



EURECA - Public Procurement of Datacenter Services in Latvia and Europe
Thursday, 12th November 2015

Energy Efficient Datacenters: Guidelines within the German public sector

Dr.-Ing. Marc-Andree Wolf, maki Consulting GmbH

Agenda

- German type I Ecolabel „Blue Angel“ for energy-efficient data centre operations (RAL-UZ 161, Feb 2015)
- Environmental issues of data centres
- German guide for green public procurement of products and services for data centers and server rooms
- Outlook: EURECAs upcoming developments

German type I Ecolabel „Blue Angel“ for energy-efficient data centre operations

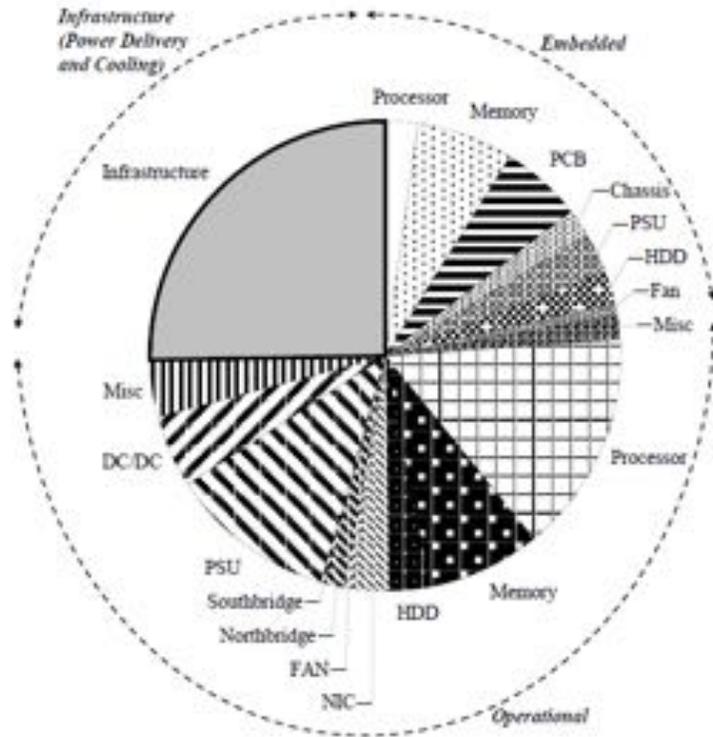
- RAL-UZ 161, „*Blauer Engel für Energieeffiziente Rechenzentrumsbetriebe*“, Feb 2015
- Full life cycle perspective
- 2nd edition of the label
- First governmentally endorsed type I label for data centres

Web: <https://www.blauer-engel.de/en/products/office/data-center-operation>

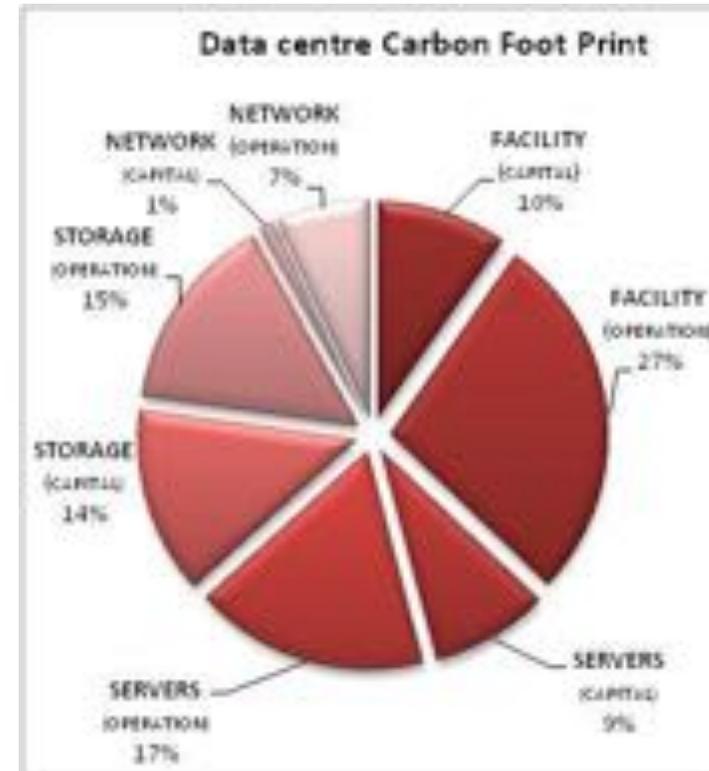


Data centre environmental footprint – what matters?

- Energy consumption during data centre operation takes up 50 to 70% of primary energy and Climate change impacts (less for several other environmental impacts)
- Equipment hardware production of servers, cooling, UPS, building and other capital goods contributes the other 30 to 50%.



Lifecycle-based Data Center Design, HP Laboratories, 2010



Environmental Performance of Data Centres - A Case Study of the Swedish National Insurance Administration
 Mid Sweden University, Sweden, 2010

Guide for procurement, based on the „Blue Angel“

- Covers selected hardware procurement, energy monitoring, operation (energy, coolant losses)
- Partly performance based (e.g. SPECpower_ssj2008), partly partial proxies (e.g. EUE), partly exclusions (e.g. no halogenated coolants for above 50 kWth, ...)
- Captures hardware production only indirectly – big hurdles for purchase of new hardware and less strict for existing older DCs (to avoid kicking out existing hardware too early)
- Specific formulations for tenders
- Annexes of templates for vendors, to ease data collection and make it consistent, support evaluation of offers
- Accompanying financial support programme in D. for SMEs for preparation towards Blue Angel. 75% contribution, up to EUR 15,000

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server**
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

Guide for green public procurement of products and services for data centers

and server rooms („Leitfaden zur umweltfreundlichen öffentlichen Beschaffung von Produkten und Dienstleistungen für Rechenzentren und Serverräume“)

1. Introduction
2. Use of guide and provider questionnaires
3. Scope
4. Definitions
5. Requirements
 - 5.1. Requirements on data center hardware**
 - 5.1.1. Server
 - 5.1.2. Refrigerating plants
 - 5.1.3. Energy efficiency of the cooling system
 - 5.1.4. Uninterruptible Power Supply (UPS)
 - 5.1.5. Energy-efficient power supplies
 - 5.1.6. Intelligent Power Distribution Units (PDUs)

...

5.2. Installation of measuring equipment

5.2.1. Installation of the measuring points

5.3. Energy monitoring

5.3.1. Energy monitoring

5.3.2. Annual Monitoring Report



...

5.2. Installation of measuring equipment

5.2.1. Installation of the measuring points

5.3. Energy monitoring

5.3.1. Energy monitoring

5.3.2. Annual Monitoring Report



...

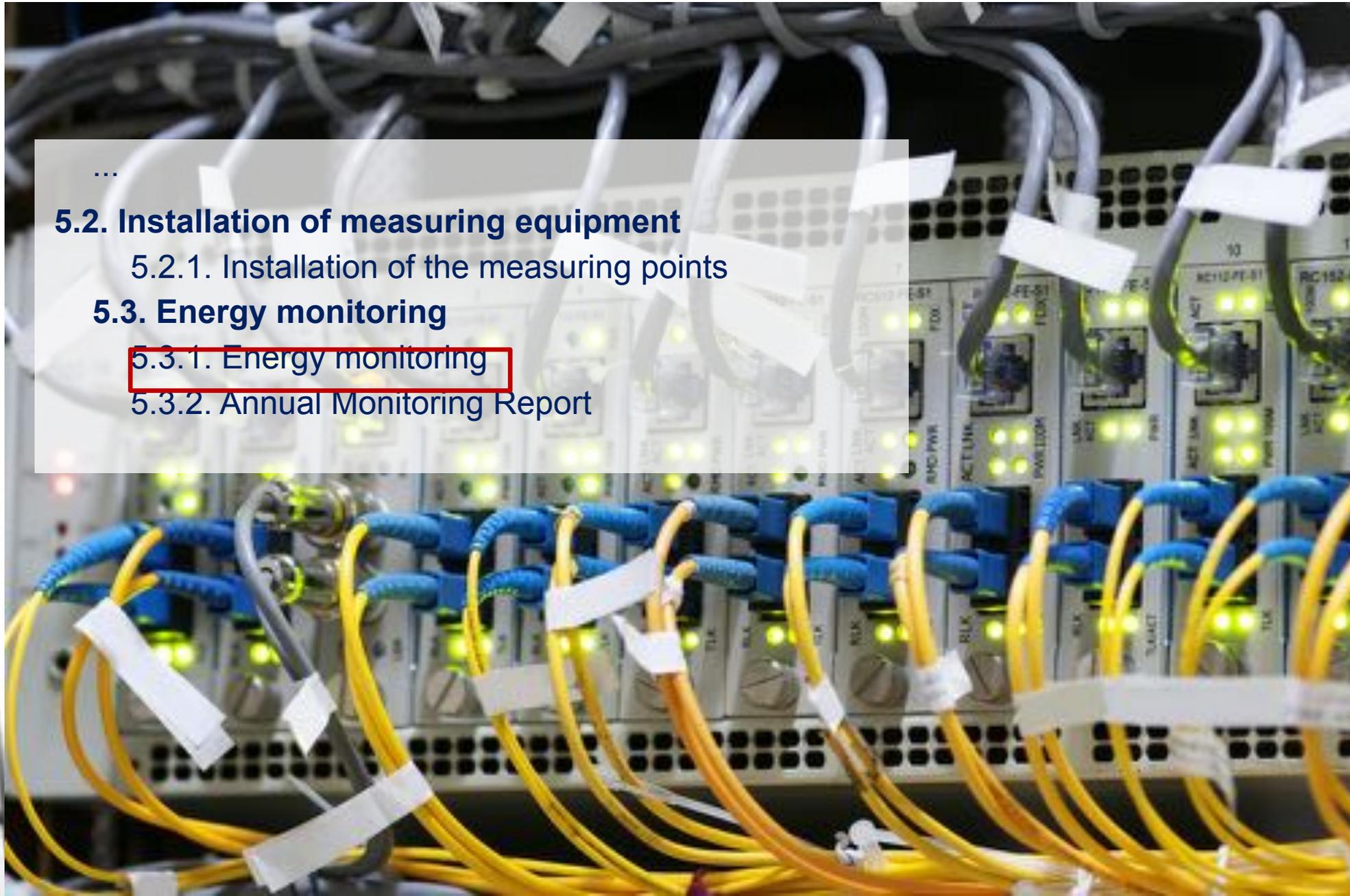
5.2. Installation of measuring equipment

5.2.1. Installation of the measuring points

5.3. Energy monitoring

5.3.1. Energy monitoring

5.3.2. Annual Monitoring Report



...

5.2. Installation of measuring equipment

5.2.1. Installation of the measuring points

5.3. Energy monitoring

5.3.1. Energy monitoring

5.3.2. Annual Monitoring Report



...

5.2. Installation of measuring equipment

5.2.1. Installation of the measuring points

5.3. Energy monitoring

5.3.1. Energy monitoring

5.3.2. Annual Monitoring Report



...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

5.4.1. Energy Efficiency Report

5.4.2. Energy management system

5.4.3. Energy monitoring

5.4.4. Energy Usage Effectiveness (EUE)

5.4.5. Energy efficiency of the cooling system

5.4.6. Uninterruptible Power Supply

5.4.7. Virtualization of servers

5.4.8. Electric Power

5.4.9. Cooling system

5.4.10. Creating an IT asset list

...

5.4. Data center operations

5.4.1. Energy Efficiency Report

5.4.2. Energy management system

5.4.3. Energy monitoring

5.4.4. Energy Usage Effectiveness (EUE)

5.4.5. Energy efficiency of the cooling system

5.4.6. Uninterruptible Power Supply

5.4.7. Virtualization of servers

5.4.8. Electric Power

5.4.9. Cooling system

5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

...

5.4. Data center operations

- 5.4.1. Energy Efficiency Report
- 5.4.2. Energy management system
- 5.4.3. Energy monitoring
- 5.4.4. Energy Usage Effectiveness (EUE)
- 5.4.5. Energy efficiency of the cooling system
- 5.4.6. Uninterruptible Power Supply
- 5.4.7. Virtualization of servers
- 5.4.8. Electric Power
- 5.4.9. Cooling system
- 5.4.10. Creating an IT asset list

Less strict, if DC is 5 years or older:

- EUE < 1.8
- JAZ cooling > 3.5
- ...

Outlook – EURECAs upcoming support

- Builds on existing guides such as elements of e.g. the German „Blue Angel“
- Adds explicitly hardware production-related elements in life cycle perspective
- Aims at consistency with new EU Procurement Directive of 2014 (currently in progress of translation to national policies) that ...
 - allows to consider product properties that come e.g. from production,
 - strenghtens life cycle costing (both TCO and eLCC),
 - eases the use of (Eco)label criteria
- Procurement support only part of EURECA framework, which covers also extensive support to self-evaluation, data centre market directory, success cases compilation, plus traning courses incl. self-learning & webinars

Questions please!

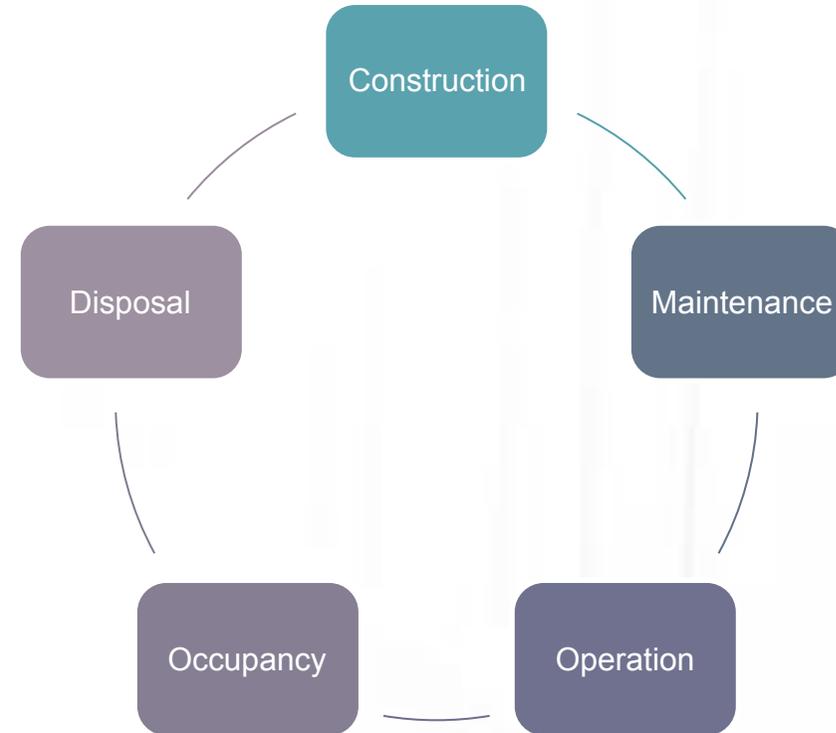
Marc-Andree Wolf (PhD), CEO
maki Consulting GmbH
Sepp-Zehentner-Str. 33 - D-83071 Stephanskirchen - Germany.
www.maki-consulting.com

Marc-Andree.Wolf@maki-consulting.com
Office: +49 (0)8031 4698679 - Mob: +49 (0)152 52725303
FAX: +49 (0)30 91462241
Skype: marcisonline - LinkedIn: <http://www.linkedin.com/profile/view?id=157355371>

Backup

Life cycle costing (LCC)

A compilation and assessment of all costs related to a product, over its entire life cycle, from production to use and maintenance, and product-end-of life



Two main
components to
overall LCC



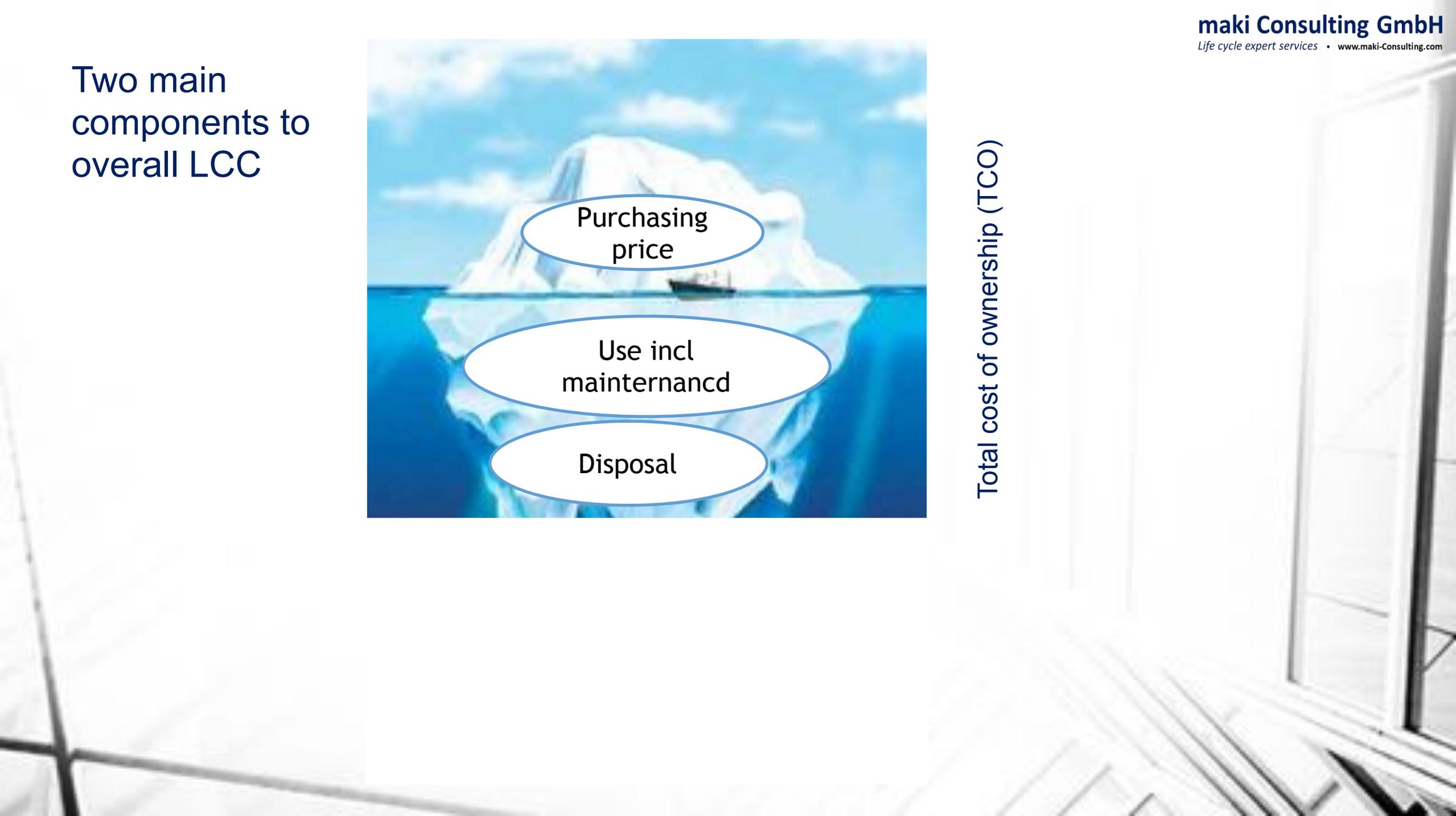
Two main
components to
overall LCC



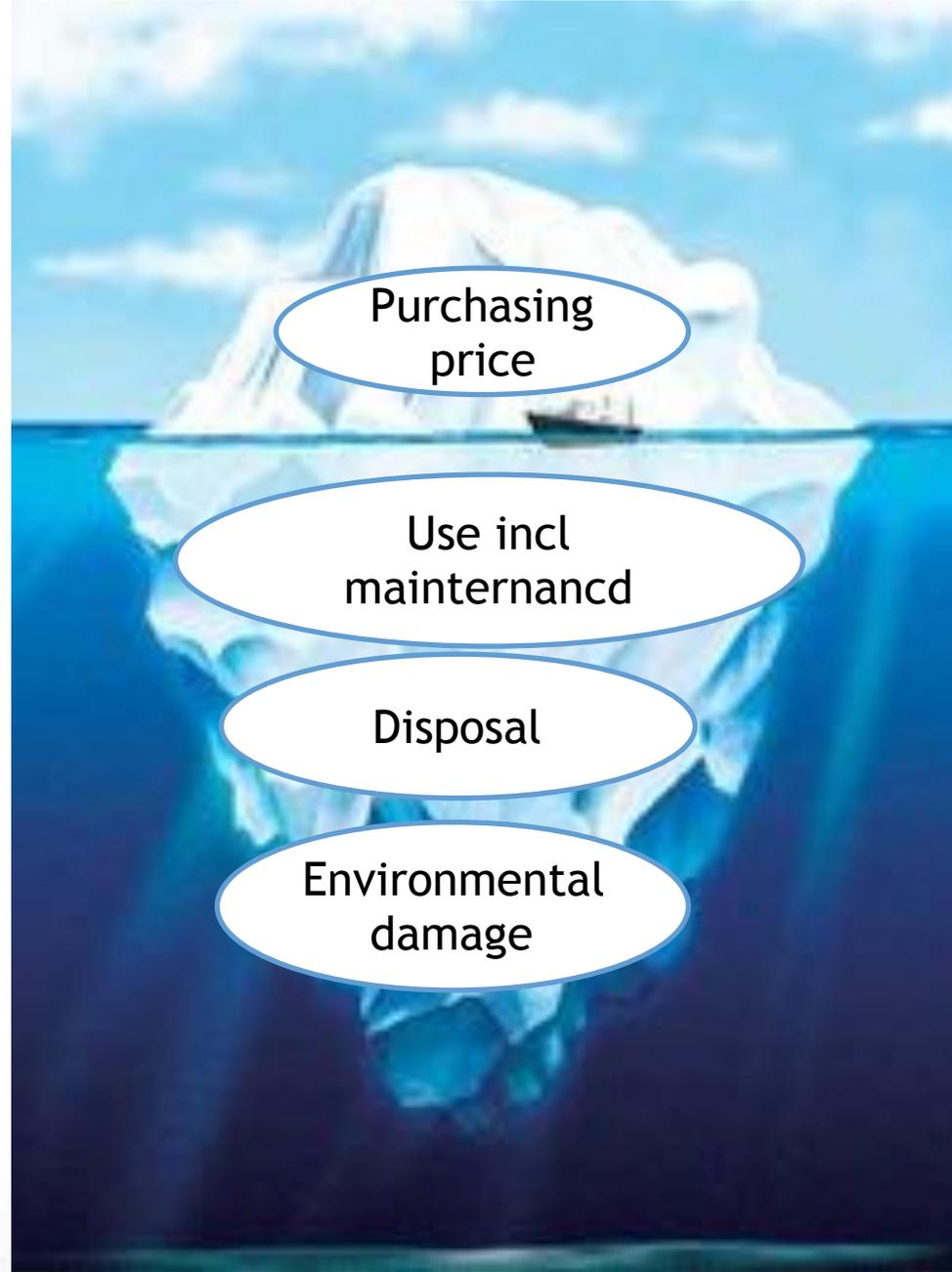
Two main
components to
overall LCC



Total cost of ownership (TCO)



Two main components to overall LCC



env. Life CcCle Costing Total cost of ownership (TCO)

overall Life CcCle Costing

Benefit of LCC (TCO)

Consideration of the costs over the whole life of an asset provides a sound basis for decision-making. With this information, it is possible to:

- Assess future resource requirements (through projection of projected itemized line item costs for relevant assets);
- Assess comparative costs of potential acquisitions (investment evaluation or appraisal);
- Decide between sources of supply (i.e. source selection);
- Account for resources used now or in the past (for reporting and auditing);
- Improve system design (through improved understanding of input trends such as manpower and utilities over the expected life cycle);
- Optimize operational and maintenance support (through more detailed understanding of input requirements over the expected life cycle)
- Assess when assets reach the end of their economic life and if renewal is required (through understanding of changes in input requirements such as manpower, chemicals, and utilities as the asset ages).

Life Cycle Assessment principles

Comprehensive coverage of relevant environmental impacts and resource depletions



Life Cycle Assessment principles

Comprehensive coverage of relevant environmental impacts and resource depletions

Extraction/use of
physical resources,
e.g.



Energy
extraction



Material
extraction



Land use /
conversion



Life Cycle Assessment principles

Comprehensive coverage of relevant environmental impacts and resource depletions

Extraction/use of physical resources, e.g.

Pressures via emissions to air, water, soil, e.g.



Energy extraction



Material extraction



Land use / conversion



CO₂,
Methane, ...



Phosphate,
NOx, ...



Cadmium, POPs,
...

Life Cycle Assessment principles

Comprehensive coverage of relevant environmental impacts and resource depletions

Impacts on resource availability, e.g.

Extraction/use of physical resources, e.g.

Pressures via emissions to air, water, soil, e.g.



Energy availability



Energy extraction



Material availability



Material extraction



Land productivity



Land use / conversion



CO₂, Methane, ...



Phosphate, NOx, ...



Cadmium, POPs, ...

Life Cycle Assessment principles

Comprehensive coverage of relevant environmental impacts and resource depletions

Impacts on resource availability, e.g.

Extraction/use of physical resources, e.g.

Pressures via emissions to air, water, soil, e.g.

Impacts on Health and Environment, e.g.



Energy availability



Energy extraction



Material availability



Material extraction



Land productivity



Land use / conversion



CO₂, Methane, ...



Climate change



Phosphate, NO_x, ...



Eutrophication



Cadmium, POPs, ...



Toxic Pressure

Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.



Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.



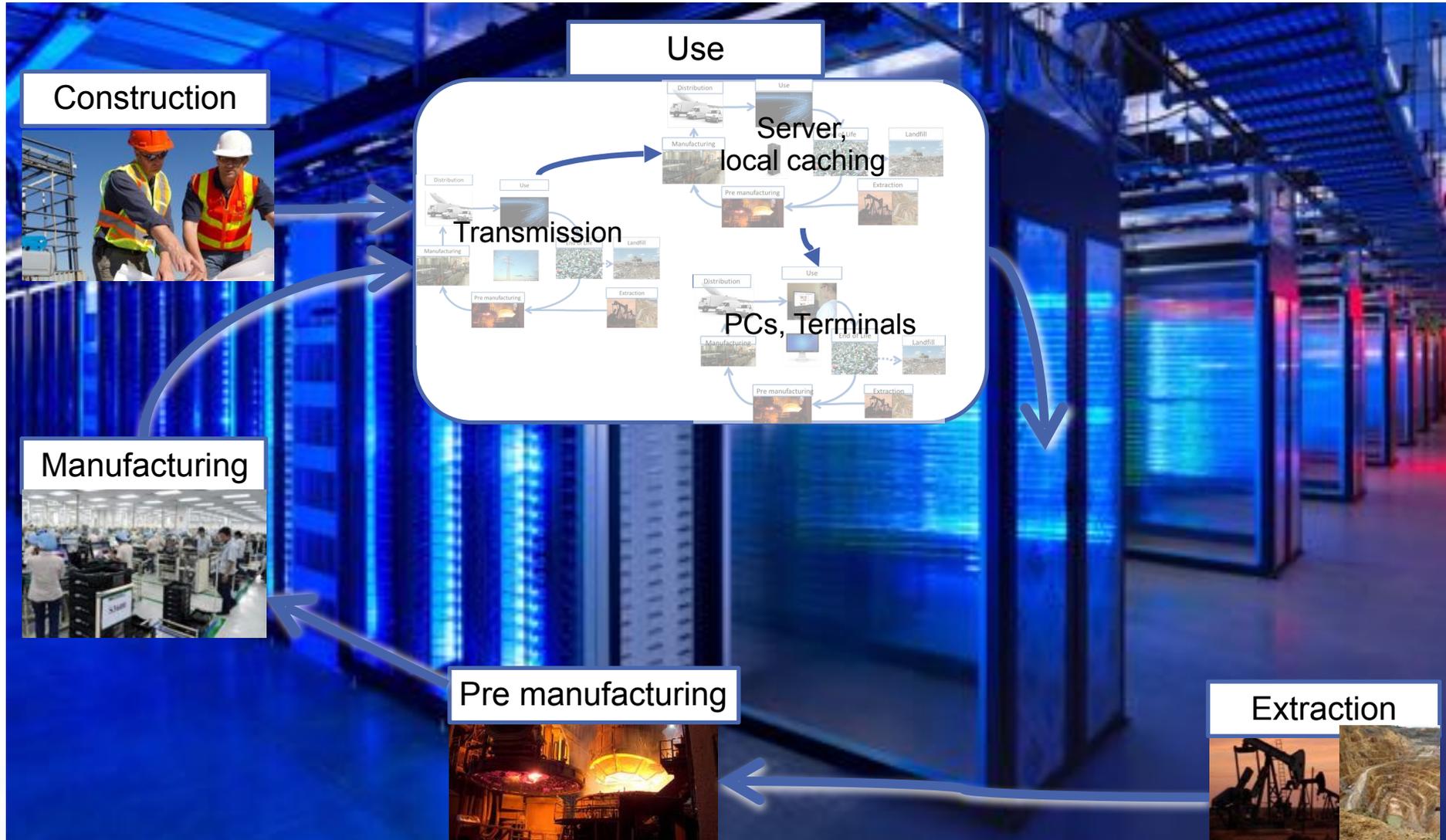
Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.



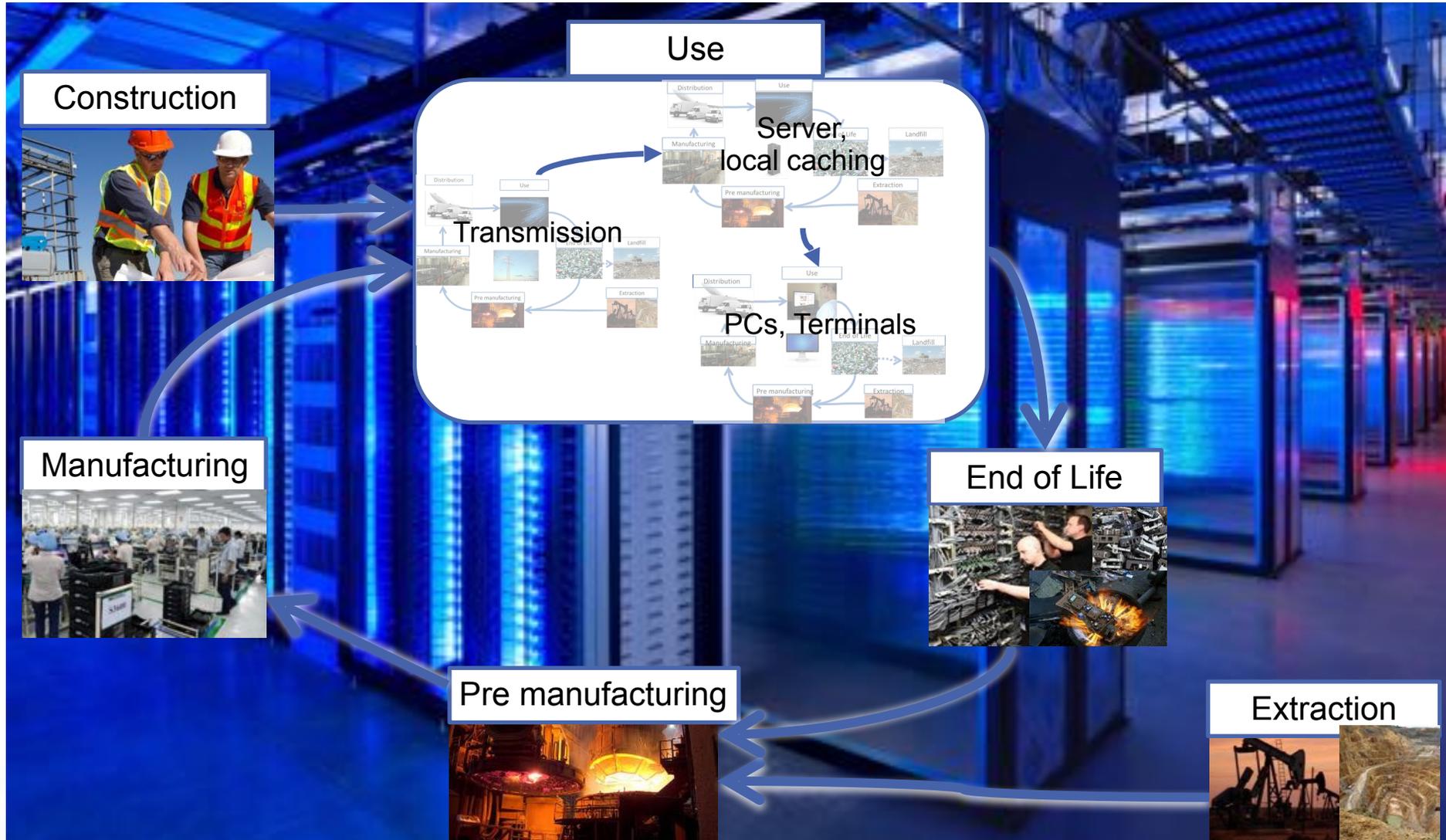
Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.



Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.



Life Cycle - DC

Over entire life cycle (i.e. supply-chain, plus use phase and end-of-life). Note that the graphic is schematic and many non-specific processes, such as transport, storage, etc. are not shown. Also not consumables such as electricity that enter into each step.

