SNIA DEVELOPER CONFERENCE

SDC 24

BY Developers FOR Developers

September 16-18, 2024
Santa Clara, CA

Sustainability Initiatives By Open Compute Project

Shruti Sethi, Sr. PM, Microsoft

Agenda

- Embodied Carbon & Operational Carbon

- OCP Sustainability formation & history

- OCP Sustainability – 3 Focus Areas

- Workstreams

  - LCA Standardization + Carbon Label / Disclosure Standardizing

  - Data Sanitization + Carbon Accounting for Circularity

  - Power + Sustainability Power Metrics

Thanks to folks & companies involved-in & driving this OCP Sustainability / Circularity work

Total Carbon Cost

Total Carbon Cost

Embodied Carbon

Operational Carbon

Manufacturing   Transport   Installation

Power utilization by IT Equipment
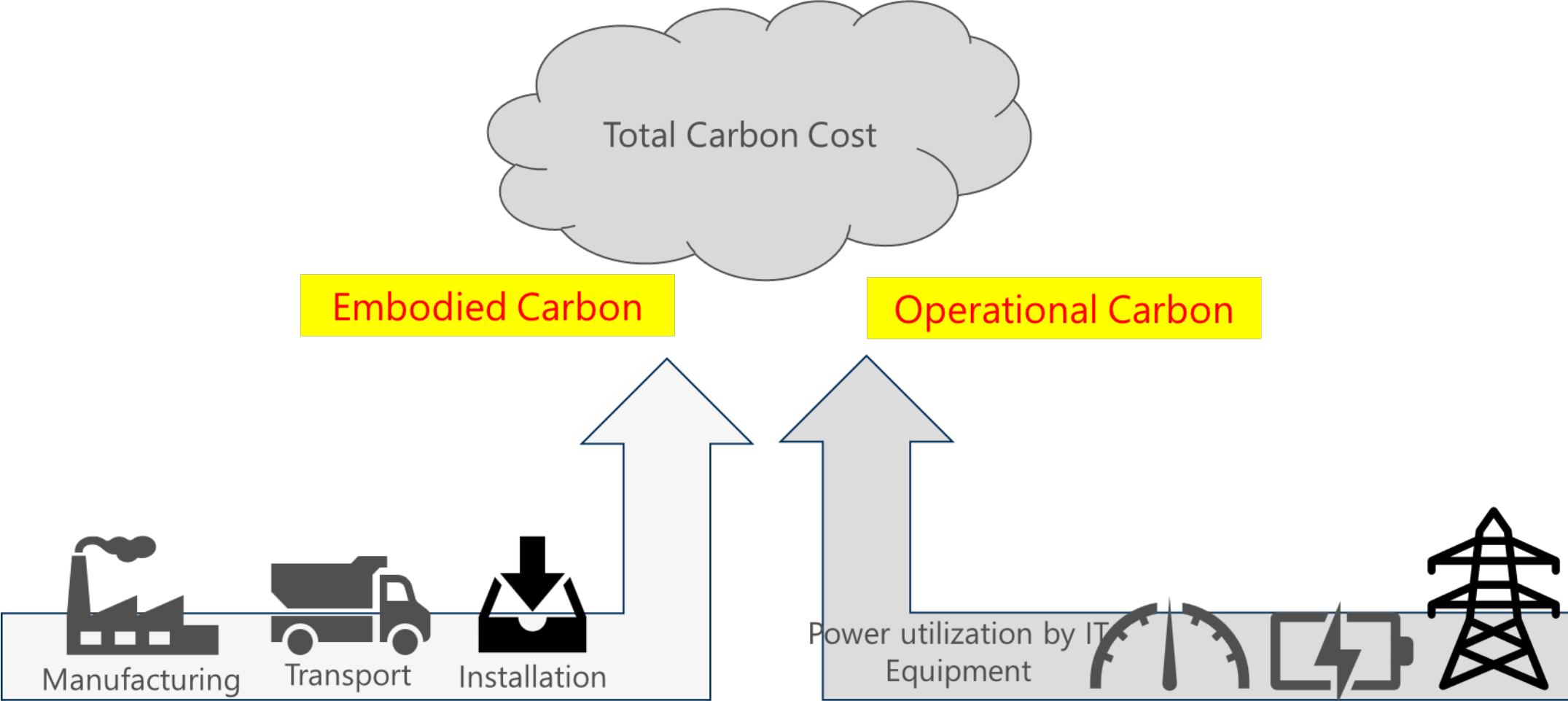
OCP Sustainability – Formation & History

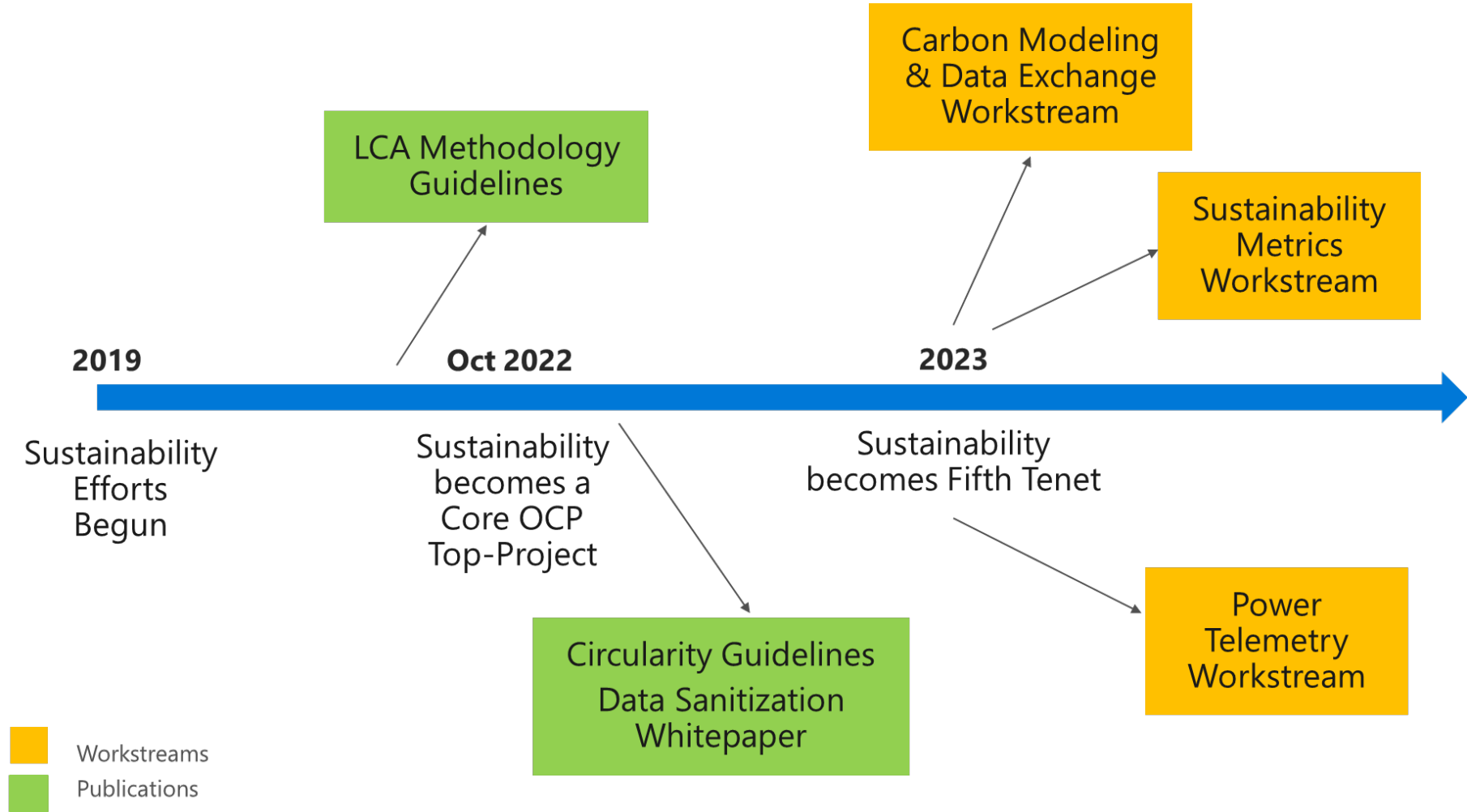# Vision & Growth

"Offer an open framework and standardized resources for data center industry to deploy industry best practices that promote reusability & circularity"

Sustainability is the youngest established Core Project under OCP

2019
Sustainability Efforts Begun

Oct 2022
Sustainability becomes a Core OCP Top-Project

2023
Sustainability becomes Fifth Tenet

LCA Methodology Guidelines

Carbon Modeling & Data Exchange Workstream

Sustainability Metrics Workstream

Circularity Guidelines
Data Sanitization Whitepaper

Power Telemetry Workstream

Workstreams
Publications

OCP Sustainability – Focus Areas

OCP Sustainability – 3 Focus Areas

Carbon 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 / Reuse

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

OCP standard firmware for multiple customers, open source tools. Hardware building blocks for servers and racks

OCP – Sustainability Workstreams

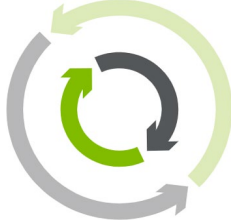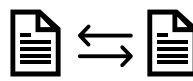**1** Carbon Transparency, Reporting
- LCA Standardization
- Carbon Label / Disclosure Format

2 Circularity
- Promoting Data Sanitization for Reuse
- Carbon Accounting for Circularity

3 Efficiency & Interoperability/ Metrics
- Power Telemetry
- Sustainability Power Metrics
- Cooling efficiency & Heat Reuse

❶ Carbon Transparency & Reporting

Carbon Label / Disclosure Format	LCA Standardization

PARTNERS

OPEN Compute Project **+** Infrastructure Masons

GOAL

- Standardize Carbon Disclosure Format for carbon information exchange among value chain members
- Guiding a taxonomy for Embodied Carbon disclosures related to data center materials and equipment, including a digital carbon label providing both calculated carbon levels and its corresponding methodology

** For further Lifecycle Assessment (LCA) Standardization OCP is pushing for work on Product Category Rule establishment **

Carbon Transparency & Reporting

Carbon Label / Disclosure Format	LCA Standardization

PARTNERS

OPEN Compute Project **+** Infrastructure Masons

WORKSTREAM LEADERS

Schneider Electric — Microsoft — Google — Meta

ACTIVITIES

1 Survey Existing Standards / Programs

2 Define Disclosure Format

3 Advance Comparability

Supplier Carbon Disclosure Form

The iMasons Climate Accord (iCA) and the Open Compute Project (OCP) have started an exciting journey in our joint effort to address the crucial issue of embodied carbon and its impact on data center sustainability. The data center industry is responsible for a significant amount of greenhouse gas emissions, with Scope 3 emissions making up the vast majority of this footprint. Almost all of these Scope 3 emissions are upstream, and take the form of embodied carbon in the materials and equipment that go into building a data center.

Scope 3 emissions, specifically embodied carbon in materials and equipment, pose a significant challenge to data center operators striving to achieve net-zero and carbon neutrality goals. As we recognize the urgency to reduce the carbon footprint of data centers, it is essential to engage our vast supply chain in measuring, reporting, and drawing down embodied carbon from data center inputs.

The goal of this Carbon Disclosure Form is to establish a standardized framework for disclosing and managing embodied carbon in data center construction and operation. By establishing a clear and consistent approach, iCA and OCP aim to drive industry-wide collaboration and innovation, enabling data center operators to make informed decisions and take effective actions to reduce their environmental impact.

Disclaimer: Please do not submit any confidential information to the Project Community. All presentation materials, proposals, meeting minutes and/or supporting documents are published by OCP and are open to the public in accordance to OCP's Bylaws and IP Policy. This can be found on the OCP OCP Policies page. If you have any questions please contact OCP.

For any questions about this form or for more information about this effort, please contact the team at Sustainability-Embodied-Carbon@OCP-All.groups.io

alex.rakow@se.com Switch account

Deliverables:
Supplier Carbon Disclosure Form

- A common format to simplify the disclosure process

- Will help the industry to gather **contextual data**, like the method used to calculate the embodied carbon figure

- Our intent is that data will become part of the OCP Marketplace

Promoting Data Sanitization	Carbon Accounting for Circularity

PARTNERS

OPEN Compute Project **+** **Circular Drive Initiative**

GOAL

- Formulate the criteria for Drive being "Secure Data Sanitized" → to provide drive reuse security
- Suggest Carbon Accounting for circularity → to incentivize primary & secondary users to enable circular reuse

Circularity - Factors encouraging Circular Reuse

Paths for raising confidence on data sanitization
LOCK, SAFE, Caliptra & Others

Tied to previous Focus Area of building a standard
Product Category Rule & Reporting.

Primary Use + Secondary Use → Possible Carbon
Amortization to **incentivize**

"Call for Research on Storage Emissions", Microsoft, Carnegie Mellon University

Source: A Call for Research on Storage Emissions (hotcarbon.org)

Embodied Emissions	CPU	DRAM	SSD	HDD	Other
Compute Rack	4%	40%	30%	0%	26%
SSD Rack	1%	9%	**80%**	1%	9%
HDD Rack	2%	11%	14%	**41%**	33%

Table 3: Embodied emission breakdown for Azure racks.

For Total Carbon Cost of all Storage Nodes/Systems, 61% from Embodied Carbon

Operational Emissions	CPU	DRAM	SSD	HDD	Other
Compute Rack	42%	18%	19%	0%	21%
SSD Rack	32%	8%	**38%**	1%	21%
HDD Rack	26%	5%	7%	**41%**	21%

Table 2: Operational emission breakdown for Azure rack types.

Discussing Extending Life / Second Life as a means to reduce Storage Carbon & concerns with it …

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Sustainability
Power Metrics

GOAL

Improving / Establishing definitions for PUE (Power Utilization Efficiency), IUE (Infrastructure Usage Efficiency) & CUE (Carbon Utilization Efficiency) metrics to reflect sustainability impact
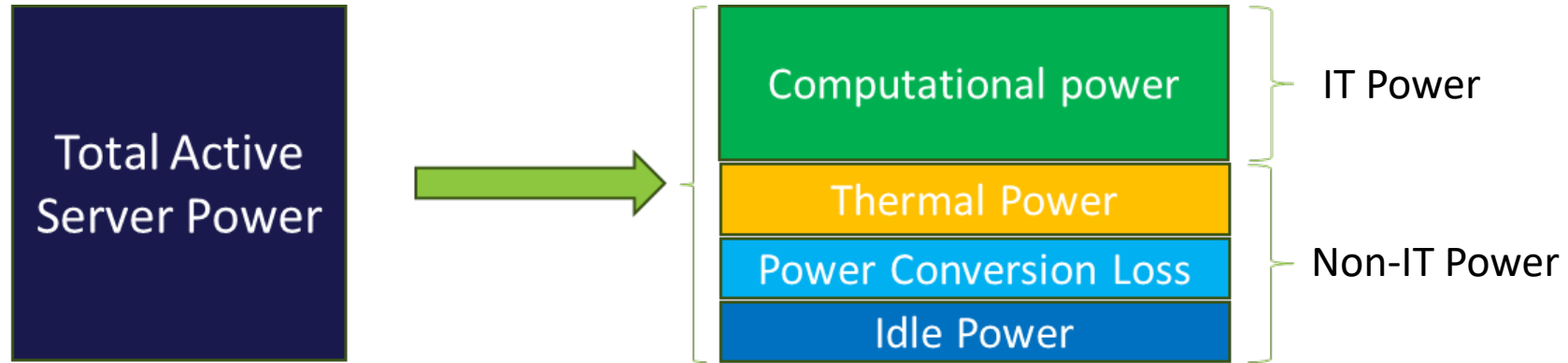
System-IUE$_{Load}$

Defined Infrastructure Utilization Efficiency (IUE) metrics and related measurements. ETA v1.0 Oct'24

PUE$_{Load}$

WHITE PAPER: SUSTAINABILITY METRICS CONSIDERATIONS – PUE

Total Active Server Power	→	Computational power	} IT Power
		Thermal Power	
		Power Conversion Loss	} Non-IT Power
		Idle Power	

$$System\text{-}IUE_{Load} = \frac{Computational\ Power_{Load}}{Total\ Active\ System\ Power_{Load}}$$

$$PUE_{Load} =$$

$$\frac{Total\ Energy\ Consumption}{Total\ IT\ Energy\ Consumption} = \frac{Total\ Energy\ Consumption}{IT\ Computation\ Power + IT\ Non-computation\ power} = \frac{Total\ Energy\ Consumption}{IT\ Computation\ Power/DC\_IUE}$$

Why Measure at load?

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Efficiency & Metrics

Power Telemetry

GOAL

Template requirements for providing power data related to sustainability efforts. This includes power and energy (use phase) measurements, location data, and device identification.

"Sustainability Power Profile" :

✓ Basic product identification
✓ Product-level power and energy reporting
✓ Measurement sample rates
✓ Product location data

This Sustainability data is made available using Redfish, the hardware management standard utilized by OCP products

```
"EnvironmentMetrics": {
    "UseCases": [
        {
            "UseCaseTitle": "Chassis",
            "UseCaseType": "Normal",
            "ReadRequirement": "Supported",
            "Purpose": "Power and energy values must be provided for
            "URIs": [
                "/redfish/v1/Chassis/{ChassisId}/EnvironmentMetrics"
            ],
            "PropertyRequirements": {
                "PowerWatts": {
```

Call To Action

**OCP Sustainability Work for Circularity & Sustainability :**
https://www.opencompute.org/projects/sustainability

Thank you!

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SUSTAINABILITY

Sustainability
Power Metrics

IUE (Infrastructure Efficiency Metric)

Computational Power =

Total Active Server Power
— Thermal Power
— Power Conversion Losses
— Idle Losses

Total Active
Server Power

Computational power — IT Power

Thermal Power

Power Conversion Loss — Non-IT Power
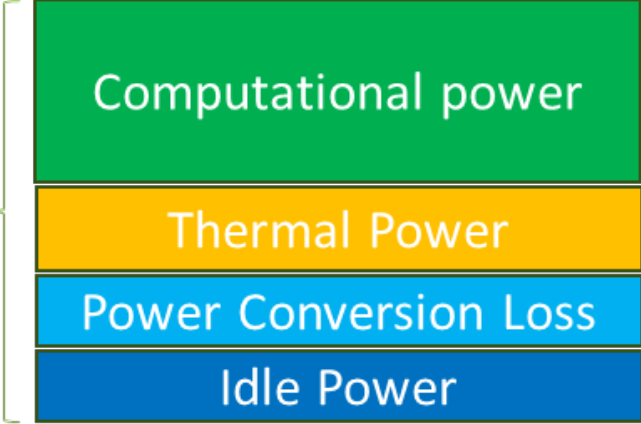
Idle Power

A portion of energy input to the systems is not used for computational purposes. The overheads are attributable to thermal, power conversion and idle power.

$$System\text{-}IUE = \frac{Computational\ Power}{Total\ Active\ Server\ Power}$$
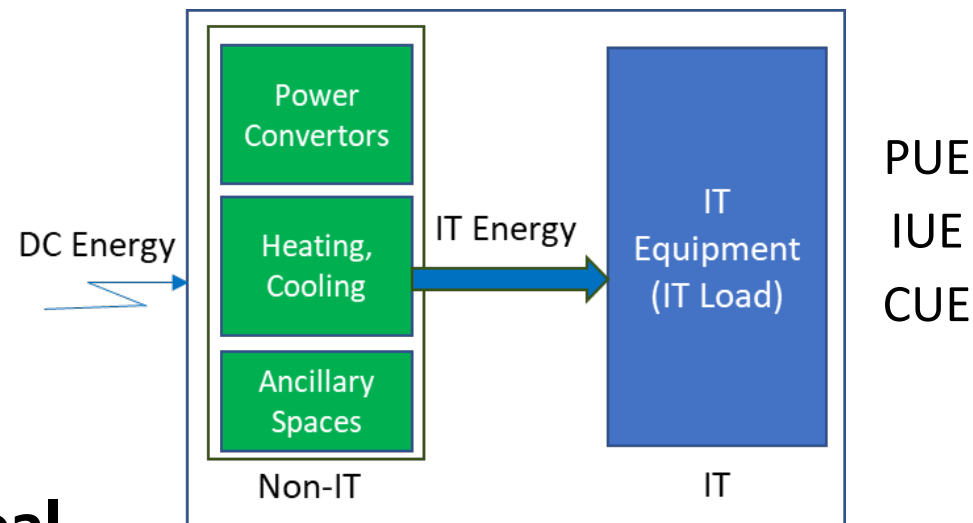
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```
{
    "@odata.type": "#EnvironmentMetrics.v1_3_1.EnvironmentMetrics",
    "Id": "EnvironmentMetrics",
    "Name": "Chassis Environment Metrics",
    "TemperatureCelsius": {
        "Reading": 39,
        "DataSourceUri": "/redfish/v1/Chassis/1U/Sensors/CPU1Temp"
    },
    "PowerWatts": {
        "Reading": 374,
        "DataSourceUri": "/redfish/v1/Chassis/1U/Sensors/TotalPower"
    },
    "EnergykWh": {
        "DataSourceUri": "/redfish/v1/Chassis/1U/Sensors/Energy",
        "Reading": 3638,
        "LifetimeReading": 6491
    },
    "@odata.id": "/redfish/v1/Chassis/1U/EnvironmentMetrics"
}
```

Goal

PUE
IUE
CUE

DC Energy → Power Convertors / Heating, Cooling / Ancillary Spaces (Non-IT) → IT Energy → IT Equipment (IT Load) (IT)

- **SUSTAINABILITY POWER PROFILE:** Template requirements for providing power data related to sustainability efforts. This includes power and energy (use phase) measurements, location data, and device identification.

- **POWER METRICS:** Improving / Establishing definitions for PUE (Power Utilization Efficiency), IUE (Infrastructure Usage Efficiency) & CUE (Carbon Utilization Efficiency) metrics to reflect sustainability impact

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