

Forschungsfabrik  
Mikroelektronik  
Deutschland

Forschungsfabrik  
Mikroelektronik  
Deutschland

Forschungsfabrik  
Mikroelektronik



FMD.iDay<sup>23</sup>

# Klimaneutralität in der IKT

Dr. Christoph Glingener

# ADTRAN



**\$1,350M**

Q2'23 LTM Revenue



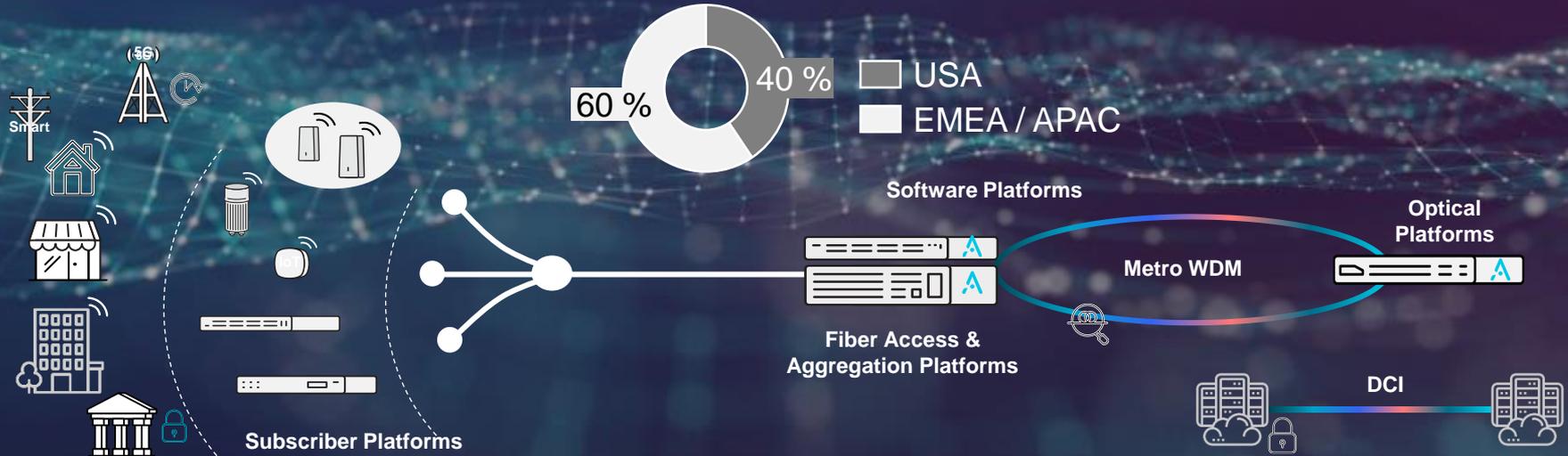
**~\$250M**

Annual R&D Spend

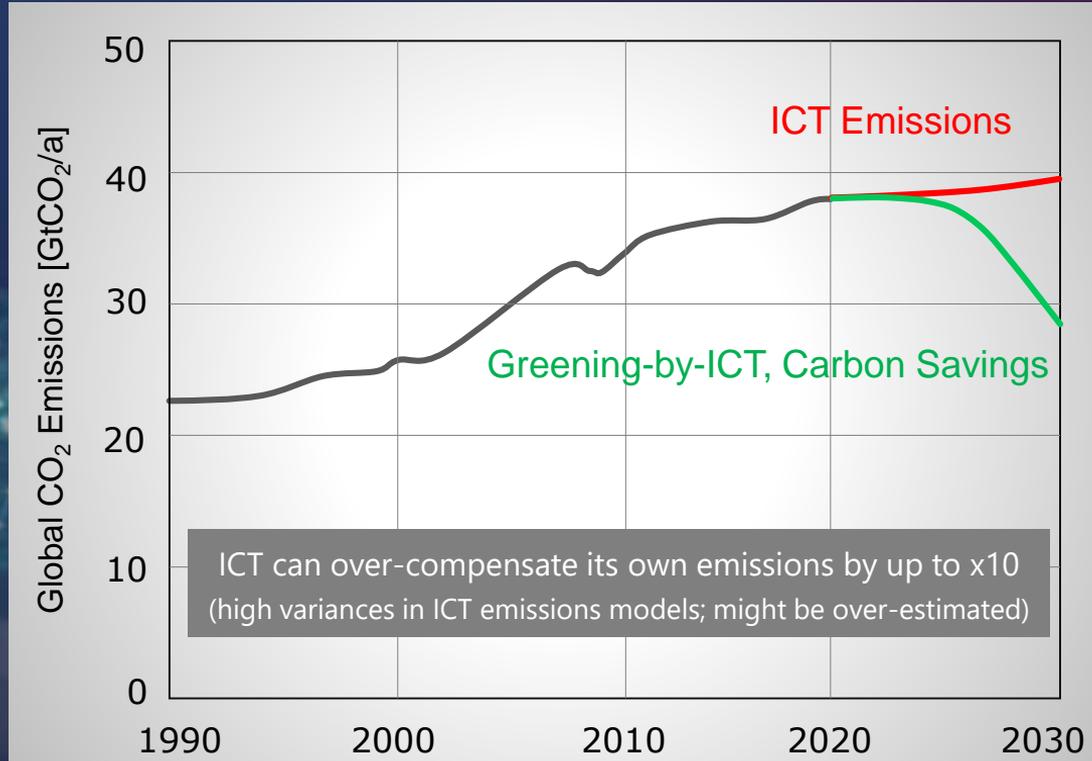


**3,300+**

Employees

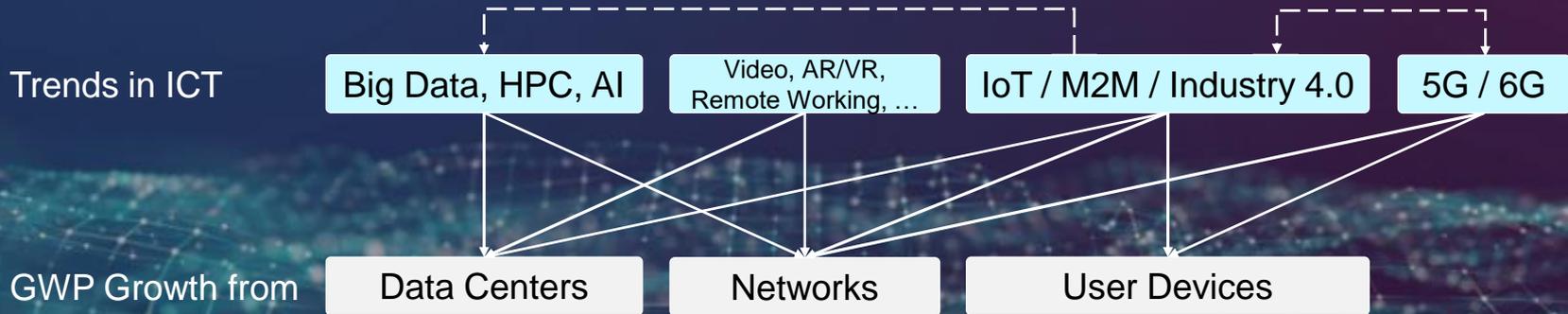


# ICT and emissions



[IPCC AR6, 2022] [#Smarter2030, Executive Summary, GeSI, 2015] [A.S.G. Andrae, Int. J. Science and Engineering Investigations Vol. 8, Issue 86, March 2019]

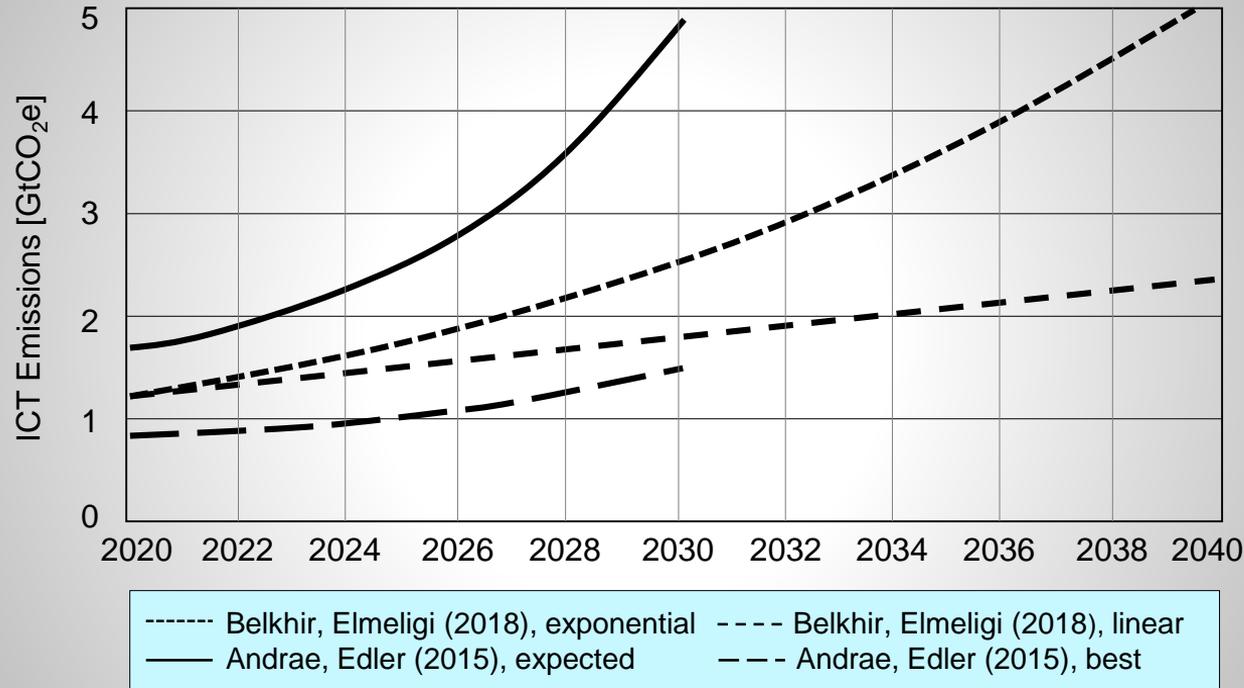
# ICT and growth



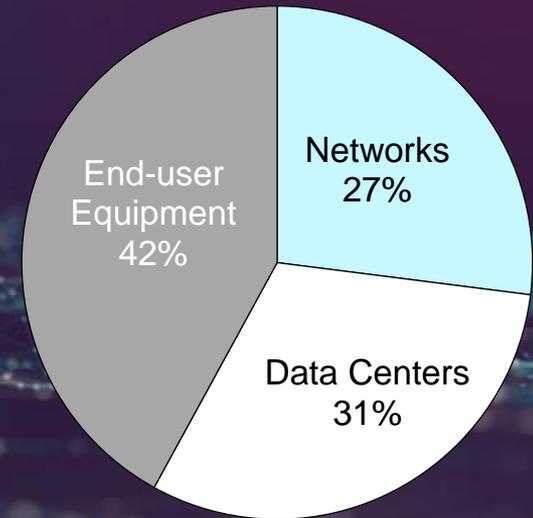
Based on [C. Freitag et al., “The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations,” Patterns, September 2021, <https://doi.org/10.1016/j.patter.2021.100340>]

GWP – global warming potential (carbon equivalents)

# ICT emissions 2020-2040

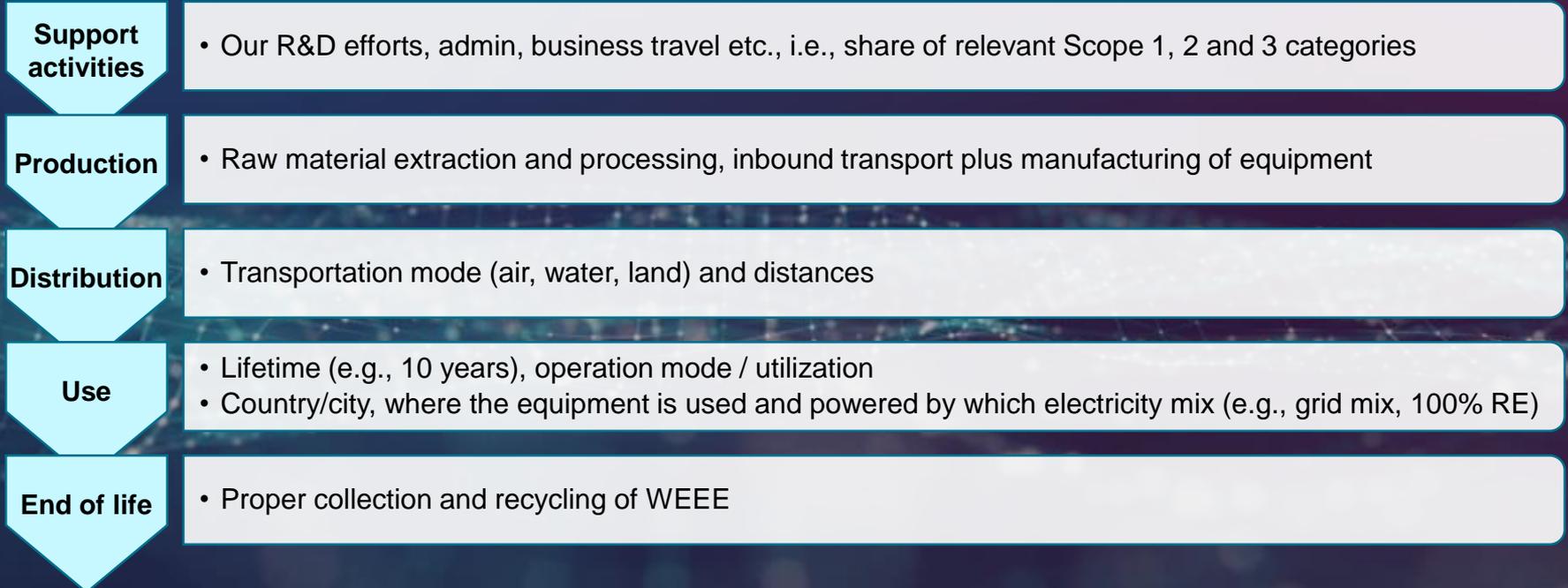


2020 excluding TVs



[C. Freitag et al., "The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations," Patterns, September 2021, <https://doi.org/10.1016/j.patter.2021.100340>]

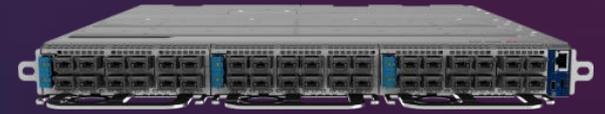
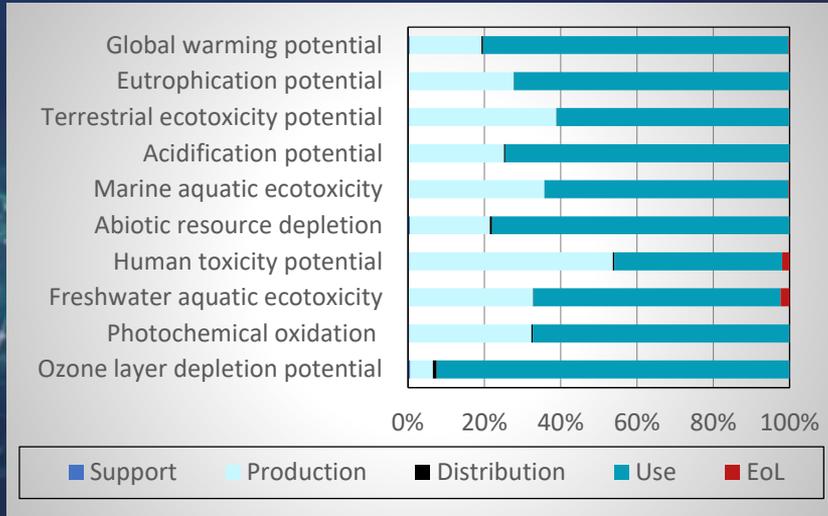
# Lifecycle phases – cradle to grave approach



RE – Renewable Energy

WEEE – Waste of Electrical and Electronic Equipment

# Lifecycle assessment (LCA) example - Teraflex

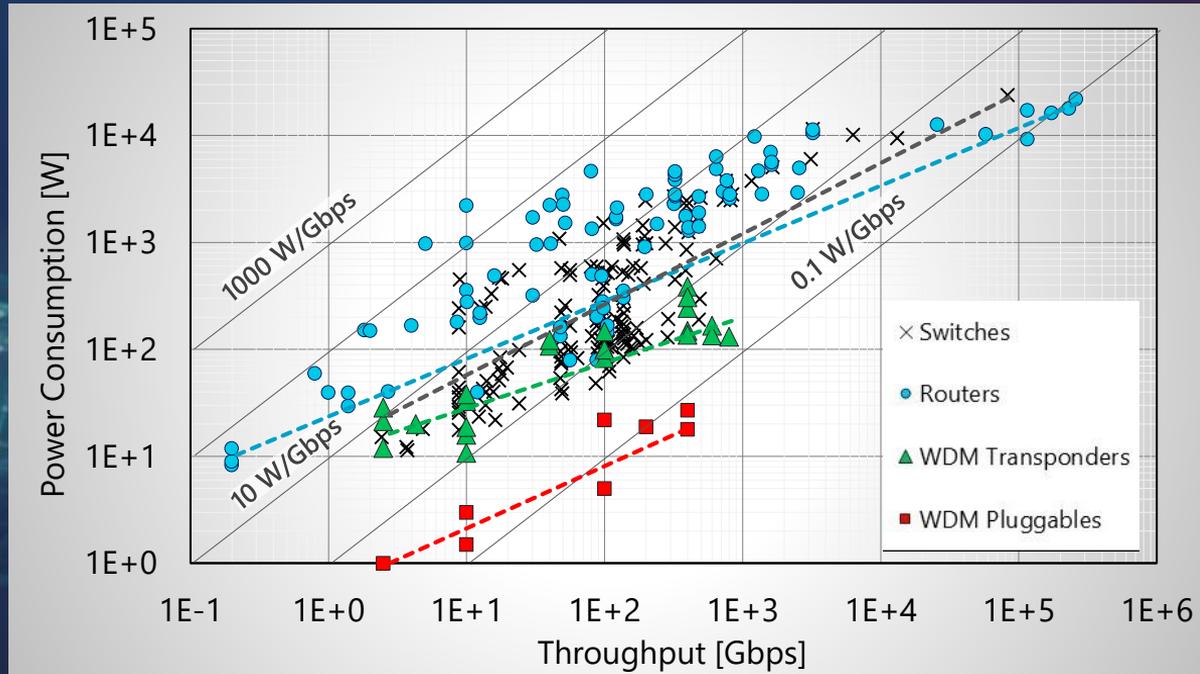


## Assumptions

- 8 years lifetime (use phase)
- 24/7 always-on use mode (negligible downtime)
- Emission factor for renewable energy (~0.04 kgCO<sub>2</sub>e/kWh)
- Even when using renewable energy, **use phase dominates** almost all midpoint parameterst

***Energy efficiency AND resource efficiency has to be the focus!***

# ICT and power consumption



- Following Internet bandwidth increase, *power consumption is exponentially increasing*
- *Energy efficiency increase cannot cope with bitrate increase – and is saturating*
- Different for end-user equipment (e.g., laptops)

[H. Mellah, B. Sansò, June 2011, DOI: 10.1109/WoWMoM.2011.5986484], [Vereecken et al., IEEE COMMAG, Vol. 49, No. 6, 2011], [Tucker et al., ECOC 2008, based on METI, 2006, Nordman, 2007], [ADVA research and specifications]

# Product example: XGS-PON OLT SDX 6330



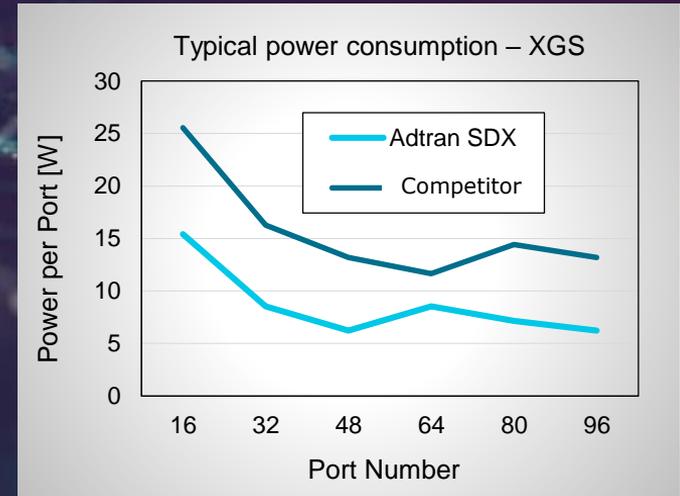
## Chassis power estimates

- Ambient (25°C), with optics (XGS), 90% load: **300 W**
- Over-Temp (70°C), with optics (XGS), 90% load: **406 W**

## Benchmarking

1. Comparison w/ competitor, see diagram
2. Comparison against European Broadband Code of Conduct (EU BB CoC). Per-port draw, ambient (25°C), with optics(XGS), 90% load: **6.25 W – complies w/ EU BB CoC**
3. Telecommunications Energy Efficiency Rating (TEER) against *Ecology Guideline For the ICT Industry\**.  
Clearly exceeds requirement for highest efficiency class of OLT

\*) ICT Ecology Guideline Council, *Ecology Guideline For the ICT Industry*, 2021, [https://www.tca.or.jp/information/pdf/ecoguideline/guideline\\_eng\\_9.pdf](https://www.tca.or.jp/information/pdf/ecoguideline/guideline_eng_9.pdf)



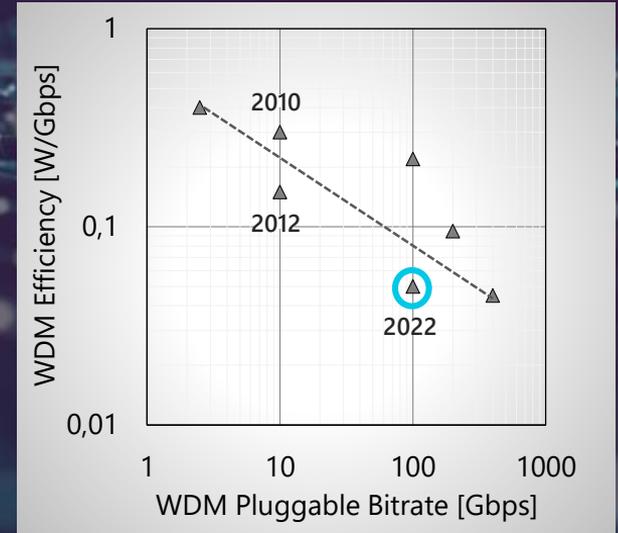
# Product example: 100ZR pluggable WDM transceiver



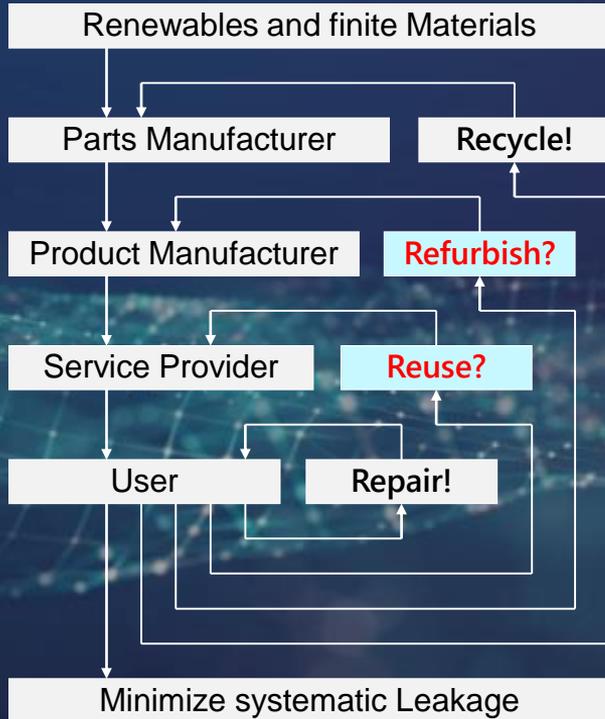
- Ultra-low-power DSP, co-developed with II-VI
- QSFP28 form factor and power envelope: **5 W**
- Amplified reach (own dispersion compensation): **300 km**

## Benchmarking

1. Against most efficient TeraFlex mode: **5 W** (100G-ZR) vs. 12 W
2. Against other pluggables, see diagram. Here, it must be noted that the 100G-ZR pluggable has significantly higher reach compared to the other pluggables shown.



# Circular economy: a 2<sup>nd</sup> life for network equipment?

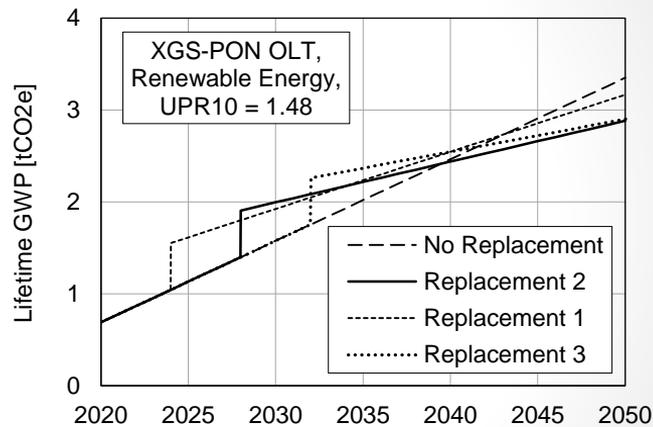
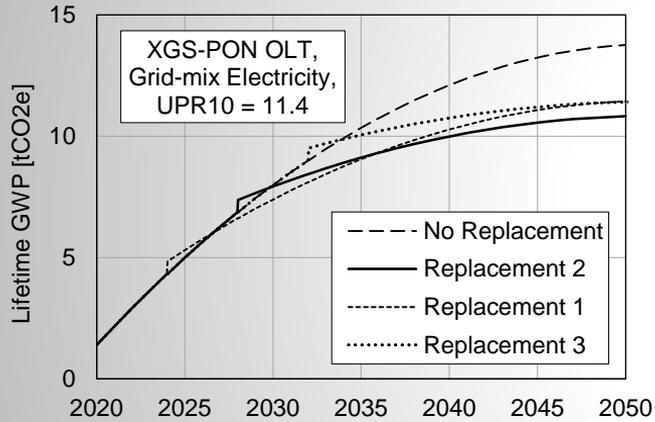


- Product LCA dominated by use phase
  - Dedicated usage in 24/7 always-on mode
  - Long usage, up to >10 years
    - Limited by increased energy efficiency of successor
    - Limited by functional obsolescence
    - Limited by REACH – substances may be banned
    - **Limited reuse, including parts reuse**
    - **Recycling is primary EoL path**
- **However, requests for reused equipment increasing**

[Ellen MacArthur Foundation. CE systems diagram, 2019.]

RE ACh - Registration, Evaluation, Authorisation and Restriction of Chemicals

# XGS-PON OLT lifetime example



XGS-PON OLT	
Power Consumption	253 W
Use Mode	24/7
Typical Lifetime	~8 years
Production GWP	600 kgCO <sub>2</sub> e

- New replacement system has better energy efficiency, however, its production costs CO<sub>2</sub>
- Here, timely replacement does make sense to minimize total lifetime emissions, ***even for renewables!***
- ***This contradicts standard circular-economy recommendations and requirements***

UPR10 – Use phase production phase ratio = GWP10 use / GWP production

# Other aspects – packaging and transportation



New plastic-free packaging that passes the NEBS fall tests

## Further optimization

- Reusability
- Use of recycled material and recyclability
- Plastics elimination where possible
- Freight-mode changes away from air freight, where applicable

# ENERGY MANAGEMENT

Adtran

Reduce operating expenses and promote sustainability, continuously improve energy efficiency, and leverage end-of-life and technology obsolescence.

## 2022 compared to 2021



Savings equivalent to 12.4 homes' electricity use for 1 year



## Since 2005



Reduction equivalent to 22,927 homes' electricity use for one year



## Key Accomplishments Equivalent To



**Annual kwh totals**  
2021: 22,679,772 kwh  
2022: 22,589,984 kwh

**Total Annual Savings**  
89,788 kwh



**Annual kwh total**  
2005: 40,572,941 kwh

**Overall Total Savings**  
2005 through 2022  
**166,271,315 kwh**  
**Overall Cost Avoided**  
**\$12,470,349**  
**Overall Metric Tons Avoided**  
**117,834**

**Renewable Certified Wind RECs**  
9,000,000 kwh

## Awards



### Southeast Award

ADTRAN East Tower Chiller Plant Optimization project received the First Place 2019 ASHRAE Region VII Regional Technology Award for the Commercial Building, Existing Category (EBCx).



### Global Award

Honorable Mention winner of an ASHRAE Technology Award in the Commercial Buildings – EBCx Category for the ADTRAN East Tower project in Huntsville, Alabama. The ASHRAE Technology Awards program recognizes outstanding achievement in the design and operation of energy-efficient buildings.



### Association of Energy Engineers Region II

Energy Manager of the Year Award for 2021 for ADTRAN energy conservation projects.



### 2022 Energy Project of the Year

## Energy Use Index (EUI)

is the amount of energy consumed, measured in Thousands of British Thermal Units (KBTUs) divided by the gross conditioned area in square feet.  
EUI = KBTU / Gross Square ft

# Adtran Huntsville DOE 50001 readiness and AEE award



## Adtran Holdings Inc.

Is recognized as an Energy Management Leader for instituting DOE's 50001 Ready program across its Headquarters campus in Huntsville, AL

UNDER THE LEADERSHIP OF

**Kelley Whalen**   **Mike Foliano**  
Energy Management   Chief Financial Officer

Recognized by the United States  
Department of Energy

February 13, 2023



April 21, 2023

Mr. Kelley Whalen  
Facilities Supervisor – Energy Management, HVAC & Electrical  
ADTRAN  
901 Explorer Boulevard  
Huntsville, AL 35906

Dear Mr. Whalen,

The Association of Energy Engineers is pleased to notify you that from the many nominations received by the AEE Awards Committee, you have been selected to receive the following International Award:

[2023 ENERGY MANAGER OF THE YEAR](#)

Congratulations from all of us at AEE!

AEE gives out prestigious awards each year to individuals and organizations that have achieved national and international prominence in promoting the practices and principles of energy engineering and energy management.

This award, recognizing your accomplishments in the energy industry, will be presented the evening of Wednesday, October 25, 2023 in Orlando, FL, held in conjunction with the 2023 AEE World Conference & Expo. It is our hope that you will be present to accept this award. We will contact you in the next few weeks with further details.

An official press release will be issued a few weeks prior to the presentation of the awards, and your company is welcome to also issue one at that time. In the meantime, feel free to share this information informally with your colleagues, friends, and family. Articles in internal company newsletters also would be acceptable at this time.

Again, we extend our warmest congratulations on your organization having been chosen for this high honor.

Cordially,

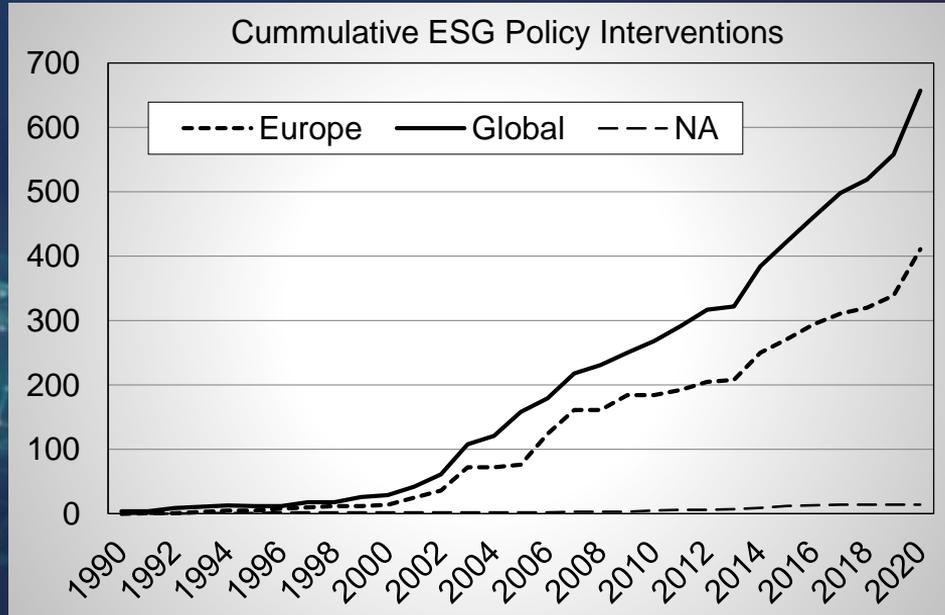
A handwritten signature in blue ink that reads "Bill Kent".

Bill Kent  
Executive Director

A handwritten signature in blue ink that reads "Carl Salas".

Carl Salas  
Awards Chair

# Regulation, reporting, assessments - ESG regulations



- The number of ESG-related policy interventions is exponentially growing!
- EU is “leading” – severe risk of becoming ***strong competitive disadvantage, especially for smaller companies***
- Often uncoordinated / duplicated, e.g., EU REACH vs. China REACH
- Often updated more than yearly, causing significant effort (e.g., REACH, CMRT)
- Often badly written (e.g., EU Taxonomy)

[Regulation database update: the unstoppable rise of RI policy, 17 March 2021 <https://www.unpri.org/pri-blog/regulation-database-update-the-unstoppable-rise-of-ri-policy/7352.article>]

ESG – Environmental Social Governance  
CMRT – Conflict Minerals Reporting Template

# Relevant ESG standards and requirements

- Examples include (**by no means complete...!**)
  - Standards
    - ISO 14001, ISO 50001, the Environmental and Energy Management Systems
    - ISO 14040/14044, ETSI ES 203 199, LCA standards
    - ISO 11469 on plastic parts, ISO 11469 on polymer codes
    - ITU-T L-Series (LCA, circular economy, emissions, energy efficiency)
    - ETSI ES 203 184, ETSI ES 203 215, ATIS-060015.02.2009, ... (TEER)
    - ESRS (upcoming EU reporting standard)
  - Regulations and Directives
    - RoHS Directive 2011/65/EU, REACh Regulation (EC) No 1907/2006
    - WEEE Directive 2012/19/EU, Packaging Directive 94/62/EC, Ecodesign Directive 2009/125/EC
    - Directive (EU) 2022/2464 (CSRD), Taxonomy Regulation (EU) 2020/852
  - Others
    - CMRT, conflict-minerals reporting (RBA)
    - EU Broadband Code of Conduct (energy consumption of residential-access equipment)
    - ICT Ecology Guideline Council, Ecology Guideline For the ICT Industry (TEER)
    - TCFD (Task force for Climate-related Financial Disclosure)
    - DPP, Digital Twin, Asset Administration Shell, ...

CMRT – Conflict-minerals reporting template  
CSRD – Corporate sustainability reporting directive  
DPP – Digital product passport  
ESRS – EU sustainability reporting standard  
PFAS – Per- and polyfluoroalkyl substances  
POPs – Persistent organic pollutants  
RBA – Responsible business alliance  
REACh – Registration, evaluation and authorization of chemicals  
RoHS – Reduction of hazardous substances  
SVHS – Substances of very high concern  
TCFD – Task force for climate-related financial disclosure  
TEER – Telecommunications energy-efficiency rating  
WEEE – Waste electrical and electronic equipment

# Reporting and assessments

- Assessment platforms
  - CDP, for carbon reporting (for JAC, others)
  - EcoVadis, for carbon and CSR reporting (for JAC, others)
  - Avetta, for CSR reporting (for other customers)
  - SBTi, for science-based climate targets (for JAC, others)
  - Customized scorecards, e.g., JAC, specific customers
  - ISS, MSCI, for CSR and carbon reporting, but done for investors
- Reporting obligations
  - Non-financial report, e.g., according to GRI, now migrating to ERSR
  - ESG risk assessment, ESG materiality assessment (not the same...!)
  - Climate transitioning plan
  - EU Taxonomy (...)
  - TCFD (task force for climate-related financial reporting)
  - SEC (US)
- Others
  - ISO 14001 (environmental management system)
  - ISO 50001 (energy management system)
  - Supply-chain acts
  - Conflict-minerals, Cobalt, Mica reporting, supply-chain due diligence
  - REACH, RoHS, POPs, SVHC, PFAS... (full-material declarations required, huge effort, there are >10,000 PFAS...)
  - Upcoming: digital product passports (the next big monster?)
- Customers
  - Tier 1s mostly via JAC
  - Fastly increasing request with different focus (e.g. CSR)

*Lots of duplicated efforts, poorly consolidated, falls too short  
Smaller suppliers can't support this!*

# Nothing is for free!

Acceptance of potential cost increase is not there!

- Total-cost-of-ownership rules!
  - Introduction of reduced emissions solution only if more cost efficient
- Renewable energy costs are higher
- Products with dedicated ecodesign are more expensive (e.g. better components...)
- Circular economy mostly not meaningful (lifetime limitations ...)
- More effort for REACH, RoHS, POP, SVHC, PFAS, supply-chain due diligence

Cost reductions are in focus

- Current high energy costs drive use of energy-efficient solutions
- CO<sub>2</sub> tax will help!

# Summary

Overall ICT emissions are driven by energy efficiency AND resource efficiency

- Bandwidth growth outpaces improvement in energy efficiency

ICT products

- Energy efficiency improving quickly
- Circular economy, i.e. reusability is limited

Use of renewable energy helps, but there's more to it.

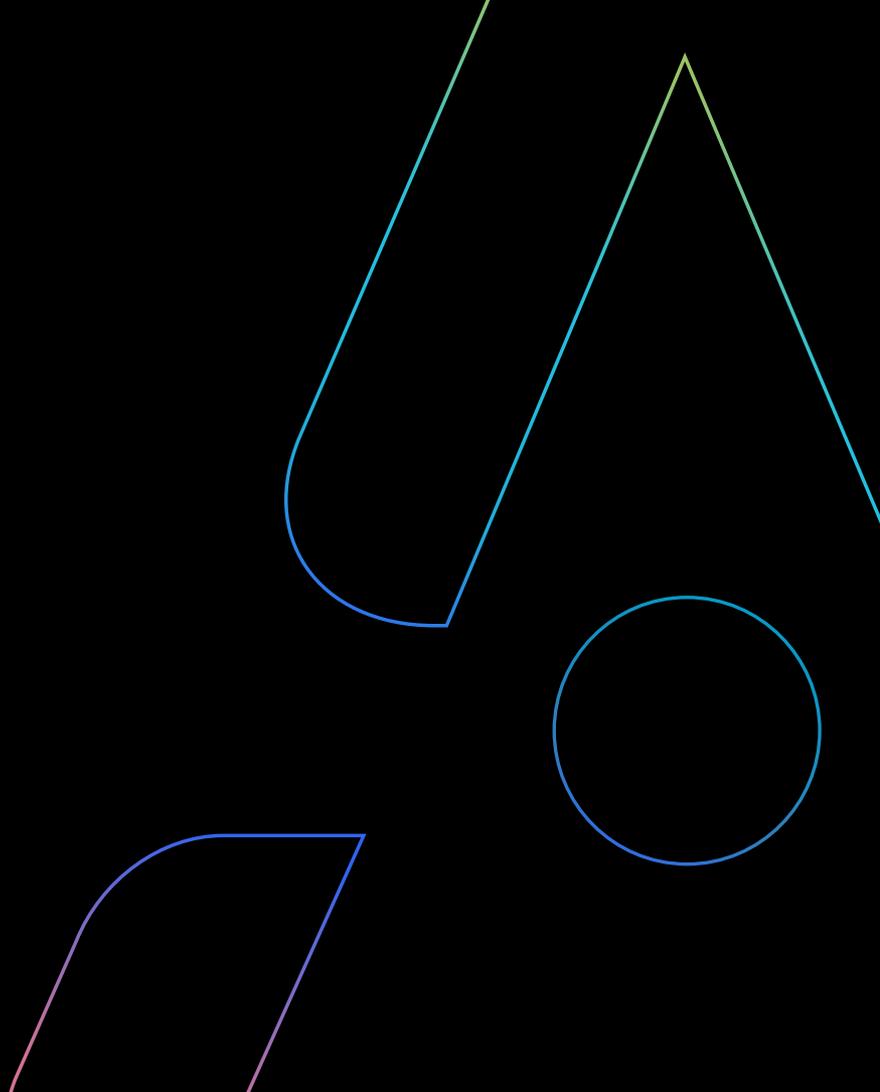
Regulations, reporting, assessment

- Overly bureaucratic!
- Need a global, simplified and coordinated approach
- Focus on own, direct emissions (potentially one pier down in supply chain)

Money rules and nothing is for free!

“Net neutral” is a (too?) strong expression – according to which standards?

**Danke**



Forschungsfabrik  
Mikroelektronik  
Deutschland

Forschungsfabrik  
Mikroelektronik  
Deutschland

Forschungsfabrik  
Mikroelektronik



FMD.iDay<sup>23</sup>