INTELLIGENCE UPDATE

Mapping PUE trends by data center region, age and size

 Jay Dietrich  Douglas Donnellan

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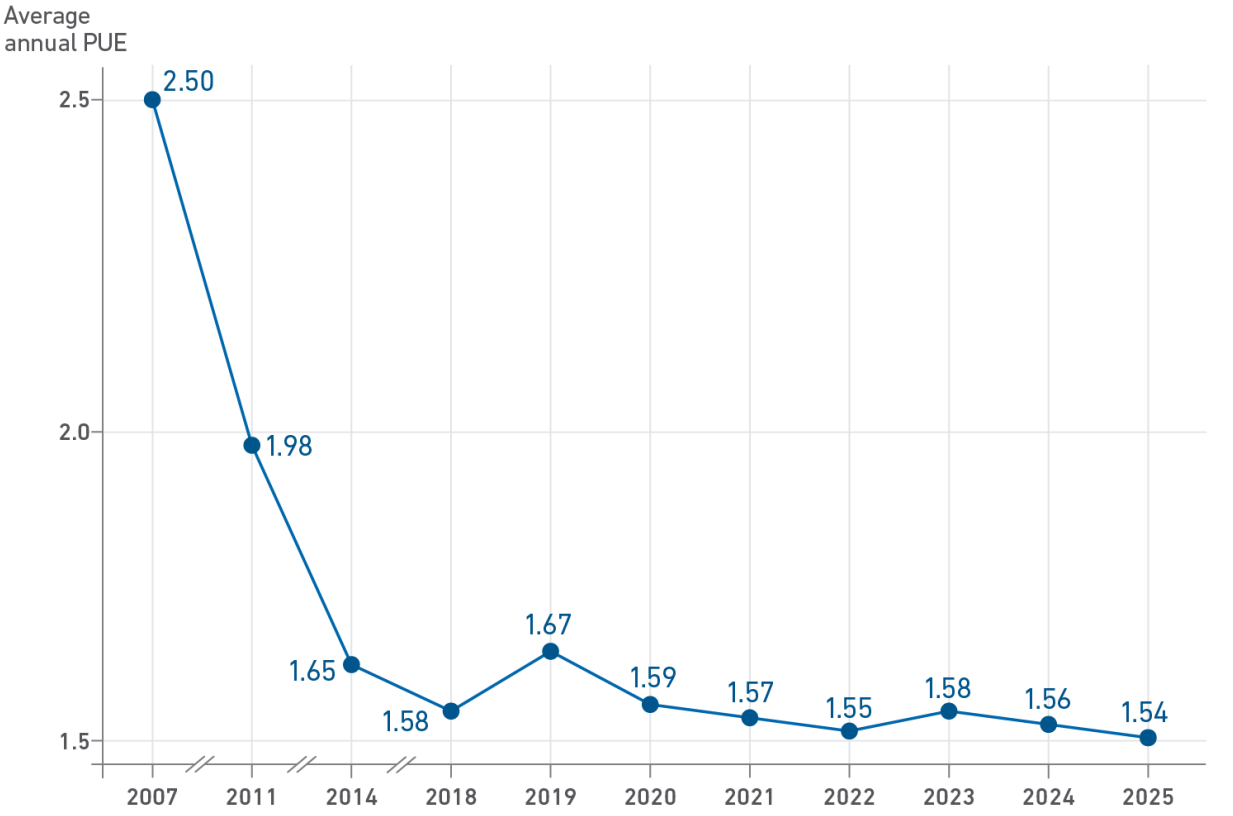
Uptime Institute has conducted its Global Data Center Survey annually since 2007, gathering insights from owners and operators to better understand the evolving state of the industry. One key question asks operators to provide the operational PUE for their largest data center, providing a barometer of energy efficiency and cooling system performance. While the global average PUE has remained relatively stable since 2018 (see **Figure 1**), this broad view masks substantial variation at the regional and site level. In this report, results are categorized by region, facility age and total provisioned IT capacity in megawatts.

Figure 1 Reported annual average global PUE value

What is the average annual PUE for your data center? (n=681)



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Historically, younger and larger facilities have tended to be more efficient than older, smaller ones. Smaller sites have proportionally higher energy consumption for cooling, rely on older and less efficient designs, struggle to attract qualified staff, and may lack the financial resources to invest in highly efficient hardware (see *Large data centers are mostly more efficient, analysis confirms*). Additionally, the cost of upgrades and lower achieved energy savings often result in low returns on investment, reducing the incentive to implement improvements.

Average annual PUE values and distribution by region

Survey results show that average PUEs are lowest in China, North America and Europe (see **Table 1**). These three markets are more advanced and well-developed, with a higher proportion of hyperscale-class facilities and a more highly trained workforce. The Asia-Pacific excluding China (APAC), Latin America, and Middle East and Africa regions are developing markets that are working toward more efficient designs, a more highly skilled workforce and larger, more efficient facilities. Over the next five to 10 years, these regions are expected to have the greatest opportunity to improve their performance as measured by PUE.

Table 1 Average annual PUE by region

	Average PUE		
	2023	2024	2025
China	1.47	1.4	1.4
North America	1.5	1.46	1.49
Europe	1.49	1.45	1.5
Asia-Pacific (not China)	1.61	1.63	1.52
Latin America	1.74	1.76	1.65
Middle East and Africa	1.68	1.75	1.68

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The number of reported data centers in the survey sample — 519 (see **Table 2**) — represents 5.1% of the 10,205 global data centers reported across the six regions by Data Center Map (viewed on October 7, 2025). While the dataset accounts for no more than 14% of a given region's data centers, it provides useful information on the PUE values in each region.

Table 2 Reported data centers as a percentage of a region's facilities

	Data centers reporting PUE	Percentage of regional data center count	Regional data center count
China	54	11.2%	484
North America	109	2.5%	4,359
Europe	133	3.9%	3,422
Asia-Pacific	78	8.9%	875
Latin America	70	13.2%	529
Middle East and Africa	75	14.0%	536
Total	**519**	**5.1%**	**10,205**

SOURCE: DATA CENTER MAP

Underlying the average regional PUE value is a broad distribution of individual PUEs in each region (see **Table 3**). China has the highest percentage of data centers — 78% — with a PUE below 1.5. Europe, North America and APAC data centers have 50-55% of their data centers in this category, while Latin America and the Middle East and Africa are at 27%. Globally, approximately half of the reported data centers have a PUE of less than 1.5. This regional-level PUE distribution illustrates that the data center industry still has work to do to improve the efficiency of its global data center portfolio.

Table 3 Operational PUE distribution by region

	PUE <1.3	PUE 1.3 to <1.5	PUE 1.5 to 1.7	PUE >1.7	Total number of data centers
Number of data centers in each region					
China	21	21	7	5	54
North America	23	33	32	21	109
Europe	29	45	32	27	133
Asia-Pacific (not China)	13	29	15	21	78
Latin America	5	14	24	27	70
Middle East and Africa	8	12	21	34	75
Percentage of data centers in each region					
China	39%	39%	13%	9%	
North America	21%	30%	29%	20%	
Europe	22%	34%	24%	20%	
Asia-Pacific (not China)	17%	37%	19%	27%	
Latin America	7%	20%	34%	39%	
Middle East and Africa	11%	16%	28%	45%	
Total data center count	**99**	**154**	**131**	**135**	**519**
Percentage of each PUE	**19%**	**30%**	**25%**	**26%**	

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A PUE value of 1.5 is used as the benchmark because it is the most often cited minimum performance standard (MPS) or best practice value for PUE. In Germany, the designated PUE MPS for operating data centers is 1.3 — a target reached by a much smaller percentage of data centers.

The differences in regional PUE values can be better understood by examining the distribution of PUE values by facility age and size, as well as by considering climatic variations. Throughout this report, it is essential to note that PUE does not capture all aspects of efficiency, such as IT performance or water usage in cooling systems (see *Uptime Institute Global Data Center Survey 2025*).

PUE values by data center age

China, APAC, and the Middle East and Africa regions have relatively young data center fleets, with roughly 70% of data centers aged 10 years or less (see **Table 4**). North America, Europe, and Latin America have older data center fleets, with 33-44% aged 10 years or less and 38-51% aged 11 to 20 years. Overall, only 11% of reported data centers are 21 years or older.

Table 4 Distribution of data center age by region

	China	North America	Europe	Asia-Pacific (not China)	Latin America	Middle East and Africa	Total
Number of data centers in each age group							
1-10 years	37	36	59	56	30	52	**270**
11-20 years	14	55	50	16	35	20	**190**
21-30 years	2	14	17	5	6	2	**46**
>30 years	0	3	7	1	0	1	**12**
Percentage of data centers in each age group							
1-10 years	70%	33%	44%	72%	42%	69%	**52%**
11-20 years	26%	51%	38%	21%	49%	27%	**37%**
21-30 years	4%	13%	13%	6%	9%	3%	**9%**
>30 years	0%	3%	5%	1%	0%	1%	**2%**
Total data center count	**53**	**108**	**133**	**78**	**71**	**75**	**518**

The total data center count is 518, not 519, because facility age was not provided for one of the PUE values

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Newer data centers have lower PUE values than older ones (see **Table 5**). This is expected, as newer facilities utilize more efficient cooling and electrical system technologies, along with integrated economizer and control systems that optimize overall performance.

Table 5 Distribution of PUE by data center age and region

Data center age region		PUE <1.3	PUE 1.3 to <1.5	PUE 1.5 to 1.7	PUE >1.7	Total number of data centers	Percentage of data centers with PUE <1.3	PUE <1.5	PUE<1.7
1- 10 years	China	13	18	4	2	**37**	35%	84%	95%
	North America	12	12	7	5	**36**	33%	67%	86%
	Europe	23	15	13	8	**59**	39%	64%	86%
	Asia-Pacific (not China)	9	25	9	13	**56**	16%	61%	77%
	Latin America	1	6	10	13	**30**	3%	23%	57%
	Middle East and Africa	5	9	19	19	**52**	10%	27%	63%
Sub-total		**63**	**85**	**62**	**60**	**270**	**23%**	**55%**	**78%**
10- 20 years	China	8	2	1	3	**14**	57%	71%	79%
	North America	9	18	20	8	**55**	16%	49%	85%
	Europe	7	20	12	11	**50**	14%	54%	78%
	Asia-Pacific (not China)	2	3	6	5	**16**	13%	31%	69%
	Latin America	3	7	11	14	**35**	9%	29%	60%
	Middle East and Africa	2	3	2	13	**20**	10%	25%	35%
Sub-total		**31**	**53**	**52**	**54**	**190**	**16%**	**44%**	**72%**
>20 years	China	0	1	1	0	**2**	0%	50%	100%
	North America	0	4	5	8	**17**	0%	24%	53%
	Europe	0	10	7	7	**24**	0%	42%	71%
	Asia-Pacific (not China)	1	1	1	3	**6**	17%	33%	50%
	Latin America	1	1	2	2	**6**	17%	33%	67%
	Middle East and Africa	1	0	0	2	**3**	33%	33%	33%
Sub-total		**3**	**17**	**16**	**22**	**58**	**5%**	**34%**	**62%**

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Data centers aged 10 years or less

Roughly one-third of data centers located in China, North America and Europe have a PUE value below 1.3. Three-quarters of the facilities in China and two-thirds of those in North America and Europe have a PUE value below 1.5. Of the data centers located in APAC, 61% operate at a PUE value below 1.5 — comparable with North America and Europe. These data centers are generally well-designed and efficiently operated, achieving lower PUE values.

Data centers in Latin America and the Middle East and Africa operate at higher PUE values, with only one-quarter of facilities achieving a PUE value below 1.5. The higher PUE values are likely due to hotter and more humid climatic conditions, less sophisticated cooling systems, and a lack of skilled operating staff.

Data centers aged 11 to 20 years

Data center performance in this category drops off compared with the younger age group. China is an exception, maintaining low PUE values, with 57% of facilities operating at a PUE value below 1.3 and 71% at a value below 1.5. In North America and Europe, roughly 50% of facilities operate at a PUE value below 1.5. Meanwhile, in Latin America and the Middle East and Africa,

approximately one-quarter of facilities operate at a PUE value below 1.5 — the same proportion observed for data centers 10 years old or less.

Performance in APAC drops off precipitously in this age group, with only 31% of facilities operating at a PUE below 1.5. The data suggests that facility design parameters and operational control in APAC have improved significantly over the past 10 years.

Data centers older than 20 years

This group of data centers, representing 11% of survey responses, demonstrates the effects of facility age on PUE performance. Only a handful of data centers achieve a PUE below 1.3, and 33% of the facilities operate at a PUE value below 1.5. The remaining two-thirds operate at a PUE value above 1.5.

PUE values by IT power demand

The reported data centers are evenly distributed across the four survey power-demand categories (see **Table 6**). Facilities in China and APAC have a higher proportion of data centers with more than 5 MW of power demand, at 74% and 64%, respectively. In contrast, Europe, Latin America, and the Middle East and Africa have the highest percentages of data centers with less than 1 MW of power demand, at 31%, 36% and 28%, respectively.

Table 6 Distribution of data center size by region

	China	North America	Europe	Asia-Pacific (not China)	Latin America	Middle East and Africa	Total
Number of data centers in each MW group							
<1MW	8	13	41	13	25	21	**121**
1-4.99 MW	6	39	44	15	31	19	**154**
5-19.99 MW	17	36	25	20	7	21	**126**
>20 MW	23	21	23	30	7	14	**118**
Percent of data centers in each MW group							
<1MW	15%	12%	31%	17%	36%	28%	**23%**
1-4.99 MW	11%	36%	33%	19%	44%	25%	**30%**
5-19.99 MW	31%	33%	19%	26%	10%	28%	**24%**
>20 MW	43%	19%	17%	38%	10%	19%	**23%**
Total data center count	**54**	**109**	**133**	**78**	**70**	**75**	**519**

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PUE performance improves as data center power demand increases (see **Table 7**). The percentage of facilities operating at a PUE below 1.5 increases from 37% for facilities with a power demand of less than 1 MW to 67% for facilities with a demand of more than 20 MW. Larger facilities will benefit from the higher operating efficiencies enabled by more robust cooling and electrical systems, as well as larger and more highly skilled operations and

maintenance teams.

Table 7 Distribution of PUE values by data center size and region

Data center size region		PUE <1.3	PUE 1.3 to <1.5	PUE 1.5 to 1.7	PUE >1.7	Total number of data centers	Percentage of data centers with PUE <1.3	PUE <1.5	PUE<1.7
<1 MW	China	2	2	2	2	**8**	25%	50%	75%
	North America	3	6	8	4	**21**	14%	43%	81%
	Europe	8	9	9	13	**39**	21%	44%	67%
	Asia-Pacific (not China)	2	2	3	6	**13**	15%	31%	54%
	Latin America	4	4	7	10	**25**	16%	32%	60%
	Middle East and Africa	5	0	6	10	**21**	24%	24%	52%
Sub-total		**24**	**23**	**35**	**45**	**127**	**19%**	**37%**	**65%**
1 MW to 4.99 MW	China	1	2	1	2	**6**	17%	50%	67%
	North America	5	14	12	8	**39**	13%	49%	79%
	Europe	8	18	10	8	**44**	18%	59%	82%
	Asia-Pacific (not China)	1	6	3	5	**15**	7%	47%	67%
	Latin America	1	1	9	14	**25**	4%	8%	44%
	Middle East and Africa	2	2	5	10	**19**	11%	21%	47%
Sub-total		**18**	**43**	**40**	**47**	**148**	**12%**	**41%**	**68%**
5 MW to 19.99 MW	China	5	8	3	1	**17**	29%	76%	94%
	North America	7	11	12	6	**36**	19%	50%	83%
	Europe	6	9	7	3	**25**	24%	60%	88%
	Asia-Pacific (not China)	4	7	3	6	**20**	20%	55%	70%
	Latin America	0	0	5	2	**7**	0%	0%	71%
	Middle East and Africa	0	6	7	8	**21**	0%	29%	62%
Sub-total		**22**	**41**	**37**	**26**	**126**	**17%**	**50%**	**79%**
20 MW or greater	China	13	9	1	0	**23**	57%	96%	100%
	North America	8	5	5	3	**21**	38%	62%	86%
	Europe	7	9	6	1	**23**	30%	70%	96%
	Asia-Pacific (not China)	6	14	6	4	**30**	20%	67%	87%
	Latin America	0	3	3	1	**7**	0%	43%	86%
	Middle East and Africa	1	4	3	6	**14**	7%	36%	57%
Sub-total		**35**	**44**	**24**	**15**	**118**	**30%**	**67%**	**87%**

Observations

PUE performance by region breaks down into three groups: (1) China; (2) North America, Europe and APAC; and (3) Latin America, and the Middle East and Africa. China exhibits the best PUE performance, with 78% of respondents reporting a PUE below 1.5. Respondents from North America, Europe, and APAC report that between 51% and 56% of their data centers operate at a PUE below 1.5.

PUE performance lags in Latin America and the Middle East and Africa, where 73% of reported data centers operate at a PUE above 1.5. The performance in the Middle East and Africa is likely affected by the hot, dry climatic conditions. The higher PUE values in both regions are also likely driven by a lack of skilled staff and less robust facility designs.

Across the overall dataset, 26% of the data centers reportedly operate at a PUE value greater than 1.7, and 51% are above 1.5, which are surprisingly high percentages. Many facilities could benefit from improved operational procedures and staff training, as well from the establishment and regular review of key measurements and metrics.

While climatic conditions will affect achievable PUE performance, the data show that these limitations can be managed through efficient data center designs and strong operational control. Some data centers in the Middle East and Africa and APAC regions — known for their climate challenges — operate at PUEs below 1.3. Additionally, 61% of data centers in APAC are operating at an average PUE value below 1.5.

The Uptime Intelligence View

The data center industry's sustainability and marketing reports, along with government regulations, cite PUE as a critical performance indicator. An analysis of available facility PUE values in this report, the 2023 and 2024 operating year EED reports published by the Netherlands, and the 2023 EED operating year data published by Ernst & Young, indicate that PUE performance varies widely across the industry. Overall, 50% of data centers operate above a PUE value of 1.5 — a benchmark frequently cited by regulatory authorities as a preferred future MPS. As the EU and others proceed with an expected PUE MPS of 1.5, many data centers will require upgrades or face closure, potentially stressing the availability of data center space.

Data center operators should take steps to improve operational control and PUE performance in their existing data centers to achieve a PUE below 1.5 where practical. New data center designs should employ highly efficient electrical and cooling infrastructures to manage operating PUEs below 1.4, as it is likely that MPS values for new data centers will be lower. These improvements will optimize both business and sustainability performance.

ABOUT THE AUTHORS

Jay Dietrich

Jay is the Research Director of Sustainability at Uptime Institute. Dietrich looks beyond the hype to analyze the transformations required in energy and IT systems, data centers and software management systems, and intra-organizational collaboration, both within and between companies, to deliver sustainable data center operations.

jdietrich@uptimeinstitute.com

Douglas Donnellan

Douglas is a Research Analyst at Uptime Institute covering sustainability in data centers. His background includes environmental research and communications, with a strong focus on education.

ddonnellan@uptimeinstitute.com

About Uptime Institute

Uptime Institute is the Global Digital Infrastructure Authority. Its Tier Standard is the IT industry's most trusted and adopted global standard for the proper design, construction, and operation of data centers – the backbone of the digital economy. For over 25 years, the company has served as the standard for data center reliability, sustainability, and efficiency, providing customers assurance that their digital infrastructure can perform at a level that is consistent with their business needs across a wide array of operating conditions.

With its data center Tier Standard & Certifications, Management & Operations reviews, broad range of related risk and performance assessments, and accredited educational curriculum completed by over 10,000 data center professionals, Uptime Institute has helped thousands of companies, in over 100 countries to optimize critical IT assets while managing costs, resources, and efficiency.