Guide

Product Use

- Energy efficiency
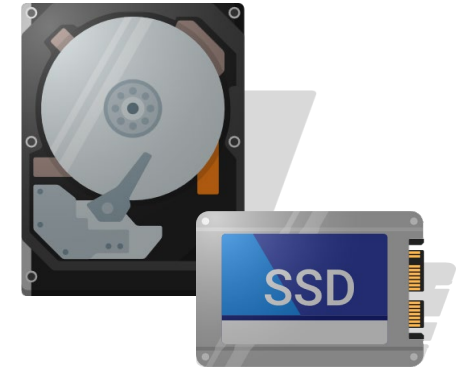- Disassembly guides
- Platform resilience
- Extended useful life

Materials

Disclosure, recycled material, reduced chemicals and toxic material

Packaging

Minimizing packaging and using recyclable materials

Reuse

- Reuse
- Repair
- Refurbish
- Remanufacture

Efficiency and Interoperability

Efficiency

- Efficiency is one aspect of sustainability! Be mindful of the language between the two

- Demonstrate impact with LCA

- Beyond PUE

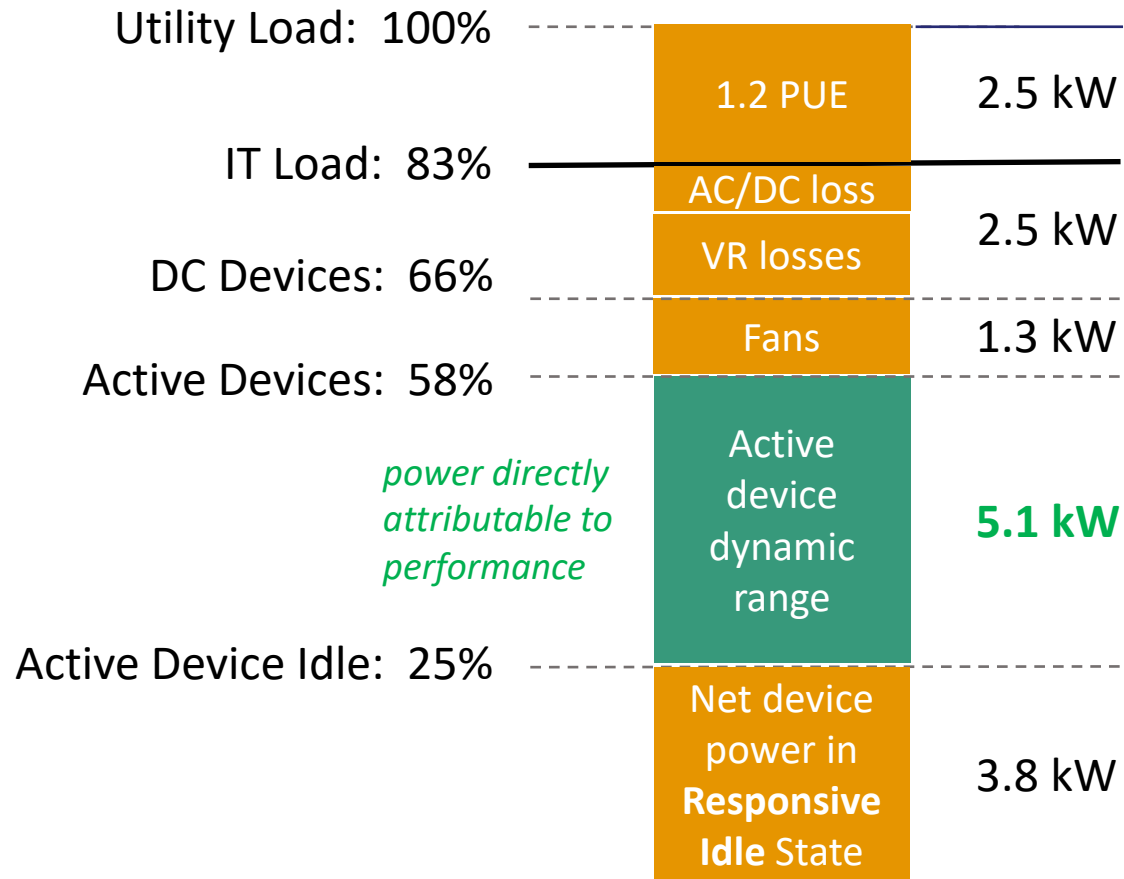- Not only energy efficiency of the device, but in idle states, thermal kit, fans, and cooling

Interoperability

- Industry standard building blocks

- Easy disassembly, hardware reuse

- Enables circular economy and reuse

- DC-MHS, Open Rack, OCP storage specifications, EDSFF / OCP NIC

Next Generation Efficiency

Summary: Sustainability in the ICT Industry

Transparency, Reporting and Metrics

- For data center operators: Reporting on energy and water usage and carbon (GHG) emissions - scope 1, 2, and 3

- For suppliers: focus on Life Cycle Assessments (LCA) & upstream reporting accuracy

Circularity

- Materials maintaining their highest value possible

- Products are designed to extend the use period of a product and consider the next use

- Extension of use (life), reuse, repair, refurbish, remanufacture, disassembly, and recycling

Efficiency & Interoperability

- Efficiency metrics beyond PUE and focus on impact of reporting, and gen over gen improvements

- Standard firmware for multiple customers, open source tools. Hardware building blocks for servers and racks