Energy UK response to Risks and opportunities to the sustainability of data centres in the UK

1 April 2026

About Energy UK

Energy UK is the trade association for the energy industry, representing companies investing billions of pounds to secure our country's current and future energy needs.

From growing start-ups to major electricity generators, grid and infrastructure developers, and energy suppliers, our members are driving change across power, heat, transport, and flexibility.

We provide a collective voice for the sector working with governments, regulators, charities and other organisations to provide crucial insight that shapes policy, offers solutions and promotes best practice.

Our broad view across the whole system supports evidence-based positions which are not tied to particular technologies, and are focused on delivering strategic benefits for people, businesses and the economy.

We champion initiatives such as our Vulnerability Commitment, which pushes suppliers to go beyond regulation to support customers with additional needs, and TIDE, the industry's drive for greater inclusion and diversity. Through our Young Energy Professionals Forum, we support the development of future leaders. We are equally committed to our team and are proud to be recognised as a 'Gold' Investors in People employer.

Energy UK is committed to being an active participant throughout this enquiry, given our members provide a critical role in building and running the electricity system data centres rely on, design and build data centre related energy infrastructure and once operational provide data centres with electricity and other energy fuels.

Should you have any questions or require further information please contact Rachel Cary, Head of Industrial Strategy Rachel.Cary@Energy-UK.org.uk.

Executive Summary

Data centres have been earmarked as a key growth sector by the Government, yet their sustainability profile demands careful consideration and strategic planning. With projections suggesting that, by 2050, data centres could account for 12% of all GB electricity demand, they must be treated as major players in the energy system, and not peripheral actors.

It is the decisions made today regarding design, siting and operational infrastructure which will have a profound impact on the rollout of data centres for decades to come. Therefore, it is right that the Environmental Audit Committee is addressing these questions now, so that we can best better prepared for the future.

The sector faces significant near-term challenges. Grid connection constraints are acute, and while proposed reforms may expedite data centre connections, there is real risk that prioritising their access to a limited network capacity could divert resources away from the essential reinforcement needed to connect renewable generation projects and other demand customers from critical parts of the economy. This tension is one which must be carefully managed to avoid undermining broader decarbonisation goals.

Increased electricity demand from data centres could present an opportunity for both electricity and wider energy system decarbonisation. Data centres can act as flexible assets through demand-side response (DSR) and energy storage co-location, unlock waste heat recovery value and fund expansion of low-carbon generation. It could also help reduce cost for other energy systems users by spreading costs across a wider consumer base.

However, the speed at which we expect the data centre sector to scale may create sudden and intense pressure on the electricity system, whereby under the current policy framework much of the opportunities will be missed.

In the short term, the priority will be to secure timely grid connections without compromising connections for other demand customers or renewable generators. It will be important to ensure minimum standards are built into data centres designs and they are carefully monitored to minimise their environmental impacts and future proof their operation. Over the medium term, the focus should be on deeper policy reform and positioning data centres as significant funders of low-carbon infrastructure expansion and active participants in a flexible low carbon energy system. Equally, data centres will have a role to play in connecting with heat networks, making them more cost-competitive and offering clean heat solutions to households in more urban and densely populated areas. And finally, in the longer term, the sector has the potential to become a catalyst for the commercialisation of next-generation nuclear technologies such as SMRs and MMRs that could play a defining role in the 2030s energy landscape.

The opportunities that lie ahead are vast, but the energy system is complex and already undergoing significant changes at pace. The Government needs to set out a bold vision for how data centres can contribute to sustainable growth and ensure different policy levers and mechanisms across multiple Departments (including DSIT, DBT, DESNZ, MHCLG and Defra), NESO and Ofgem align with this approach.

It is only through close cooperation and active engagement across sectors of the economy that we will successfully capitalise on these opportunities – and, critically, avoid the risk of treating data centres as peripheral players in the system, rather than the active players they must become in the energy landscape of the future.

Enquiry Questions

What current and future factors and trends are driving demand for data centres and what opportunities and challenges do they pose for the UK?

Data centres currently use 1-2% of electricity in Great Britain (GB). The rapid adoption of AI, machine learning, and the Internet of Things means data centres are forecast to account for 12% of GB electricity demand by 2050, the equivalent of more than 20 million homes.[1] However, forecasts vary significantly depending on the level of uptake of AI, and the future of electricity demand for data centres is highly uncertain.

Opportunities

- If connected to the electricity grid, the increase in electricity demand offers potential benefits to other electricity consumers by spreading the non-commodity costs. This could help make up for lower-than-expected growth in demand due to slow electrification of transport and heat.
- With policy change, growth in data centre demand could also help increase the amount of low carbon generation required to electrify the economy. Changes to Greenhouse Gas (GHG) and Environmental, Sustainability and Governance (ESG) reporting could help drive investment in additional capacity beyond that currently being delivered by government support schemes such as the Contracts for Difference (CfD) Scheme. They could also play a role in keeping existing low carbon capacity on the system after government support mechanisms expire, helping to pay for the additional maintenance costs and investment required.
- Data centres could also contribute to electricity security of supply if mandated and encouraged to use electricity flexibly and install low carbon storage and generation technologies to supplement this. If located in the right areas and they invest in energy storage, they could increase the efficiency of the whole system, reducing carbon emissions associated with constraints.
- An opportunity which requires further improvement is the development of low carbon cooling technologies and options to utilise waste heat. Heat networks currently supply just 2–3% of UK heat demand but are expected to grow to approximately 20% by 2050. Delivering this scale-up will require large, reliable, year-round heat sources located close to demand centres. Data centres, particularly new build, are uniquely suited to play this role. However, this rapid expansion of digital infrastructure presents a narrow but critical window. Design and siting decisions taken today will lock in operational outcomes for 20–30 years. If heat recovery is not designed in from the outset, opportunities to capture large volumes of low carbon heat will be materially more complex and expensive to realise later. By combining data centres with new build developing, data centres could benefit from reduced cooling costs and benefit heat networks by providing waste heat, increasing their efficiency and providing lower cost low carbon heat.

Challenges

- While there are huge opportunities ahead, there are limitations to the scale of new low carbon generation that can be brought forward in time to power additional data centre demand deployment to due to delays in receiving a grid connection, even with connection reform already underway. These are due to challenges in network capacity delivery caused by supply chain and technical challenges faced by network

[1] NESO (2025), FES: Data Workbook 2025; Energy UK analysis

operators.[2] Despite ongoing reform, many low carbon generators and network operators struggle to gain timely planning permission because of environmental regulation and a lack of capacity at statutory organisations.

- The other key challenge for data centres, and for all other demand users, is securing timely connections to the distribution and transmission networks. Proposed reforms by DESNZ[3] and Ofgem[4] to prioritise the connection of data centres could have a subsequent impact on low carbon generation if it diverts resources away from reinforcements required to connect generation projects. There is also concern that some of the reform proposals that prioritise data centres ahead of other types of demand could deprioritise other essential connections vital to wider Government policy.
- Government reforms to demand network connection should be based on clear principles around wider social, economic and environmental factors. However, the criteria set out in the DESNZ consultation omit environmental and energy systems impacts. This could lead to both higher electricity system emissions and increased costs to other system users, as it fails to take into account the energy system costs associated with both connecting the asset and running the system.
- Given constraints in available network capacity in many areas of the distribution and transmission network, reallocating and prioritising demand connections for existing capacity will only lead to further delays for other types of end users. It is key that we reinforce networks to ensure there is sufficient capacity for all end users by forecasting data centre demand accurately and ensuring future network price controls have adequate headroom in them to enable sufficient investment by both transmission and distribution network operators and the National Energy System Operator (NESO). However, predicting future data centre demand and its location is challenging and could lead to significant over- or underspend, both with negative impacts on wider energy system users.
- Network operators are currently unable to make anticipatory investments under the current price control frameworks and can only consider new data centres once they receive an actual application from a data centre developer. This is a disjointed process, as it takes significantly longer to then build the required network infrastructure to connect a data centre than it does to build the data centre itself. This is a particular issue at the transmission level, when connection triggers wider reinforcement.
- Similarly, data centre developers can also find it hard to access consistent information on network availability, connection times, and costs until they have already submitted an application. This contributes to the cycle of delays in receiving timely grid connections. Similar factors were at play in the USA, and this led to the installation of standalone gas-fired systems for some parties. On-site and 'private wire' power assets can reduce costs and timelines for data centres to be made operational, but their viability depends on space and site characteristics.
- The Government should require mandatory carbon reporting for all data centres, requiring developers to consider, for example, what is required to secure access to low-carbon power from the grid or on-site. Those installing gas generation as a bridging solution before full or partial grid connection can be secured should be set mandatory carbon targets that ensure a move away from gas as the primary power source.

[2] Ofgem (2026), Update on delays to connection dates for some TMO4+ Protected Projects
[3] DESNZ (2026), Accelerating electricity network connections for strategic demand
[4] Ofgem (2026), Demand connections reform

- The need for more reinforcement ahead of need going forward has been recognised at a distribution level by Ofgem in its proposals for the Electricity Distribution Price Control 3 (ED3).[5] It will be important that, as we move into ED3, the flexible 'use cases' Ofgem has outlined are promoted to data centre operators and incentivised - e.g. flexible grid connections. This can help data centres play a critical role in delivering system-wide flexibility, with benefits to consumer bills

What are the environmental impacts that different types of data centres are currently having in the UK, and what are the future impacts likely to be?

The main impact will be associated with the significant grid electricity they consume. Water usage, noise and local air pollution emissions may also be an issue depending on the technology, cooling and energy systems installed.

The environmental impact of data centre grid electricity use will depend on the type of power used by the data centre and how it is procured. At the national level, it will depend on the ability to scale low carbon generation at sufficient pace to meet demand as covered below.

The timing of data centre electricity demand and its relationship to national low carbon power generation and demand will have an impact on the carbon emissions associated with the sector. It will also depend on the location of the data centre and the availability of low carbon power in the local network. Some technology companies have made commitments to reduce greenhouse gas emissions by obtaining 24/7 carbon-free energy, which can help reduce operational emissions, but this alone will not help increase the capacity of low carbon power on the system. It will be vital for data centres to flex their electricity usage as much as possible by load shifting and investing in low carbon flexible assets to minimise the impact.

Following the Access SCR, data centres can take up non-firm connections that are cognisant of existing thermal and voltage constraints. Non-firm connections can provide a range of environmental and cost benefits, including:

- They can enable better utilisation of existing infrastructure, reducing the need for network reinforcement in some areas.
- They can reduce the cost and emissions associated with constraints as they enable operators to manage congestion in real-time.
- They can help speed up the integration of renewable generation and other distributed energy resources (DERs).

To incentivise this, data centres, and other electricity users, that accept non-firm connections, provide DSR, and co-locate BESS should receive priority or fast-track processing in SSEP and NESO connection queues, processing in national and regional spatial plans and the network connections queue.

Ofgem should actively monitor the number, application and impact of non-connections and phased connections to avoid any adverse consequences such as delays to necessary reinforcements. Clear guidance for those types of connections should be set out by Ofgem, with processes standardised across network areas in line with the drive for standardisation and service improvements under the End-to-end Review of Connections Processes.

[5] Ofgem (2025), Sector specific methodology consultation: electricity distribution price control (ED3)

Given their significant impact on the network and other energy users, we welcome the inclusion of considering minimum levels of demand flexibility for data centres as a requirement for connection in the recent DESNZ consultation and voluntary levels for faster connection.[6]

In GB, most data centres currently in development are connected to the electricity grid with diesel or Hydrotreated Vegetable Oil (HVO) back-up generators to use if their power supply fails. To meet environmental rules, they must limit operating hours to fewer than 50 per year and are prohibited from entering into flexibility markets, so they can't use this back-up capacity to contribute to efficient electricity system operation. An alternative to this approach would be to use battery storage, or potentially cleaner and more efficient gas turbines, with the potential for low-carbon gas to be used in future. If designed currently, these systems could provide the dual function of backup supply to the data centre and dispatchable generation to the grid. Co-located flexible demand with onsite or private-wire generation could help reduce the size of the electricity system and reduce operational costs, resulting in wider consumer savings.

However, the current approach to hybrid sites is inadequate, and the approach to enabling projects to use on-site generation and storage to manage their impact on the system needs to be considered. Several barriers need to be addressed:

- The demand connection capacity requirements detailed in the Security and Quality of Supply Standard (SQSS) 3.5.1 should be clarified. This clarification could help to ensure that those connecting new demand, while permanently reducing their maximum demand needs through flexible technologies, are recognised as holding a lower network requirement, resulting in a lower cost to connect. This should also feed through into ongoing network charges. Pricing network charges based on capacity impact and actual usage, i.e. reforming DUoS and TNUoS to give explicit credit to flexibility services, is also required.
- Changes to environmental permitting would encourage a move away from diesel generators to cleaner gas and electric technologies. These technologies could then be expanded and coordinated with others to enable data centres to participate in DSR activities.[7] [8]
- Wider changes to licence exemptions could encourage a range of solutions, such as the use of clean private-wire networks incorporating generation and storage. This can more broadly optimise and standardise network connection processes across network operators. The Government and Ofgem should review existing license conditions, codes and guidance regarding private wire network solutions to assess if these remain appropriate.
- Data centres must apply separately for an import and export license for any co-located generation or private wire energy assets, adding complexity and cost. Data centres installing behind-the-meter batteries will need to apply for headroom in network capacity so they can charge the battery. This would be improved if applications were streamlined to consider the many facets.

[6] Government is considering a range of measures, including whether categories of large demand users, such as data centres, should be required to provide a minimum level of demand flexibility as a condition of connection, enabling NESO to curtail or limit demand

[7] DESNZ, DEFRA and Data Centres could agree a streamlined environmental permit process for hydrogen ready gas turbines fuelled by HVO, methanol or biodiesel and hydrogen in the longer-term.

[8] Data centres would also need to install export metering and make changes to control systems on sites to enable them to participate in markets.

- Current generation licenses prevent existing generators from providing private-wire power to more than one offtaker, as well as limiting the commercial basis on which such power can be sold. This limits the potential for co-location between data centres and existing power generators, which could otherwise offer higher efficiency 'matching' of power demand to supply without the need for e.g. any associated transmission network reinforcement.
- Planning regulations currently discourage data centres with private power supplies above 50MW being identified as Nationally Significant Infrastructure Projects (NSIPs), requiring them to take the more arduous planning route of a DCO rather than seeking approval by the Local Authority. This discourages concentration of larger data centre loads with bespoke generation assets that could otherwise offer potential efficiency gains. The impact of any new on-site or private wire generation on other electricity market participants and system operation needs to be considered further.[9]
- Greater regulatory clarity is needed on the use of onsite generation by clarifying definitions of emergency use versus market participation, enabling clean backup generators to participate in grid services.

What are the potential short, medium and long-term projections of these impacts?

In the short-term the critical issue will be ensuring that data centres get a timely grid connection without negatively impacting other demand customers or low carbon generation. By providing flexibility through load control and installation of low carbon flexible assets, they can also make a useful contribution to helping alleviate constraints that are currently high but due to fall in the 2030s as the network is reinforced (see below). [10]

In the medium-term, and with policy reform, data centres can contribute to the funding of additional existing and new mature low carbon generation and potentially network build, helping to expand the size of the low carbon electricity system beyond 2030. They could also play a role in bringing forward flexible storage and generation assets (running at low load factors as back-up), helping to contribute to our security of supply. [11] This will be vital to enabling the whole economy to electrify, moving to more efficient and lower carbon forms of energy supply. There may be some timing issues to meet growing data centre demand due to limitations in renewable build out and nuclear build and technology development.

And, in the long-term, data centres could help bring forward commercial investment in emerging technologies, including SMRs and MMRs that may be deployed in the mid-2030s.[12] A well-designed planning system that considers data centres as part of new development could lead to optimal siting for waste heat use by homes, businesses and industry. A combination of policy levers could be used to encourage data centres that can be located far from customers to use excess electricity generated in parts of the country that are constrained due to remaining network constraints even after planned reinforcements.

What impact are data centres having on climate change and the Government's Net Zero targets and how will this change in the short, medium and long term in the UK?

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[9] Data centres would also need to install export metering and make changes to control systems on sites to enable them to participate in markets.

[10] This is when renewables have to be curtailed in some locations of the electricity network as there is insufficient capacity to transmit their power. This results in gas generation being turned up in other areas to balance the system.

[11] This is particularly relevant given that most recent Capacity Market arrangements have not delivered any new large-scale gas generation in GB.

[12] NIA (2025), Powering the UK Data boom the nuclear solution to the UK's data centre energy crunch

N/A

To what extent will Artificial Intelligence (AI) accelerate the need for data centres and is this being adequately taken account of by the Government and relevant bodies, such as the Climate Change Committee and the Office for Environmental Protection, in terms of nature, the environment and climate change?

N/A

To what extent do existing policies, such as the Environmental Improvement Plan and the Planning and Infrastructure Act and associated policies, take account of the potential impact of data centres, particularly in terms of water use, nature and the environment?

The policies in question are built on a framework that assesses the environmental impact of all potential developments, meaning data centres are subject to the same assessments as other infrastructure projects. The challenge is that data centres should not be considered in the same way as they pose specific risks. Given that data centres have grown rapidly in the UK in a short space of time, environmental impacts are likely to be less well quantified than other forms of infrastructure. Equally, data centres have a variety of complexities that differentiate them, such as whether they use water coolant systems or not. Data centres are subject to the sharing of Environmental Impact Assessments, as are other projects.

The level of planning scrutiny depends on the size of the data centre development and whether it is installing energy generation capacity.

The updated National Planning Policy Framework (NPPF) in England significantly strengthens support for data centres, classifying them as critical infrastructure and urging local planners to facilitate their development. However, the proposals set out in Annex A - Data Centres and onsite energy generation are unclear and underdeveloped. [13]

Large developments need to submit an energy statement/strategy and go through the DCO process, with the Environment Agency setting out the energy requirements for the site, grid access and generation. Smaller data centres go through Local Authority planning. Containerised, small-scale modular data centres fall within the scope of minor planning applications or, in some cases, permitted development.

Planning requirements for successful data centre applications can include: pre-development agreement from water companies, power connections, district heating network feasibility studies, local employment obligations, biodiversity net gain and public benefits packages.[14]

There are currently no sustainability-specific planning conditions beyond standard environmental impact considerations. Mandatory sustainability metrics should be introduced as a planning condition, provided they are proportionate and do not create barriers for smaller, modular projects that may be more sustainable than hyperscale facilities. The metrics proposed in Annex 1 should become mandatory planning conditions for all new data centres above a threshold capacity (e.g., 1 MW IT load). This would create a level playing field and reward projects designed for sustainability rather than minimum compliance.

Some grid connections already require some minimum standards. For example, some DNO connection offers include Active Network Management (ANM) requirements that mandate

[13] Energy UK (2026), Energy UK response to National Planning Policy Framework: proposed reforms and other changes to the planning system

[14] National Grid DSO (2025), An analysis of the growth and impact of data centres in National Grid Electricity Distribution's licence areas.

flexible load behaviour. However, there is no explicit requirement for BESS co-location, waste heat planning, or carbon reporting.

Enforcement is lacking, and there is no systematic post-connection monitoring of data centre sustainability performance. Monitoring operational performance will be key and will require additional roles for the Environment Agency and/or Local Authorities, but it will require clear metrics and reporting templates to be practical.

There is currently a lack of alignment in the timescales for securing all of the requirements necessary for a new development, with a timeline mismatch throughout the customer journey. Streamlining the process so developers could apply for electricity, water, gas, and planning permission all together would be welcomed and enable better coordination across different policy objectives. Given long-lead times, data centres may apply for grid connection years ahead of seeking planning permission. However, Ofgem has proposed that those seeking a demand connection should receive partial or planning permission before seeking a grid offer.

Lessons can be learned from regulators in the US who have sought to gather information from data centre developers and utilities to ascertain likely energy demand growth and the environmental impacts of individual data centres, alongside the cumulative impact of multiple data centres within an area or even state and multi-state level impacts. [15]

The Government should work with other institutions to introduce guidance, advice, and requirements for all new data centres across planning and electricity network connection processes. It will be important for the Government to work with NESO, Ofgem, and industry to introduce energy specific guidance, advice, and even specific requirements for all new data centres, linking these to processes and conditions for network connection and planning permissions, to establish best practice and set minimum standards e.g. for energy efficiency and ability to connect to heat networks, building on international standards.

How should the impact of data centres be factored into future policies, such as the Land Use Framework, regional planning, housebuilding and reform of the water sector?

As above, data centres are subject to the same environmental laws and assessments as other infrastructure. What makes data centres unique is the speed of scaling up, and subsequent rapid demand of resources such as electricity, and water for cooling in some designs.

Spatial planning for energy, but also for other resources such as water, will be of greater relevance for data centres than for other developments. Data centres have a large physical footprint, with the largest site in development equal in size to nine football pitches. These will need to compete with other demands for land, including housing, food production, and energy generation.

How important is the location of data centres, and what factors should be considered for optimum siting of them?

Many data centres need to be located near areas of high economic activity, and new sites need careful planning. For most data centres, location is driven by network access, adjacency to fibre networks, and customer demand. In many cases, the type of data centre defines where it will be located, as it may need to be close to customers or near other data centres.

[15] Regulatory Assistance Project (2026), Building Resilient Foundations for Large Loads

Co-located sites and those using AI models will stay in areas close to customers. Data centres using the Cloud may also need to be near other data centres to create resilience, but in the US, some cloud computing is done several hundred kilometres away from customers. Therefore, data centres delivering specific activities such as AI model training and potentially some cloud data processes can be based in areas away from customers.

New data centre demand is welcome in some areas of the country where excess renewable generation is otherwise curtailed but could be more challenging to manage than in others. Coordinating data centre development and wider demand changes, with the buildout of clean power generation, could help to maximise the use of low-carbon electricity and deliver lower energy bills across the UK. Only some types of data centres can be located far from end-users, and these require a range of incentives and frameworks to know where to locate. For example, some estimates project that up to around 1GW of data centres could be based in Scotland, near to the ~10GW of wind farms currently in that country. Scotland only accounts for 10% of GB electricity demand, so much of the power generated is transported to England. UK curtailment costs £1.8 billion in 2025 and is forecast to increase further in the coming years.[16]

However, where there is congestion on the grid, many windfarms are paid to stop generating by NESO due to insufficient grid capacity. A much more complex analysis of the potential for locating demand closer to generation is required before commenting on whether this would be a viable alternative to transporting that energy to existing demand centres in the south of GB via significant network upgrades.

Estimates of future hyperscaler data centre growth in GB are inherently uncertain and depend on factors including the need for data sovereignty (which could drive investment to GB) and the relative cost of electricity compared to other jurisdictions (which could deter investment in GB). Some estimates suggest that a larger share of data centres in the future will consist of hyperscale business models. In 2017, small on-premises enterprise data centres comprised 60% of the market, and hyperscale data centres only accounted for 20%. By 2023, hyperscale data centres represented 40% of the market, and could reach 60% of the market by 2027.[17] There has been a drive for cloud service providers to develop more facilities for businesses that wish to outsource their IT infrastructure. This drive is partly due to the EU Exit, as the UK sector seeks to become more self-sustaining.[18]

An alternate optimal location for many smaller data centres will be integrated into denser areas where there is heat demand for homes and businesses. For example, edge data centres, which are smaller, more distributed sites, should be located closer to end users to reduce latency for applications such as autonomous systems, gaming or real-time analytics.

Network connection is likely to be the largest energy-related driver of location in the near term. In the short-term, reforms to demand network connection should better factor in the location of the demand and impact on the electricity system, rather than being applied across all demand regardless of its location. Prioritisation could be given to those that can be built in areas with significant curtailment of renewable generation and therefore absorb excess renewable generation, or in dense urban areas where waste heat can be utilised.

Once connected, network charges also have the potential to provide a fairly strong locational signal. Under Ofgem's review of network charges, the regulator should consider the options for a strategic locational signal for demand, and options for exemptions for strategically

[16] EDF (2026), UK constraint costs in 2026: why we need a better map for the energy transition
[17] ICIS (2026), Data centres: Hungry for power, Forecasting European power demand from data centres to 2035
[18] Knight Frank (2024), Data Centre Development Report

needed sectors like data centres. Ensuring that the data centres based in more built-up industrial areas are, where possible, built close to current and future heat networks, and considering the options for mandating connection to these networks would also be welcome.

The Government and NESO, working alongside industry via the AI Energy Council and wider engagement, should look to quickly establish clarity over the optimal locations and likely energy impacts of additional data centre investment in the UK. The current process is opaque, and it is not clear how sites are being selected, what energy requirements are being placed on them, nor how many future zones will be selected.

To enable better planning and more proactive and strategic building of the networks required for all data centre not just those in AI growth zones, a more understanding of the likely future demand and location of data centres across the UK needs to be established quickly as part of the work of the AI Opportunities Action Plan. This can then be factored into longer-term network planning by NESO, which will subsequently flow through to future network price controls.

Longer-term strategic network planning needs to consider likely investment not just across data centres but the whole economy. As NESO establishes an approach to strategic spatial planning, consideration of the estimated impact of changes in demand, whether due to electrification or the connection of new developments, must be core to the approach taken.

As well as energy policy locational signals, wider levers such as planning and infrastructure provision will also play a key role in siting data centres in optimal locations for both electricity and heat considerations.

Has the Climate Change Committee adequately taken into account the impact of data centres, especially in its advice on the Seventh Carbon Budget?

N/A

What existing and emerging technologies can be used to minimise the environmental and climate change impact of data centres?

Data centres could contribute to system flexibility to reduce costs for other consumers and carbon emissions associated with running the electricity system. This could involve both demand turn-up at times of high low-carbon generation and demand reduction to move consumption away from peak demand, reducing the size of the electricity system.

Many data centres, especially hyperscalers that own their own data racks, can provide some DSR by either load shifting – reducing computing demands by sharing tasks between sites or delaying non-time-critical operations – or by using their own generation and storage to manage their usage at peak times. Hyperscalers typically absorb the financial risk of downtime themselves rather than relying on uptime guarantees from external providers (SLAs). They also have visibility over their own workloads.

There may be potential for flexibility across all types of data centres in cooling demand, which can account for a considerable proportion of total electricity usage, with significant potential for data centres connected to heat networks to reduce cooling loads for short periods of time without breaching temperature limits.

As the scope for large-scale demand shifting is often quite limited, on-site generation or investing in additional energy storage capacity are likely to be the most realistic options to enable data centres to engage in DSR and reduce electricity consumption at peak times, or to reduce the size of their network connection overall.

Data centre developers should be encouraged to immediately reduce their system impact by installing low carbon on-site energy options and agree to some DSR, potentially by partnering with nearby end users able to offer flexibility, to enable earlier connection dates. There are, however, many barriers that will need to be removed to help enable this, as outlined above.

The Government should look to ensure that new data centres can technically provide DSR and that leasing or other commercial arrangements don't preclude it. This will require considering site characteristics and data centre type, while also making DSR an attractive option for users.

A range of changes would be required to deliver this approach, some of which are already in progress, and others which require additional workstreams and resources to deliver. These proposed changes would help ensure that data centres contribute to efficient electricity system operation and help reduce the size of the electricity system needed, reducing bills for all consumers. It would also create new business models, accelerating investment in low carbon technologies and supporting innovation.

Flexibility markets need to be designed in a way that encourages the economic participation of all options for larger-scale demand flexibility, including data centres. Revenues from flexibility markets need to be sufficiently attractive to overcome the administrative burden of participating and/or the loss of workload capacity. This requires action to address structural problems impacting the business case for flexibility, including rules preventing revenue stacking and barriers to capacity my market access. The direct financial rewards for flexibility are often unclear or insufficient, especially when compared to the potential costs of downtime or Service Level Agreement (SLA) breaches. [19]

As well as making flexibility markets more attractive, the Government should work with NESO to determine the minimum flexibility requirements, technical and commercial, for existing and new data centres to ensure impacts on security of supply and overall system costs are minimised. This could see appropriate requirements for DSR capability set at a certain percentage of connection capacity for data centres operating over a certain threshold and be factored into planning requirements.

Lessons can be learnt from the USA, where programmes are seeking to reduce the peak demand from data centres to speed up grid connections and enable the growth of the sector (see question on international examples below).

Other barriers to data centres offering flexibility identified by LCP Delta[20] and other Energy UK members include:

- Regulatory divergence: EU-level guidance can provide some clarity, but differences in national applications and local policies make it a challenge for data centre operators to apply a strategy across their global portfolio.
- Cultural norms: Data centre operators tend to be risk-averse, with a strong focus on reliability and reputation. As such, adopting flexible energy usage can be perceived as a threat to the core business, rather than an opportunity.

[19] LCP Delta (2026), How to incentivise flexibility in European data centres: From rigid load to a grid asset by 2030

[20] LCP Delta (2026), How to incentivise flexibility in European data centres: From rigid load to a grid asset by 2030

- Contractual: Rigid SLAs and 'five nines' reliability contracts leave little room for operational flexibility. Altering these agreements would require a fundamental shift in how services are delivered and guaranteed.

However, flexibility does not have to compromise reliability. Operators can:

- Oversize and partition backup capacity: Reserve a protected band of Uninterruptible Power Supply (UPS) and BESS strictly for emergencies, while using surplus for grid services. This will be delivered by oversizing the asset past what the data centre needs for backup requirements.
- Automate safeguards: Deploy energy management systems (EMS) with hard ceilings to prevent SLA breaches.
- Innovate contracts: Introduce flexibility clauses that define safe operating envelopes and compensation for curtailment events.
- Aggregation of multiple sites: Spread risk and reduce reliability concerns by participating in flexibility markets with various other data centre sites in a coordinated portfolio via an aggregator.
- Leverage clean power assets during short periods of grid curtailment, as a mechanism to enable them to continue their operations as normal i.e. avoiding the modulating of compute.
- An alternative to changing SLAs may be to develop new business models that deliver reliability and flexibility at the same time - e.g. delivering flexible grid connections via clean power portfolios.

These measures allow operators to monetise flexibility without risking uptime, turning reliability concerns into a competitive advantage.

There are also technologies to help reduce water use as outlined in the case studies below.

How mature are these technologies and are they ready to be rolled out at the scale and pace required to match the potential expansion of data centres?

There may be innovative solutions available to better share and utilise existing network connection capacity. Network operators report that data centre utilisation is only around 40-60% of their connection capacity.

Data centres can already make a significant contribution to efficient low carbon power system operation through load shifting, installing batteries and gas-based generation – though this should only be as back-up capacity under carbon limits.

However, data centre capacity to load shift requires further development and there is a need for national and EU-funded demonstration programmes, building on EPRI's DCFlex project (see international examples below). A number of companies are working on inference optimisation. For example, in GB Emerald AI, EPRI, National Grid, Nebius, and NVIDIA recently announced a landmark UK-first demonstration proving high-performance AI infrastructure that can operate as a flexible, grid-responsive asset. The trial cut electricity demand of a 96 NVIDIA Blackwell Ultra cluster by more than a third in under a minute, without disrupting critical compute workloads.[21]

A combination of all three technologies will play a role as they provide different system services and benefits, over different timescales.

[21] National Grid (2026), UK-first trial of AI Grid Technology Successfully Demonstrates the Ability of Data Centres to Adjust Power Needs

Load shifting

- The ability to move tasks both in time and between data centres and areas/countries will depend on both the type and ownership of the data centre racks and nature of the tasks undertaken, which may change over time.
- Google is undertaking work to look at how it can shift tasks, specifically around AI learning models, and participate in flexibility markets. [22] It has moved computational loads in Ireland and is looking at load shifting between markets.
- Cooling loads can offer significant flexibility particularly if the data centre is connected to a heat network. A recent UKERC report notes the potential for Thermal Energy Storage and thermal inertia to time shift the cooling of data centres. [23]
- Flexitricity can provide cold store capabilities that can give 3% reduced consumption over 1 hour. No-one is currently doing this in the UK, but more substantial work is underway in the US where there is a mandate for cold storage.
- Load shifting is most suitable for AI training loads which may represent a significant proportion of the future market, but this is uncertain. They are also unlikely to be in urban areas that face higher levels of congestion on the distribution network. In these areas batteries may be a faster and more scalable option.

Batteries

- All data centres have Uninterruptible Power Supply (UPS). UKERC notes that it is estimated that a substantial fraction (10%-50%) of the UPS capacity within data centres is excess and potentially can be used as a source of flexibility to the electricity grid. However, most of them are "dumb" – i.e. they use the grid electricity to charge them, but can't discharge back to the grid. Some data centre operators, including Microsoft, are upgrading these so they are smart. There is currently 1.5GW of data centres, meaning 1.5GW of UPS with 4-5 min run-time that could provide a very quick response.
- Diesel generators are there to provide 72 hours of back-up whereas the UPS is there for short periods when grid goes down. BESS units are particularly useful from a space footprint perspective. An 8hr BESS unit, which can cover 16hr of load, occupies a similar space to a traditional diesel generator.
- The installation of BESS to deal with longer periods and can be oversized to contribute to system operation. The scale will depend on the capital expenditure available versus possible revenue. Additionally, gas turbines have longer start up times so BESS could play important bridging role.
- Additional investment in BESS colocation both behind the meter and in front of the meter, including in AI training data centres, would enable data centres to participate in load shifting, and can support a smooth integration with the power system by reducing grid strain, increasing load stability and improving data centre Voltage Ride Through (VRT) characteristics.
- Modelling of AI data centre clusters suggests we can expect significant power fluctuations from sites unless managed in a way that smooths power load. Connecting a BESS battery, in parallel to the data centre load, helps reduce the variability of the load by 70%, improving grid reliability, power quality and offering grid stability assurance. There are significant implications for other users of wider energy system because of such significant load variations. These can cause damage to nearby generators, and voltage flicker.

[22] Googe (2025), How we're making data centers more flexible to benefit power grids
[23] UKERC (2025), Flexibility in the GB Power System

- Data centres are investing in batteries to optimise their grid connection and manage increased demand during hot periods, enabling them to increase the number of racks at a site without the need for changes to network connection size.
- Research in the US of 22 balancing authorities found that 2-5hr of curtailment (0.25% of new load) enabled through BESS storage, opened-up the capacity equivalent to 10% of UK peak load.[24]
- Projects designed to improve the variability of the load are typically sized to peak load. If only 30% of the load is variable, a 30% peak load battery could therefore be most appropriate.

Gas turbines

- There is potential to install modular 5MW turbines on-site or via private wire. These could be fuelled by methanol or other alternative fuels before gas supply comes online, or the data centre can secure electricity grid connection. These could potentially use hydrogen in the longer-term.
- Simple open cycle gas generation turbines (OCGT) are the most flexible but least efficient. These OCGT can be retrofitted later to a Combined Heat and Power (CHP) or CCGT system depending on future use and heat demand to phase the capital spend. Absorption chillers can also be incorporated into the design.
- If the gas system is going to be off grid for a long time it needs to be as efficient as possible, but raises concerns over carbon emissions. Having several data centres together might be able to justify big and efficient combined cycle plant but would need to ensure it is grid connected and not used as a primary power source.
- Back-up gas turbine systems could play a role in security of supply. If there is a significant issue on the network, they would revert to providing power to data centre site. However, they can't provide black start like products, but these may not be required by NESO until issues are resolved.
- This option is suitable at most sites, as in Ireland 10MW of flexible capacity has been installed at 25 sites in Dublin.
- The arrangement of gas plant would be different to how emergency generation is typically arranged so should be considered at the design stage making the opportunity more readily accessible for new builds.

Role of energy hubs that service multiple data centres

Large data centres or sites that combine multiple smaller data centres offer opportunities to share power supply, where for fault scenarios it only affects part of the site. They offer economies of scale and typically results in higher overall efficiencies. Energy campuses will attract independent power providers who can manage the power system and have experience of dealing with the complexities of interacting with the grid as a market player. They also offer opportunities to explore the integration of data centres with other solutions such as district heat networks.

In terms of barriers, land and location constraints are a key consideration as prime data locations are in areas with high land costs and competing development priorities. Growth into regional hubs presents an opportunity but requires coordinated infrastructure investment and local authority commitment.

[24] DUKE University (2025), Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems

What specific role can renewable energy play in reducing the carbon footprint of data centres?

Data centres in GB use imported electricity from the grid as their main power source, thus benefiting from an increasingly low carbon power supply. Many data centre operators choose to use REGOs[25] with standard supply as way to meet carbon targets, however, there have been concerns with this approach to accounting and whether this helps contribute to additional decarbonisation beyond that being delivered by existing government policy.

Data centre demand could be used to drive additional renewable investment and help enable renewable assets to stay on the system at their end of their government support through entering into Corporate Power Purchase Agreements (CPPAs) with renewable assets that are not currently under a CfD. In Energy UK's response to the Government's CPPA call for evidence, we suggested that Government makes several reforms including changes to emissions reporting to enable this. [26]

What opportunities do data centres offer in helping to power and heat local communities and amenities, and what will be required to deliver benefits?

Waste heat from data centres has significant potential as a source of low cost, low carbon heating when they are located near large heat users, as evidenced by projects like the Old Oak and Park Royal Development Corporation (OPDC) heat network in London. [27] The OPDC has received £36 million in government funding to construct a heat network using waste heat from data centres, providing heating to over 10,000 homes and 250,000m^2 of commercial space. Similarly, Energy UK member Hemiko will be breaking ground on its OPEN heat network in Summer 2026, which will be drawing heat from nearby data centres to power homes and businesses.

Data centres offer several advantages as anchor heat sources, such as:

- Consistent year-round output with high load factors
- Predictable thermal profiles as server densities increase
- Urban or peri-urban siting, often near existing or future demand
- Long operational lifetimes, aligning with heat network asset horizons

Unlike many intermittent renewable heat sources, data centres produce steady baseload heat. When integrated into district heating systems, this reduces reliance on gas peaking plants and improves network economics.

Waste heat recovery delivers system-level benefits through lower overall carbon emissions, reduced peak electricity demand for electric heating, improved public acceptability of data centre growth and enhanced energy system efficiency

For these reasons, heat metrics should sit alongside PUE, WUE and CUE as core sustainability indicators (see Annex).

The UKPN Hot Chips trial modelled how data centres could be integrated with heat networks by upgrading the low temperature waste heat using heat pumps. [28] It estimates savings of up

[25] The REGO scheme was established under the Electricity (Guarantees of Origin of Electricity Produced from Renewable Energy Sources) Regulations 2003 and forms a core part of the 2005 Fuel Mix Disclosure (FMD) framework.
[26] Energy UK (2026), Energy UK Response to Corporate Power Purchase Agreements Call for Evidence
[27] Hemiko (2025), OPDC
[28] UKPN (2025), Hot Chips trial

to £40bn by 2050, reductions in grid demand by up to 65% compared to using air source heat pumps, and an annual reduction of 12,000 tonnes of CO_2 compared with natural gas. [29]

New large developments can provide significant opportunities to co-locate data centres with housing and businesses, providing benefits to both:

- Heat networks can be connected to different sources of waste heat at different temperatures, then upgrading them to the required temperature via large heat pumps and other heat generation technologies based within an energy centre. New heat networks can provide both heating and cooling to those connected.
- Heat networks can connect plots to new data centres, providing both power and low cost cooling for the data centre operator. The data centre exports heat to the heat network, supplementing other sources of heat and increasing its efficiency.
- Both the data centre and heat network can be designed to run self-sufficiently. The data centre can cool independently, and the heat network can run without the waste heat from the data centre. But when connected, they reduce running costs for both. However, this can reduce the commercial case for the heat network (see below).

In this way, data centres can play an important role in making heat networks cost-competitive, addressing the challenge of high electricity costs in GB. Further, they can provide an option to households in dense urban areas where heat pumps may not be suitable.

To capitalise on this, it requires careful planning of how data centres and new housing developments are planned. If built without consideration of future housing needs, data centres could end up using all of the available network capacity, restricting the ability for housing and commercial development in the area.

Despite these benefits, there is only a small number of schemes being developed in this manner, and this is due to a number of factors:

- There is a lack of clear policy treatment for this heat within carbon accounting frameworks, which risks undermining viable projects. Rejected heat from data centres should be explicitly recognised as a waste product and treated as zero carbon at the point of offtake.[30]
- Demand-side measures are needed to ensure data centres provide waste heat where possible. This will require reforms to planning to set a national policy expectation, assessing the feasibility of heat reuse. Alignment with heat zoning and Local Area Energy Planning Mandated or strongly facilitated heat offtake – particularly in areas of high heat density – would significantly improve the viability of schemes utilising data centre waste heat. Without credible and consistent demand signals, projects will remain difficult to finance, even where there is an abundant and low-cost heat source available.
- There are significant commercial barriers to deployment because heat network developers face challenges in securing sufficient counterparty certainty when relying on a single data centre as a heat source. The risk that a data centre may reduce output, relocate, or cease operations creates significant investment uncertainty.

[29] ENA (2025), Hot Chips trial

[30] This reflects the reality that the heat would otherwise be discharged to atmosphere and aligns with wider principles of resource efficiency and waste heat recovery. This treatment should be independent of the carbon intensity of the electricity used to power the data centre. The decarbonisation of electricity supply and improvements in data centre efficiency are appropriately addressed on the supply side.

Targeted policy support is needed to address this risk, whether through standardised contractual frameworks, backstop arrangements, or other mechanisms that provide greater confidence in long-term heat supply. A new guaranteed mechanism for electricity CPPAs, as advocated in Energy UK's response to the Government CfE on CPPAs, could potentially be expanded to heat to enable this.

- There needs to be strong mandates within planning policy for data centres to be 'ready to connect' to heat networks and offtake their waste heat. Currently, some data centre developers are only installing basic connection pipework and are not appropriately sizing for plant room space with all necessary equipment.
- Economic incentives may also be required, such as capital support for first-of-a-kind schemes, targeted business rate or connection incentives where heat export is delivered and support for shared infrastructure corridors.
- Once operational, the amount of waste heat used should be captured using new metrics such as Annual Energy Reuse Factor reporting (see Appendix).
- The creation of a national waste heat registry aligned to heat zoning would also be welcome.

Applying a one-size-fits-all mandate does risk stranded investment where viable heat demand does not exist. A viability-based hierarchy approach is preferable:

1. Reuse where viable demand exists
2. Enable future reuse
3. Reject only where capture is demonstrably unviable

This mirrors successful waste policy frameworks that prioritise reuse over disposal. Heat recovery must be demonstrably neutral, or beneficial, to core data centre operations. Metrics must reflect this and avoid unintended reliability risks. Modular, phased heat recovery systems are therefore critical to align capacity growth with demand growth.

Data centres investing in gas systems may also generate significant waste heat that can be utilised, and therefore these should also be considered.

Are there beneficial or precautionary lessons to learn from the impact of data centres outside the UK?

On waste heat:

International policy signals indicate that waste heat recovery is shifting from voluntary best practice to an expected standard. The German Act on Energy Efficiency (EnEfG), in effect since late 2023, mandates that new data centres with a connected load over 300kW must achieve specific Energy Reuse Factors (ERF) to ensure waste heat recovery, starting at 10% in 2026, rising to 15% in 2027, and 20% by 2028.

France's recent transposition of the EU Energy Efficiency Directive requires data centres over 1 MW to install heat recovery systems. Operational schemes in Helsinki, Oslo and Dublin also demonstrate technical feasibility at scale where demand density and policy clarity align.

On renewable procurement and dispatchable generation:

Irish policy is driving investment in dispatchable generation and new renewables. Data centres that service the data and digital sector are a core component of the Irish economy, but represent a major and growing source of electricity demand. The energy system on the island of Ireland is currently struggling to integrate them with electricity demand for data

centres currently at 21% of total demand, with a projected rise to 30% within 10 years. Ireland previously encouraged the co-location of renewable power generation with data centres, but this was technically challenging for many sites. A de facto moratorium was put in place on new data centre connections to the transmission system from 2022.

Three recent policy updates will shape the landscape for data centres and other large energy users (LEU's) in Ireland, ranging from near-term Grid Code modifications to longer-term strategic changes of how Ireland's grid accommodates large, new demands:

- EirGrid's Large Demand Facility Fault Ride-Through Proposed Solutions, the Irish Government's LEAP - Large Energy User Action Plan, and the CRU's Large Energy Users Connection Policy will have substantial near- and longer-term impacts on existing and new data centres in Ireland.
- In December 2025 the Commission for Regulation of Utilities (CRU) has published its (CRU/2025236) on Large Energy User (LEU) connection policy, establishing a new framework for how data centres connect to the Irish grid.[31] The policy introduces size based requirements, a mandatory renewable energy obligation, and stronger locational and performance criteria. It aims to balance data centre growth with grid stability and decarbonisation goals after several years of uncertainty for developers.
- The decision paper marks an end to the blanket moratorium on additional data centre grid connections in the Dublin region. The requirements are now linked to the Maximum Import Capacity (MIC) that the data centre is seeking, measured in megavolt-amperes (MVA). This applies to all new data centre applications to the Irish electricity network or existing data centres seeking to increase the MIC.

However, these requirements depend on the size of the data centre:

- Below 1 MVA (De minimis): Exempt from major technical requirements. Subject to location constraints.
- 1 MVA to <10 MVA: Must provide onsite generation registered as an auto producer and participate in the wholesale market and meet the renewable energy requirement. ≥10 MVA: Must deliver dispatchable onsite or proximate generation and/or storage matching (de rated) MIC. Assets must be separately connected and metered. Cannot operate at full MIC until associated energy assets are delivered. Renewable energy requirement applies.

Further to this, projects above 1 MVA must source 80% of annual demand from additional renewable electricity generated in Ireland. This renewable power must physically feed into the Irish grid and come from projects that are newly built or fully repowered, not from any generator supported by REFIT, RESS, or ORESS. This renewable capacity is taken into account as part of the dispatchable capacity requirement using derating factors, and compliance is achieved through a six-year glide path.

On load shifting and flexibility:

In 2024, the U.S. Department of Energy recommended flexible data centres and, as a result, the Electric Power Research Institute (EPRI) launched its Data Center Flexible Load (DCFlex) initiative to demonstrate how data centres can support and stabilise the electric grid. The initiative aims to deploy five to 10 large-scale flexibility hubs and develop a blueprint for utilities, market operators, technology innovators and policymakers. A study found that just a small amount of peak shaving (reducing demand at peak times) will enable a much greater capacity of data centres to be connected to the system without increasing peak demand or

[31] CRU (2025), Large Energy Users Connection Policy

the capacity needs and costs of the system. Data centres in the US are starting to optimise certain tasks or move them between sites, and using periods of low temperatures to reduce cooling electricity demands. They are also looking at using on-site or leased natural gas or energy storage installed as bridging generation until they can get grid connection. In the US there are well established DSR programmes that reward a range of end users for shifting electricity demand, but these were designed for existing firm loads. Network operators are now starting to offer earlier network connection for data centres willing to curtail a small proportion of their load. New controllable load services are being established in several US states, but they need to be standardised and rolled out more widely.

Key international examples of best practice include:

- Google's partnership with Shell as its 24/7 Carbon-Free Energy (CFE) Manager in the UK. The partnership is designed to contribute to grid stability and the transition; Shell is optimising Google's existing clean energy portfolio, including the off-take from its long-term agreement with ENGIE from the Moray West project in Scotland, storing surplus energy when production is high and releasing stored power back to the grid when production is low.
- Google's partnership with Fluence and Centrica to leverage on-site batteries at its St Ghislain data centre in Belgium, rather than opting for traditional diesel generators. The 2.75MW system supports its 24/7 CFE goal by providing back-up power, managing energy loads and increasing grid stability.
- Google's partnership with Haminan Energia in Finland to recover heat from a data centre. Heat is re-routed from the data centre and provided free of charge by Google to the local district heating network, covering 80% of its annual heat demand - powering local households, schools and public service buildings.
- Microsoft's 'gen-less' Willesden & Kensall Green Data Centre in London. As part of its sustainability plan, Microsoft has not installed back up diesel generators and instead opted for the additional connection resiliency from the network as their preferred solution.

Further examples of data centres operating flexibly have been included in the annex.

<u>On grid connection:</u>

LCP Delta has identified a number of international models for allocating grid capacity fairly, such as:

- German grid operators have moved to a pro-rata allocation model, distributing available capacity fairly among applicants. This replaces the old first-come-first-served system and helps prevent speculative projects from blocking the queue.
- France offers fast-track status for strategic data centres and has introduced reserved grid capacity sites. A 'use-it-or-lose-it' rule ensures that idle grid reservations are reallocated, while tax incentives reward efficient, green data centre operations.
- In Belgium, Elia (Dutch TSO) is proposing a capped electricity allocation specifically for data centres to protect other industries. Flexible connection contracts are also being explored to allow earlier access with non-firm supply agreements.
- The Dutch regulator (ACM), introduced a new priority system for grid connections, giving preference to projects that alleviate congestion (eg. via storage or flexibility). However, data centres were excluded from the priority list, leading to legal challenges from industry groups.

<u>On incentive alignment with wider policy goals:</u>

There are several examples in the US on how states are incentivising data centre development and linking it to broader policy goals:

- Minnesota charges large data centres annual fees (from 2-5 million USD) based on their peak demand and allocates those funds to low-income weatherization and energy efficiency programs.
- Iowa recently allowed data centre tax exemptions to expire 10 or 15 years after site preparation begins (depending on the facility location). The taxes which will be raised following expiration will go into an energy infrastructure fund. Eligibility for the tax exemptions also depends on meeting minimum investment requirements in the state.
- In Kansas, there are tax exemptions to data centres that commit to invest at least $250 million, maintain at least 20 new Kansas jobs, purchase power from local utilities for at least 10 years and implement water conservation efforts.

To what extent will the resource demands of data centres impact on other sectors with regard to competition for resources and decarbonisation?

It is crucial that water availability is considered as different systems use different levels of water, and the type of cooling system used impacts energy use. Energy-efficient designs incorporate passive cooling to reduce water and energy demand from cooling. Air cooling systems can be used in water constrained areas, but these use more energy than evaporative systems.

Some of the areas with high demand for computing capacity are in water-scarce areas, such as the Oxford-Cambridge corridor. New technologies are being developed but clear standards for water use and transparent operational monitoring will ensure these systems are deployed effectively and will help to build public trust. The wider water impacts associated with the additional electricity generation required to power data centres also needs to be considered and managed.

Interactions with other key sectors, including water, agriculture, housing and industry, need to be carefully managed. Policy levers beyond energy, including tax incentives and planning reforms, will need to be applied to encourage investment in optimal locations, balancing the full set of considerations. Reforms to planning could range from incentives to fast-track options for critical industries. The Government should also create a registry of data centres in development (potentially through the RESP process) to enable other sectors to plan accordingly. This work could be led by the newly created National Infrastructure and Service Transformation Authority (NISTA).

Appendix 1: Metrics for sustainable data centres

Existing metrics and standards

There are a number of voluntary and mandatory standards that data centres currently adhere to:

- **Power Usage Effectiveness (PUE)** is a key data centre metric that measures energy efficiency by dividing total facility power by the power used for IT equipment, with a lower score (closer to 1.0) indicating better efficiency.
- **Water usage effectiveness (WUE)** total annual water consumption (litres)/IT power (kWh)
- **Carbon use effectiveness (CUE)** = Total CO_2 (kg)/Total IT Energy (kWh) with carbon emission sources include electricity consumption, cooling water consumption, and equipment lifecycles.
- **Environmental impacts** including total footprint and land intensity (land needed per unit of IT capacity), noise and local emissions etc – these are reported to the Environmental Agency
- **PAS 2080 standard** for infrastructure to managing whole life infrastructure
- The GLA is due to set out a specific policy for data centres in the next **revision of the London Plan**. [32]
- European data centre energy efficiency is driven by the recast **Energy Efficiency Directive (EED) (2023/1791)**, which mandates strict reporting for facilities with a >500 kW demand. Key requirements include mandatory Power Usage Effectiveness (PUE) reporting, energy audits, renewable energy usage, and by 2026, minimum waste heat reuse.
- EirGrid's Large Demand Facility Fault Ride-Through Proposed Solutions, the Irish Government's LEAP - Large Energy User Action Plan, and the **CRU's Large Energy Users Connection Policy** will have substantial near- and longer-term impacts on existing and new data centres in Ireland.
- Best practice guidelines introduced by the EU in 2025 (2025 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency) also offer a good framework.

New energy and environmental metrics

Energy UK suggests that additional metrics should be introduced that monitor a range of environmental and important wider energy impacts. New metrics should assess the degree to which data centres:

- Invest in additional low carbon power generation
- Minimise carbon emissions and maximise the use of low carbon power
- Contribute to electricity security of supply and efficient system operation
- Use the heat generated from the data centre and not waste it
- Minimise water usage

Data centres may not be able to meet higher standards across all metrics. For example locations in areas with excess renewables may be far from end users and unable to use waste heat. While well-suited to small data centres in urban areas, efficient use of waste heat becomes more challenging at larger scales of datacentre (which may be more efficiently

[32] BBC (2026), New policy coming on data centres, City Hall says

powered), when the data centre (and any associated power supply) is more likely to be situated in rural locations.

An additional metric that could be considered is the ability for data centres to contribute to the delivery of network investment similar to the commitment by Anthropic. [33] However it is unclear whether this will have a material impact on the speed of delivery due to similar blockers to progress faced by independent network operators.

These metrics should be introduced into planning and all grid connection requirements and/or be introduced as part of on-going monitoring requirements once the data centre is operational. Additional requirements could be linked to early grid connection.

Where possible standards should be aligned over time with other markets.

[33] https://www.anthropic.com/news/covering-electricity-price-increases

Appendix 2: Additional metrics for sustainable data centres

	Standard Benchmark		Best Practise	
Metric objective	Design	Operation	Design	Operation
Investing in additional low carbon generation		REGO backed power supply		CPPA with unsupported low carbon project (built without a Government contract or end of life).
			Investment in behind the meter or on-site PV or other low carbon form of generation Export capacity kW as % of total data centre capacity	Min achieved load factor Amount of low carbon power generated or net exported
Electricity security of supply and efficient system operation	Technically and commercially able to load shift. Connect BESS units with load smoothing capability to reduce impact of load fluctuations and manage frequency and voltage concerns Accelerate connections by allowing data centres to connect quicker, if they install BESS units	Monitoring should distinguish between data centres with firm transmission connections (which may require costly reinforcement) and those operating under flexible/non-firm distribution connections (which reduce grid strain).	Flexibility capacity enabled: MW of data centre load connected to markets. Time-to-connect: Average duration for grid connection approvals.	Participation in flexibility and demand-side response markets (yes/no + MWh dispatched) Participation rate: Number of operators providing flexibility services. Carbon reduction impact: Tonnes of CO_2 avoided through flexibility. Number of SLA breaches due to flexibility measures.

	with data centres as part of interruptible or ‘flex connect’ connections. National Grid has started doing this, but this is used in PG&E’s ‘flex connect program’ too.	**Peak Coincidence Ratio (PCR)** How much of the data centre’s load coincides with system peak. • % of max demand that occurs during top "X" system stress hours **Flexible Capacity Ratio (FCR)** Dispatchable flexibility as a % of peak demand. Includes: • Load shed • BESS discharge • Export from onsite generation **Mandatory carbon reporting** to ensure any gas capacity runs at low load factors. Reduction in carbon emissions over time for those without grid connection initially.		
Minimising carbon emissions and maximising use of low carbon power	Consideration of location of new data in relation to low carbon generation taking into account likely network constraints and build during its operation	**Grid-alignment score** Half-hourly carbon reporting done by area of network to show real carbon emissions impact. **Metric on curtailment reduction** (MWh of otherwise-constrained generation absorbed per year)	Data centre only located if in area of network where there is sufficient low carbon generation to provide its need or they intend to invest in its own low carbon power source.	

Using waste heat	**Mandatory Heat Feasibility Assessment** • Mapping of current and projected (10–15 year) heat demand within defined radius • Assessment of technical feasibility (temperature, distance, phasing) • Engagement with Local Authority heat zoning / Local Area Energy Planning This should be embedded within planning consent and grid connection processes. **Design for Future Heat Export** Even where immediate demand is not present, data centres should demonstrate: • Space allocation for heat exchangers and primary export pipework • Hydraulic separation to protect IT systems • Allowance for temperature uplift via heat pumps • Future connection points	**Energy Reuse Factor (ERF)** % of DC's total energy input that is reused in heat network or other sectors such as agri greenhouse heating or thermoelectric power generation • Percentage of total energy input reused externally • Reported annually • Clear methodology and boundary definitions Where viable demand exists, we support a **declining minimum threshold over time**, providing market certainty while allowing early market maturation. Or **Energy Reuse Efficiency (ERE)** can be used to couple data center efficiency and data center energy reuse into one factor **Time-to-Enablement Commitment** Where a viable heat network opportunity is identified: • Commitment to enable export within 2–3 years of operation	**Active Heat Export & Infrastructure Investment** Gold standard facilities would demonstrate: - Investment in thermal storage - Modular heat recovery infrastructure aligned with phased network growth - Long-term commercial agreements with offtakers **Heat Registry & Transparency** Mandatory registration of: - Location - Expected heat profile (MWth, temperature, load factor) - Export readiness status This would reduce coordination failure between developers and heat network promoters and support national heat zoning strategies.	**Active Heat Export & Infrastructure Investment** • Operational export to heat network (MWth, temperature, load factor)

	Retrofitting this infrastructure is significantly more expensive and risks foreclosing viable projects.	• Reporting on commercial progress toward offtake agreements This ensures feasibility assessments translate into delivery.		
Minimising water usage and strain	Installed closed loop systems if in area of water stress	Total Site Water Withdrawal by Source (Potable Mains, Reclaimed/Greywater, Groundwater, Surface Water) Water Usage Effectiveness (WUE), with special recognition for zero/near-zero water cooling		Consumption per year

Appendix 3: Case Studies

EALA energy is developing a modular, combined Battery Energy Storage System (BESS) and AI inference data centre platform, deployable at 3 - 10 MW per location at or adjacent to curtailed wind farm sites across Scotland's islands and northern mainland. The first deployment is planned for Shetland, adjacent to the 443 MW Viking Wind Farm, where approximately 42 - 43% of generation is curtailed due to transmission constraints. Each module combines a BESS with an AI inference data centre, orchestrated by an Energy Management System (EMS) that dynamically optimises across energy absorption, grid services, and compute workload scheduling. The platform is designed to operate under flexible (non-firm) connection at 11 kV distribution level, requiring no transmission reinforcement.

Siemens Energy closed-loop cooling system for data centres In response to the growing concerns over water scarcity and the need for sustainable energy solutions, Siemens Energy has developed an innovative closed loop cooling system that can be used by data centres. This system not only enhances energy efficiency but also significantly reduces water consumption. The closed-loop cooling system leverages small gas and steam turbines in a combined cycle to increase plant efficiency from 48-50% to over 90% using absorption chillers. The high-grade steam generated from the gas turbine boiler drives a steam turbine, boosting efficiency from 37% to nearly 50%. The low-grade heat is then utilised by the absorption chiller, further increasing efficiency to over 90%. The cooled water from this chiller loop, maintained at 7°C, can be used in a closed-loop cycle to cool a data centre. Traditional evaporative cooling methods for data centres require vast amounts of water. For instance, a 100MW data centre can use up to 760 million litres of water annually. In contrast, the Siemens Energy system only requires occasional top-ups to compensate for minor losses. The system can provide low-grade heat to supply district heating at around 36-40°C, offering affordable heating solutions to nearby businesses and homes. This technology has been sold to a European customer to provide heating, cooling, and power to a large events complex, and it will in combination supply heating to a local district heating network.

Engineers at the University of California San Diego have developed a new cooling technology that could significantly improve the energy efficiency of data centers and high-powered electronics. The technology features a specially engineered fiber membrane that passively removes heat through evaporation. It offers a promising alternative to traditional cooling systems like fans, heat sinks and liquid pumps. It could also reduce the water use associated with many current cooling systems.[34]

Appendix 4: International comparisons for data centres operating flexibly, as provided by LCP Delta

EcoDataCenter 1 (Falun Data Centre) in Sweden sets a benchmark for sustainable flexibility in data centre operations. It combines renewable energy sourcing, heat recovery, and advanced efficiency measures to deliver carbon-neutral performance while actively supporting local decarbonisation. Waste heat recovery from data centre feeds district heating networks, reducing fossil fuel use and contributing to regional carbon reduction. Renewable matching and load optimisation enable a PUE (Power Usage Effectiveness) of ~1.28.

Microsoft's Stackbo data centre in Sweden integrates BESS to replace diesel backup and enable grid services via a flexibility service provider. This approach supports renewable matching , improves reliability, and introduces contractual innovation through aggregator

[34] UC San Diego Today (2026), New Cooling Tech Could Curb Data Centers' Rising Energy Demands

partnerships, allowing flexibility monetisation without compromising SLAs. BESS eliminates diesel reliance when appropriately sized, reduces emissions, and provides frequency regulation for grid stability.

Google's St. Ghislain data centre installed a 2.75 MW BESS to replace part of its diesel backup. Half the battery capacity is reserved for emergency backup, while the remainder participates in Belgium's ancillary services market via Centrica acting as the aggregator. This enables the operator to generate revenue from flexibility services without compromising SLA compliance.

Meta's hyperscale data centre in Odense captures waste heat via rooftop exchangers, upgrades it with a 45 MW heat pump system, and supplies it to the city's district heating network. This arrangement helped Odense shut down its last coal plant and now meets over 8% of the city's heating demand. The project demonstrates how data centres can deliver community value while reducing their own cooling costs.