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Public Energy Efficiency Register of Data Centres (PEER-DC)

10. Plenary Meeting Concerted Action for the Energy Efficiency Directive, 21.-23. March 2022, Lisbon, Portugal.

Prof. Dr. Peter Radgen

Projekt on behalf of :

Contract Number:
37EV201030

Umwelt Bundesamt

Under the technical supervision of the:

Bundesministerium für Wirtschaft und Klimaschutz

Background and Motivation

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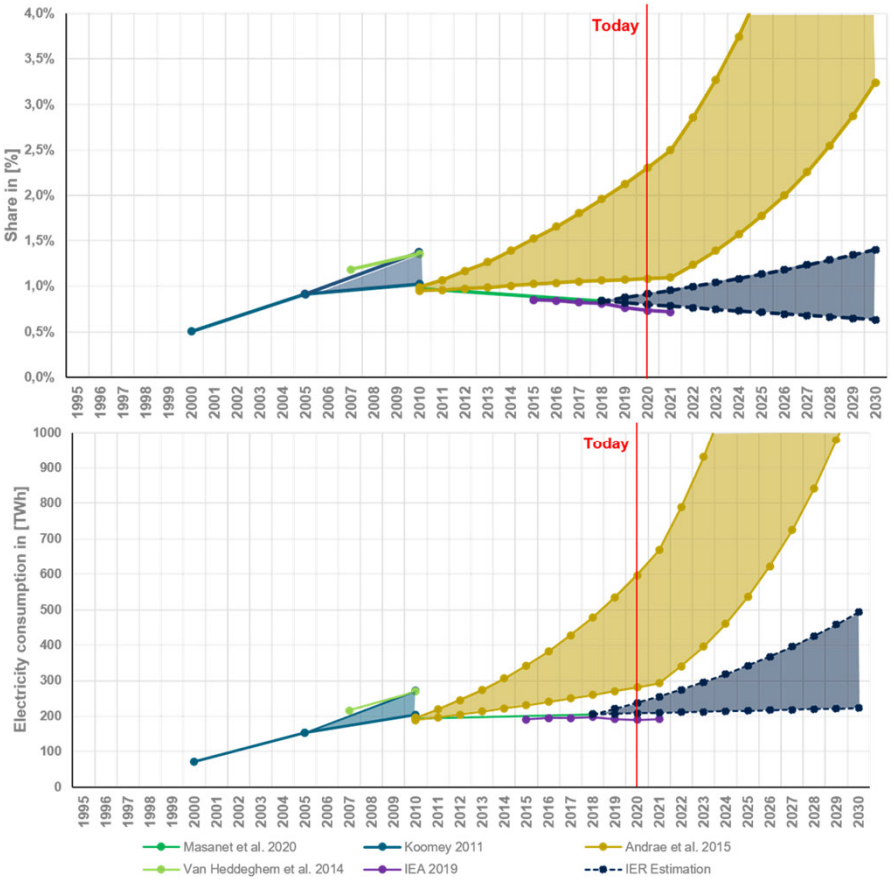
- Large growth in the area of digital infrastructures with significant increase in electricity consumption.
- Lack of transparency with regard to electricity consumption, growth and efficiency, therefore a uniform approach is required for recording and evaluating the efficiency of data centres.
- Energy efficiency and use of renewable energies at European level (cf. RED II and EED Directive).
- Energy Efficiency with high priority given the recent political developments

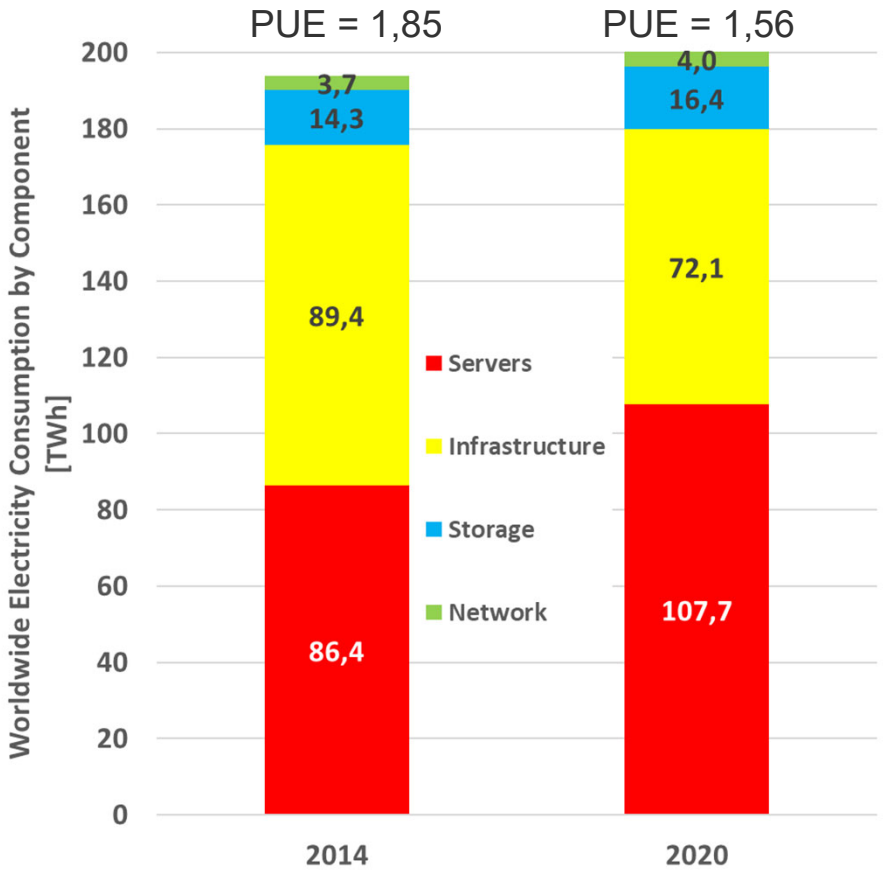
Development of global power consumption in data centres

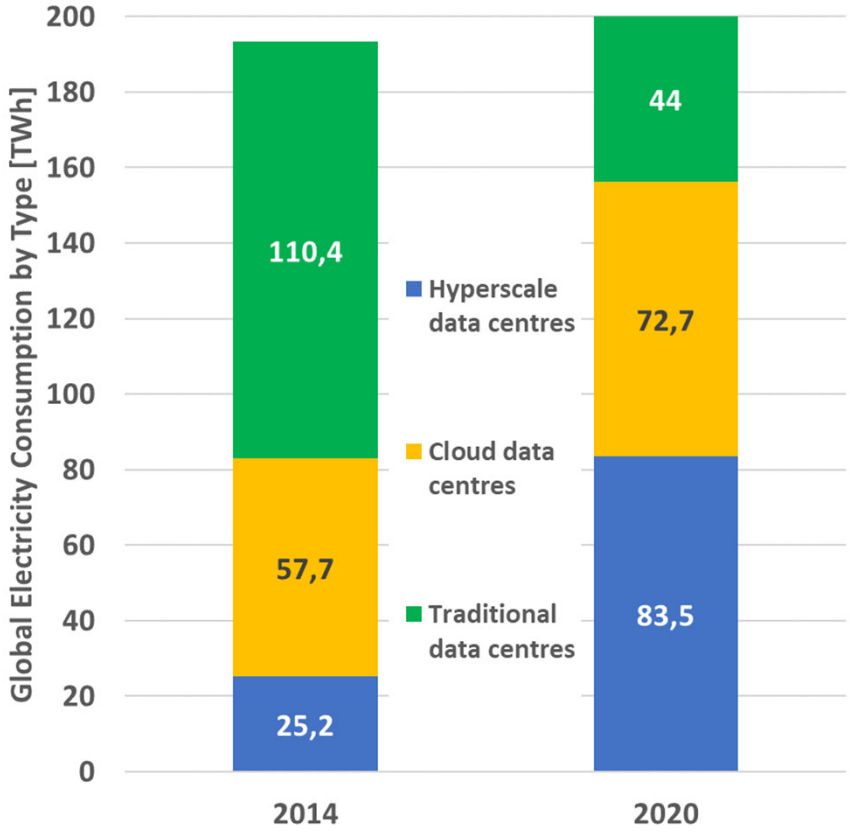


To be noted: All numbers are given in German format

Distribution of Electricity Consumption

By Component and Type





Data Source: IEA, Paris, 2021. www.iea.org/data-and-statistics/charts/global-data-centre-energy-demand-by-end-use-and-data-centre-type-2014-2020

Data Centre Classification

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Type	Hyper Scaler	Co-Location	Managed Services Data Centres	Enterprise Data Centres	Edge Data Centres
Description	**Data and applications are hosted by a cloud services provider for a broad number of clients.** Examples Amazon Web Services Microsoft Azure, Google, IBM Cloud.	**Providing housing for third parties IT infrastructure.** Owned by a third party and located off company premises. Co-locator is providing infrastructure (e.g. building, cooling, electricity supply bandwidth, security) Customers providing and managing their IT components (e.g. servers, storage, firewalls).	**Managed by a third party on behalf of a company.** The company leases the equipment and infrastructure instead of buying it.	**Built, owned, and operated by companies for themselves.** Typically housed on the corporate campus.	**Small footprint with location close to end users (at the edge of the network)** and devices for data that need processing close to the originating source for fast services with minimal latency. Typical applications: - 5G - IoT - Healthcare - Autonomous driving - Smart factories and cities
Typical Size	**50-300 MW**	**1-100 MW**	**500 kW – 20 MW**	**10 kW – 20 MW**	**250 kW – 2 MW**

Planned Achievements of the PEER-DC Project

(Project Duration until 31.07.2023)

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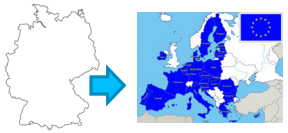
Overall Target

Creating transparency with regard to energy consumption, energy efficiency and environmental protection in the area of data centres

Applied Approach

- Development of a register for data centres and visualisation of the data of the register for easy use
- Development of an evaluation system and evaluation software for energy-efficient data centres
- Analysis of the transferability of the results and the feasibility of the rating system for data centres at European level.
- Communication and Stakeholder Management



Creating a Win-win situation for all actors

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Data centre operator

- Visibility of own digital services and climate protection measures
- Competition for the most efficient data centres
- Uniform evaluation standards for comparing data centres
- Creation of a market for waste heat from data centres

Data centre customers

- Overview of available data centre services
- Selection of energy-efficient, climate-friendly data centres

Regulator

- Targeted measures to promote IT infrastructures and IT locations
- Basis for development of data centre market and services
- Development of connected load and energy consumption for power plant and power grid planning
- Recording greenhouse gas emissions for monitoring climate protection obligations

Data Collection and Data Sharing

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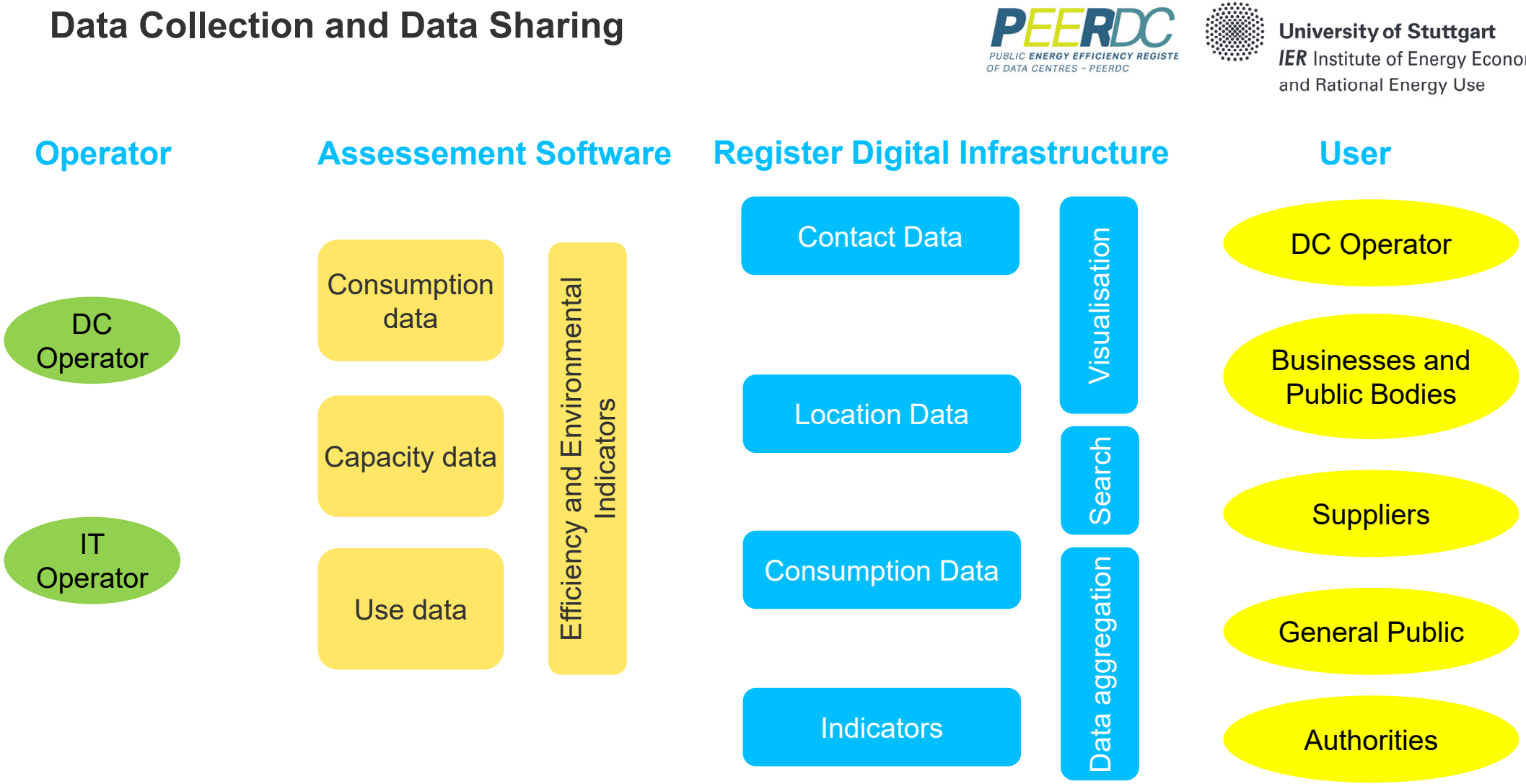

Potential Coverage of the Register

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- In principle **all operators of digital infrastructures above a certain size should be covered** (sizes to be covered under discussion).
- A distinction will be made between the different types of data centres and IT operators
- Data centre operators (Colo) without influence on the efficient operation of IT hardware but IT hardware responsible for 70-80% of total electricity consumption of a data centre
- Therefore IT operators within a data centre should be covered by the register as well
- The **PEER-DC project** will focus to collect on co-location and managed services data centres but we be open to all interested parties. Participation is on **voluntary basis.**

Data Collection from Data Centres

(under development; no decisions taken)

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Data Centre (Basic)

- Identification code
- Designation by Owner
- Name of Owner
- Geographical Position (Country, Postcode, Town, Street, Street Number)
- Building area (gross floor area)
- IT-Area (Whitespace)
- Land Area
- Availability class EN 50600 / ISO 22237
- Contact Data (Name, Phone, Mail, Full Address)

Points marked in red are listed in the Commission draft of July 2021 under EED Annex VI Number 2

Data Centre (Technical Data)

- Nominal connected loads of the IT and the entire data centre
- Classification of the data centre according to IT connected load (<100kW, <500 kW; < 1MW, < 5MW; <10MW, <50 MW; <100 MW; >= 100 MW)
- Installed electrical power of emergency generators (if any)
- Installed electrical capacity of generators by energy source (if available)
- Installed electrical storage capacity of the uninterruptible power supply (UPS) system
- Information on the refrigerants and refrigerant charge quantities used
- If applicable, further information

Data Centre (Energy)

- Total Energy Consumption of Data Center
- Annual energy consumption of information and communication technology systems
- Annual energy consumption of cooling systems
- Total consumption of fuels and combustibles
- Type and quantity of refrigerant used in the cooling system, as well as the quantities of refrigerant disposed of and refilled during the year
- Total annual amount of heat discharged from the data centre
- Amount of energy recycled
- Total water consumption and water quality
- Electrical work of self-generated electricity by energy source
- Annual Data Traffic

Data Centre (Indicators)

- Power usage Effectiveness (PUE)
- Energy Reuse Factor (ERF)
- Renewable Energy Factor (REF)
- Cooling Efficiency Ratio (CER)
- Water usage effectiveness (WUE)
- Average CPU utilisation ration

Challenge Data Security and Critical Infrastructure

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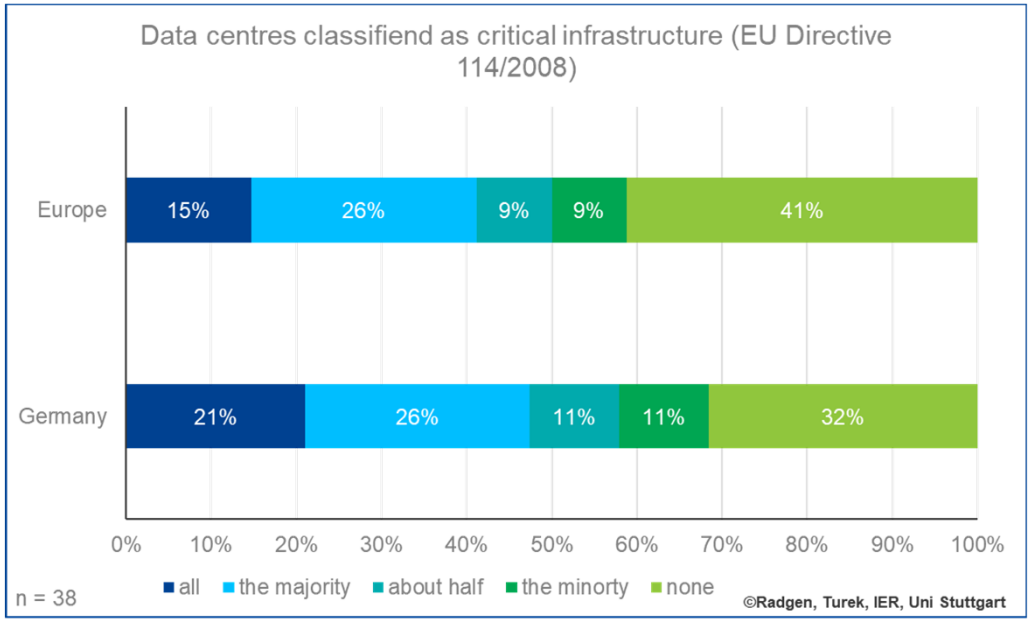
Security of the registry data is an highly important aspect for willingness to provide data

- Separation of registry data database and database for external access
- Database encryption
- General Data Protection Regulation (Regulation (EU) 2016/679 of 27 April 2016)
- Some data sets might require special protection to not dispose the critical infrastructure to additional risks



Source: Radgen, P.; Turek, D.: Study of the impact of the Corona pandemic on Data Centers, IER, University of Stuttgart, 2021

Visualisation of the Data Center Register

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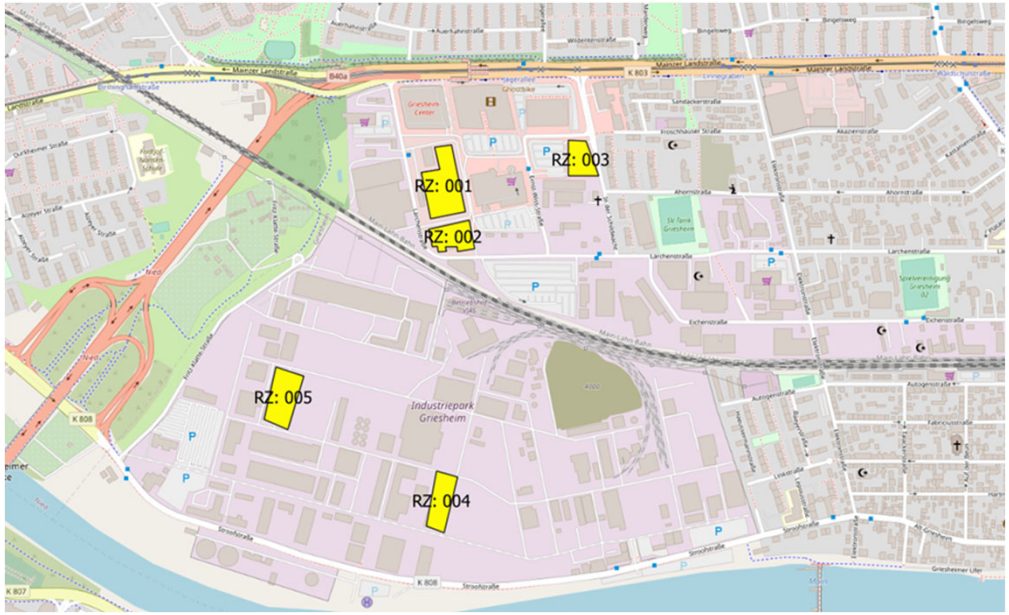

The public register will aggregate locations instead of showing individual locations only

Geografical resolution under discussion

Analysis Software for Data Center Evaluation and Data Provision to the Data Centre Register

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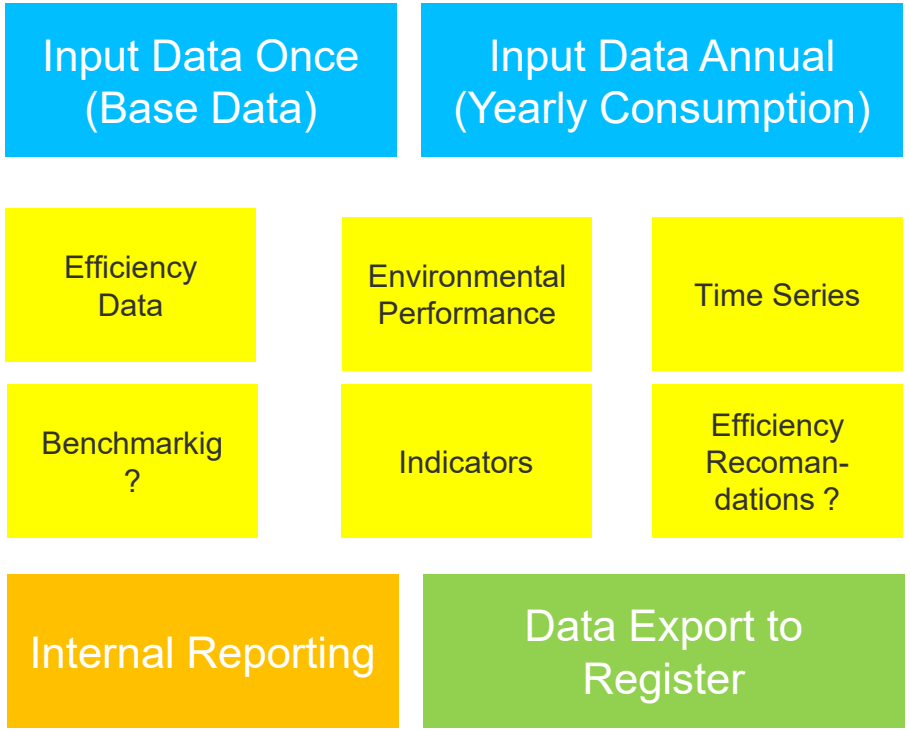
Software Development for the Analysis of the energetical and environmental performance of data centres to

- Easily collect the necessary data
- Support in identifying energy saving opportunities
- Pinpointing to poor operation practices
- Calculate the indicators automatically and in an uniform and comparable way
- Provide an interface for the data export the public energy efficiency register of data centres



How to define an Energy Efficient Datacentre ?

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- Generally efficiency is defined as the ratio between use and efforts
- Whereas the efforts are typically clear (electricity to run the datacentre), the use is much harder to define
  - The number of computing operations performed by the servers?
  - The storage space occupied with user data?
  - The data transferred via the external network interface?
  - The cooling provided for the servers?
  - …

- Useful metrics for efficiency are different for different types of data centres and can have a very different level of detail.
- They should also be able to distinguish between technical aspects and organisational aspects of efficiency
- Organisational improvements are cheaper and quicker to implement but technical improvements provide more stable effects

Oversight of Data depending on Business Model

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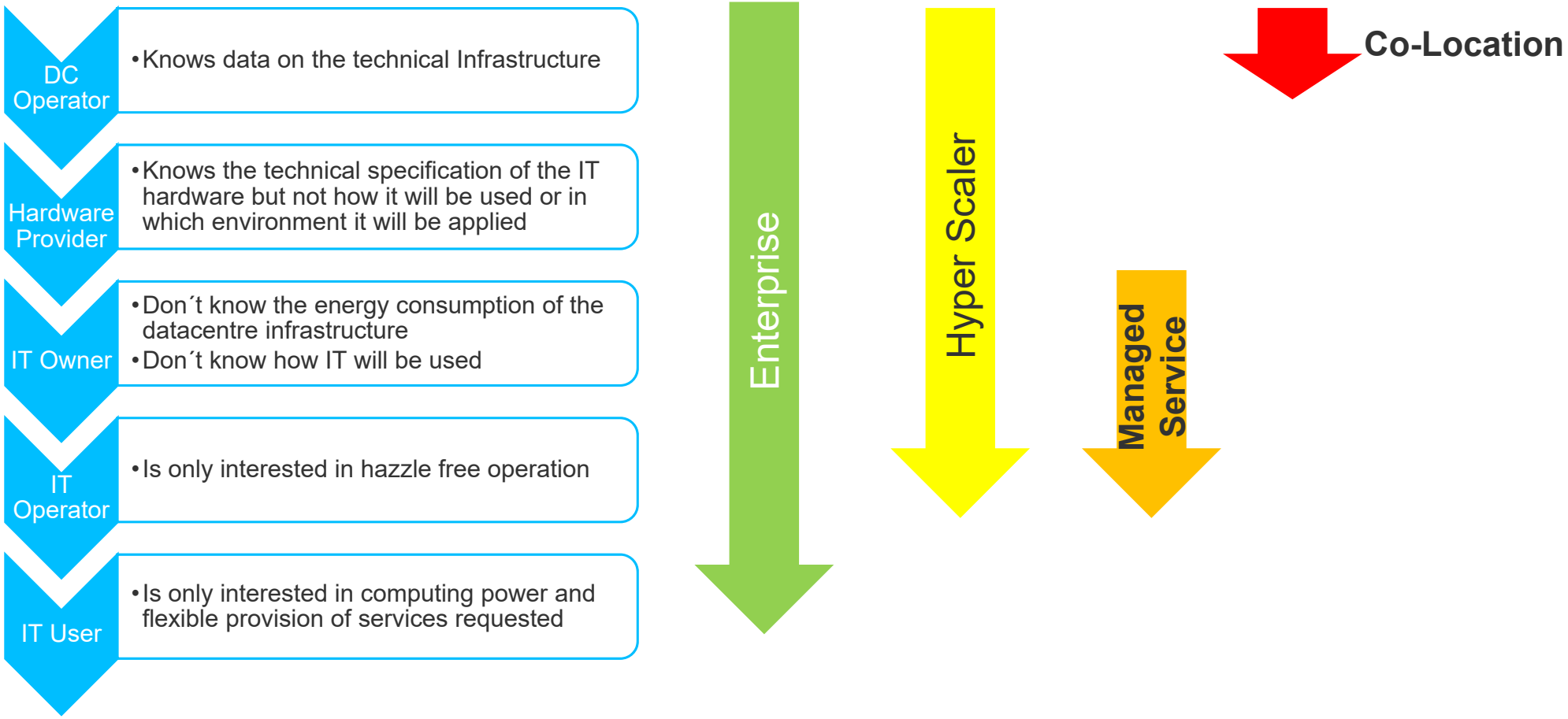

Which indicators for the analysis of the IT are useful and can be easily calculated based on available data in the data centre

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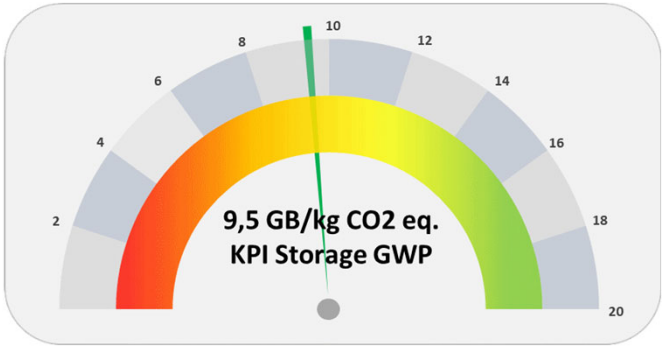
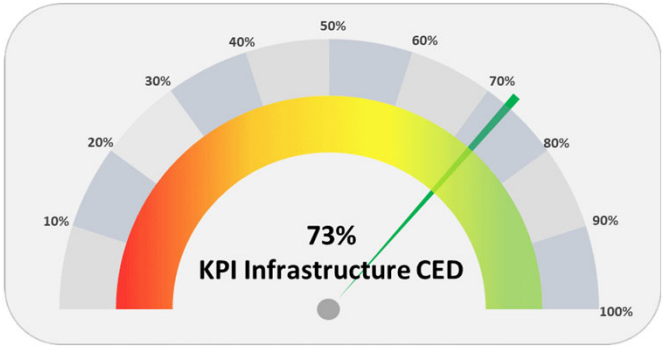
Example KPI Storage



Question:
What is the specific CO_2 Emission of storage capacity use

- KPI: Greenhouse gas efficiency of data storage systems (GB/ t CO_{2eq})
- Use: Utilized storage space
- Impact: CO_2-Emissions

Example KPI Infrastructure



Question:
What is the primary energy efficiency of the data center infrastructure

- KPI: Primary Energy Efficiency Infrastructure
- Use: Electricity for cooling, heating, air conditioning, Elevator and Lighting
- Impact: Primary Energy consumption

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Thank you!

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Project Consortium

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Project Partners

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DATA CENTER GROUP

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Further Information

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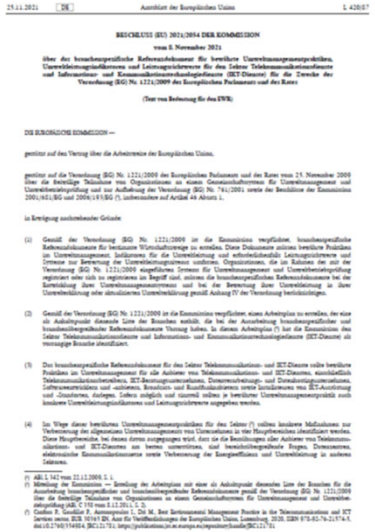
COMMISSION DECISION (EU) 2021/2054; 08.11.2021
sectoral reference document on best environmental management practices, environmental performance indicators and benchmarks of excellence for the telecommunications and information and communication technologies (ICT) services sector



BESCHLUSS (EU) 2021/2054 DER KOMMISSION

vom 8. November 2021

https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32021D2054

2021 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency, Version 12.1.0 (Final Version)

JRC TECHNICAL REPORT

2021 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency

Version 12.1.0 (Final Version)

Acton M., Bertoldi P., Booth J.

2021

https://e3p.jrc.ec.europa.eu/sites/default/files/documents/publications/jrc123653_jrc119571_2021_best_practice_guidelines_final_v1_1.pdf

Climate Neutral Data Centre Pact Self-Regulatory Initiative Policy Proposal

Climate Neutral Data Centre Pact

Self-Regulatory Initiative Policy Proposal

CLIMATE NEUTRAL DATA CENTER

The Climate Neutral Data Centre Pact (CNDCP) includes 54 individual data centre operators and 22 data centre and cloud industry trade associations. Data centres are the tangible assets where cloud and internet technologies live and interact, and where users connect to and access digital services. Data centres have become the transactional foundation of our modern society and the global economy. As data centre operators, we place a high level of importance on sustainability, energy efficiency, clean energy, reliability, and security, and use tools, technologies and systems to ensure we deliver. The focus and span of control of the Pact is on achieving sustainable data centre facilities.

We have all committed to meet commonly accepted goals for energy efficiency, carbon-free or renewable energy, water conservation, circular economy, and heat recovery and reuse. Through the Climate Neutral Data Centre Self-Regulatory Initiative, we have set ambitious targets that put our industry on a path to meet the European Commission's goal for climate neutral data centres by 2030, and supporting the wider goal of the European Green Deal to make Europe the first climate neutral continent by 2050. This is an historic and unprecedented commitment by an industry to proactively lead the transition to a climate neutral economy.

We see a breadth of opportunities for data centres to support decarbonisation through digitalisation, and ensure the global economy has access to advanced technologies to innovate and grow sustainably. Data centres can also play a key role in decarbonising Europe's energy system by enabling the development of new renewable energy on the electric grid, providing carbon-free system services to the grid, and supporting heat recovery and reuse where possible and practical. Moreover, by operating in a manner that uses resources in the most efficient and sustainable manner, we are confident that we can support a shared digital and climate-neutral future.

During the development of the Self-Regulatory Initiative, the European Commission asked the data centre industry to create a document that outlined our policy requests to ease our pathway towards climate neutrality. This paper responds to that request and outlines a list of policy recommendations that we are asking the European Union to address. We appreciate the opportunity to offer these recommendations and view this as the starting point of a conversation between the data centre industry and the European Union. Our proposals are set forth in the following pages. We look forward to the start of this important dialogue.

https://www.climateneutraldatacentre.net/wp-content/uploads/2021/06/CNDCP-Policy-Paper_FINAL.pdf

Further Information

Blue Angel for Climate Friendly Colocation Data Centers (DE-UZ 214).
The environmental label is awarded to colocation data centers – meaning the building space and technical building equipment used to offer coloca

https://produktinfo.blauer-engel.de/uploads/criteriafile/en/DE-UZ%20214-202001-en%20criteria-V3.pdf

Blue Angel for Energy-Efficient Data Center Operation (DE-UZ 161)

https://produktinfo.blauer-engel.de/uploads/criteriafile/en/DE-UZ%20161-201901-en%20Criteria-V2.pdf