

Agenda

Time	Agenda item	Content
09:30 - 09:45	Welcome and introduction	 Opening remarks DG ENER Introduction of the study team
09:45 - 10:00	Presentation of the findings from Topic 1	 Update on the data completeness and quality User experience (preliminary results)
10:00 - 10:15	Topic 1 interactive session	Q&As and discussions with participants
10:15 - 10:30	Coffee break	
10:30 - 11:00	Presentation of the findings from Topic 2	Minimum performance standards
11:00 - 11:30	Topic 2 interactive session	Q&As and discussions with participants
11:30 - 12:00	Recap of the workshop, next steps and closing remarks	 Summary of key points, questions and action items Timeline and expectations for the next stages of the study Closing remarks by the study team and DG ENER







Study objectives



Support the European Commission in assessing data centre energy efficiency and proposing additional measures in conjunction with refining the already established EU-wide rating scheme for the sustainability of data centres.



Assess the energy efficiency and sustainability of data centres in the EU, as well as the reporting scheme, the reported data and the user experience of the reporting entities.



Identify strategies for implementation, including establishing an EU-wide rating scheme and minimum performance standards, and recommend improvements to enhance efficiency and support the transition to a net-zero emission data centre sector.



Support the preparation of the Report to the European Parliament and the Council on the progress of the establishment of a common EU rating scheme for data centres and its impact for the EU and the Member States.







Workshop objective

The third workshop will cover results from the first reporting period and ways to further improve the sustainability of data centers.

- 1. Overview of data completeness and quality from the first reporting period
- 2. Preliminary findings when it comes to the user experience of reporting the data
- 3. Discussion on the minimum performance standards



Topic 1: Assessment of the sustainability of data centres in EU and of the respective reporting scheme

Assess the energy efficiency and sustainability of European data centres, including the reporting scheme, the reported data and the user experience of the reporting entities.

- Data completeness assessment Proportion of reporting data centres and completeness of reported information and KPIs
- Data quality assessment Comparing reported data against baseline numbers from desk research and stakeholder engagement activities and checking the plausibility of the data reported
- EU data centres energy efficiency and sustainability assessment Aggregating several metrics on data centre energy performance and sustainability based on the reported and collected data, benchmarked with available sources







Data assessment - Introduction

How we use the data

- All data points are anonymised to ensure privacy and are used solely for analytical purposes.
- No individual or companyspecific information is disclosed, including names or detailed geographical locations.
- Only selected indicators are made available to the study team based on priority and confidentiality assessment.

Disclaimer

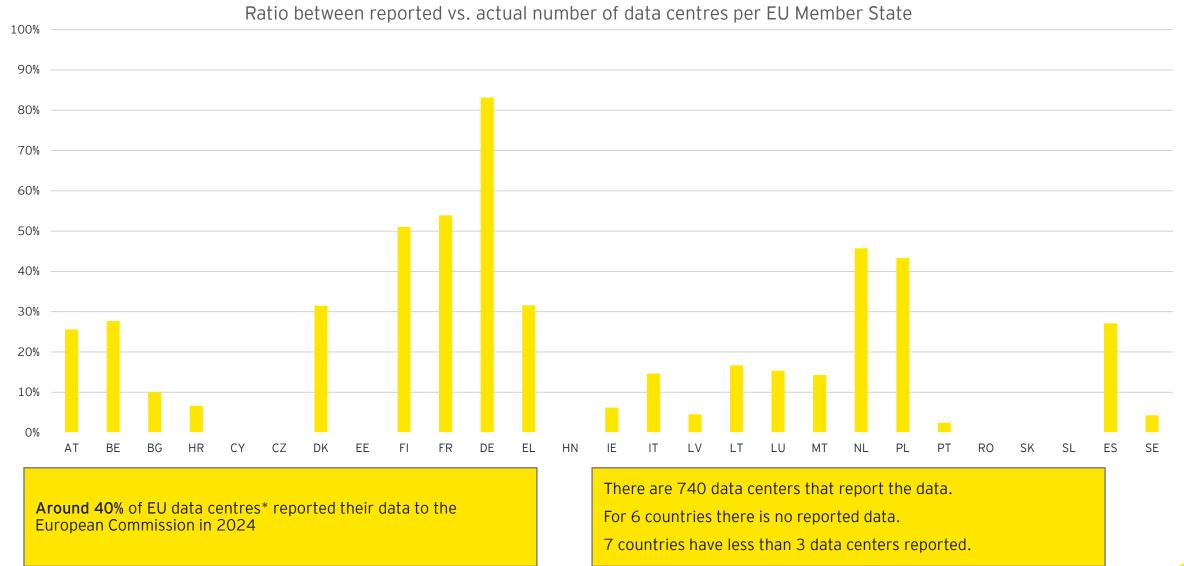
- The focus is on data centres with installed capacity higher than 500 kW, as participation in the reporting scheme is mandatory for them.
- Data from the first reporting period is still expected to be received so the preliminary results may change.

Benchmark Source

- The primary benchmark source used is datacentermap.com.
- This source is not complete and fully representative of reality; total number of data centers will be further complemented with additional data.



Data completeness





Data quality - Filtering 1

Types of indicators	Indicators	Plausibility check	Data points	Reliable data
	Installed IT power demand	Installed IT power demand ≤ Total energy consumption	637	97.16%
	Data centre computer room floor area	Data centre computer room floor area ≥ Total floor area	642	99.59%
	Total energy consumption Total	Total energy consumption ≥ Total energy consumption of IT equipment	638	99.32%
Total energy consumption of 11 equipment	(Total energy consumption / 5) ≥ Total energy consumption from back-up generators	553	99.46%	
	Total energy consumption ≥ Total energy consumption of IT equipment	634	99.32%	
Energy and sustainability	Energy and sustainability indicators Total energy consumption of IT equipment Total water input Waste heat reused Average waste heat temperature Total renewable energy consumption	Total water input ≥ Total potable water input	618	99.46%
		Total energy consumption ≥ Waste heat reused	609	99.86%
	Average waste heat temperature	15 ≤ Average waste heat temperature ≤ 60 degrees	529	100.00%
	Total renewable energy consumption	Total energy consumption ≥ Total renewable energy consumption	607	96.62%
	Total renewable energy consumption from Guarantees of Origin	Total renewable energy consumption ≥ Total renewable energy consumption from Guarantees of Origin	617	100.00%
	Total renewable energy consumption from Power Purchasing Agreements	Total renewable energy consumption ≥ Total renewable energy consumption from Power Purchasing Agreements	617	100.00%
	Total renewable energy consumption from on-site renewables	Total renewable energy consumption ≥ Total renewable energy consumption from on-site renewables	567	100.00%



Data quality - Filtering 2

- Subsequent plausibility checks where conducted in order to further filter the data
 - Unrealistically low figures (e.g., IT power of 1 kW)
 - Unrealistically high figures (e.g., IT power of 600 MW)
- The previous plausibility table alongside the further checks provides filtering. However, this
 does not translate into a total removal of the data entry.
 - E.g., Although water reporting was inaccurate, the data entry can still offer valuable insights on REF, ERF, and PUE.

Data quality - Filtering 3

Metric	% Reliable	# Potentially unreliable	Explanations		
Power density	92.46%	49	Predominantly zero or implausibly low values, e.g. 0.0048 kW/m²		
Full load hours	ad hours 79.54% 133 Many entries fall outside expected ranges, typically below hours (Some low values can be explained by recent				
PUE	91.69%	Often reported as N/A or with unrealistically high values			
WUE	93.54% 42 Often reported as N/A or exceeding realistic lin		Often reported as N/A or exceeding realistic limits		
Overall result	76.77%	151	Multiple unreliable values may be reported by a single data centre		

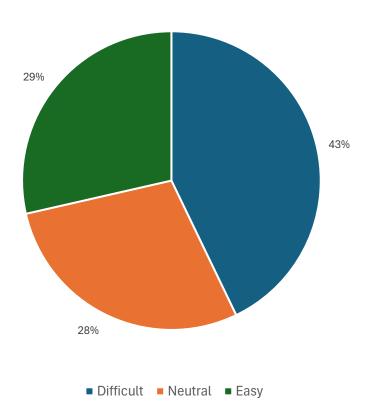
After filtering 3 potentially unreliable data points were identified

- 151 entries flagged as potentially unreliable
- ~77% of the reported data deemed reliable

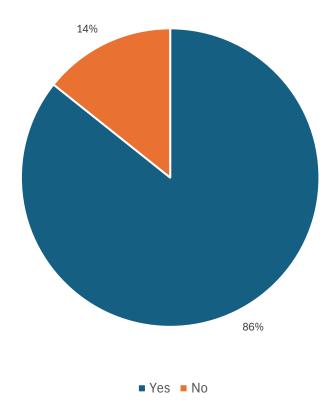


User experience key insights - Survey

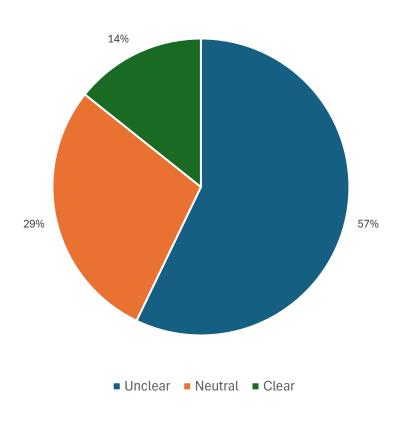
How would you rate the ease of navigation on the register's website?



Did you encounter any technical issues while using the register?



Were the instructions and definitions provided for each indicator clear and helpful?





User experience key insights - Workshop 2

Respondents provided a range of constructive suggestions to enhance the scheme (1):

Simplification

- In certain instances, to consider removing customer-related metrics such as IT specifications and network/storage indicators.
- Eliminate redundant data traffic indicators.
- Harmonize requirements across Member States to reduce national-level inconsistencies.

Improved Tools & Processes

- Introduce APIs to support automated reporting and data submission.
- Allow data import/export in common formats like Excel and JSON.

Transparency & Public Access

- Create public dashboards to share regional data center information with citizens.
- Maintain confidentiality protections for sensitive business information.



User experience key insights - Workshop 2

Respondents provided a range of constructive suggestions to enhance the scheme (2):

Better Coordination

- Strengthen collaboration between national contact points and EU-level authorities.
- Standardize definitions and methodologies across all Member States.

Enhanced Metrics

- Include the age of IT systems to provide context in performance evaluations.
- Expand heat reuse reporting to reflect both readiness and actual usage.

Special Considerations

- Differentiate requirements for critical infrastructure versus enterprise data centers.
- Adapt thresholds to account for the limitations of older or smaller facilities.



Stakeholder engagement activities - Timeline

February March April May

Survey campaign 1

Survey to fill in data gaps

- Answers: 143
- Stakeholders targeted: Data centre operator/owner, EU/National industry association, others
- Engagement rate: 21.5%

Survey to understand the sustainability of data centres

- Answers: 154
- Stakeholders targeted: Data centre operator/owner, EU/National industry association, others
- Engagement rate: 23.2%

Survey campaign 2

Survey for user experience

- Answers: 15
- Stakeholders targeted: Data centre operator/owner
- Engagement rate: 39%

Interview campaign

Interviews to bridge the gaps in data and further discuss the sustainability of data centres

- Interviews held: 8
- Stakeholders targeted: Data centre operator/owner, industry owners, standard organisations, technology providers





Topic 2: Next steps towards a sustainable data centre sector

Contribution to the development and implementation of effective measures that will drive the data centre sector towards enhanced sustainability. This includes:

- Establishment of a common EU rating scheme
- Proposal of minimum performance standards
- Assessment of the feasibility of transitioning towards a net-zero emission data centre sector

Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955

Article 12

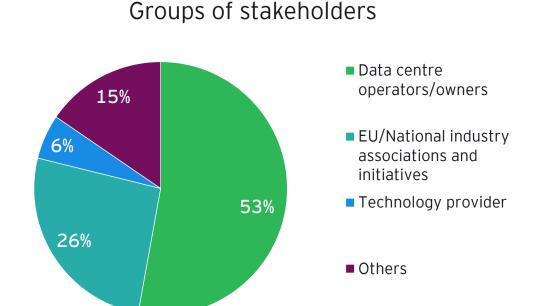
Data centres

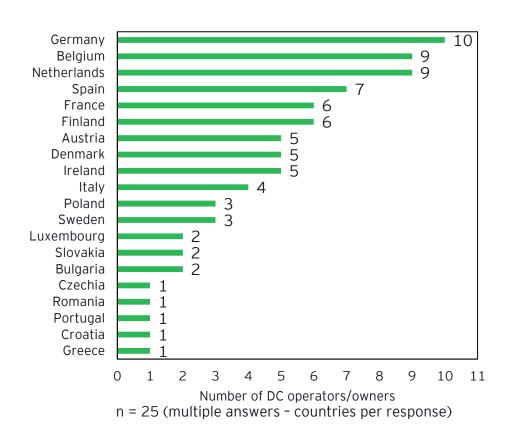
- 1. By 15 May 2024 and every year thereafter, Member States shall require owners and operators of data centres in their territory with a power demand of the installed information technology (IT) of at least 500kW, to make the information set out in Annex VII publicly available, except for information subject to Union and national law protecting trade and business secrets and confidentiality.
- 2. Paragraph 1 shall not apply to data centres used for, or providing their services exclusively with the final aim of, defence and civil protection.
- 3. The Commission shall establish a European database on data centres that includes information communicated by the obligated data centres in accordance with paragraph 1. The European database shall be publicly available on an aggregated level.
- 4. Member States shall encourage owners and operators of data centres in their territory with a power demand of the installed IT equal to or greater than 1 MW to take into account the best practices referred to in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency.
- 5. By 15 May 2025, the Commission shall assess the available data on the energy efficiency of data centres submitted to it pursuant to paragraphs 1 and 3 and shall submit a report to the European Parliament and to the Council, accompanied, where appropriate, by legislative proposals containing further measures to improve energy efficiency, including establishing minimum performance standards and an assessment on the feasibility of transition towards a net-zero emission data centres sector, in close consultation with the relevant stakeholders. Such proposals may establish a timeframe within which existing data centres are to be required to meet minimum performance.



As of 01. 04. 2025, 148 responses were collected, out of which, 123 were eligible for further analysis.

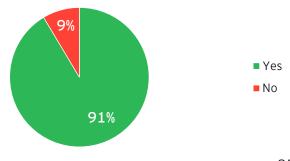
n = 123





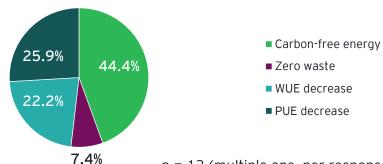
Steps towards a sustainable data centre sector - internal sustainability plans

Does your organisation have a developed internal sustainability plan?

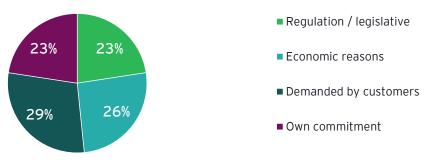


n = 35

What goals and/or performance standards have you stated in your internal sustainability plan?

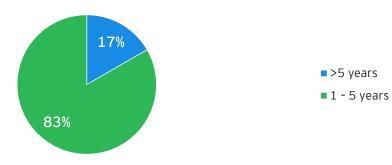


What was your primary motivation to create and adapt the internal sustainability plan?



n = 20 (multiple answers per response)

In what timeframe do you expect to achieve your internal goals and/or performance standards?

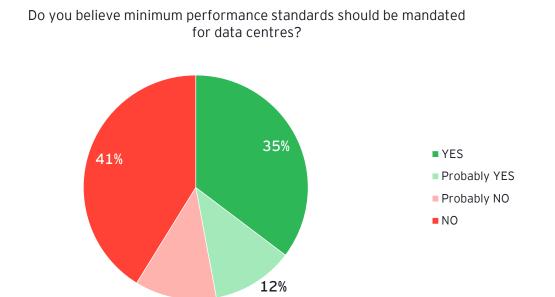


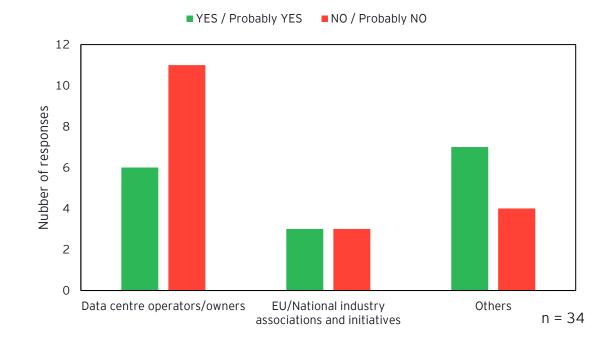


12%

Steps towards a sustainable data centre sector - minimum performance standards

n = 34

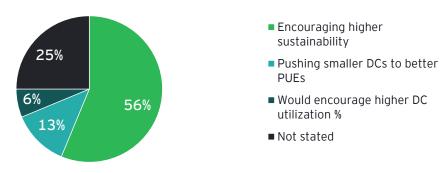






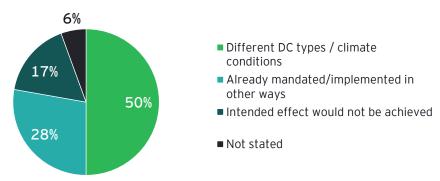
Steps towards a sustainable data centre sector - minimum performance standards

What is your primary reason for support?

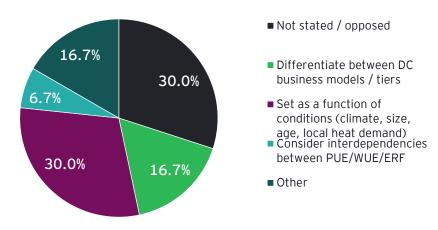


n = 16

What is your primary reason for opposition?



How should minimum performance standards account for differences between data centres?

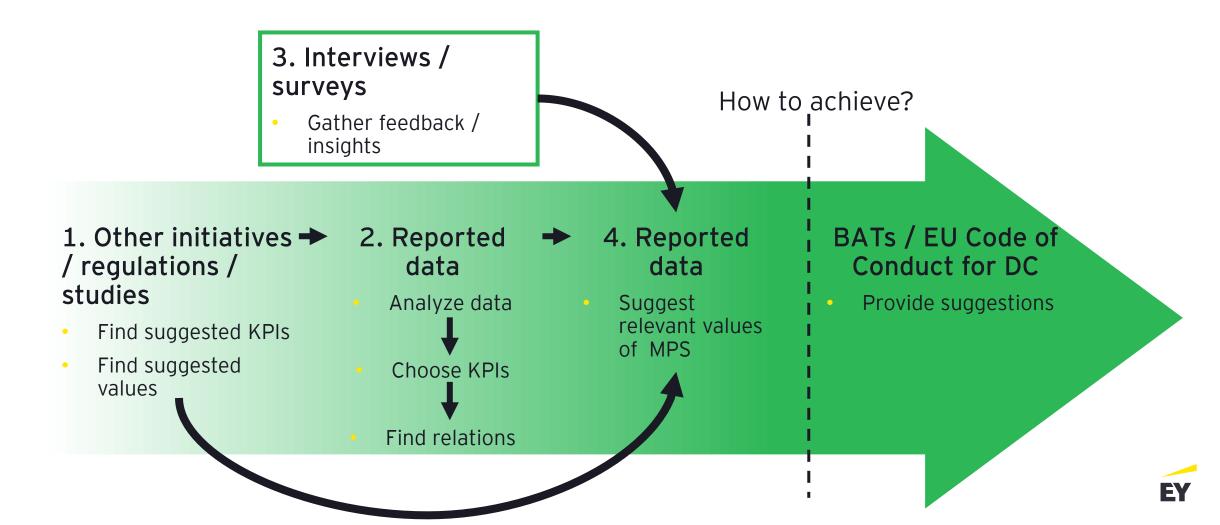


n = 30 (multiple answers per response)



Minimum performance standards: The logic

MPS based on the reported data (not to increase the administrative burden)



Minimum performance standards: Overview

Directive/initiative/guideline/project/label		Indicator								
		WUE	REF	ERF	CER	CUE	ITEU _{sv}			
German Energy Efficiency Act (Germany)	Χ		Х	Х						
Directive GB 40879-2021 (China)	Χ									
Climate Neutral Data Center Pact (EUDCA)	Х	Х	X	Χ*						
Noord-Holland initiative (Netherlands)	Х									
Green Public Procurement Guideline (UNEP: U4E)	Х	Х	X	Х	Х					
Guide to Environmental Sustainability Metrics (Schneider Electric)	Х	Х	Х			Х				
Project DC-CFA (Singapore)	Х									
Blauer Engel (Germany)	Х		X	Х	Х		Х			

Already being reported

Not aplicable within current reporting scheme





PUE and WUE: Overview of of values proposed by other studies/regulations

Discotive (initiative / guidling / project / lobe)	Indicator:					PL	JE							WUE [m	3/MWh]		
Directive/initiative/guidline/project/label	Notes / Deadline:	2015	2019	2023	2024	2025	2026	2027	2029	2030	2031	2025	2027	2029	2030	2031	2040
	Existing DC					1.5		1.4	1.3		1.2	1.5	1	0.5		0.2	
Green Public Procurement Guidline (UNEP: U4E)	Design value					1.4		1.3	1.2		1.1						
	New DC after 3 years					1.5		1.4	1.3		1.2						
Guide to Environmental Sustainability Metrics (Schneider Electric)	Aim for	1.2-1.3 ^{a,g}				0.30-0.459											
Climate Neutral Data Center Pact (EUDCA)	Existing DC									1.3-1.4					f		0.4
	Design value					1.3/1.4 b						f					
Directive GB 40879-2021 (China)	Mandated					1.15- 1.5 ^c											
Project DC-CFA (Singapore)	Aim for					1.3 ^d											
	Existing DC							1.5		1.3							
German Energy Efficiency Act (Germany)	Design value						1.2										
	New DC after 2 years																
Noord-Holland initiative (Netherlands)	Design value	1.16 ^{e,g}															
Blauer Engel (Germany)	Required to obtain label																
	Design value	1.6	1.5	1.3	1.25												

Notes:

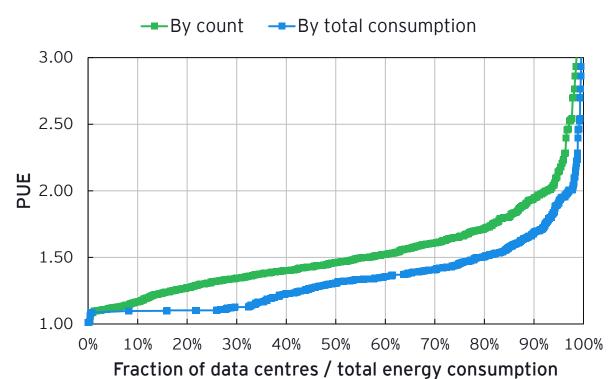
- ^a Achieved at 75-85% load
- b Achieved at 100% load; hot/cold climate
- ^c Inversely proportional to energy consumption
- d Achieved at 100% load
- e For DC over 5 MVA ca. 4.25 MW
- f DC should set their own target by defined date
- g Deadline unknown

$$PUE = \frac{Total\ energy\ consumption}{Total\ IT\ eqipment\ consumption}$$

 $WUE = \frac{Total\ water\ consumption}{Total\ IT\ eqipment\ consumption}$



PUE and WUE: Current status

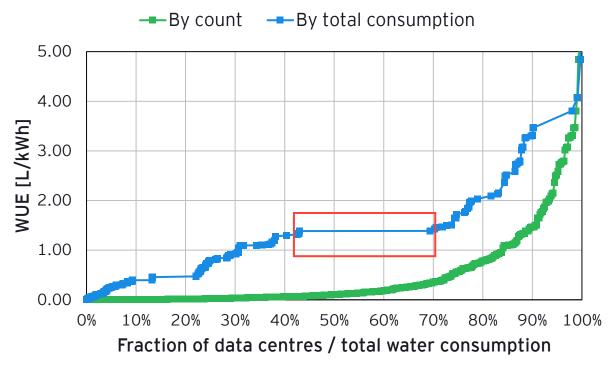


n = 600; Total energy consumption: 12.9 TWh

Median (PUE): 1.46

Mean (PUE): 1.59

Weighted average (PUE, total energy): 1.36



Only DC with WUE > 0 considered; n = 413; Total water consumption: $4.7 \text{ mil. } \text{m}^3$

Median (WUE): 0.11 L/kWh

Mean (WUE): 0.57 L/kWh

Weighted average (WUE, total energy): 0.57 L/kWh

Weighted average (WUE, total water): 1.50 L/kWh



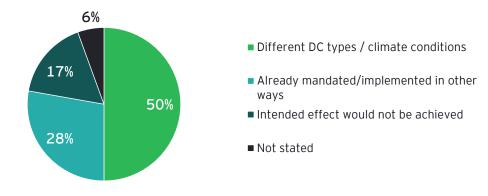
PUE and WUE: Main factors

Common statement: PUE and WUE are interdependent - inversely proportional

Main factors affecting PUE and/or WUE:

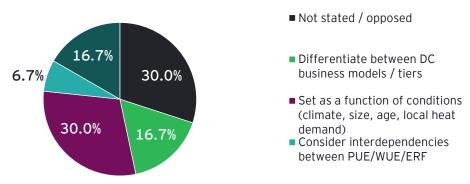
- Climate conditions (CDD)
- DC size
- DC type
- DC age

What is your primary reason for opposition?



n = 18

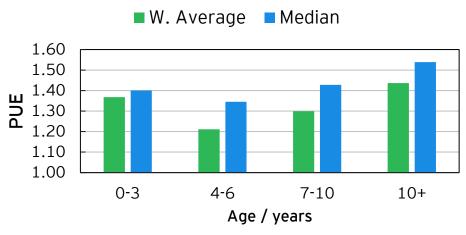
How should minimum performance standards account for differences between data centres?



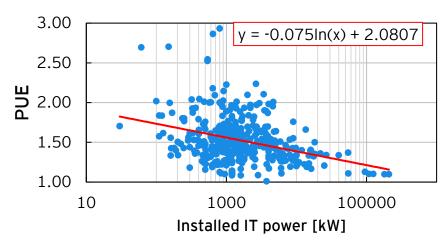
n = 30 (multiple answers per response)



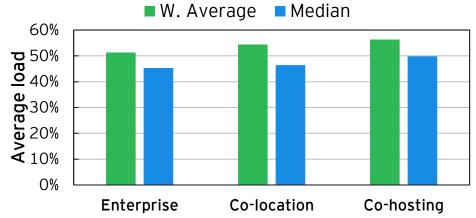
PUE and WUE: Effects of data centre type, size, and age



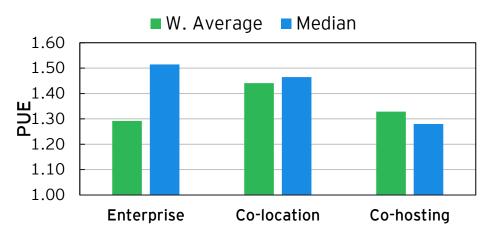
Number of DC: 84 (0-3); 65 (4-6); 62 (7-10); 245 (10+)



Only DC aged 3+ years with PUE < 3 considered; n = 386



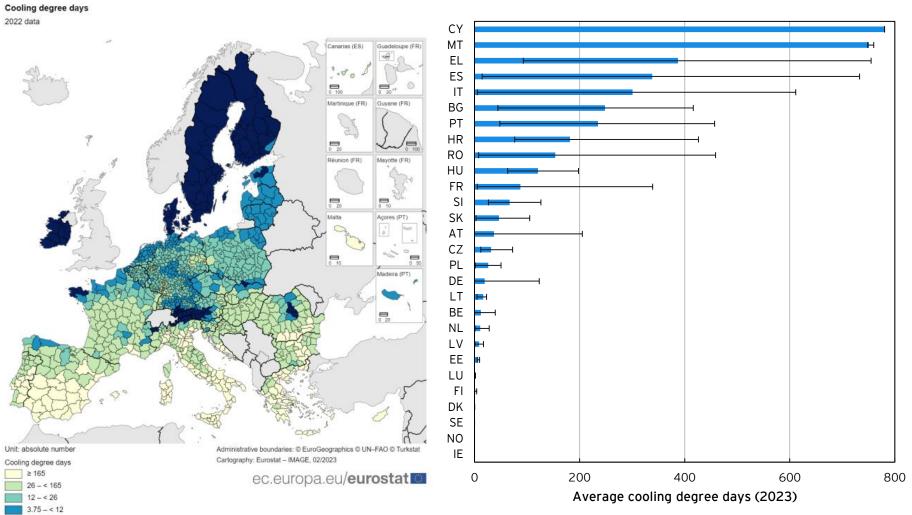
Number of DC: 160 (Enterprise); 244 (Co-location); 45 (Co-hosting) stal energy consumtion: 4.9 TWh (Enterprise); 5.3 TWh (Co-location); 0.7 TWh (Co-hostin



Number of DC: 160 (Enterprise); 244 (Co-location); 45 (Co-hosting) stal energy consumtion: 4.9 TWh (Enterprise); 5.3 TWh (Co-location); 0.7 TWh (Co-hostin



PUE and WUE: Climate conditions (CDD) - reporting



Cca. 22% of values of CDD reported incorrectly.

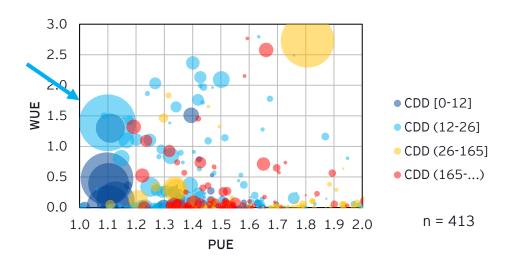
Examples include:

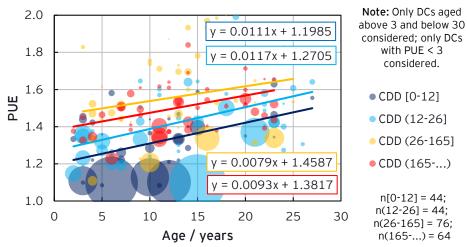
- DC in BE: 1878 CDD
- DC in IT: 5159 CDD (cca. HDD of northern Finland)
- All DC in DE reported 19 (2023 country-wide average, however, DE range 0 - 123)

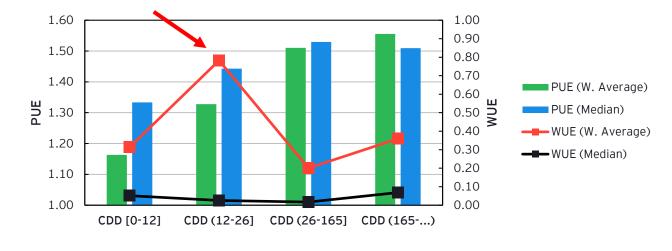
In this regard we recommend to specify the calculation of CDD.

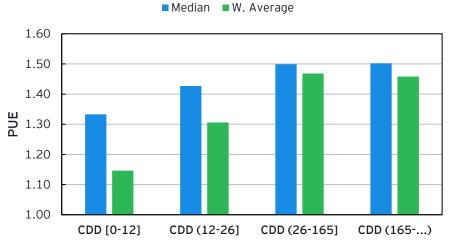


PUE and WUE: Combined factors - current status









DCs aged 3 and above and below 30 years considered; only DCs with PUE < 3 considens n[0-12] = 44; n(12-26] = 44; n(26-165] = 76; n(165-...) = 64



Furthermore, we encourage policy makers to introduce stricter regulations on national level where deemed necessary and feasible.

ble / non-potable water - MPS (WUE)

Note: Only DCs aged

above 3 and below 30

considered; only DCs

with PUE < 3

considered.

• CDD [0-12]

CDD (12-26)

CDD (26-165)

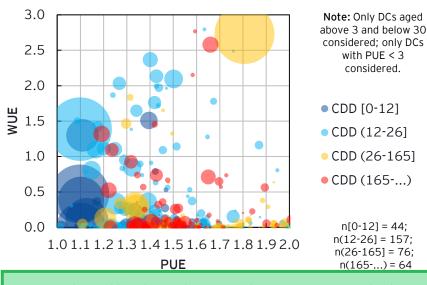
• CDD (165-...)

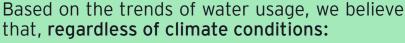
n[0-12] = 44:

n(12-26) = 44;

n(26-165) = 157;

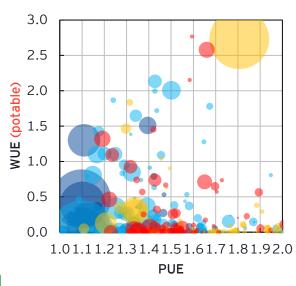
n(165-...) = 64

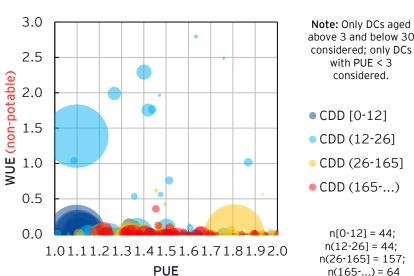


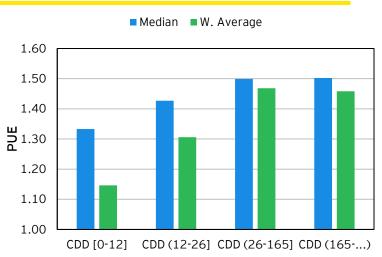


- 1. It is feasible for existing DC to achieve WUE < 0.4 calculated based on the potable water consumption by 2030.
- 2. New DC commissioned in 2027 and later should be designed for WUE < 0.4 regardless of the water source.

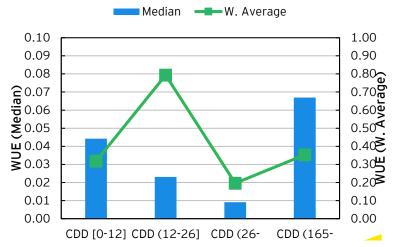
We recommend to further focus on leveraging the values of WUE regardless of water source after this target is achieved.





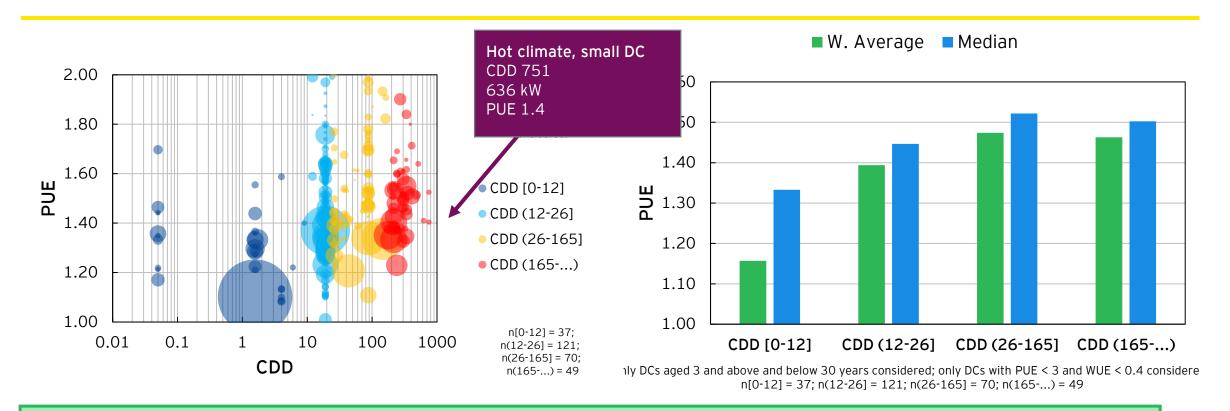


nly DCs aged 3 and above and below 30 years considered; only DCs wit 3 considered. n[0-12] = 44; n(12-26] = 157; n(26-165] = 76; n(165-...



nly DCs aged 3 and above and below 30 years considered; only DCs wit 3 considered. n[0-12] = 44; n(12-26] = 157; n(26-165] = 76; n(165-...

PUE and WUE: WUE < 0.4 DC - MPS (PUE)



Considering the interdependencies between water and power usage, we believe that, regardless of climate conditions:

- 1. It is feasible for existing DC to achieve PUE < 1.5 by 2030.
- 2. New DC **commissioned in 2027** and later should be designed for **PUE < 1.3** while they should achieve **operational PUE < 1.4** within 3 years of operation.

Furthermore, we encourage policy makers to introduce stricter regulations on national level where deemed necessary and feasible.



REF: Overview of values proposed by other studies/regulations

Directive/initiative/guidline/project/label	Indicator:				REF			
Directive/initiative/guidinie/project/laber	Notes / Deadline:	2023	2024	2025	2026	2027	2029	2031
	Existing DC			50%		60%	70%	80%
Green Public Procurement Guidline (UNEP: U4E)	Design value							
	New DC after 3 years							
Guide to Environmental Sustainability Metrics (Schneider Electric)	vironmental Sustainability Metrics (Schneider Aim for					g		
Climate Navital Data Contan Data (FUDCA)	Existing DC				75%			100%
Climate Neutral Data Center Pact (EUDCA)	Design value							100%
Directive GB 40879-2021 (China)	Mandated							
Project DC-CFA (Singapore)	Aim for							
	Existing DC		50%			100%		
German Energy Efficiency Act (Germany)	Design value							
	New DC after 2 years							
Noord-Holland initiative (Netherlands)	Design value							
Planta Frank (Company)	Required to obtain label	100%						
Blauer Engel (Germany)	Design value							

Notes:

g Deadline unknown

$$REF = \frac{Total\ renewable\ energy\ consumption}{Total\ energy\ consumption}$$



REF: Current status and proposed MPS

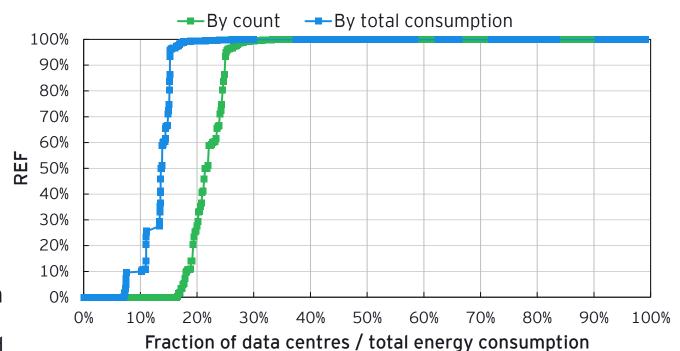
Weighted average (REF): 86.8%

Over 79% of reported total energy consumed was 100% renewable.

Over **70% of data centres** (by count) reported to have consumed 100% renewable energy.

Vast majority of consumed renewable energy has a guarantee of origin, followed to a certain extent by power purchase agreements. Only a small fraction of renewable energy is produced on-site.

Quality of reporting on the renewable-energy consumption disallows for a more comprehensible assessment.



n = 615; Total energy consumption: 13.0 TWh

Based on the current state of development of introduction of renewable energy, we believe that a **100% target** (considering all means of acquisition) is achievable **by 2030**. We recommend to further focus on the renewable energy sources after this target is achieved.



ERF: Overview of values proposed by other studies/regulations

Directive/initiative/guidline/project/label	Indicator:				REF				
Directive/initiative/guidinie/project/laber	Notes / Deadline:	2023	2025	2026	2027	2028	2029	2031	
	Existing DC		30%		40%		50%	60%	
Green Public Procurement Guidline (UNEP: U4E)	Design value								
	New DC after 3 years								
Guide to Environmental Sustainability Metrics (Schneider Electric)	Aim for								
Climate Navital Data Contan Data (FUDCA)	Existing DC	Explore possibilities ^h							
Climate Neutral Data Center Pact (EUDCA)	Design value								
Directive GB 40879-2021 (China)	Mandated								
Project DC-CFA (Singapore)	Aim for								
	Existing DC								
German Energy Efficiency Act (Germany)	Design value			10%	15%	20%			
	New DC after 2 years			10%	15%	20%			
Noord-Holland initiative (Netherlands)	Design value								
Plana Frank (Carrana)	Required to obtain label	>0							
Blauer Engel (Germany)	Design value								

Notes:

$$ERF = \frac{Total\ waste\ heat\ reused}{Total\ energy\ consumption}$$



^h No specific target or timeframe proposed.

ERF: Projects and success stories

Netherlands

In Groningen, QTS Data Centers and Bytesnet are collaborating with WarmteStad, to provide residual heat for a large-scale sustainable district heating project.

Belgium

In Brussels, the Digital Realty DC sends excess heat to warm local households through a new sustainable district heating project in Zaventem.

Norway

In Olso, Stack Infrastructure and Hafslund Olso Celsio, have completed a joint project. The DC is providing heat and hot water for up to 5000 homes.

Sweden

The atNorth DC in Kista is supplying the Stockholm district heating network, Exergi, with its residual heat. The residual heat from the DC heats 20.000 apartments.

Italy

In Milan, a2a, DBA Group, and Retelit are collaborating to transform the residual heat from DC Avalon 3 into thermal energy for 1,250 families.



ERF: Projects and success stories



ReUseHeat

A successful integration of the excess heat from an air-cooled DC into the low-temperature DH network of the city of Brunswick via an external CO2 heat pump.

moderator MODERATOR

EU project aimed at developing a novel, custom-designed immersioncooling system using phase change materials to provide excess heat at 50-65°C.



THUNDER

Aimed at developing and demonstrating a seasonal thermal storage based on thermochemical materials coupled with a high-temperature heat pump for accumulation of excess heat (~60°C) during summertime and subsequent release into a DH network (86°C) in winter.



BYTES2 Bytes2Heat

Focuses on removing (especially) legal and commercial barriers in uptake of excess heat from DC for heating applications. Tools and guidelines, e.g., for matching heat supply with demand, for calculating ROI, etc., are being developed, alongside the promotion of the best practices of innovative pilot projects.

Residual heat from data centres provides substantial **potential** for decarbonisation of European district heating, agriculture, and other temperature industries.

We strongly support (and actively take part in) further research and exploration of possible implementation cases.

On the contrary, we **do not** suggest considering heat reuse as a EU-wide MPS, given the current circumstances and state of development.

We encourage policy makers to introduce regulations national level where deemed necessary and feasible.



Source: Web pages of the respective projects.

Summary

Based on the reported data and considering the stakeholders' input, both obtained by 24. 04. 2025, we suggest considering the following MPS:

PUE

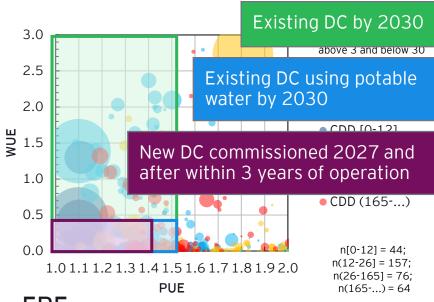
- Operational PUE < 1.5 for existing DC by 2030
- Design PUE < 1.3 for DC commissioned 2027 and later, operational PUE < 1.4 achieved within 3 years of operation

WUE

- WUE < 0.4 L/kWh (based on potable water) for all DC by 2030
- WUE < 0.4 L/kWh (regardless of origin) for DC commissioned 2027 and after
- Further focus on WUE regardless of water source

REF

- REF = 100% for all DC (regardless of origin) by 2030
- Further focus on the origin of renewable energy



ERF

We do not believe that mandating a EUwide criterion is feasible - we propose for it to be assessed locally.

For all MPS, we encourage policy makers to introduce stricter regulations on national level where deemed necessary and feasible.

A few remarks...

- This was just one iteration, not the end of the discussion.
- Further data analyses and stakeholer consultations are possible (and planned).
- One can only make a right decision with the right data...
- If you have specific feedback to the proposed minimum perforance stadards and/or you believe that we have not taken something crucial into consideration, or in any other case, please, feel free to send and e-mail to <u>eudcear@be.ey.com</u>.

Your inputs are highly appreciated!





Next steps

Project landing page: https://www.borderstep.org/projekte/eudcear/

Project email address: eudcear@be.ey.com

Engagement activities

- The interview period will end mid may
- The technical report of this study will be published in Q4 2025 (around October)





