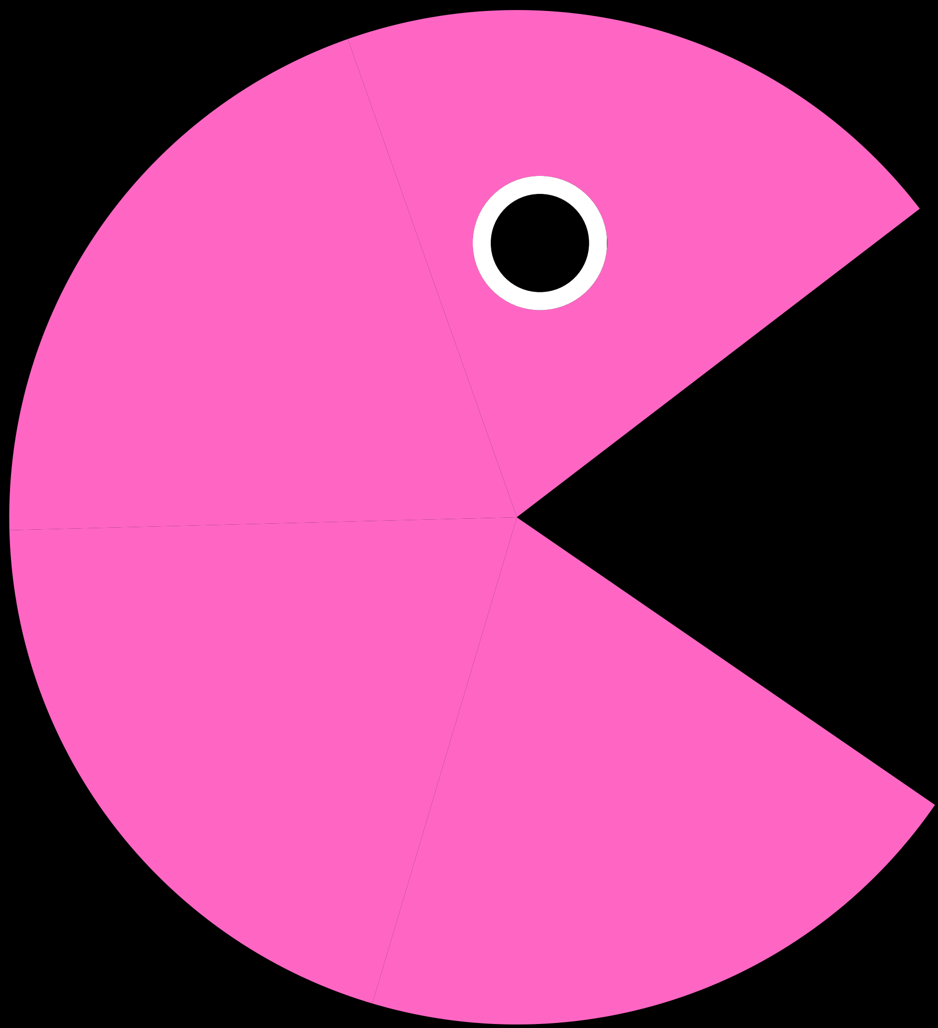
SYSTEM OVERLOAD:

How new data centres could throw Europe's energy transition off course



BEYOND FOSSIL FUELS

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1. INTRODUCTION

There is evidence of an unprecedented growth of data centres across Europe. This report looks at the impact of this data centre growth in Europe on power demand, the energy transition, and the climate. Data centres require considerable amounts of energy in the form of electricity, yet there is little information about the impact this growth could have on Europe's energy transition and Greenhouse Gas (GHG) emissions.

Beyond Fossil Fuels decided to ask some fundamental questions about how Europe's new data centres are going to be powered. Using the best available data, we have attempted to estimate new data centres' electricity demand by 2030, and hypothesise two energy sourcing options for data centres—fossil fuels versus renewable energy. We have made straightforward calculations to estimate possible impacts on emissions and the energy transition.

According to the report's findings, newly-established data centres could significantly increase emissions in Europe if they rely even partly on fossil fuels. The findings also suggest that new data centres could indirectly raise emissions if they rely on existing or already planned renewables rather than being powered by new renewable energy. New data centres using renewables without increasing the overall share of renewable energy, could mean other critical sectors falling back on fossil fuels.

The report concludes that far greater transparency on growth projections, energy demand and fossil fuel usage is needed, and that tech companies must commit to phase out fossil fuels and power new data centres with new and additional renewable energy that is deliverable in the same grid and in the same hour as their energy needs.

The research entails uncomplex calculations, yet even these basic estimates suggest that this is an issue of significant scale that should be taken seriously. This should spark a sense of urgency and motivate immediate action from tech companies and policy makers, ensuring greater transparency and access to information around data centre growth.

Although there is considerable uncertainty and many unknown factors around the growth and energy consumption of data centres, this cannot be an excuse for inaction. This report attempts to contribute to the wider debate on data centre demand with the aim of spurring action.

1.1 Europe needs to decarbonise its power sector by 2035 to reach its climate targets

There is an intensifying and accelerating global climate crisis. Natural disasters—heat waves, storms, droughts, wildfires, and flooding—caused by extreme weather are taking a devastating toll on people, costing the economy billions, and becoming more common inside, as well as outside, Europe. The science is clear that we must drastically and urgently reduce global GHG emissions[1].

The International Energy Agency (IEA) has said that in order for Europe to meet its climate goals, the power sector must be cleaned up by 2035[2] at a scale that would contribute to the decarbonisation of the European economy. As this will be primarily achieved through the electrification of transportation, heating and industry, a significant increase in electricity demand is predicted in the European Union (EU). The UK also aims to cut emissions 68% by 2030 and has recently set an ambitious clean power plan[3].

Electrification—together with energy savings—is an essential process that will contribute to reduced GHG emissions. However, as sectors become more electrified (e.g. building heating, heat in low-heat industrial processes and automotive) power demand will increase. New demand from growing sectors e.g. the IT sector and data centres could also contribute to increasing electricity demand. The more demand is placed on the power sector, the more pressure on the available energy, especially renewable energy, which will form the backbone of new energy supply from 2035.

Too much pressure on power demand could derail the energy transition and emission reductions, which are urgently needed. In addition to efficiency efforts in electrifying sectors, it is necessary to assess whether or how much new demand can be introduced while ensuring that renewable sources of electricity cover the demand growth and displace fossil fuels in the power sector.

The EU has set targets to reduce net GHG emissions by at least 55% by 2030[4], and most member states have set National Energy and Climate Plans (NECPs) up to 2030[5], which detail their key climate targets and actions. As G7 members, the UK, Italy, France, and Germany, have all committed to decarbonise their power sector by 2035[6]. Replacing fossil fuels and renewables is the most effective and cost-efficient way to achieve this transition.

In order to meet its decarbonisation commitments, and to lower dependency on Russian gas, the EU has set targets to reach at least 42.5% (and, if possible, 45%) renewable energy in power generation, industry, buildings, and transport by 2030.

The transition of the EU electricity sector is gaining increased momentum. Driven by expanding wind and solar power, renewables have risen from a 34% share of EU electricity in 2019 to 47% in 2024, while the share of fossil fuels declined from 39% to a historic low of 29%. This decline cut total power sector emissions in 2024 to below half of their peak in 2007[7].

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1 https://www.ipcc.ch/assessment-report/ar6/
2 https://www.google.com/url?q=https://www.iea.org/reports/net-zero-by-2050&sa=D&source=docs&ust=1736856098623178&usg=AOvVaw0-z2u0sVUHW9IsB20WKipM
3 UK refs https://commonslibrary.parliament.uk/research-briefings/cbp-9888/ + https://www.gov.uk/government/publications/clean-power-2030-action-plan
4 https://www.consilium.europa.eu/en/policies/fit-for-55/
5 https://ember-energy.org/data/live-eu-necp-tracker/#context
6 https://www.spglobal.com/commodity-insights/en/news-research/latest-news/energy-transition/052722-g7-nations-agree-to-decarbonize-power-sectors-by-2035
7 https://ember-energy.org/latest-insights/global-electricity-review-2024/

At the same time, there are proposals to increase gas capacities in many European countries by 32%[8].

This is also the case in some countries where governments have already committed to decarbonising their electricity sectors by 2030 or 2035. At this stage, many of these planned gas plants are proposals and it is not clear whether they will be built or not, or whether much cheaper renewables and clean flexibility solutions, such as battery storage, will make them obsolete.

The problem is that many national governments have not formulated a clear plan to stop using fossil gas to produce electricity, and are unable to provide clarity and guidance to the market. There is also a significant underinvestment[9] in clean flexibility solutions, such as grids, storage, and demand-side response, which are essential for the transition to a fully renewables-based power system.

1.2 The challenge presented by new data centre demand in Europe

Amidst this urgent effort to decarbonise and transition the power sector away from fossil fuels, we are also seeing major growth in the number and size of data centres in Europe. Artificial Intelligence (AI) is a major factor driving global growth in data centre development, along with digitalisation, the expansion of cloud infrastructure and cryptocurrency[10].

The European data centre market, valued at USD 42.98 billion in 2023, is expected to reach USD 64.50 billion by 2029[11]. The growth of the European data centre sector is driven in part by 'hyperscalers'—major tech companies like Google, Microsoft, Amazon, and Meta[12]—that are expanding cloud infrastructure as well as investing heavily in parallel efforts to create the most commercially successful and dominant AI models[13]. These four Big Tech companies alone have spent a combined $130-150 billion each year since 2022 on capital expenditure, citing AI data centres as a primary driver of spending[14]. These hyperscalers are forecast to drive 65% of data centre demand in Europe, according to the consultancy company McKinsey[15].

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[8] https://beyondfossilfuels.org/2024/11/15/europes-gas-power-plant-overbuild-undermines-climate-credibility/
[9] Ibidem
[10] https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ai-power-expanding-data-center-capacity-to-meet-growing-demand
[11] https://www.arizton.com/market-reports/europe-data-center-market-analysis
[12] McKinsey estimates that hyperscalers will drive 65% of the demand for new data centres in Europe by 2028
https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-role-of-power-in-unlocking-the-european-ai-revolution
[13] https://www.nzherald.co.nz/business/markets-with-madison/the-ai-wars-how-amazon-microsoft-google-and-meta-are-investing/JIFJT4MATBBCHJILEQUJR7ZYIQ/
[14] https://archive.is/RAX4M
[15] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-role-of-power-in-unlocking-the-european-ai-revolution

The dominant AI systems being rolled out today are highly resource-intensive. A single query from ChatGPT, the AI model developed by OpenAI (with multi-billion dollar investment from Microsoft), requires 2.9 watt-hours of electricity, compared with 0.3 watt-hours for a Google search; a nearly tenfold increase[16]. The latest microchips that drive the compute power behind AI can consume nearly twice as much power as their predecessors[17].

Training AI is highly resource and energy-intensive. A single training run of Pathways Language Model (PaLM) at a Google data centre in Oklahoma, where 89% of its energy requirements come from carbon-free energy sources, resulted in 271,43 tons of carbon dioxide equivalent (CO_2e). This is equivalent to the emissions produced by a fully occupied commercial jet during 1.5 flights across the United States. These PaLM training runs take place thousands of times a day, every day[18].

Recent developments have suggested that it could be possible to train AI systems using much fewer resources, including energy[19]. If this is the case, it could call into question the rapid scaling of AI infrastructure and huge energy demand that underpins Big Tech's business models today, such as the assumption that a vast concentration of high-powered microchips or Graphics Processing Units (GPUs) is required to train an AI model.

On the other hand, such technological advances could accelerate the adoption and use of AI systems, which could still drive up energy use and emissions from AI, albeit in a more diffuse manner. In other words, because efficiency can drive down costs and increase adoption, greater efficiency of AI is not a guarantee of lower energy use and emissions overall[20]. **Reducing AI's carbon footprint rests on political will and corporate action to reduce emissions, including commitments to phase out fossil fuels and bring AI expansion in line with planetary boundaries.**

There are a host of environmental and social issues connected to data centre developments, including pressure on water, land, and air quality. Local communities are often those most directly affected by the associated environmental harms. The data centre supply chain is also a major source of emissions from energy and other sources: the production of semiconductors—the microchips that underpin AI's compute power—is forecast to emit 86 million metric tons of CO_2e emitted per year by 2030[21]. The focus of this report, however, is on the new power demand from data centre sites in Europe and emissions related to that demand.

16 https://iea.blob.core.windows.net/assets/6b2fd954-2017-408e-bf08-952fdd62118a/Electricity2024-Analysisandforecastto2026.pdf
17 https://www.tomshardware.com/tech-industry/nvidias-h100-gpus-will-consume-more-power-than-some-countries-each-gpu-consumes-700w-of-power-35-million-are-expected-to-be-sold-in-the-coming-year
18 https://www.thegreenwebfoundation.org/publications/report-ai-environmental-impact/ and https://arxiv.org/pdf/2204.02311#appendix.B
19 https://www.exponentialview.co/p/deepseek-everything-you-need-to-know?utm_source=post-email-title&publication_id=2252&post_id=155850427&utm_campaign=email-post-title&isFreemail=true&r=181yb&triedRedirect=true&utm_medium=email
20 https://arxiv.org/pdf/2501.16548
21 https://www.greenpeace.org/eastasia/invisible-emissions/

Data centres and their associated energy demand are growing at an incredibly fast pace, which is only predicted to accelerate in the coming years. The IEA has forecast that by 2026 data centres could account for 29% of new electricity demand in Europe[22], while McKinsey projects that it could remain at 15-25% of net new demand by 2030[23]. There is a great deal of uncertainty about electricity demand growth in Europe, including data centre growth, however McKinsey suggests that data centre growth is less unpredictable than other sectors like transportation and industry[24].

Data centres are adding significant additional demand in Europe at a time when the continent must decarbonise its power grids as fast as possible. In parts of Europe, data centres are already placing immense burdens on the grid[25]. Europe is also not the locus of all data centre growth: for example, the US is also seeing significant growth[26].

It is clear that data centres will be a key source of new energy demand in Europe up to 2030, when Europe must urgently deliver on key climate commitments. Whether or not Europe can sustain this new demand depends on the impact these additional terawatt-hours (TWh) of electricity have on Europe's decarbonisation plans and its GHG emissions in the intervening years.

There are strong reasons to be concerned about the impact this new data centre demand could have on Europe's emissions. Morgan Stanley suggests that data centre carbon emissions are set to triple by 2030 on account of AI, emitting 2.5 billion tons of CO_2e[27]. In the US, tech companies' data centre expansion plans are already driving a major expansion in fossil gas[28]. There are worrying signs in Europe too: in Ireland, where data centres account for over 20% of electricity consumption, new data centres are connecting directly to the gas network[29]. There are also indications that data centres are prolonging coal and gas infrastructure in other parts of Europe[30].

Meanwhile, emissions from Big Tech are rising, with tech giants raising the prospect of rolling back their climate commitments. Google's emissions have grown 48% in five years, leading it to say that there was 'significant uncertainty' around reaching their 2030 net zero

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[22] https://iea.blob.core.windows.net/assets/6b2fd954-2017-408e-bf08-952fdd62118a/Electricity2024-Analysisandforecastto2026.pdf
[23] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-role-of-power-in-unlocking-the-european-ai-revolution
[24] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/electricity-demand-in-europe-growing-or-going
[25] https://www.friendsoftheearth.ie/assets/files/pdf/data_centrres_and_the_carbon_budgets_-_prof_hannah_daly_dec_2024.pdf
[26] https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/ai-power-expanding-data-center-capacity-to-meet-growing-demand
[27] https://www.reuters.com/markets/carbon/global-data-center-industry-emit-25-billion-tons-co2-through-2030-morgan-stanley-2024-09-03/
[28] https://www.ft.com/content/63c3ceb2-5e30-44f4-bd39-cb40edafa4f8
[29] https://www.friendsoftheearth.ie/assets/files/pdf/data_centrres_and_the_carbon_budgets_-_prof_hannah_daly_dec_2024.pdf
[30] https://www.reuters.com/technology/artificial-intelligence/how-ai-cloud-computing-may-delay-transition-clean-energy-2024-11-21/

target[31]. Microsoft's total emissions in 2023 were about 30% higher than in 2020[32], with its President stating that its decarbonisation goal was 'more than five times as far away as it was in 2020.'

To begin to analyse the implications of data centre growth in Europe until 2030, the important question is: **how will Europe's data centres be powered?** The answer depends largely on the decisions of the key corporate actors and on political action. Over the next decade, there are two main options of energy sources for this new demand: fossil gas and renewable energy.

1.3 Objectives of this report

This report attempts to analyse the implications of this crossroads Europe finds itself at. It asks, what would happen regarding emissions and power sector dynamics if—in the worst case—the new demand generated by data centres is met largely with fossil gas, and conversely, what would happen if the new demand is met by renewable energy?

There is a great level of uncertainty around what the real power demand growth for data centres will be. Due to this uncertainty, the report uses hypotheses to explore possible implications, building on a methodology used by S&P Global[33]. Uncertainty aside, it is clear that, even with increased efficiency, the power needs of data centres will continue to grow as Europe's economies digitise further, alongside increased power demand from other sectors as they electrify.

1.4 Methodology

To conduct this analysis, we first make a projection of how many TWh of electricity could be generated by data centre growth in Europe (the 27 EU countries and the UK) by 2030. From 2023 to 2030, we calculate both low and high demand cases, to account for the degree of uncertainty in data centre growth.

To paint a picture of the theoretical implications for Europe's energy transition, the report then looks at two simple hypotheses for how these additional new TWh of electricity could be supplied to data centres in Europe until 2030: a) one where fossil fuels plays a significant role (61% fossil gas) in meeting the new power demand, and b) one where the new demand is met entirely by renewables (looking at high and low demand projections for both).

We then take a closer look at the climate implications for the EU specifically (excluding the UK). For the 'high demand, low renewables' and 'low demand, low renewables' contexts, we estimate how much gas-fired electricity would need to be generated between 2025 and 2030

[31] https://www.theguardian.com/technology/article/2024/jul/02/google-ai-emissions
[32] https://www.bloomberg.com/news/articles/2024-05-15/microsoft-s-ai-investment-imperils-climate-goal-as-emissions-jump-30?srnd=undefined
[33] https://www.spglobal.com/ratings/en/research/articles/241030-data-centers-rapid-growth-will-test-u-s-tech-sector-s-decarbonization-ambitions-13302390

to meet the new demand. We then estimate the GHG emissions that could result under these projections.

After assessing the implications for the EU of a low renewable power supply for new data centres, we look at the implications of the high renewables projections for the EU and the UK. We analyse the resulting GHG emissions, as well as the percentage of planned renewable energy generation that could be consumed by data centres within this option. For the latter, we also look at the results for the UK.

2. FINDINGS

2.1 Summary of Findings

Europe (the EU and the UK) could see an additional 287 TWh of electricity demand from data centres, assuming high demand growth. If even 61% of this demand is met with fossil fuels, nearly 85 TWh of additional electricity could be generated by burning fossil gas in the EU in 2030. This could lead to the EU's GHG emissions rising by up to 121 million tons of CO_2e.

If, on the other hand, the demand is met with renewables, emissions would fall to almost zero. However, assuming this renewable energy is taken from the already-planned growth in renewable energy generation in the EU, this would mean nearly 20% of new renewables in the EU would need to go to data centres, which could limit access to renewables in other sectors. If not enough renewable energy projects are built across the EU to meet all demand, renewables would fail to displace overall fossil fuel use in the economy.

Even in the UK, which is actively working towards early fossil fuel phase out in the power sector and an ambitious development of renewables, the data centre boom and its associated energy demand represent a real challenge that must be factored in by both policy makers and the industry.

2.2 Impact of new data centres on European power demand

According to the IEA, a substantial increase in electricity consumption from data centres is inevitable[34]. At the same time, there is uncertainty about the level of data centre growth we may see in the coming years. This is due to a number of factors including supply chain issues, access to energy, algorithmic optimisations and other efficiency trends, as well as wider economic factors[35].

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[34] https://iea.blob.core.windows.net/assets/fb481b31-df88-4f2c-a435-c8b075e992be/WorldEnergyOutlook2024.pdf
[35] https://iea.blob.core.windows.net/assets/fb481b31-df88-4f2c-a435-c8b075e992be/WorldEnergyOutlook2024.pdf and https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/electricity-demand-in-europe-growing-or-going

We therefore identified two power demand hypotheses, 'high demand' and 'low demand'. For the EU and UK, those are defined separately using the best information available for each geography. This results in four overall projections: high and low demand for the EU, and high and low demand for the UK.

For the EU, the levels corresponding to 'low demand' are derived from the IEA's most recent projections (IEA 2024a)[36], and 'high demand' from McKinsey's latest estimates (McKinsey 2024)[37]. The IEA's compound annual growth rates (CAGR) and McKinsey's projections were calculated using Equation 1 by the authors with data extracted from respective reports (shown in Table 1 below).

$$CAGR = \left(\frac{E_{end}}{E_{start}}\right)^{\frac{1}{(Y_{end} - Y_{start})}} - 1 \quad \text{(Eq. 1)}$$

Where, $CAGR$ is compound annual growth rate, E is electricity demand, Y is year.

Table 1. CAGR used in the high and low power demand hypotheses of data centres in the EU.

Hypotheses	CAGR	Source
High demand	13.02%	IEA 2024a
Low demand	9.95%	McKinsey 2024

For the UK, the 'low' and 'high' electricity demand projections are both from the National Energy System Operator (NESO) for the UK (NESO 2022)[38].

The electricity demand for the baseline year (2022) is extracted from IEA 2024a for the EU, and NESO 2022 for the UK. As shown in Table 2, for the EU, the baseline is the same for both the 'high demand' and 'low demand' hypotheses, while for the UK, the baselines are slightly different, as NESO estimates aim to account for uncertainties around technological advancements.

Table 2. Baseline power demands used in the high and low power demand hypotheses for the EU and UK.

Region	Hypothesis	Baseline power demand (TWh)	Source
EU	High demand	99.7	IEA 2024a
EU	Low demand	99.7	IEA 2024a
UK	High demand	10.2	NESO 2022
UK	Low demand	4.1	NESO 2022

[36] IEA 2024a. Electricity 2024: Analysis and forecast to 2026. IEA, January 2024. https://www.iea.org/reports/electricity-2024
[37] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-role-of-power-in-unlocking-the-european-ai-revolution
[38] https://www.neso.energy/document/246446/download

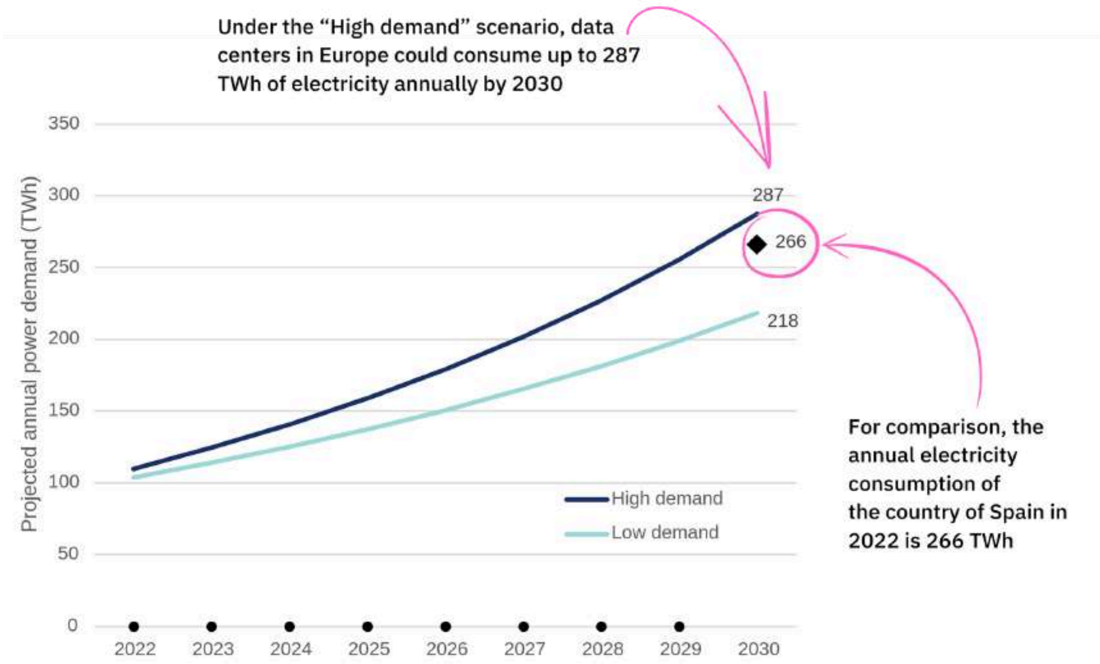
In 2022, data centres in Europe consumed about 104-110 TWh of electricity, as shown in Table 3, which is roughly 3.4% of Europe's total power generation (3,099 TWh according to data from Ember Electricity Data Explorer[39]). The electricity demand of data centres in Europe can expect to see an 160% increase (compared to 2022) and reach 287 TWh in 2030, under the 'high demand' hypothesis as illustrated in Figure 1. For comparison, in 2022, the annual average electricity consumption of Spain, one of the EU's largest countries, was 266 TWh. Even with a slower growth rate, under low demand, the industry's power demand could still be 218 TWh in the year 2030, which is enough to power Portugal and Poland combined (combined total annual average power consumption is 218 TWh[40]).

Table 3. Baseline and projected data centre power demand (TWh) in Europe under two demand hypotheses.

Year	Low demand			High demand		
	EU	UK	EU+UK	EU	UK	EU+UK
2022	99.7	4.1	103.8	99.7	10.2	109.9
2023	109.6	4.4	114.0	112.7	11.8	124.5
2024	120.5	4.6	125.2	127.4	13.4	140.7
2025	132.5	4.9	137.4	144.0	15.0	158.9
2026	145.7	5.0	150.7	162.7	16.4	179.1
2027	160.2	5.1	165.3	183.9	17.7	201.6
2028	176.1	5.2	181.4	207.8	19.1	227.0
2029	193.7	5.3	199.0	234.9	20.5	255.4
2030	212.9	5.4	218.4	265.5	21.9	287.4

[39] https://ember-energy.org/data/electricity-data-explorer/. Accessed January 23, 2025.
[40] https://ember-energy.org/data/electricity-data-explorer/

Figure 1. **Baseline and projected data centre power demand (TWh) in Europe under two demand hypotheses.**



Note: Spain's electricity consumption in 2022 is 266 TWh.

2.3 Fossil gas supply for meeting new demand would undermine Europe's energy transition

As noted in the report's introduction, future power demand from newly added data centres in Europe is going to be met largely either by gas-fueled power plants or renewable energy.

We therefore hypothesise two future power mix options for the additional electricity required by new data centres: one high fossil, low renewable energy hypothesis, where 61% is from fossil gas and 39% is from renewables (as noted above, this is based on an S&P Global calculation); and another high renewable energy hypothesis with 100% of the electricity consumed by new data centres coming from renewable power sources.

This leaves us with four overall possible estimates:

- 'high demand, low renewable energy'
- 'low demand, low renewable energy'
- 'high demand, high renewable energy'
- 'low demand, high renewable energy'

The renewable energy considered in our hypotheses includes solar and wind. The contribution percentages of each power source are shown in Table 4. The solar and wind contribution ratio within renewables is determined based on a six-year (2025-2030) average of projected new solar and wind generation estimates from IEA 2024b[41], for the EU and UK separately.

Table 4. Percentage contribution to the total additional power generation required by data centres relating to the two power mix options for the EU and UK.

Plant type	EU - High renewable energy (RE)	EU - Low RE	UK - High RE	UK - Low RE
Gas	0%	61%	0%	61%
Wind	33%	13%	45%	18%
Solar	67%	26%	55%	22%

Note: Percentages may not sum to 100% due to rounding.

$$\overline{EF}_{s,r,p} = \sum_{i=1}^{n}\left(EF_{f_i,r,p} \times PC_{f_i,r,p,s}\right) \qquad \text{(Eq. 2)}$$

Where, $\overline{EF}$ is average emission factor of a given power mix, s is hypothesis, PC is percent contribution to the total additional power generation.

The average emission factors of the two power mix options in the two regions can be calculated using Equation 2.

2.3.1 New data centre demand could significantly raise emissions in the EU if fossil fuels are in the mix

In the previous section, we found that of the 218-287 TWh of electricity consumed by data centres in 2030, more than half of it would come from new data centres. Meeting this new demand, under the 'high demand, low renewable energy' projection, where 61% of the demand is met with fossil fuels, would entail the EU generating 84.3 TWh by burning fossil gas over the next five years, as shown in Table 5 below. This would be equivalent to what Germany generated from its whole fleet of fossil gas plants in 2024.

Table 5. Share of electricity generated from renewable energy and fossil gas to power new data centres coming online between 2025 and 2030 under the 'high demand, low renewable energy and 'low demand, low renewable energy' hypotheses.

Year	Low demand added TWh	Low demand		High demand added TWh	High demand	
		Gas generation	RE generation		Gas generation	RE generation
2025	12.5	7.6	4.9	16.6	10	6.6
2026	25.2	15.4	9.8	35.3	21.5	13.8

[41] IEA 2024b. https://www.iea.org/data-and-statistics/data-tools/renewable-energy-progress-tracker. Accessed on December 19, 2024.

2027	39.7	24.2	15.5	56.5	34.5	22.0
2028	55.6	33.9	21.7	80.5	49.1	31.4
2029	73.2	44.7	28.5	107.5	65.6	41.9
2030	92.4	56.4	36.0	138.1	84.3	53.8

Using fossil gas to power new data centres in Europe would also significantly raise emissions. As shown in Table 6 below, for fossil gas, regional-average emission factors are back-calculated using Equation 3 with fuel-specific power generation and emissions estimates for respective regions for 2022 from the Ember Electricity Data Explorer[42]. For solar and wind, emission factors are assumed as zero.

$$EF_{f,r,p} = \frac{EM_{f,r,p}}{EG_{f,r,p}} \qquad \text{(Eq. 3)}$$

Where, EF is emission factor, EM is GHG emissions, EG is electricity generation, f is fuel type, r is region, p is period and can be baseline or future.

Table 6. Emission factors (tCO2-eq/MWh) used for estimating power generation related GHG emissions for the EU and UK.

Fuel source	Emission factors for the EU	Emission factors for the UK	Source
Gas	0.459	0.480	Ember Electricity Data Explorer

As shown in Table 7 and Figure 2 below, the annual emissions of newly added data centres in the EU could grow from nearly 5 million tons of CO_2e in 2025 to almost 39 million in 2030, with a growth rate of about 53%, under the 'high demand, low renewable energy' hypothesis. This is more than Lithuania and Estonia's annual (2022 level) emissions combined (EDGAR 2023), and more than what the gas fleet in Germany, one of the largest fleets in Europe, emitted in 2024 (34.1 million tons of CO_2e)[43].

Table 7. Projected annual emissions (million tons of CO_2e embedded in the new data centre power demand for the EU.

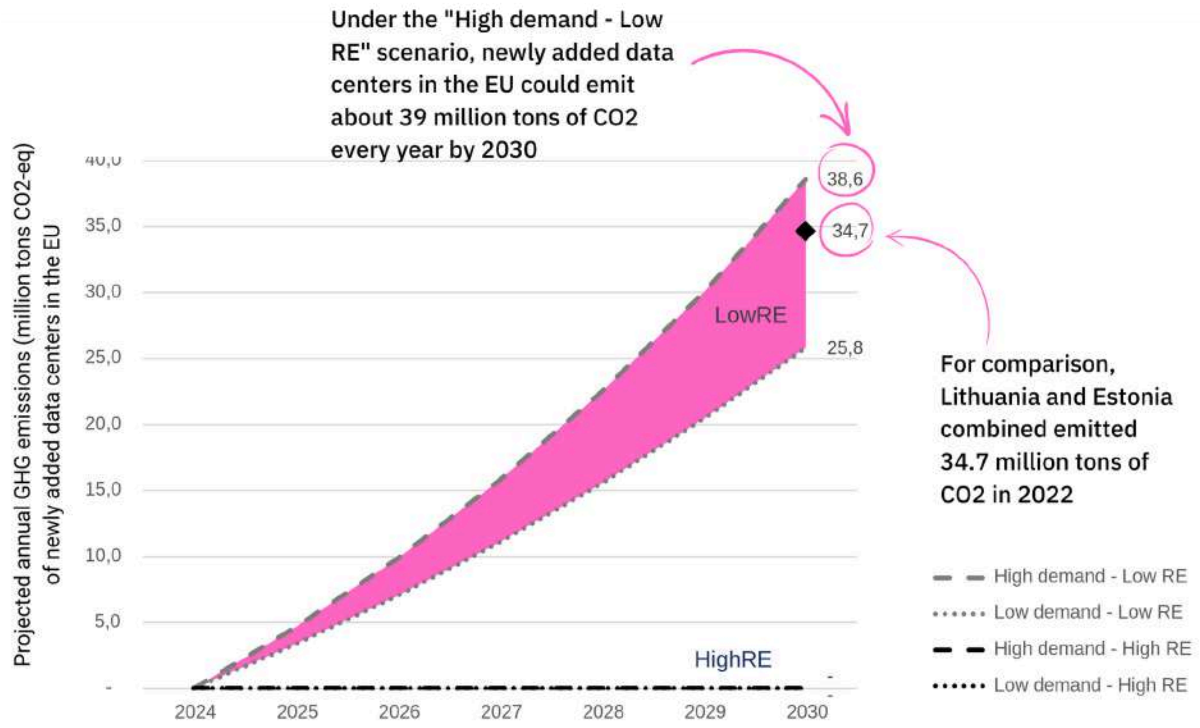
Year	High RE				Low RE			
	Low demand		High demand		Low demand		High demand	
	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative	Annual	Cumulative
2024	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.0	0.00	0.00	0.00	3.35	3.35	4.63	4.63
2026	0.00	0.00	0.00	0.00	7.03	10.38	9.87	14.51

42 https://ember-energy.org/data/electricity-data-explorer/. Accessed January 23, 2025.
43 https://ember-energy.org/data/electricity-data-explorer/ Accessed January 23, 2025.

2027	0.00	0.00	0.00	0.00	11.09	21.47	15.79	30.30
2028	0.00	0.00	0.00	0.00	15.54	37.01	22.49	52.79
2029	0.00	0.00	0.00	0.00	20.43	57.44	30.05	82.84
2030	0.00	0.00	0.00	0.00	25.82	83.26	38.60	121.44

Note: Renewable energy sources like solar and wind power do not produce carbon emissions as part of the electricity generation process[44].

Figure 2. Projected annual GHG emissions of newly added data centres from 2025 to 2030.

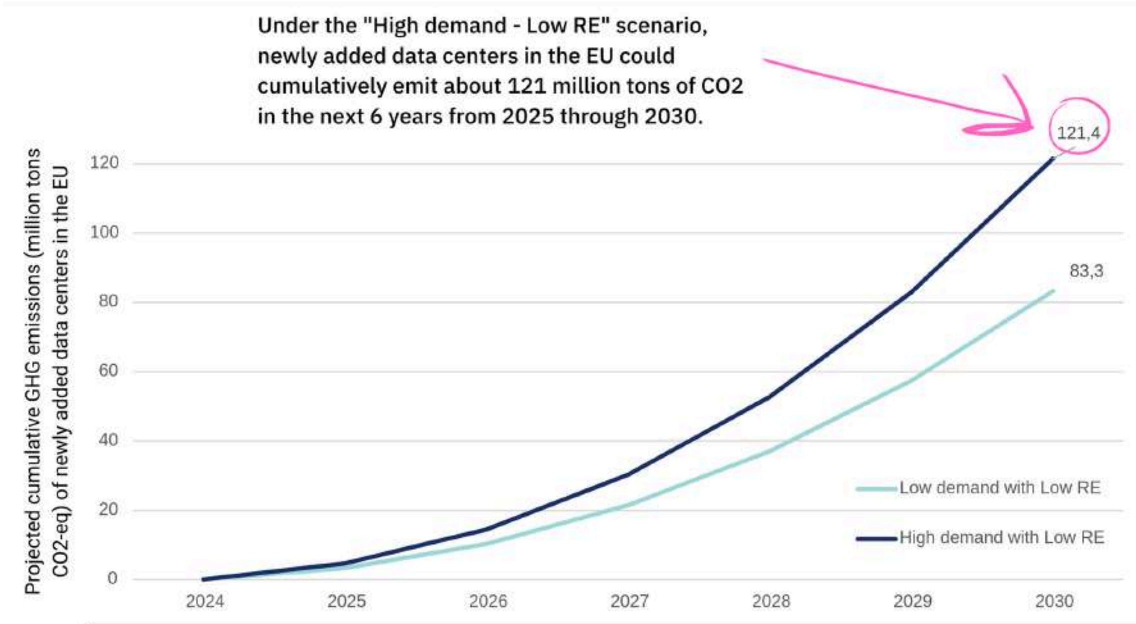


Notes: This chart shows the added emissions from the newly added data centres in the EU starting from 2025, with 2024 being the baseline at zero; Lithuania and Estonia's 2022 GHG emission data are from EDGAR 2023[45].

Cumulatively, new data centres could emit 121 million tons of CO_2e in the coming six years (2025-2030), as shown in Figure 3. This is equivalent to half the reduction target set by the German government regarding CO_2e emissions for the entire country and across all sectors by 2030 as per the climate plan[46]. It is also nearly equivalent to what the fossil gas power plants of Italy, Germany, and the UK combined emitted in 2024[47].

[44] As noted in the section 5.1, this does not account for the embodied emissions in the supply chain of renewable energy infrastructure.
[45] https://edgar.jrc.ec.europa.eu/report_2023. Accessed on December 19, 2024.
[46] https://www.gesetze-im-internet.de/ksg/anlage_2.html
[47] https://ember-energy.org/data/electricity-data-explorer/

<u>Figure 3.</u> Projected cumulative GHG emissions of newly added data centres from 2025 to 2030.



Note: Graph starts at zero in 2024.

At a slower expansion rate, within the ‘low demand, low renewable energy' context, the annual emissions of newly added data centres in the EU can expect to grow from 3 million tons of CO_2e in 2025 to 26 million in 2030, with a CAGR of over 50%.

The calculations show that data centre growth would lead to a significant increase in power demand and that if this were to be disproportionately met by fossil gas (through prolonging the operation of gas plants or permits being given to build new plants), it would represent a significant fossil-lock in at a time when Europe needs to be accelerating its fossil exit.

If new data centres in the EU were powered fully by renewables, there would be no additional GHG emissions from the sector by 2030. However, if new data centre demand is powered by renewable energy that is intended for other sectors (instead of building more renewable energy that meets data centre demand *as well as* the demand growth from other sectors), this may not reduce overall emissions. The next section analyses what would happen if the new demand was met purely by already-planned renewable energy generation.

2.3.2 New data centre demand could undermine the EU’s existing renewable energy ambitions

As shown in Table 8, by 2030, approximately an additional 146 TWh of new electricity would need to be generated by renewable energy in order to support the current plans for the expansion of data centres in Europe within the ‘high demand, high renewable energy’ context.

Table 8. Added renewable energy generation and data centre demand (TWh) powered by renewable energy since 2024 in Europe within the ‘high demand, high renewable energy’ and ‘high demand, low renewable energy’ contexts.

Year	Total added RE generation in Europe	High demand, low RE		High demand, high RE	
		Added data centre demand powered by RE	Share of total added RE generation	Added data centre demand powered by RE	Share of total added RE generation
2025	105.7	7.1	6.7%	18.2	17.2%
2026	213.9	14.9	7.0%	38.3	17.9%
2027	337.0	23.7	7.0%	60.9	18.1%
2028	465.7	33.6	7.2%	86.2	18.5%
2029	608.4	44.7	7.4%	114.7	18.8%
2030	769.1	57.2	7.4%	146.6	19.1%

Note: Projected total added renewable energy generation data for Europe are from IEA 2024b.

Our methodology assumes that the renewable energy would be non-additional to already planned generation, in order to further analyse the impact on the EU's ability to provide renewable energy to decarbonise its economy if the new demand is met with additional versus non-additional renewable energy.

For the EU, within the 'high demand, high renewable energy' context, as illustrated in Table 9 and Figure 4 below, data centres' renewable energy demand could climb to approximately 138 TWh. Based on the current IEA projections, this would account for a significant portion of the annual renewable energy generation that the EU would be adding, growing from 18.1% in 2023 to 21.2% in 2030.

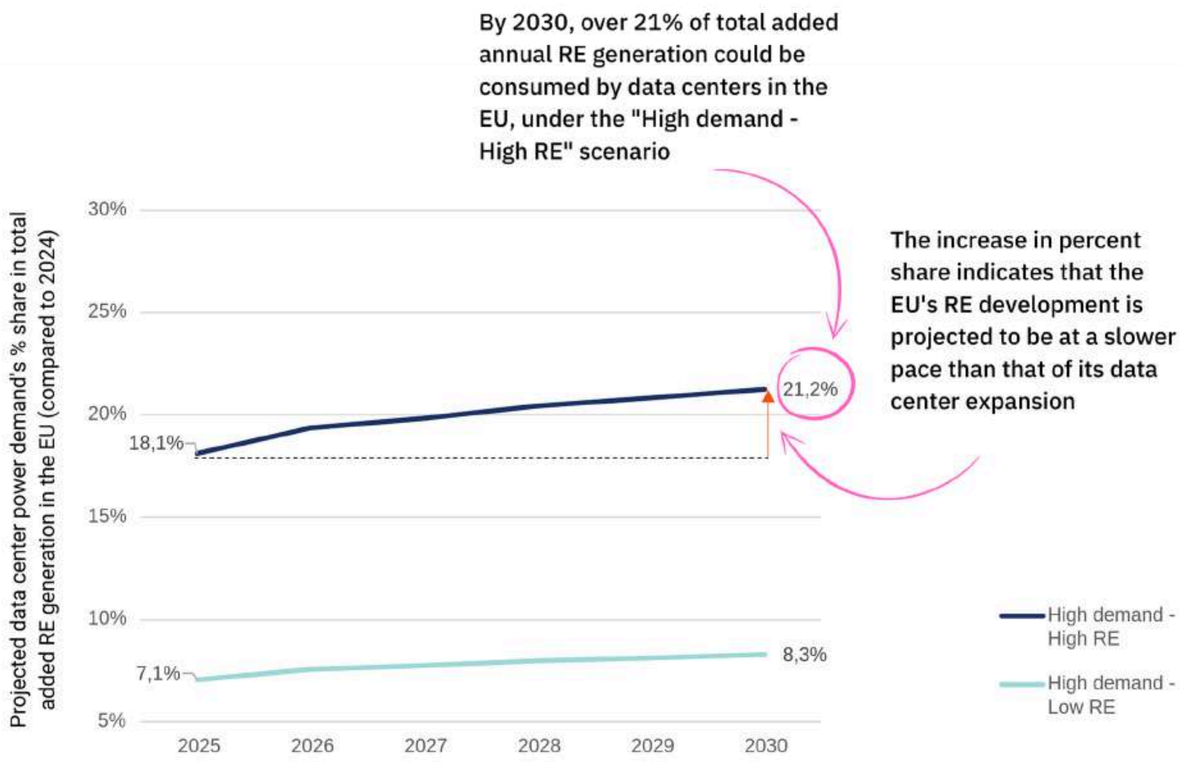
Additionally, this growth in the share of renewable energy going toward data centres indicates that renewable energy in the EU is projected to develop at a slower pace than that of the projected data centre expansion in the region.

Table 9. Added renewable energy generation and data centre demand (TWh) powered by renewable energy since 2024 in the EU within the 'high demand, high renewable energy' and 'high demand, low renewable energy' contexts.

Year	Total added RE generation in the EU	High demand, low RE		High demand, low RE	
		Added data centre demand powered by RE	Share of total added RE generation	Added data centre demand powered by RE	Share of total added RE generation
2025	91.6	6.5	7.1%	16.6	18.1%
2026	182.5	13.8	7.6%	35.3	19.4%
2027	284.9	22.0	7.7%	56.5	19.8%
2028	394.7	31.4	7.9%	80.5	20.4%
2029	516.0	41.9	8.1%	107.5	20.8%
2030	650.3	53.9	8.3%	138.1	21.2%

Note: Projected total added development generation data for the EU are from IEA 2024b.

<u>Figure 4.</u> Percentage share of total added (compared to the 2022 baseline) renewable energy generation consumed by new data centres in the EU under two demand hypotheses.



Note: Projected total added renewable energy generation data for the EU are from IEA 2024b.

This should raise concerns that the EU's current renewable expansion plans are inadequate to meet power demand growth from data centres *and* other sectors. For example, under REPowerEU, electricity demand for transport in the EU could grow by approximately 130 TWh between 2024 and 2030[48]. **New data centre demand alone could consume as much as the added power needed for the electrification of the entire transport sector in the EU by 2030**.

While the EU has seen a considerable and welcome growth in renewable energy, EU governments are still facing a situation where they must do more to meet their renewables targets. Unless action is taken and significantly more renewable energy is invested in and planned to be built, there is a risk that additional data centre demand could attract the already available and planned renewables. In turn, this could lower the overall share of renewables available on the market to displace fossil fuels for other parts of the economy. If projected data centre expansion outstrips planned renewables growth without bringing additional renewables to market, this could put the current momentum of the wider power sector energy transition at risk.The UK's AI plans vs renewables ambitions

[48] Assessment based on TYNDP 2024 Draft Scenarios Report – May 2024, https://2024.entsos-tyndp-scenarios.eu/

The UK's AI plans vs renewables ambitions

On the other hand, applying the hypothesis to the UK, we see that the context is different, as the UK government lays out a more transparent and ambitious plan to decarbonise its power sector. Nonetheless, concerns also arise for the UK. Within the 'high demand, high renewable energy' context, with the government's current renewable energy commitment, 11.4% of the total added annual renewable energy generation would be required by data centres in the short term, and 7.2% by 2030 (see Figure 5 and Table 10 in Annex).

The UK government's plan to achieve clean power by 2030 sets out the transformation needed toward a largely renewables-based power sector, reducing the share of fossil gas to less than 5%[49] (while having already phased out coal from power generation). At the same time, it is also a growing hub of data centres and has just announced an action plan to embed AI 20-fold into the economy[50]. It is unclear whether its AI ambitions are in line with its clean power goals.

The UK is planning 'AI growth zones' that would direct 'clean energy' towards data centres and provide access to power grids[51]. The AI plan involves investigating the potential of Small modular reactors (SMRs), however as these will only be available at the very earliest after 2030, they cannot play a role in the 2030 clean power plan. This would leave renewables to fill the gap, requiring nearly 12% of newly added renewables in the UK in the short term (according to the 'high demand, high renewable energy' hypothesis). This could create a risk of insufficient renewable energy available to decarbonise the rest of the power sector and meet growing demand from electrification elsewhere in the economy that needs to be mitigated.

The UK's clean energy plan already requires major grid upgrades for new energy projects, housing and electrification of industry. According to the National Grid, it may need to increase grid infrastructure five times what has been achieved in the last 30 years[52]. More data centres will only increase the load on these already strained grids. According to the NESO, the clean power plan accounts for a 400% increase in power demand from data centres[53], but it is not clear if the planned 20-fold increase in publicly-controlled AI is also factored in.

[49] https://www.gov.uk/government/publications/clean-power-2030-action-plan
[50] https://www.gov.uk/government/news/prime-minister-sets-out-blueprint-to-turbocharge-ai
[51] https://www.gov.uk/government/publications/ai-opportunities-action-plan-government-response/ai-opportunities-action-plan-government-response
[52] https://www.nationalgrid.com/document/152011/download
[53] https://www.neso.energy/document/346791/download

CASE STUDY: Microsoft

Microsoft's Global Electricity Demand On Track to Exceed 44 TWh - Renewable Procurement not Keeping Pace

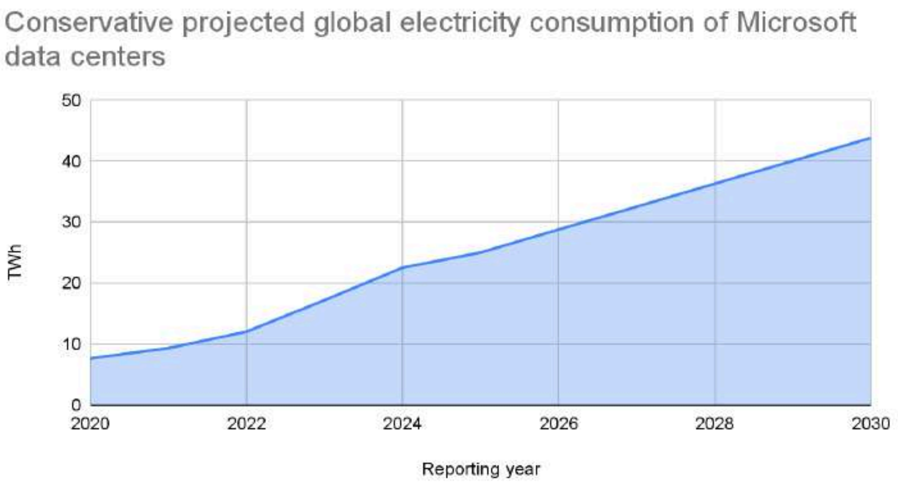
Microsoft's data centre expansion is driving significant electricity consumption in Europe. Relying on unbundled renewable energy certificates could lock in fossil fuel dependence and contribute to pushing Europe off track from meeting its climate targets.

Microsoft is actively expanding its data centre capacity to support its growing cloud business and meet the rising demand for data storage and processing. Other tech giants including Google, Amazon, and Meta, are also rapidly expanding hyperscale data centres globally. These companies dominate global cloud infrastructure and are among the largest electricity consumers worldwide. Their energy strategies have an outsized impact on global emissions.

Conservative estimates project Microsoft's global electricity consumption will reach 44 TWh[54] by 2030 (see diagram below). The EMEA (Europe, Middle East, Africa) region accounts for 24%[55] of this total. Over 90%[56] of this energy is used by data centres, which are expected to consume up to 11 TWh annually (comparable to Lithuania's[57] annual electricity use). Most data centres in this region are in Europe, with only a few in Africa and the Middle East, making the energy demand predominantly European.[58]

Notably, Microsoft only reports on its self-built data centres. However, these represent only a shrinking share of operations[59], as Microsoft and other tech companies rely heavily on leased or third party data centres, whose energy demands are often underreported or excluded from corporate disclosures.

[54] Microsoft's data centre electricity needs for the reporting years 2020-2024 are calculated based on global electricity consumption data and Scope 2 emissions from data centres, as reported in CDP disclosures. The projection for electricity use in Microsoft's data centres from 2025 to 2030 was derived using a line of best fit.
[55] Microsoft 2024 CDP report.
[56] Microsoft 2024 CDP report.
[57] https://www.cia.gov/the-world-factbook/field/electricity/country-comparison/
[58] https://datacenters.microsoft.com/globe/explore/
[59] https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-role-of-power-in-unlocking-the-european-ai-revolution#/



Despite claiming that their data centres are matched with 100% renewable energy[60], Microsoft's latest energy reporting reveals a heavy use of 'unbundled' renewable energy certificates that only exist on paper in Europe, which do little to decarbonize the grid and can hide a reliance on fossil fuels. Microsoft has recently signed several large power purchase agreements (PPAs) to add new renewable capacity in Europe, increasing its purchase of higher-impact renewables. However, its extreme growth trajectory in regions with high fossil fuel power generation raises doubts about whether its renewable energy procurement can keep up with rising energy demand.

As Microsoft continues to expand its data centre operations across Europe[61], its climate targets are getting further out of reach. Even more concerning is the underestimation of its climate impact. Hidden emissions from manufacturing energy-intensive microchips, outsourced emissions from rented colocation facilities, and reliance on carbon offsets[62] all obscure the real environmental impact. If these factors were fully accounted for, the climate impact would likely be much higher. These issues are further compounded by a lack of transparency, making accountability and meaningful progress even more challenging.

To mitigate these impacts, Microsoft must invest in high-impact renewable energy additional to the grid, improve transparency on energy use and emissions, and align its operations with its 100% renewable energy goals. Without these measures, its data centre expansion risks fueling the climate crisis.

This research was contributed by Stand.earth

[60] https://datacenters.microsoft.com/globe/powering-sustainable-transformation/
[61] https://azure.Microsoft.com/en-us/blog/Microsoft-supports-cloud-infrastructure-demand-in-europe/
[62] https://www.ft.com/content/3ac7e92f-bea5-4460-8791-23a2697d8b80

3. RECOMMENDATIONS

The report's findings suggest that the growth of data centres risks derailing Europe's energy transition, unless immediate action is taken. Without commitments to source fossil-free, renewable energy for new data centres, the increase in emissions from its data centres could affect its climate ambitions. Unless renewable energy generation for data centres is additional to the already planned generation, Europe's power sector decarbonisation could be thrown off course.

Based on the findings, we are demanding that:

1. **All new data centres in Europe must be fossil-free**

A direct rise in emissions from fossil gas expansion is not an acceptable option. Europe needs to be looking to phase out fossil gas, not open more gas plants. As discussed above, with nuclear too slow, risky and expensive, and other technologies not available at scale, the only viable and sustainable alternative to fossil fuels is renewable energy.

Companies must commit to phase fossil fuels out of their power sourcing and make the switch to renewable energy. As part of this, companies must provide greater transparency around their real-time fossil fuel use, in particular by disclosing their location-based emissions per data centre[63]. They must also disclose data on the lifecycle emissions of their data centres, including the embodied carbon of the equipment itself—such as chips, servers, storage devices, and other hardware.

2. **New data centres energy demand must be met with *new and additional* renewable energy in the same deliverable grid**

Switching to renewable energy clearly cuts direct emissions from data centres to near zero. However the question is, will this come from existing renewables, or new but already planned renewables, or wholly new and additional renewable energy? Taking existing renewable energy is an unviable option; new demand should be met with new generation. Sourcing from renewables that are already planned and factored into Europe's renewable targets also raises issues: new data centre demand could take up to 20% of this planned renewable energy generation in the coming five years.

This could slow down the wider power sector energy transition. Other sectors are already facing challenges in meeting their renewable goals. High data centre demand could limit the renewables available to decarbonise these other critical sectors. To mitigate this, **a switch to renewables by data centres will therefore only support Europe's climate goals if companies commit to bringing *new and additional* renewables online.**

[63] The EU has introduced a reporting framework for data centres with the first results to be published (in aggregate form) in the first half of 2025.
https://energy.ec.europa.eu/news/commission-adopts-eu-wide-scheme-rating-sustainability-data-centres-2024-03-15_en

Additional renewables imply that the renewable energy project would not have been built without the intervention and support of the company. For example a project that has received public financial support cannot be counted as additional, as it was already receiving support. It also implies that the investment is not crowding out other renewable projects.

Signing Corporate Power Purchase Agreements (CPPAs), where companies provide financial support and long term guarantees to renewable energy projects, can support the development of additional renewables. Yet, evidence indicates that CPPAs make up only a small portion of new data centre demand power sourcing. In Ireland, a key data centre hotspot, recent estimates suggest as little as 16% of the new electricity demand from data centres in Ireland between 2020 and 2023 was met with CPPAs.

New data centre power demand requires new capacity. Companies bear the responsibility to ensure their new power demand is not sourced from renewables that were already destined for other sectors. They must take action to support new and additional renewable capacity that increases the overall share of renewables.

3. **New data centres must be at least 90% matched with renewable energy from the start.**

The current system of how companies can claim to use renewable energy is not incentivising the phase out of fossil fuels nor the development of new renewables. By allowing companies to buy ‘unbundled’ renewable energy certificates that only exist on paper[64] from anywhere in Europe at any time of day or night (annual matching), it hides a de facto reliance on fossil fuels. The system creates no incentive for companies to actually clean up their power supply. Data centres cannot play a role in driving more renewables on to the grid and reducing fossil fuels unless they move towards buying locally-sourced renewable energy that is matched on an hourly basis to their energy use.

Companies must aim at 100%—in other words 24/7—hourly matching as soon as possible, and no later than 2030. Larger companies especially have the resources required to achieve this. Some companies have made commitments and efforts[65] to move in this direction. In the meantime, companies must aim for at least 90% matching of new data centre power demand with renewable energy, to ensure that their new data centres are not incentivising additional fossil fuels.

Companies like Amazon and Meta, however, are going in the opposite direction and advocating for renewable energy sourcing rules that fully detaches their purchases from their real energy use. Such approaches will essentially allow companies to offset their fossil fuel

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64
https://newclimate.org/resources/publications/navigating-the-nuances-of-corporate-renewable-electricity-procurement. Renewable Energy Certificates are known as Guarantees of Origin in Europe.

65 Google has committed to be 24/7 hourly matched with carbon-free energy by 2030 https://www.google.com/about/datacenters/cleanenergy/ and Microsoft has supported efforts for a 24/7 carbon-free marketplace.
https://www.datacenterdynamics.com/en/news/google-and-microsoft-back-247-carbon-free-energy-marketplace/

use with certificates[66]. All companies must, at the very least, endorse the principle of 24/7 hourly matching and reject false solutions.

4. **Companies must commit to transparency on energy demand projections for their upcoming data centres**

It is likely that a portion of new demand from data centres is already accounted for in renewable energy growth projections and grid expansion plans etc. However, with the data centre boom accelerating at an unprecedented rate, it cannot be assumed that the totality of this intense growth has been accounted for. We need far greater clarity on how much of this new demand has been factored into planning and how much has not. There remains a great deal of uncertainty about how the AI and data centre boom will unfold. Transparency on the location and power demand of the planned data centres will allow proper planning to ensure the growth remains within sustainable limits.

5. **Data centre growth must happen at a sustainable pace and within sustainable limits**

As the findings of this report suggest, data centre growth could put pressure on access to energy and grids, and especially renewable energy across key sectors. Where data centres are taking a significant portion of available electricity, putting intense pressure on the grid, and failing to displace fossil fuels, policy makers must consider moratoria or caps on data centre energy demand.

Essential sectors of society—like schools, hospitals, and households—must have priority access to energy. The electrification of industry and heating is also an essential measure that reduces overall emissions, and so should take priority over energy uses such as AI workloads that do not directly lower emissions. This prioritisation may therefore require companies and policy makers to rethink the speed and scale of data centre development if it cannot grow within sustainable limits.

[66] https://beyondfossilfuels.org/2024/10/10/24-7-renewable-electricity-matching/

4. CONCLUSION

Today, there is an upward trajectory of renewable energy in Europe, and a decline in fossil fuels, that is reducing emissions and providing an affordable, secure, and sustainable power system. The findings of this report present a stark vision of the impact data centre growth could have on Europe's energy transition, specifically in slowing down Europe's power sector transition. In the absence of clear policies by companies and governments to ensure new demand is met with new and additional renewables and investments in grids, there is a clear risk of a significant rise in emissions due to data centre growth. This is either caused directly, through expanded gas infrastructure, or indirectly, by new data centres consuming such a high share of planned renewables that other sectors are forced to rely on fossil fuels.

New power demand must not lead to more fossil fuels in Europe, nor must it derail the energy transition by outstripping the development of new renewable energy. Data centre energy demand growth is a multifaceted issue which will affect the fate of Europe's energy transition, requiring efforts from companies, governments, municipalities, the EU, grid operators, and others to manage the challenge. But the risks associated with data centre growth must be addressed head on.

This report finds it is urgent to ask if and how we can sustain the growth and pace of data centre development in Europe. 2030 is a critical year for Europe's climate goals and energy transition. We cannot afford to miss this deadline, yet the risk that data centres' insatiable appetite for energy presents in driving up emissions is clear and present.

While its proponents have been claiming that AI—one of the drivers of this growth—is a solution for the climate crisis, its carbon footprint is actually a major concern. Tech companies bear a responsibility to reduce their emissions and not contribute to climate change. In addition, AI tools are also sold by the world's richest tech companies to the world's largest fossil fuel companies to continue to explore and extract oil and gas. At the very least, they must cease contracts with the oil and gas industry before AI's positive role in the climate crisis can be considered.

This report has made projections of possible future energy demand from data centres. The worst case scenarios should serve as a warning. Yet the future is not written and a great deal of uncertainty abounds. What is clear is that which path we take will depend largely on the actions of companies and governments. These actors, especially Big Tech corporations with huge resources at their disposal, must take action now to avoid data centres derailing Europe's energy transition plans and fueling the climate crisis.

5. ANNEX

5.1 Scope of Research

Geographic scope

We include the EU and UK in the analysis. Unless stated otherwise, in this report, we refer to these two regions together as Europe. We utilise IEA data as well as projections from McKinsey for the EU, and data from the NESO for the UK.

Power demand scope

The scope of the report is also restricted to new data centre demand in Europe. We do not assess the implications in terms of emissions for existing European data centres, which will also still be operational in 2030, bringing additional emissions and impacts on top of what is calculated in this report. We have chosen to focus on new demand only to assess what impact this will have for Europe on energy transition plans and emissions.

Energy sources scope

Where we mention renewable energy here we are specifically referring to wind and solar. Other energy sources could play a marginal role but for different reasons will not emerge as dominant energy sources. Coal is possibly playing a role in meeting demand today in Europe, however, the development of new coal plants in Europe is unlikely due to unfavourable economics and given the necessity of Europe's coal phase out. Traditional nuclear energy will not be available at the scale, speed, and costs needed. SMRs have been reported to be a potential solution to the demand, however none will be available in the next five years, and there is uncertainty even beyond that timeframe[67]. SMRs will therefore not be useful in meeting current demand growth. This is not to mention the broader cost and safety issues related to the expansion of nuclear energy. While some hydropower and biomass are under development in Europe, they carry critical risks towards nature, and in any case, will likely remain marginal.

The new demand created by data centres up to 2030 will therefore be mostly met by fossil gas and/or renewables, as these are the only technologies available in time and at scale.

Timeframe scope

With 2022 as the baseline year, the projection period starts from 2025 and ends in 2030.

Power supply scope

For the first power supply option we hypothesised a high share of fossil fuel taking into account the actual dynamics in the market, which indicate that renewables will be a part of

[67] https://ieefa.org/articles/nuclear-hype-ignores-high-cost-long-timelines

the sourcing. We chose a ratio of 61% gas to 39% renewables, borrowing from S&P Global's projections for the US[68], to accommodate a relatively high but plausible range of fossil gas, while keeping a realistic amount of renewables in the mix.

For the second power supply option, we asked: what if 100% of the new demand from data centres was met with renewables? Major tech companies like Google, Microsoft, and Amazon are committed to 2030 net zero targets, so this renewable trajectory could be plausible if commitments are enforced and data centre growth is aligned to credible and robust renewable energy procurement.

For the high renewables trajectory, we estimate emissions, however the report also takes into account the needs of the entire power sector with regard to the renewable energy transition. Our methodology assumes that the renewable energy would be non-additional to already planned generation in order to further analyse the impact if the new demand is met with additional versus non-additional renewable energy.

There must be an adequate supply of renewable energy to meet the needs of all sectors, and so data centres' choice to opt to invest in renewable energy that is additional or non-additional to what is already planned is significant. If new data centre demand is met with non-additional renewable energy, what impact will this have on the availability of renewable energy for other sectors? In particular, for the electrification of key sectors like heat and transportation. We therefore looked at the IEA's projection on total renewable energy generation to be added in Europe up until 2030, and calculated what percentage of that new planned generation would be needed to meet the new power demand from data centre growth.

Data centre scope

Coverage of data centre types and geographies within the data sources we are utilising are not always consistent, reflecting the lack of consistency across the different sources we are relying on. IEA 2024a includes traditional data centres, dedicated AI centres, and crypto-mining consumptions and projects for the EU, while McKinsey 2024 focuses on non-crypto mining data centres in Europe. UK NESO 2022 does not specify the detailed categories of data centres they include in their projections.

Other limitations

Emission factors for fossil-fueled electricity generation are unlikely to change much in the years leading up to 2030, unless large-scale Carbon Capture, Usage, and Storage (CCUS) is adopted, which is unlikely in the short term. In our analysis, for simplicity purposes, we assume that emission factors stay the same throughout the baseline and projection periods.

We focus on quantifying the GHG emissions embedded in the electricity consumed by the data centres, and do not account for upstream emissions, which also vary depending on the

[68] https://www.spglobal.com/ratings/en/research/articles/241030-data-centers-rapid-growth-will-test-u-s-tech-sector-s-decarbonization-ambitions-13302390

specific source of fuel, for example in gas extraction or renewable energy supply chains, and could be significant[69].

There are also local cases where data centres are supplied with electricity generated by their own fossil-fuel captive power plants when disruptions or restrictions of the grid occur[70], which may result in higher emissions and are not included in the analysis, given that our hypotheses are made at a regional level.

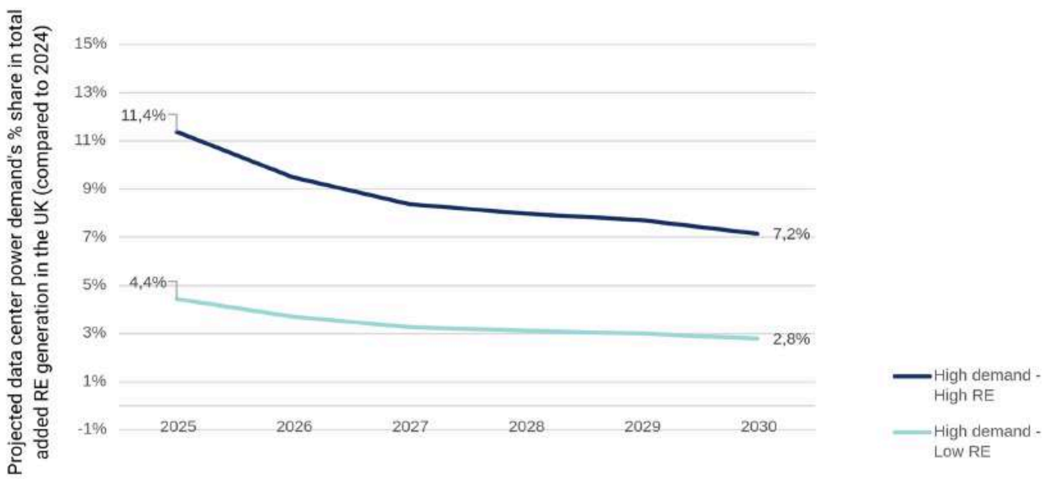
5.2 UK Tables and Figures

Table 10. Added renewable energy generation and data centre demand (TWh) powered by renewable energy since 2024 in the UK within the 'high demand, high renewable energy' and 'high demand, low renewable energy' contexts.

Year	Total added RE generation in the UK	High demand, low RE		High demand, high RE	
		Added data centre demand powered by RE	Share of total added RE generation	Added data centre demand powered by RE	Share of total added RE generation
2025	14.1	0.6	4.4%	1.6	11.4%
2026	31.4	1.2	3.7%	3.0	9.5%
2027	52.1	1.7	3.3%	4.4	8.4%
2028	72.0	2.2	3.1%	5.7	8.0%
2029	92.4	2.8	3.0%	7.1	7.7%
2030	118.8	3.3	2.8%	8.5	7.2%

Note: Projected total added renewable energy generation data for the UK are from IEA 2024b.

Figure 5. Percentage share of total added (compared to the 2024 baseline) renewable energy generation could be consumed by new data centres in the UK within two demand hypotheses.



[69] https://www.greenpeace.org/static/planet4-eastasia-stateless/2022/10/89382b33-supplychange.pdf
[70] https://www.thejournal.ie/investigates-data-centres-6554698-Nov2024/

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ABOUT:

Beyond Fossil Fuels is a collective civil society campaign committed to ensuring all of Europe's electricity is generated from fossil-free, renewable energy by 2035. It expands and builds upon the Europe Beyond Coal campaign, and its goal of a coal-free Europe in power and heat by 2030 at the latest.

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