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Germany's experiences with the energy performance of data centres

Concerted Action, Paphos (Cyprus)

23. October 2025

Paul Papenbrock & Christopher Niederelz

Agenda

1. The German Data Center Boom
2. The Energy Efficiency Act (EnEfG)
3. German Data Centers in Numbers
4. Questions & Answers

Chances and Challenges

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The German Data Center Boom

Germany overview

Chancellor Friedrich Merz

Source: https://www.bundesregierung.de/breg-de/bundesregierung/bundeskanzleramt

Economy

- Economy: **3rd largest in the world**
- Population: **83.6 million** (1% of global population)
- GDP per capita: **54,989 USD**

Electricity Sector

- Total installed capacity: **252.2 GW** (71.3% renewable)
- Gross consumption: **512 TWh** (54.5% renewable)

Greenhouse Gas Emissions

- Total CO_2 eq. emission: **649 Mt**
- Per capita emissions: **7.8 t CO_2 eq.**

→ Germany accounts for ~1,5% of global emissions and ranks 12th worldwide

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Source: GIZ based on Bundesnetzagentur 2025, UBA 2025, Destatis 2025

Energy efficiency of DCs is stagnating globally

Highest amount of DCs in Europe, only behind US and CHN

Number of DCs in accordance with installed IT-Power

- More than 2.000 DCs > 100 kW
- 100 DCs > 5MW

Total energy consumption: **20 TWh/a (2024)**

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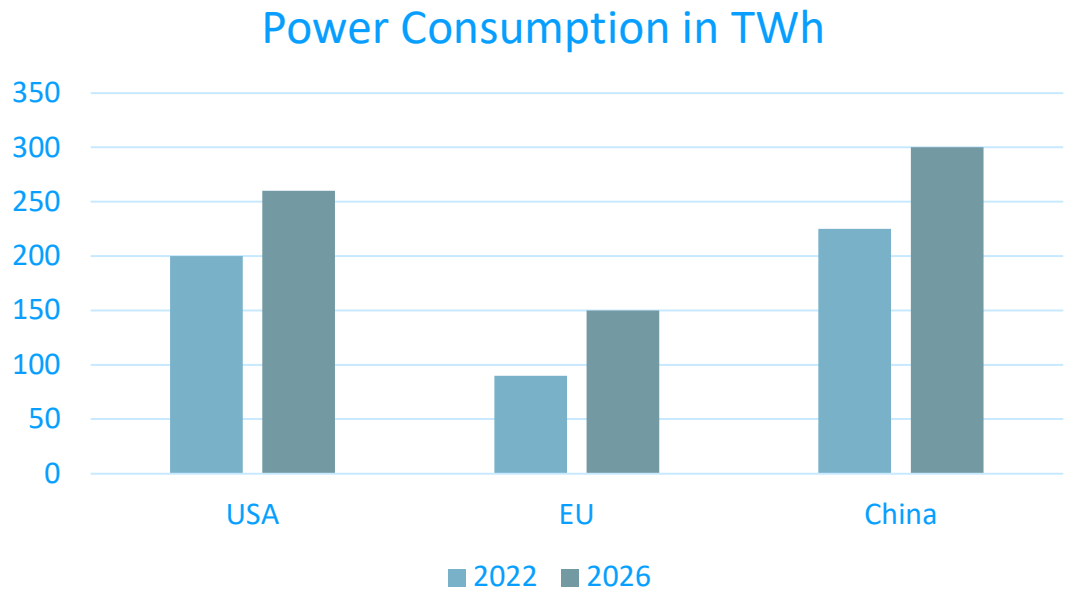
Icons: flaticon.com

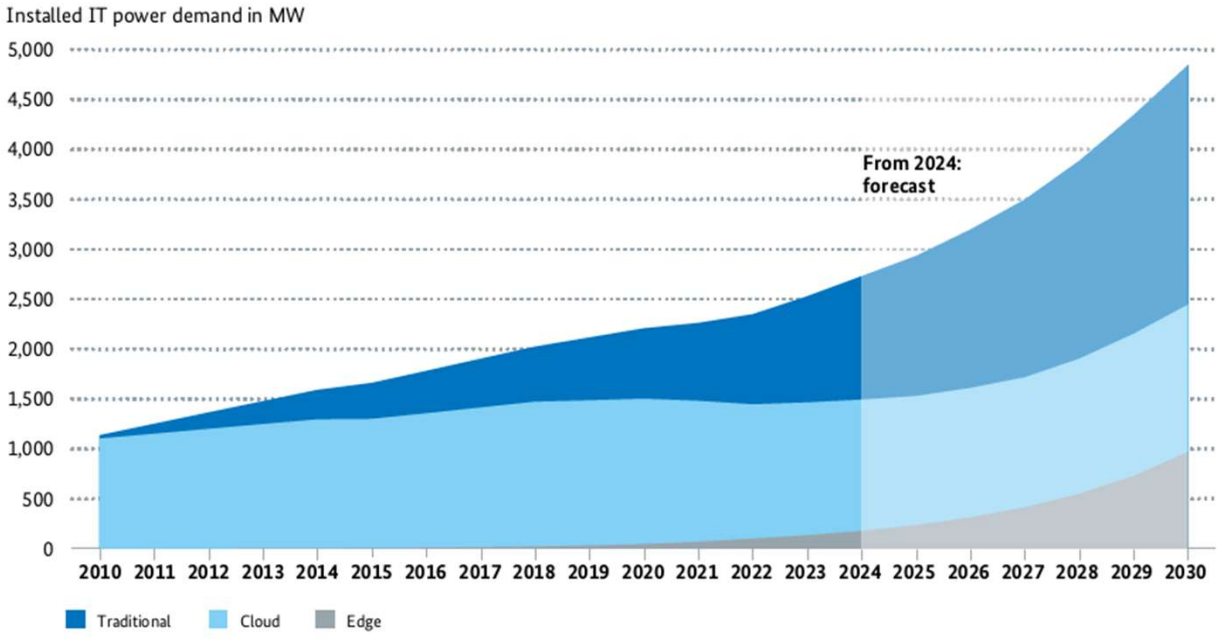
Global growth – but other regions grow faster



Source: iea (2024)

Demand for IT-Capacity is rising exponentially

Figure 1: Development of the capacities of data centre and smaller IT installations in Germany from 2010 to 2024 and forecast until 2030.



Source: Hintemann et al. (2024a)

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Investment is fueled by AI Trend

Source: ARD: Wirtschaft vor Acht, 15.7.2025, https://www.ardmediathek.de/video/wirtschaft-vor-acht/ki-investitionsboom-mit-risiken-und-nebenwirkungen/ard/Y3JpZDovL2Rhc2Vyc3RlLmRlL3dpcnRzY2hhZnQgdm9yIGFjaHQvMjAyNS0wNy0xNV8xOS01NS1NRVNa

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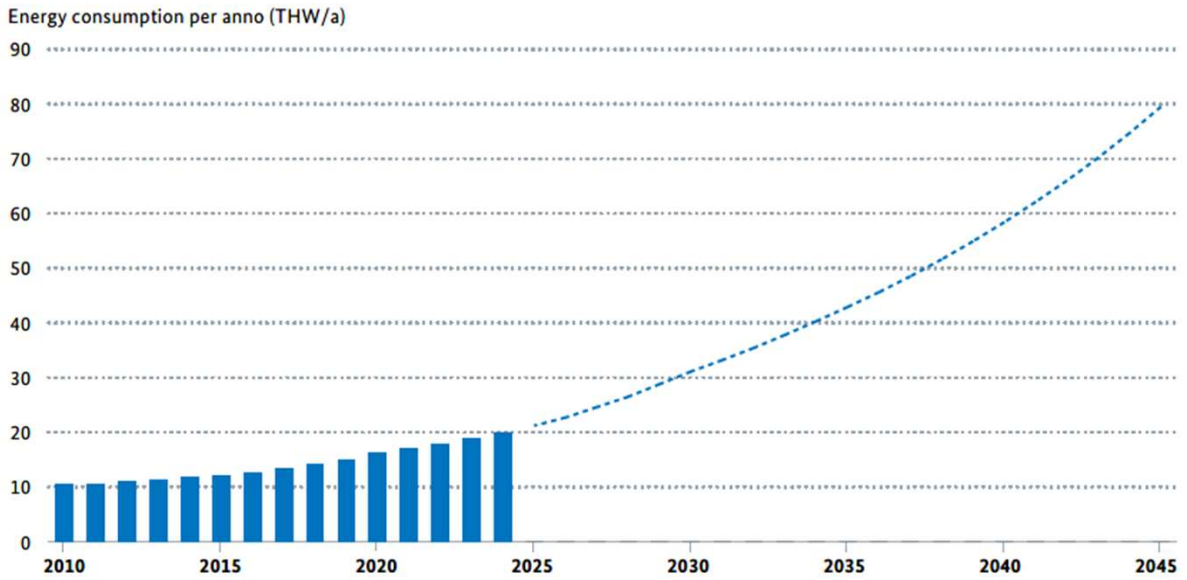
Energy Consumption of DCs is rising exponentially

Figure 4: Development of the electricity needs of data centres and smaller IT installations in Germany in the years 2010 through 2024, and long-term prediction through 2045.



Source: Calculations by Borderstep

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Germany Implements the EED

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The Energy Efficiency Act (EnEfG)

The Energy Efficiency Act (EnEfG) in Germany

- First legal framework to improve energy efficiency in GER across sectors (18th of November 2023)
- Implementing other requirements from EED, e. g. Art. 5 EED, Art 8 EED
- Scope beyond current Art 12 EED, e.g.
    - MEPS
    - additional requirements
    - national reporting scheme (DCReg)
    - obligation for smaller DCs

Introduction of strong MEPS

Starting operation before July 2026	Starting of operation from July 2026
PUE requirements: **PUE 1,5 from** July 2027 **PUE 1,3 from** July 2030	**PUE requirement:** **PUE 1,2**
No waste heat usage mandatory	**Mandatory waste heat usage of at least (ERF)**: **10% from** July 2026, **15% from** July 2027 **20% from** July 2028

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EnEfG: Additional requirements

RE usage:
zu 50% starting 2024 / **100% from** 2027

Information obligation about individual energy consumption per customer

Transfer of specific energy related KPIs to national data base

Implementation of EMS/UMS until July 2025; certification necessary from 2026 for DCs > 1 MW or > 300 kW if public body

Icons: flaticon.com

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The German Registry for Data Centers (DCReg)

- DCReg has been in operation since June 2024
- second report DCs >500kW by March 2025
- first wave of DCs >300kW by in July 2025
- **Public Database Q4 2025**

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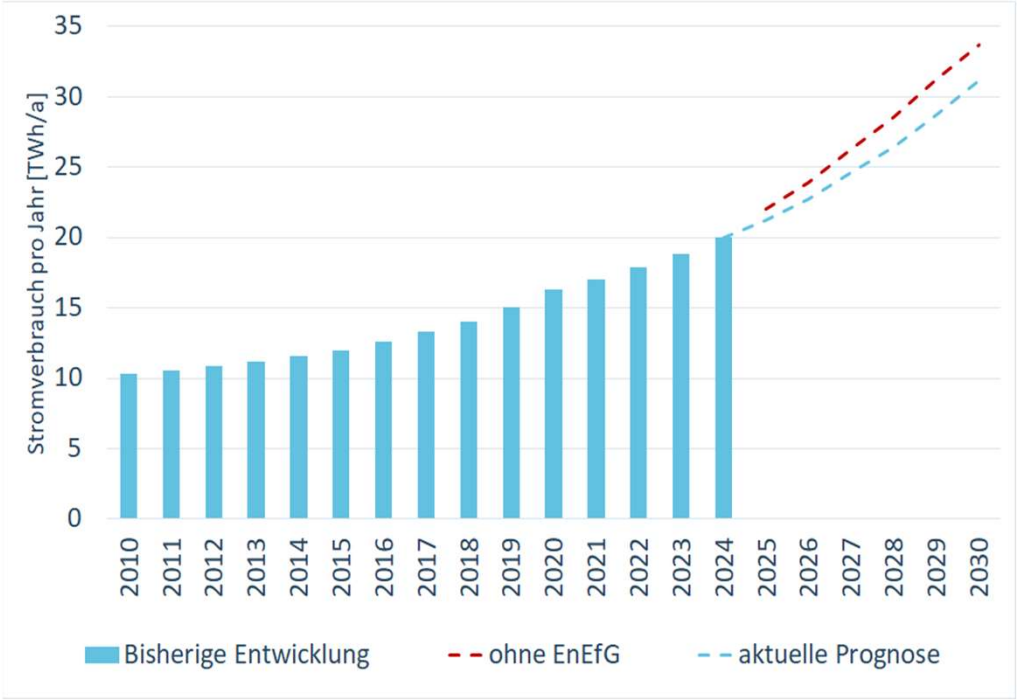
MEPS provide significant potential for savings

2030:

- 2.5 TWh of electricity
- Avrg. PUE of 1.25 (instead of 1.35)
- 1 TWh of heat (district heating)

2045:

- Up to 10 TWh of heat



Source: Hintemann et al. (2025)

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Compliance, Efficiency & Colocation DCs

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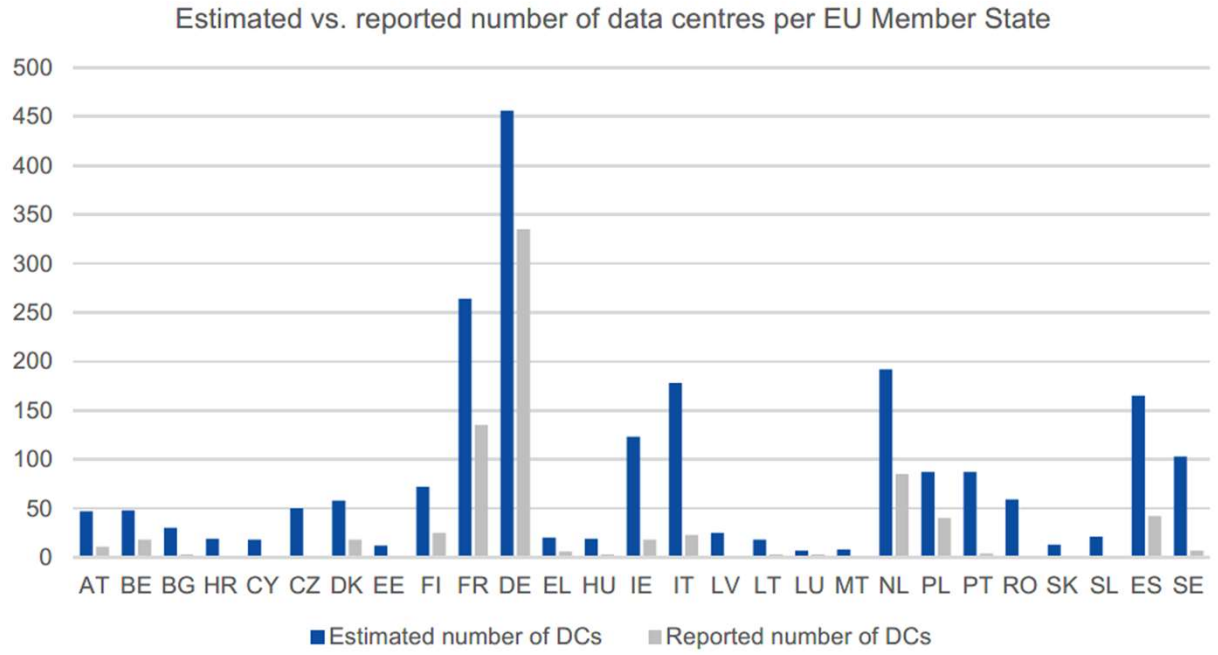
German Data Centers in Numbers

DCs from GER were overall compliant

770 data centers reported in the first year (335 from GER)



(Source: EU-COM 2025, p. 23)

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The German Reporting Scheme

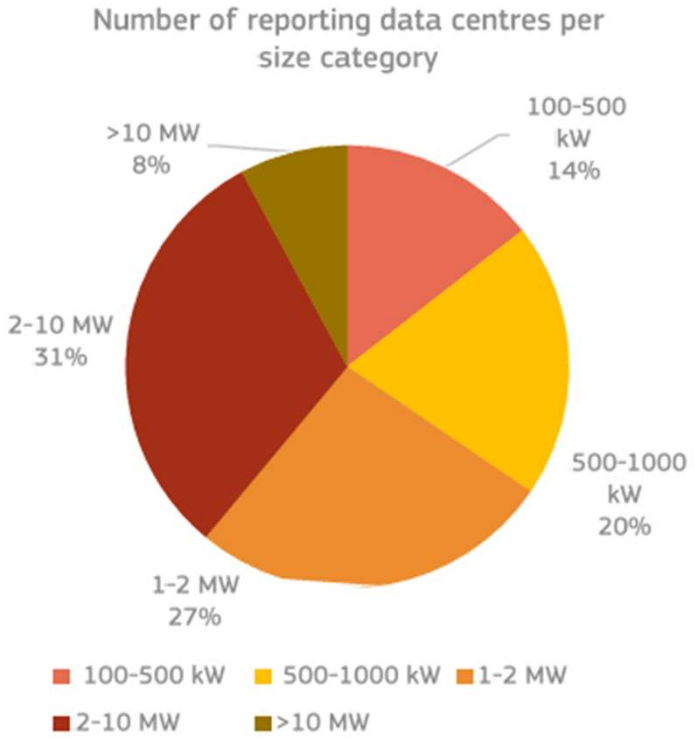
- 2024: 335 DCs reporting
- 2025: 398 DCs reporting
- 60 DCs < 500 kW

BUT

- Data Quality (e.g. unplausible figures, missing values)
- Data Completeness (reported vs. estimated)

Numbers show a lack of data

- Total energy consumption of the reporting data centers: 14 TWh
- 0.5 % of EU electricy consumption
- Work needs to be done to enforcing compliance
    - Increase data quality



(Source: EU-COM 2025, p. 27)

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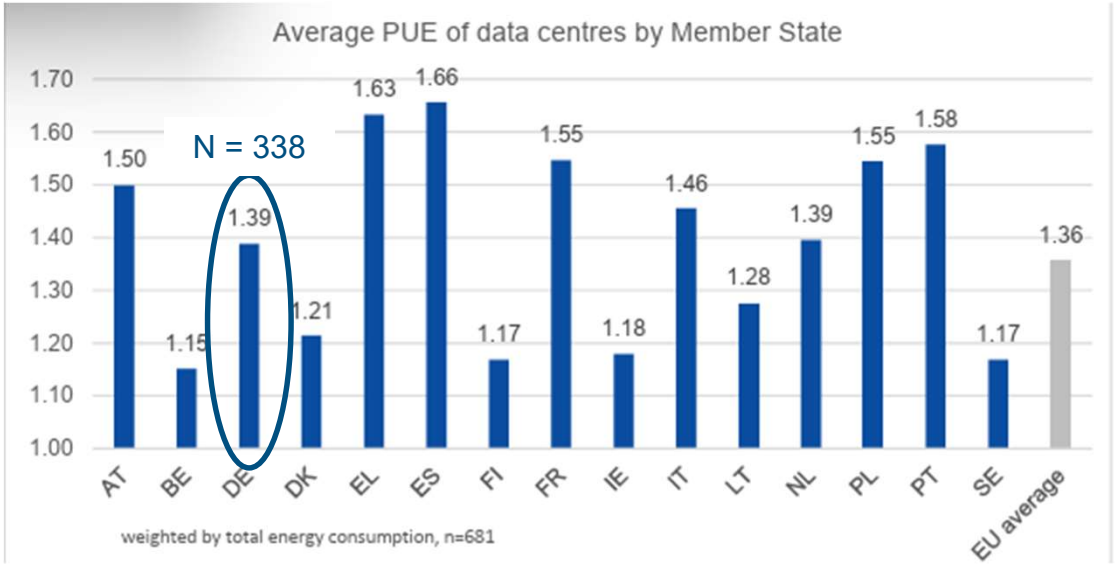
PUE of German Data Centers in Comparison



- PUE slightly above EU-average
- almost half of all known EU DCs
- before introduction of PUE-requirements (7/2026 onward)

(Source: EU-COM 2025, p. 34, own markup)

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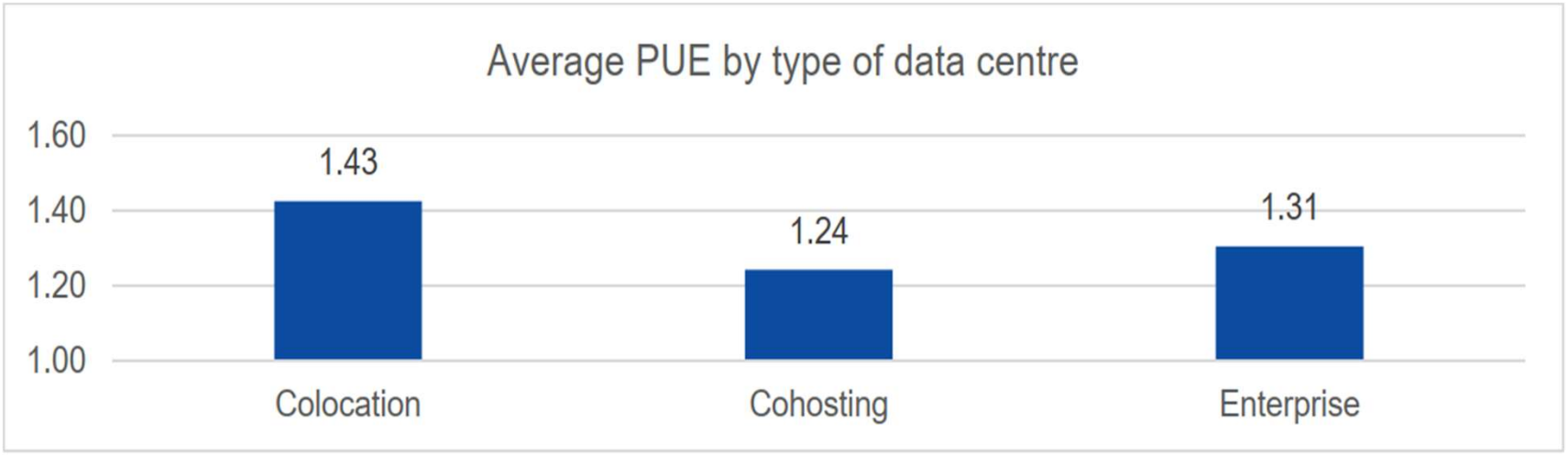
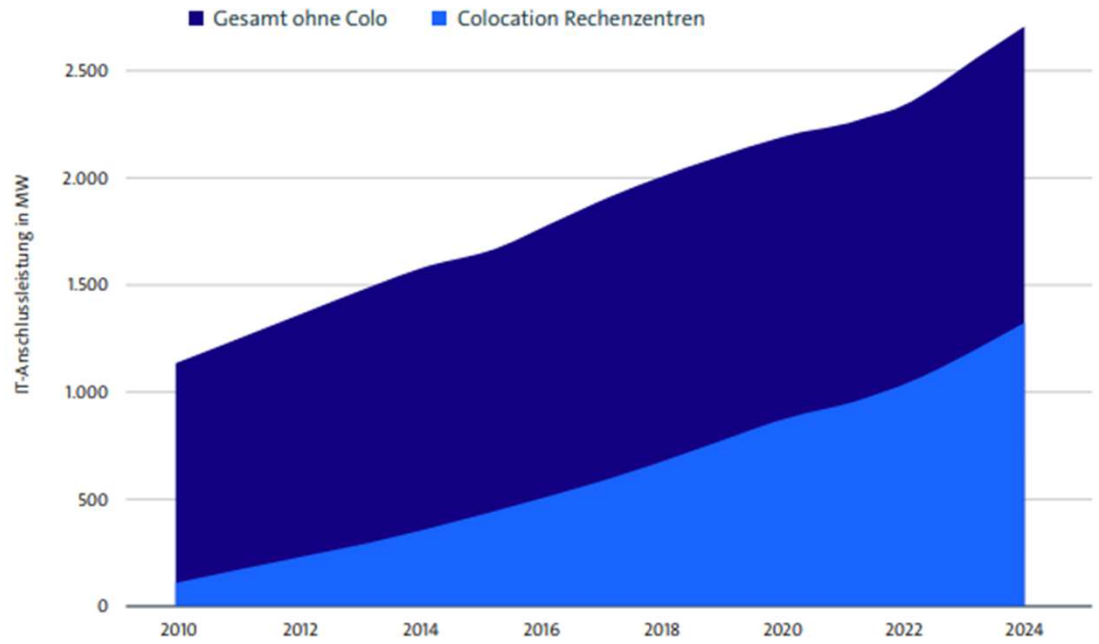
Co-Location Data Centers are Inefficient



(Source: EU-COM 2025, p. 38)

Co-Location Data Centers on the Rise



- around half of all PD of DCs due to co-location
- challenges for data collection

(Source: bitkom 2025, p. 11)

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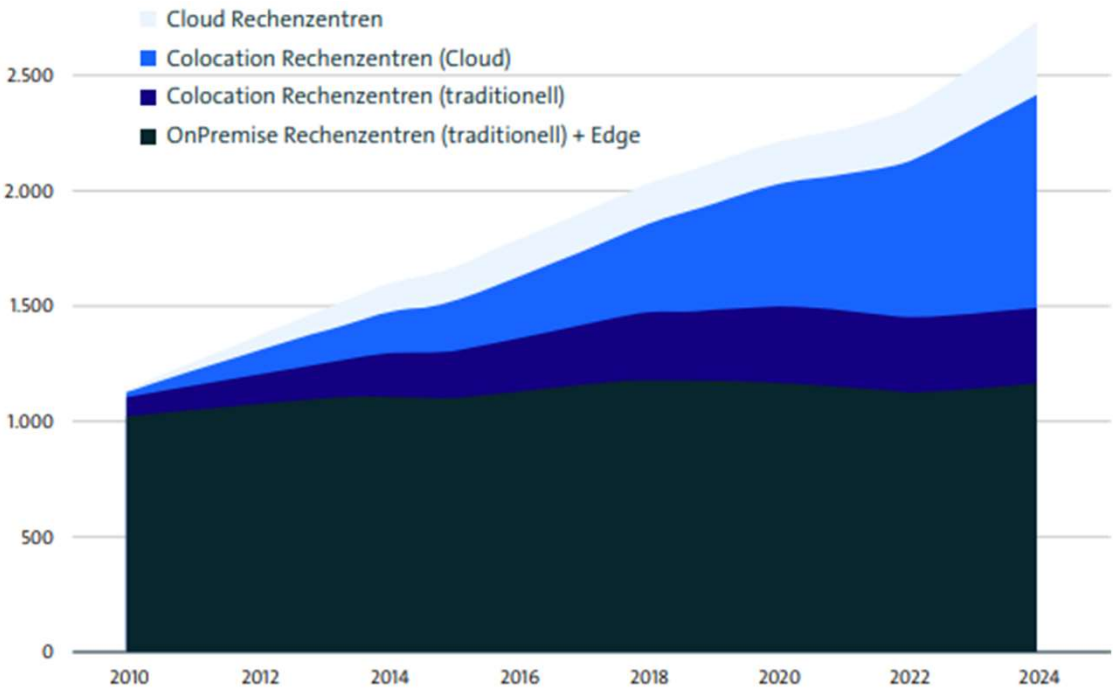
The Cloud Drives the Expansion



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- on-premise DCs constant
- cloud-based services drive the expansion
- mostly big hyperscalers

(Source: bitkom 2025, p. 12)

What‘s Next?

- Public Plattform DCReg Q4 2025
- Improving data quality
    - Plausibility checks
    - Missing values
- Revision of Energy Efficiency Act (EnEfG)
- Draft of a German data center strategy

Questions & Answers

Questions & Answers

Please be aware that the Mentimeter-Results:

- are non-representative
- may include more than one response per member state

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How much do you agree with these statements?

33

> Working with estimates and unknown data center numbers is a big problem.

Strongly disagree — Strongly agree

> Co-location data centers are a big challenge for our data collection efforts.

Strongly disagree — 2 skipped — Strongly agree

> Our overall attitude towards the current data center boom is unambigiously positive.

Strongly disagree — Strongly agree

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Thank you
for your attention!

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