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Data Centre Demand and Speculative Overcapacity

Executive summary

The strongest, cleanest evidence of **overcapacity today is not global delivered stock; it is the gap between queueing and credible need in specific power markets, especially Great Britain**. Ofgem said that GB demand-connection applications had reached about **125 GW by June 2025**, almost **three times** current system peak demand, and that **data centres alone accounted for roughly 50 GW** across around **140 projects**. NESO's own independent 2025 scenarios, by contrast, put total GB **data-centre connections at only 9.9-14.6 GW by 2050**, with electricity demand rising from an estimated **7.6 TWh and 2.4 GW connected in 2024** to **30-41 TWh by 2035**. On the neatest like-for-like comparison, the current GB data-centre queue is therefore about **3.4-5.1 times** even NESO's 2050 connection requirement, and roughly **21 times** today's connected load. That is the single most defensible "speculative overhang" figure in this research. [1]

Ireland is a different story. There, the measured load is already materially large rather than merely promised. Ireland's Central Statistics Office reported that data centres consumed **6,969 GWh in 2024**, equal to **22% of metered electricity consumption**. EirGrid's 2026-2035 adequacy assessment then showed **17 transmission-level** and **five 110 kV distribution-level** data-centre projects either connected or holding signed connection agreements, with **2024 demand of 959 MVA** for the bundled category "data centre and new technology loads", rising to **1,402-2,183 MVA by 2035** depending on scenario. That is evidence of **real system stress and a heavy contracted pipeline**, but it is not the same as the GB pattern of queue inflation outrunning credible need by several multiples. [2]

At the **global** level, the evidence is far more mixed. The IEA estimates that data centres consumed **415 TWh in 2024**, about **1.5% of world electricity**, and projects a **Base Case** of about **945 TWh by 2030**. The IEA-4E critical review, which is more sceptical of headline hype, finds that high-quality studies imply around **335-360 TWh in 2023** and a plausible **600-800 TWh in 2030**, with AI-specific data-centre use rising to about **200-400 TWh** by 2030. In other words, independent institutions still see **very strong real growth**, but not support for the wilder end of the market narrative. At the same time, market data still show tight delivered markets rather than a broad, present-tense glut: CBRE reported a **global weighted vacancy rate of 6.6% in Q1 2025**, while Synergy Research said the number of operational hyperscale data centres reached **1,136 by end-2024** and the future hyperscale pipeline stood at **504** in March 2025. The balanced conclusion is therefore this: **a global "everything is already overbuilt" thesis is not yet supported by the best evidence; a regional "queues and financing are running far ahead of credible need" thesis is.** [3]

The measured baseline

The most important discipline here is to keep **measured**, **contracted**, and **announced** figures separate. Even in 2026, that remains harder than it should be. The IEA-4E review notes that **most governments still do not collect or publish official statistics on data-centre energy use**, and that such consumption is usually buried within the broader commercial-building category. That matters especially in the UK, where public debate often treats queue applications, consultant forecasts, and actual consumption as though they were interchangeable. They are not. [4]

For **global measured-or-best-institutional-estimate electricity use**, the most robust figure is the IEA's **415 TWh in 2024**, equal to around **1.5% of world electricity consumption**. The IEA also reported that data-centre electricity demand **rose 17% in 2025**, which suggests the sector is still accelerating rather than flattening in the aggregate. The United States accounted for the largest share of 2024 global data-centre electricity use at **45%**, followed by **China at 25%** and **Europe at 15%**. [5]

For the **United States**, Lawrence Berkeley National Laboratory's December 2024 update remains the best independent bottom-up estimate: **178 TWh in 2023**, excluding crypto, or **4.4% of US electricity use**, including roughly **40 TWh** for AI-specialised servers. LBNL projected a very wide but still bounded range of **325-580 TWh in 2028**. That range is far below the most feverish extrapolations, but still large enough to make the US the main engine of global demand growth. [6]

For **Great Britain**, there is still **no official audited national metered series published specifically for data centres**. The best public system-operator proxy is NESO's estimate that GB data-centre demand in **2024** was **7.6 TWh** from **2.4 GW connected facilities**, around **2% of GB electricity demand**. That is useful, but it is still an estimate rather than a direct regulator-published metered series. This lack of transparency is itself one of the report's core findings. [7]

For **Ireland**, by contrast, the metered picture is unusually clear. The CSO reported data-centre electricity use of **6,969 GWh in 2024**, up from roughly **6,336 GWh in 2023**, and equal to **22% of metered electricity consumption** in 2024. In the Irish case, the data-centre debate is no longer about hypothetical growth alone; it is about an already large and measurable share of national load. [8]

Water is where the fog thickens. England's National Framework for Water Resources says explicitly that the authorities are **"experiencing barriers in gaining information about water consumption"** from the data-centre sector and that **without this information they are unable to accurately model or predict future water needs**. That is the most important UK water fact: the system does not yet know enough. A UK government-commissioned review, citing the IEA, says global data-centre water use is **over 560 billion litres per year** and could rise to **1.2 trillion litres by 2030**, but this is **not** the same thing as a globally audited official meter series. It is best treated as a sector estimate, not a fully observed baseline. [9]

The credible baseline of genuine future demand

The sober baseline is not "no growth". Independent institutional work points to **substantial real growth**, but also to large uncertainty and clear efficiency offsets. The IEA's 2025 *Energy and AI* report projects global data-centre electricity consumption to reach around **945 TWh by 2030** in its Base Case. The IEA-4E critical review is more cautious and notes that published 2030 projections span almost **40-fold**, from **210 TWh to 7,900 TWh**, but concludes that a plausible range is closer to **600-800 TWh by 2030**, with AI-related data-centre electricity use of **200-400 TWh** by then. In other words, independent experts do not deny the boom; they dispute the most extravagant versions of it. [10]

The biggest reason not to naively extrapolate raw capacity announcements is that **efficiency is improving very quickly**, both in hardware and in algorithms. Stanford's 2025 AI Index reports that the **inference cost** of a system performing at **GPT-3.5 level** fell by more than **280-fold between November 2022 and October 2024**. The same report says hardware costs have fallen by about **30% a year**, while energy efficiency has improved by roughly **40% a year**. Epoch AI likewise reports that GPU **FLOP/s per**

watt has doubled about every **2.4 years**, and that **pre-training compute efficiency** is improving at roughly **3x per year**. Those are not reasons to dismiss demand growth, but they are reasons to reject simplistic “every new AI use-case requires a proportional new block of megawatts” thinking. [11]

There is a second restraint on the most bullish demand claims: **algorithmic progress is not negligible**. Epoch AI’s analysis of language-model progress finds that while most gains since 2018 have still come from more compute and data, algorithmic changes have also mattered, and the economics of delivering a given level of model performance are moving fast. That means some workloads that look impossibly expensive on current hardware may become commercially routine without requiring a one-for-one multiplication of power demand. [12]

For **Great Britain**, the most credible independent baseline is NESO’s *Future Energy Scenarios 2025*. That puts data-centre electricity demand at **30-41 TWh in 2035** and **51-71 TWh in 2050**, with **9.9-14.6 GW** of connections by 2050 across the main net-zero pathways. Those figures are large enough to matter to the grid, but they are still nowhere near enough to justify a **50 GW** queue if every application were treated as genuine, bankable need. [13]

For **Ireland**, EirGrid’s 2026-2035 adequacy forecast gives a sizeable but more measured ramp. The category it models is broader than data centres alone — **“data centre and new technology loads”** — which is an important limitation. Within that category, **2024 demand was 959 MVA**, and the 2035 range is **1,402 MVA in the low scenario**, **1,870 MVA in the median**, and **2,183 MVA in the high**. EirGrid also says that by **2030**, this bundled category could account for **32% of all Irish electricity demand** in the median view. That is a severe system-planning issue, but it is still a forecast bounded by actual contracts and historical ramp patterns rather than by developer press releases. [14]

The announced and speculative figure

For **Great Britain**, the clearest announced-or-queued number is Ofgem’s estimate of **around 50 GW of data-centre demand applications** within a total demand-connection application pool of **about 125 GW** by June 2025. Ofgem’s own framing is telling: this total was almost **three times** current system peak demand, and it was one reason the regulator concluded that the old first-come, first-served process was no longer fit for purpose. This is precisely the kind of “zombie project” problem the queue reforms are trying to unwind. [15]

NESO’s March 2026 call-for-input summary adds a second sign of speculation: among responding data-centre projects, a **majority had not secured an end-customer or off-taker when they applied for connection**. That does not prove bad faith. It does, however, mean much of the queue is best described as **optionality-seeking** rather than as fixed demand. In infrastructure history, optionality tends to look visionary in the boom and speculative in the bust. [16]

The ratio arithmetic is stark enough to state plainly:

Geography	Measured or connected today	Credible independent baseline	Announced or queued figure	What the gap implies
Great Britain	**2.4 GW** connected; **7.6 TWh** in 2024 (NESO estimate) [17]	**9.9-14.6 GW** connections by 2050; **30-41 TWh** by 2035 [13]	**~50 GW** data-centre queue within **125 GW** demand applications [15]	Derived ratio: queue is **~3.4-5.1x** the 2050 connection requirement and **~20.8x** current connected load.
London	**~760 MW** peak demand at 99 sites [18]	No fully independent London-only load forecast found in this pass	City Hall says queue requests are **up to 10x** current demand [18]	Strong local sign that requested capacity far outruns present load, though the underlying technical study is consultant-produced.
Ireland	**6,969 GWh** metered in 2024; **959 MVA** for "data centre and new technology loads" in 2024 [19]	**1,402-2,183 MVA** by 2035 for the same bundled category [20]	**17 transmission** + **5 distribution** projects connected or signed; final CRU policy now requires matching onsite/proximate generation for new sites to ramp or operate fully [21]	Large contracted pipeline, but public official data do **not** permit a clean phantom-capacity ratio comparable to GB.
Global	**415 TWh** in 2024 [22]	**600-800 TWh** by 2030 in the IEA-4E plausible range; **945 TWh** in IEA Base Case [23]	Hyperscale pipeline of **504 future facilities** in March 2025; operational hyperscale fleet **1,136** at end-2024 [24]	I could **not** derive a defensible global MW overcapacity ratio from public sources, because pipelines are reported in mixed units and mix planning, leasing and retrofits.

That last row matters. **Globally, the evidence does not support a neat single overcapacity ratio**. The market is too heterogeneous, and announced pipelines are not reported with the same clarity as grid queues in GB. In fact, the current market data can be read the other way: Synergy sees a very large hyperscale pipeline, but CBRE still sees **tight vacancy** and demand outpacing supply in many core and emerging hubs. The speculative excess is therefore **more obvious in connection queues, financing chains and some AI-specific campuses than in global delivered occupancy data**. [25]

Dissenting voices and bust signals

The most credible sceptics are not only campaigners. They include system operators, market analysts, and investors who do not deny AI's importance but doubt the buildout math.

Ofgem and NESO are sceptical in the most practical way: they are rewriting the queue because too much of it is not construction-ready. Ofgem said the current process was letting projects progress without sufficiently distinguishing strategic and viable demand from speculative demand, while NESO's own scenario work implies a far smaller long-run connection need than the queue suggests. [26]

EirGrid and the CRU are sceptical in a different way. Ireland's regulator decided in December 2025 that a new data-centre connection **cannot be operational or ramp to full Maximum Import Capacity** unless associated onsite or proximate generation and/or storage is also delivered and operational at a matching de-rated level. Regulators do not impose rules like that when they think the issue is a harmless paper queue; they do it when they see a security-of-supply problem. [27]

George Kamiya and Vlad Coroamă, in the IEA-4E critical review, are the best methodological sceptics I found. Their point is not that demand will stay flat. Their point is that the public debate is polluted by bad estimates. They note that published 2030 global forecasts differ by almost **40 times**, and they narrow the plausible 2030 range to **600-800 TWh**, with AI-specific use at **200-400 TWh**. That is a direct warning against both hype-heavy developer forecasts and simplistic anti-tech extrapolations. [28]

David Cahn of Sequoia is the clearest financial sceptic. His "**AI's $600B Question**" argues that the revenue implied by the AI infrastructure buildout is far above current realised end-user value. He also argues that supply shortages have eased, GPU stockpiles are growing, and AI compute is moving towards a more commodity-like market structure with weaker pricing power than promoters imply. This is not an energy-systems model, but it is a serious warning that infrastructure spend may be outrunning monetisable demand. [29]

Howard Marks of Oaktree is the historical sceptic. He does not claim to know whether AI is "the" bubble, but he argues that transformational technologies **regularly** attract **too much infrastructure** and that debt can magnify the eventual losses. He is unusually blunt that some data centres may become uneconomic and later be bought by a new generation of owners "at pennies on the dollar". [30]

Actual **bust signals** are appearing, but selectively rather than system-wide. Reuters reported that TD Cowen's supply-chain checks showed Microsoft had cancelled a **couple of hundred megawatts** of US leases in February 2025, and then by March analysts said Microsoft had pulled back from projects amounting to about **2 GW** of electricity in the US and Europe over the prior six months, specifically citing a possible **oversupply position relative to demand forecast**. That is one of the clearest real-time warnings from a hyperscale customer rather than an activist. [31]

Project attrition is also rising at the local level. Construction Dive and Utility Dive both reported, citing Baird analyst Justin Hauke, that data-centre **cancellations rose to 25 in 2025 from 6 in 2024**, with public opposition and power access increasingly acting as brakes. Charlotte has already imposed a **150-day moratorium** on new data-centre construction while it studies energy, water and zoning impacts. These are not proof of a macro bust, but they are early tremors. [32]

The financial plumbing is becoming more fragile too. Reuters reported that a UBS analysis found AI data-centre and project-financing deals surged to **$125 billion in 2025**, up from **$15 billion** in the same period of 2024, while Morgan Stanley estimated private credit could provide more than half of the **$1.5 trillion** needed for data-centre buildout to 2028. At the same time, Oracle's growing debt load and capital-raising plans have become a live market concern, with Reuters reporting fresh worries in June 2026 over debt-funded AI buildout. Debt is not itself overcapacity — but in every historical analogue, it is what turns over-optimism into forced selling. [33]

Yet the counterevidence is strong enough that any honest report must state it clearly. CBRE still finds vacancy falling, not rising, in global markets. Synergy still sees a rapidly expanding operational hyperscale base. The nearer truth is therefore not "the boom is fake"; it is "**real demand exists, but the paper buildout around it is running ahead of what the best independent models and some customer behaviours can presently justify**." [34]

Historical parallels

The history does not whisper that every boom is a fraud. It says something subtler and more dangerous: **transformational infrastructure often does get built — and society may benefit from it — but investors and localities still suffer badly when promoted scale outruns bankable demand**. The table below keeps to the figures I could defend; where I could not independently corroborate a requested number, I say so.

Analogue	Promoted scale	Realised outcome	Who benefited first	Who was left holding the loss	Confidence
British Railway Mania	Railway securities and enthusiasm exploded; the number of railroad securities listed in London and their prices **roughly tripled between 1843 and 1845**. Rail capital formation peaked at **nearly 7% of GDP** in **1847**. Odlyzko describes it as one of history's greatest technology manias. [35]	The network still transformed Britain, but the boom ended in financial crash and the eventual proving-out of demand came only after the speculative phase had burned through capital. I did **not** independently corroborate a single clean aggregate investor-loss figure or a primary-source mileage authorised-versus-built ratio in this pass. [36]	Promoters, contractors, landowners, engineers, and later consolidators who bought distressed assets cheaply. [37]	Investors who bought on excitement rather than earnings; later equity holders once prices reverted. [38]	**Medium** for the macro pattern; **lower** for one-line totals of authorised mileage and aggregate loss.

Analogue	Promoted scale	Realised outcome	Who benefited first	Who was left holding the loss	Confidence
Telecom and fibre-optic glut	Internet traffic was widely hyped as doubling every **three months**; by contrast Odlyzko's work showed actual backbone traffic growth nearer **80-100% a year**. US telecom spending reached **$345 billion in 2001**. [39]	Huge volumes of fibre stayed dark; Hecht's review says creditors tried to unload dark-fibre networks for **pennies on the dollar**, and cites Odlyzko's estimate that the collapse **vaporised about $2 trillion of stock valuation**. [40]	Fibre-equipment vendors and insiders who sold early; later acquirers of distressed network assets. [40]	Equity and bond investors in firms such as WorldCom, Global Crossing and other overbuilt carriers. [40]	**High** for the direction of the lesson; **medium** for exact aggregate values.

Analogue	Promoted scale	Realised outcome	Who benefited first	Who was left holding the loss	Confidence
Hyundai semiconductor plant, Dunfermline	A **£2.4 billion** two-phase project and roughly **2,000 jobs** were promised. [41]	The project was **halted before production started**; the Guardian reported Hyundai **never received promised grants because no new jobs were created**. EE Times later described Motorola buying the prepared site, and later reporting described the plant as a never-used “white elephant”. Public reports conflict on how much Hyundai actually spent before cancellation — around **£250 million** on the shell in one account, much more in folklore — so I treat the spend figure as disputed. [42]	Construction contractors and later acquirers of a ready-made site. [43]	The main losers were the original developer and the local political narrative that had sold the project as industrial salvation. [44]	**Medium** on promised scale and failure to launch; **low-to-medium** on actual spend totals.

Analogue	Promoted scale	Realised outcome	Who benefited first	Who was left holding the loss	Confidence
Trump Menie golf resort, Aberdeenshire	Trump promised about **£1 billion** of investment and **6,000 jobs** at Menie. [45]	By 2016-17, reporting indicated only about **100-150 direct jobs** had materialised and key elements of the original resort vision — large hotel and housing components — had not appeared. These employment figures are historical snapshots rather than a current 2026 audit, so they are best read as evidence of early under-delivery rather than a current headcount. [45]	The promoter gained political leverage, publicity and favourable planning treatment. [45]	Local communities bore environmental and planning costs while the promised employment and investment gap persisted. [46]	**Medium** for the promise-versus-delivery pattern; **lower** for the current long-run realised total.

The historical rhyme is not that infrastructure manias leave nothing behind. Rather, they tend to leave **useful physical assets, damaged balance sheets, and a trail of investors, communities, or public planners who made decisions on promoted demand instead of realised demand**. Railways, fibre and data centres all share that dangerous mixture of genuine long-run utility and near-term speculative excess. [47]

The pattern

A pattern emerges from the numbers, and it deserves to be stated plainly.

Where **actual metered demand is already high**, as in Ireland, the argument is about whether public systems should devote more grid and water headroom to further private campuses. Where **queue demand greatly exceeds independent grid scenarios**, as in Great Britain, the argument is first about **clearing the fog of speculative claims** before land, wires and water are allocated as though all applications were inevitable. Those are different political and technical questions, and muddling them produces bad policy. [48]

The best evidence supports four broad propositions. First, **global data-centre demand is real and still growing fast**. Second, **headline forecasts are highly unreliable unless they explicitly model efficiency gains and adoption uncertainty**. Third, **GB queue data already show speculative overhang far above credible need**. Fourth, **delivered global capacity does not yet show a broad glut**, because vacancy remains low and the strongest signs of excess are still concentrated in queues, financing stacks, and some AI-specific lease pullbacks rather than in a universal collapse of rents or occupancy. [49]

What do the analogies predict, with proper caution? Probably **not** empty data halls everywhere next year. More likely: **queue reform, project attrition, slower ramp schedules, selective cancellations, more expensive debt, and distressed refinancing for weaker tenants or second-tier locations**. In markets with genuine scarcity and deep customer demand — Northern Virginia, major cloud regions, parts of Dublin — completed assets may remain valuable even if many announced schemes never leave the paper stage. That outcome would fit both the historical pattern and the present evidence. [50]

If one sentence must carry the weight of the report, it is this: **the clearest defensible gap is between GB's paper queue of roughly 50 GW of data-centre applications and NESO's own 2050 requirement of 9.9-14.6 GW, while globally the evidence points to a real boom shadowed by speculative excess rather than a universal, already-realised glut.** [51]

References and limitations

Key sources used in this report were the **IEA**'s *Energy and AI* analysis and executive summary, published **10 April 2025**, plus the IEA's **16 April 2026** update on 2025 growth. [52]

For methodological scepticism and country estimates, I relied heavily on **George Kamiya and Vlad C. Coroamă**, *Data Centre Energy Use: Critical Review of Models and Results*, prepared for **IEA-4E EDNA**, **March 2025**. [53]

For the US baseline, I used the summary of **LBNL / Shehabi et al. (2024)** as cited in the IEA-4E review. [6]

For Great Britain, the main sources were **NESO, Future Energy Scenarios 2025**, **21 November 2025**; **Ofgem, Call for Input on strategic demand and queue reform**, **7 May 2026**; NESO's **Summary of Responses** on demand queue reform, **18 March 2026**; and **National Grid Electricity Distribution's Data Centre Impact Study**, **1 November 2025**. [54]

For Ireland, the main sources were the **CSO Metered Electricity Consumption** release and data cube for 2024; **EirGrid/SONI All-Island Resource Adequacy Assessment 2026-2035**; and the **CRU Large Energy User connection policy decision**, **12 December 2025**. [55]

For water, I used **Environment Agency / GOV.UK National Framework for Water Resources 2025**, updated **15 April 2026**, and a **UK government-commissioned review** that cites the IEA water estimates. [9]

For market pipeline and occupancy context, I used **Synergy Research Group** releases from **9 January 2025**, **19 March 2025**, **24 June 2025**, and **13 April 2026**, as well as **CBRE Global Data Center Trends 2025**. [56]

For financial scepticism and current bust signals, I used **David Cahn, Sequoia Capital**, **20 June 2024**; **Howard Marks, Oaktree**, **9 December 2025**; **Goldman Sachs**, **1 May 2026**; plus Reuters reporting through **June 2026** on Microsoft lease cancellations, debt financing and Oracle's buildout. [57]

For historical analogies, I used **Andrew Odlyzko**'s work on Railway Mania, the **New York Fed**'s *Crisis Chronicles* piece, **McCartney (2024)** on network and capital expansion during Railway Mania, **Jeff Hecht (2016)** on the fibre-optic bubble, plus contemporary reporting on **Hyundai Dunfermline** and **Trump Menie**. [58]

The main unresolved questions are these. **The UK still does not publish a clean national metered data-centre electricity series**; **the UK and Ireland do not publish a robust national water-consumption series for data centres**; **the exact share of phantom or duplicate queue applications is not publicly quantified**; **a defensible global MW overcapacity ratio cannot be constructed from the public sources I reviewed**; and for the historical analogues, **exact aggregate capital lost** in Railway Mania and **exact public subsidy committed or spent** on Hyundai Dunfermline were not independently corroborated to the standard required for stronger claims. Those are not small caveats. They are part of the story. [59]

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