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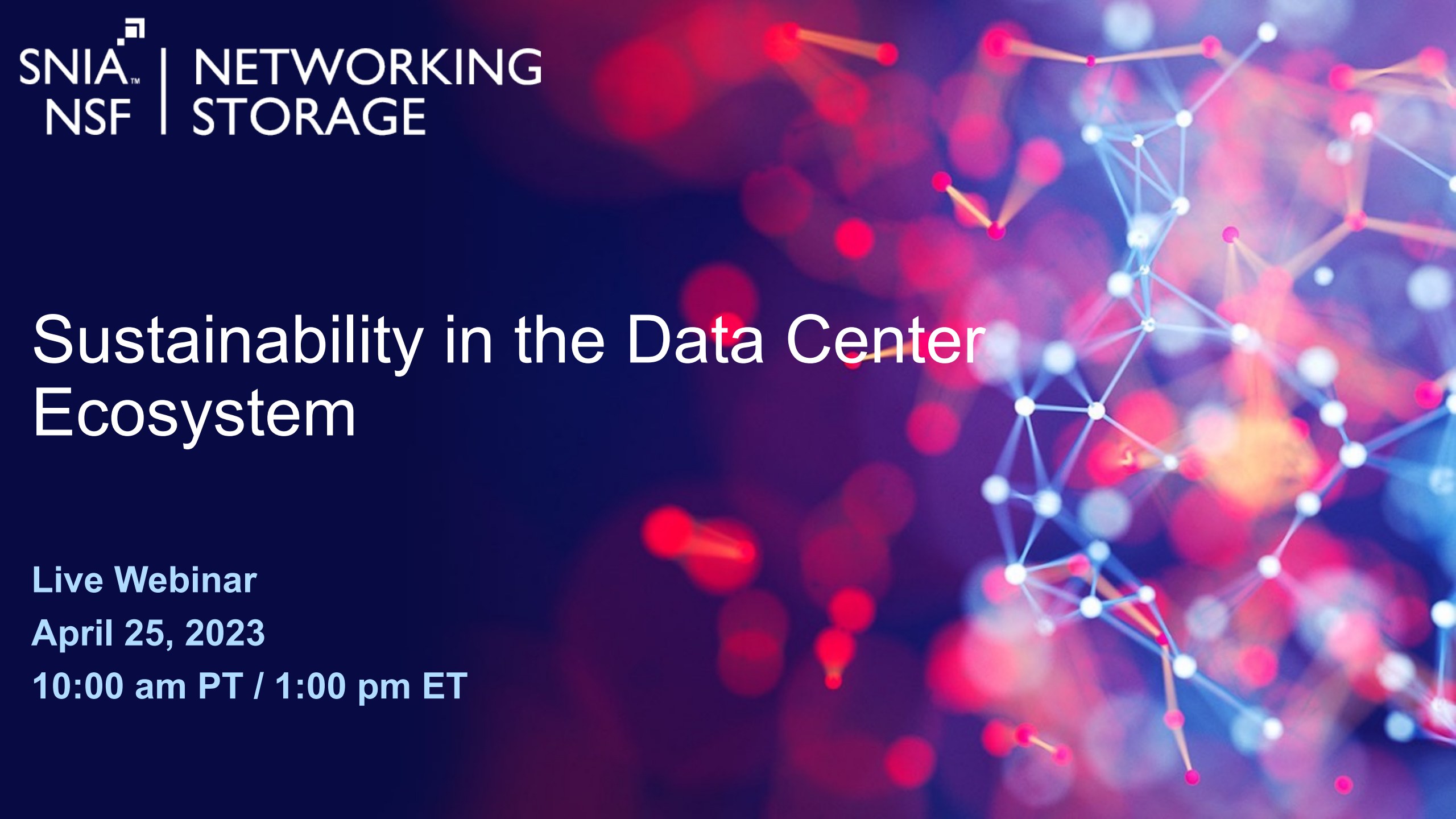
Sustainability in the Data Center Ecosystem



Live Webinar

April 25, 2023

10:00 am PT / 1:00 pm ET

Today's Presenters

Wayne Adams
SNIA Board of Directors

Stephen Chenoweth
Director, Product Sustainability
Intel

Ty Schmitt
Vice President/Fellow
Dell Technologies

David McIntyre
SNIA Board of Directors
Samsung

SNIA - By the Numbers

Industry Leading Organizations

180

Active Contributing Members

2,500

IT End Users & Storage Pros Worldwide

50,000

Technologies We Cover

Ethernet, Fibre Channel, InfiniBand®

iSCSI, NVMe-oF™, NFS, SMB

Virtualized, HCI, Software-defined Storage

Storage Protocols (block, file, object)

Securing Data

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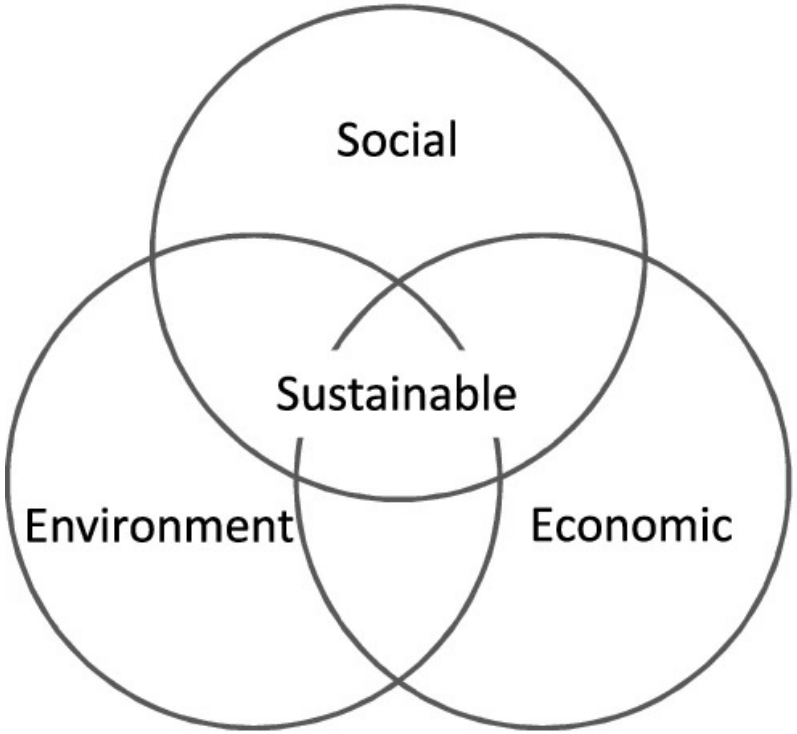
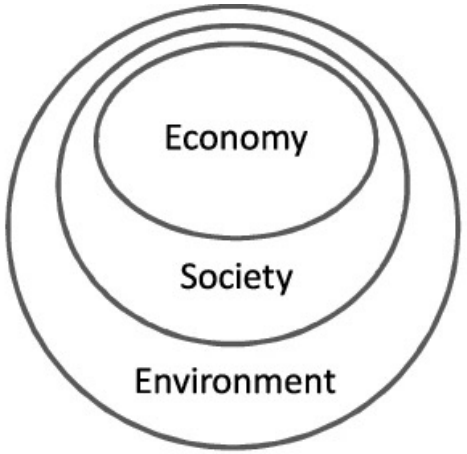
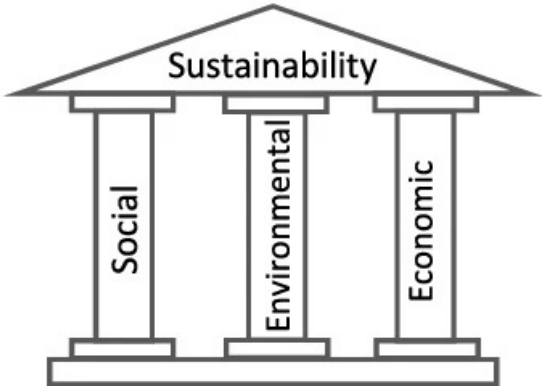
Today's Agenda

- Sustainability defined
- Semiconductor industry sustainability
- Power measurement
- Sustainability in the data center
- Panel discussion

Sustainability Definition





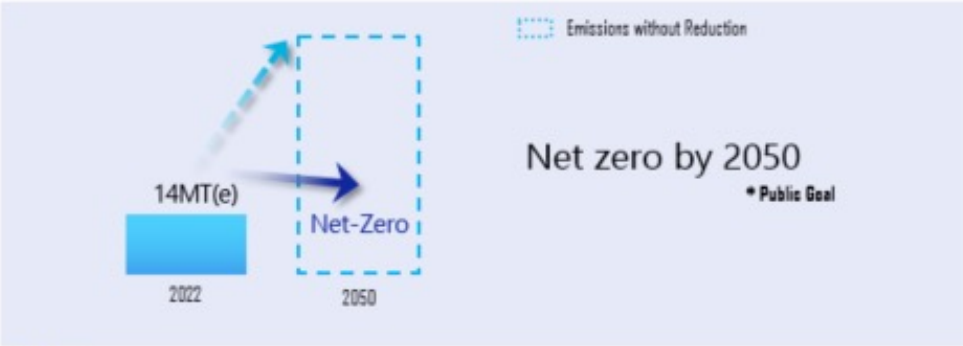


Source: Wikipedia https://en.wikipedia.org/wiki/Sustainability

Common Semiconductor Company Sustainability Goals

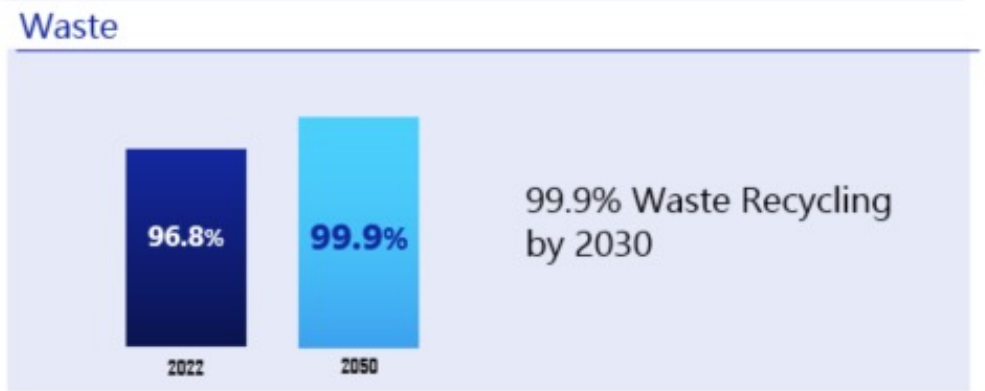
Sustainability Goals in the Semiconductor Supply Chain

Carbon

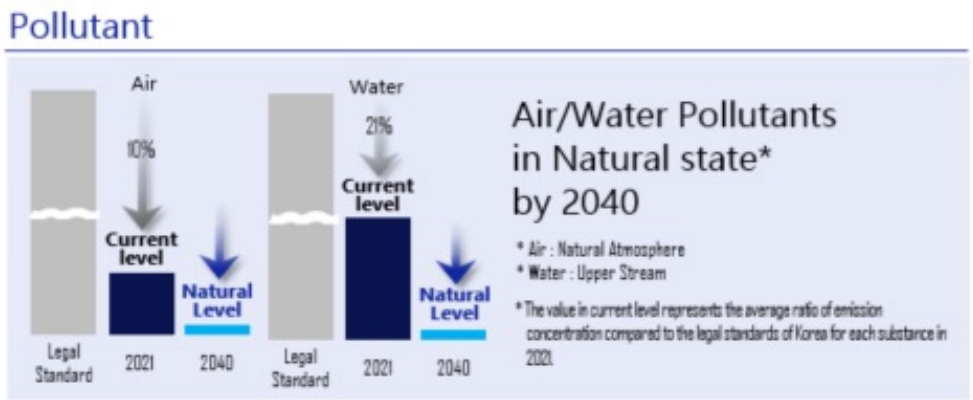


Water

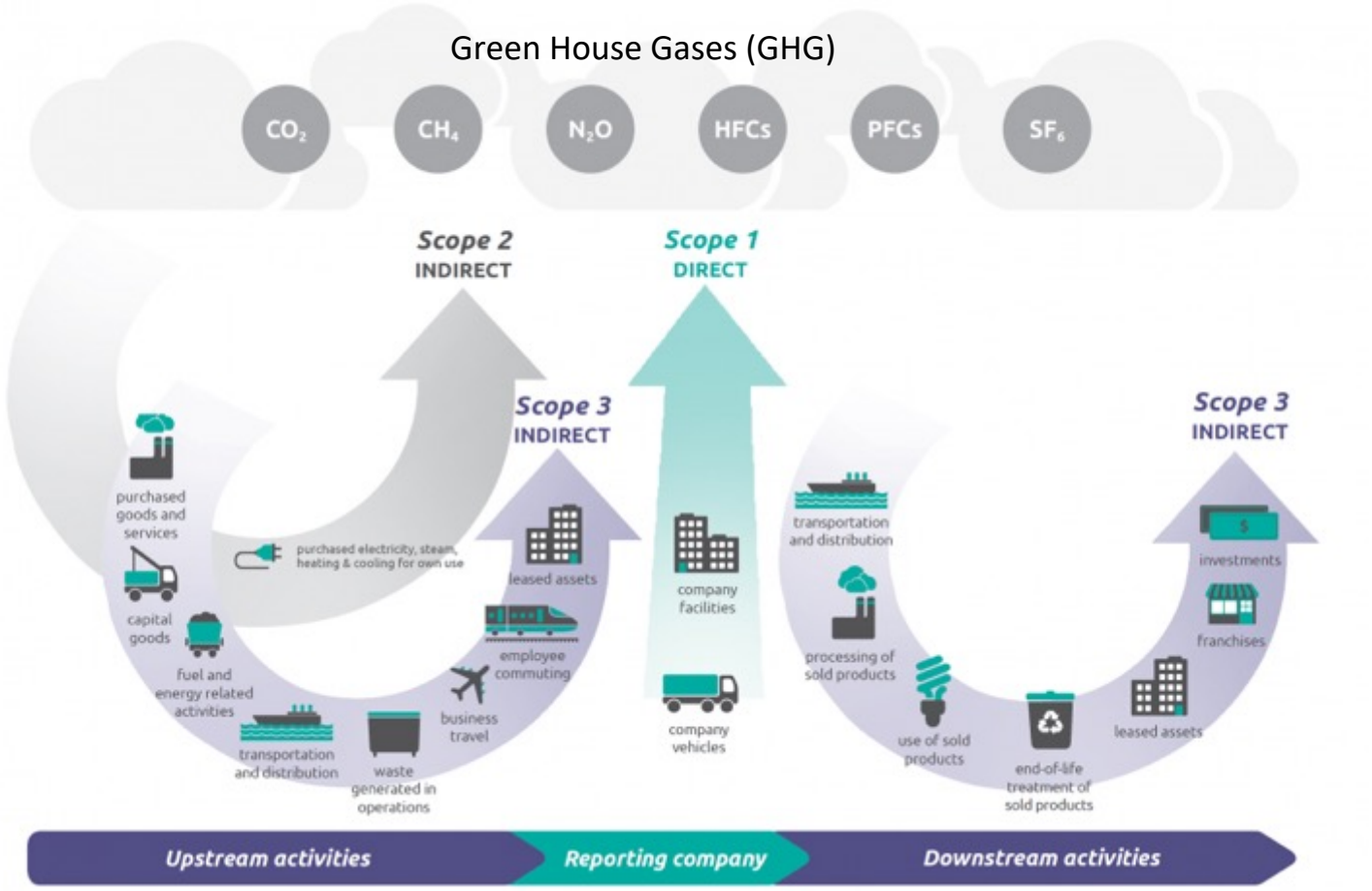
Waste



Pollutant



Defining Emissions: A Primer



Greenhouse Gas Emissions – Scope 1, 2, 3

Source: Greenhouse Gas Protocol

Scope 1 emissions are those that come directly from operations.

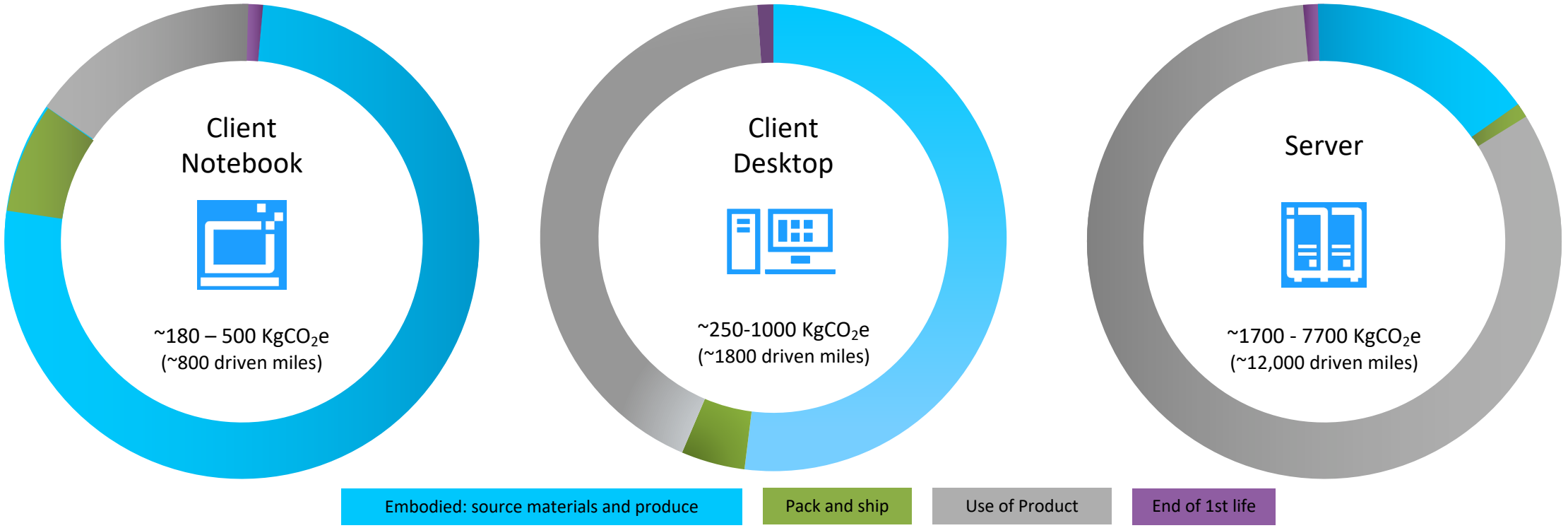
Scope 2 emissions are associated with the electricity used to operate facilities.

Scope 3 emissions

includes indirect impacts from upstream and downstream sources such as supply chain, transportation, logistics & distribution, and product use.

Embodied Product Carbon Footprint (PCF) of semiconductors and services is calculated using scope 1 and 2 emissions and upstream scope 3 emissions.

Notebook, Desktop and Server Carbon Footprint: Embodied and Use of Product



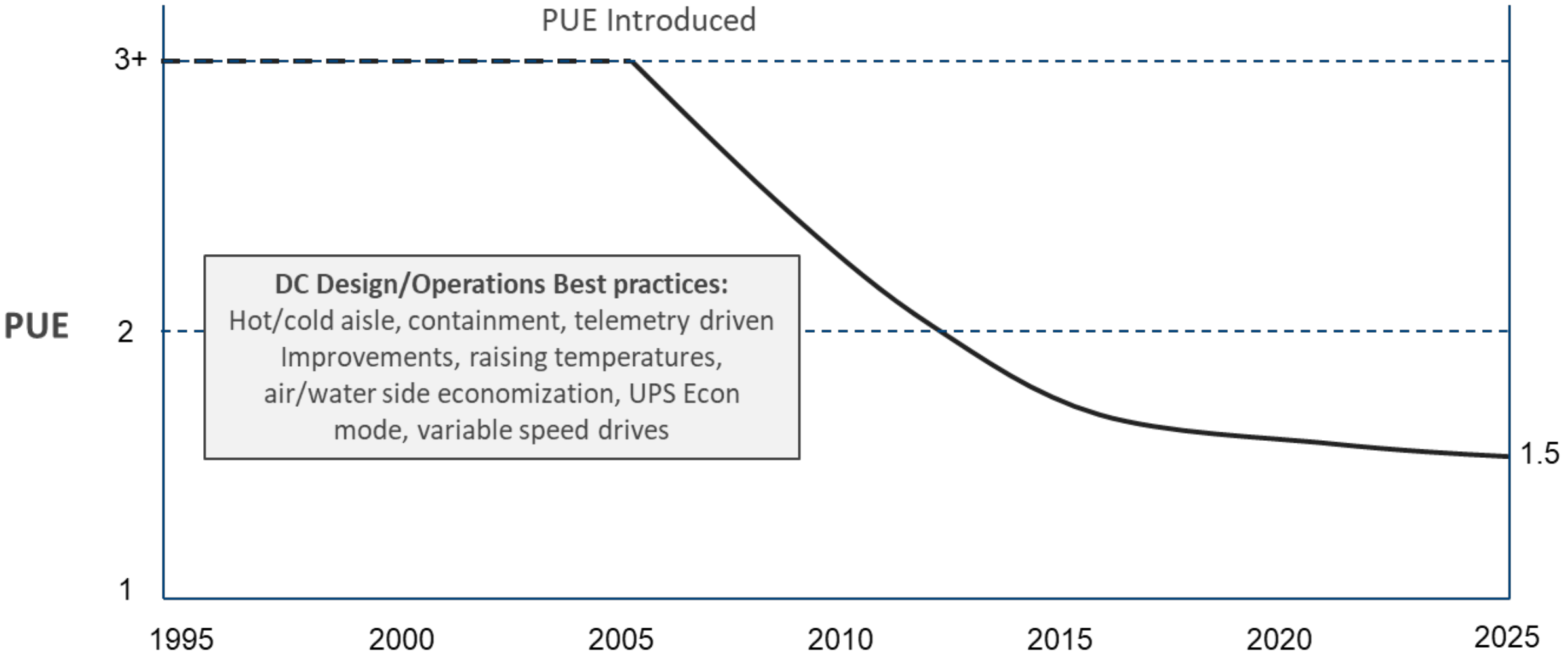
Client Notebook Carbon footprint is mostly embodied, compared to Server that has majority in use of product. Client Desktop carbon footprint is split between use phase and embodied.

Source: Various OEMs. Conversion to Miles: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

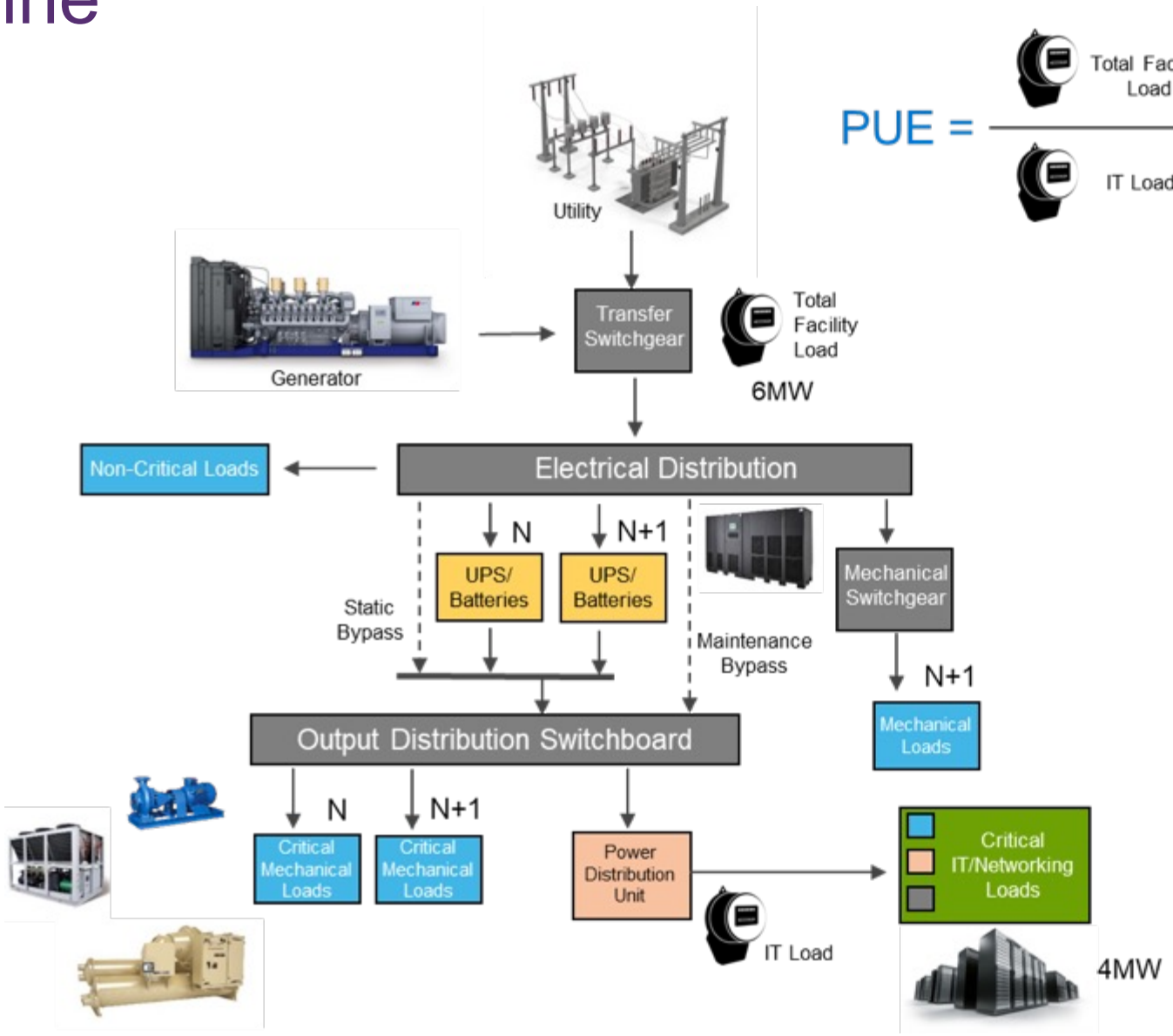
Assumes 4-year initial life

Assumes 100% carbon-based power during use phase

The Power of a Metric



Baseline



Traditional (Best Practice)

Switching	1-2%
Transformer	2-4%
UPS (Online)	3-6%
Distribution	1-3%
Sub Total	**7-15%**
CHAH/CRAC's	*5-15%*
Water (chillers, pumps, etc)	*10-40%*

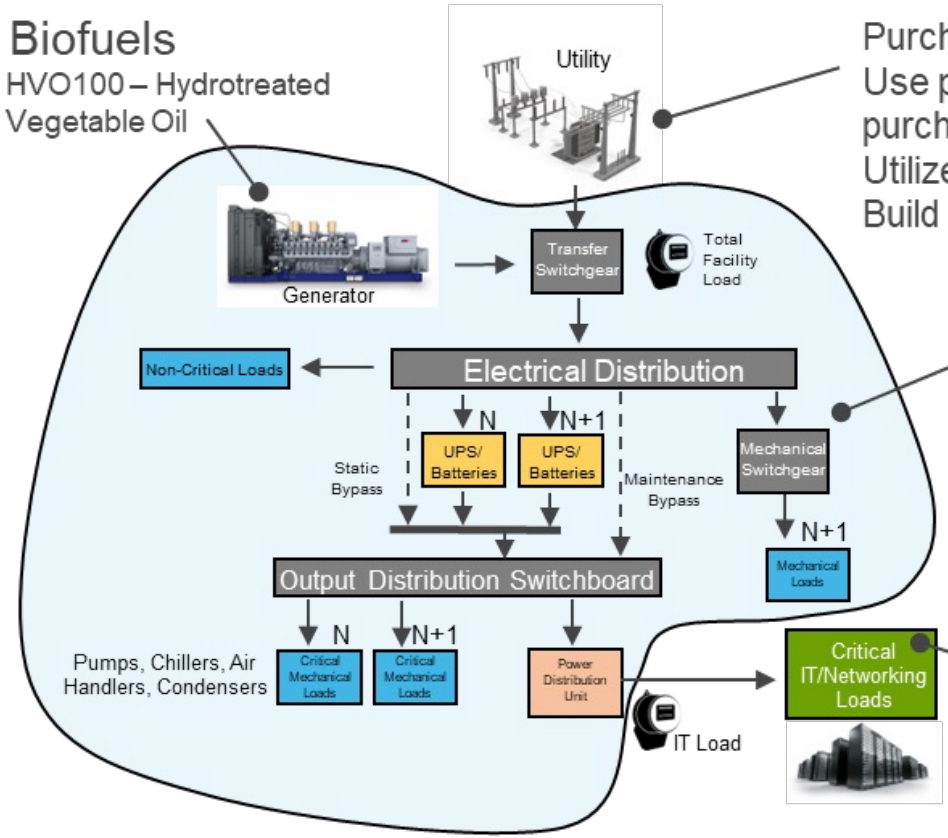
Annual PUE: 1.22 – 1.70

$$PUE = \frac{6MW}{4MW} = 1.5$$

ITUE is about assessing the power usage effectiveness of this number

Data Center Sustainability (Energy)

Biofuels
HVO100 – Hydrotreated Vegetable Oil



Purchase renewable energy certificates
Use physical or financial green power purchase agreements (PPA)
Utilize utility provided green tariffs
Build on-prem green energy infrastructure

More efficiency/energy mode UPSs
Telemetry optimized variable speed motors
Higher operating temperatures/delta T
Air/water side economization
Liquid cooling
Fresh air/hybrid cooling

Room/rack level efficiency best practices
Expanded (ASHRAE A2) environment
Higher utilization of IT equipment
Higher voltage power supplies/distribution
Distributed power and cooling
Liquid/Immersion cooling
Telemetry driven power management
De-densification of IT equipment

Data Center Sustainability KPIs (short list)

PUE – Power Usage Effectiveness
CUE – Carbon Usage Effectiveness
WUE – Water Usage Effectiveness
ITUE – IT Power Usage Effectiveness

CCF – Cooling Capacity Efficiency
DCSE – Data Center Space Efficiency
GEC – Green Energy Coefficient
TCE – Technology Carbon Efficiency

A Pragmatist's view: **Focus on what you can control**

The road to sustainability begins inside the walls of your data center

CONSOLIDATE WORKLOADS

REDUCE DATA FOOTPRINT

AUDIT INFRASTRUCTURE

DELIVER ON-DEMAND CAPABILITIES

OPTIMIZE TO REDUCE HVAC COSTS

LEVERAGE INHERENT GREEN CAPABILITIES

Panel Discussion

Get Involved: Collaborate with industry groups

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Thank You

