Climate Action Committee
Thursday 12 November 2026
9th Meeting, 2026 (Session 7)

The environmental impacts of hyperscale data centres

Introduction

1. The Climate Action Committee has agreed to undertake an inquiry into the environmental impacts of hyperscale data centres.

2. This paper provides background detail to inform the final set of evidence sessions as part of the inquiry.

Background

Parliamentary activity on data centres

3. The Scottish Parliament Information Centre (SPICe) published a blog post on data centres in June 2026.

4. On 3 September there was a Members Business Debate on Hyperscale AI Data Centres and a Scottish Green Party debate on 16 September on Hyperscale Data Centres.

5. The Economy, Tourism and Energy Committee took evidence on artificial intelligence and its impact on the economy on 8 September. It held a further session on energy use on 15 September.

6. The Social Justice, Housing and Local Government Committee (SJHLG) has planning within its remit and at its meeting on 9 September, questions were posed to the Minister for Public Finance, Hannah Mary Goodlad, on planning and data centres.

7. A public petition has been submitted by Action to Protect Rural Scotland calling for a moratorium on planning applications for all hyperscale data centres until their environmental impacts have been fully assessed. The Scottish Government has responded to the petition. The Public Petitions Committee considered the petition on 8 October and agreed to write to the Scottish Government to seek further information, and to the Social Justice, Housing and Local Government Committee to ask if the issues raised in the petition will form part of its work programme.

Previous Scottish Government activity on data centres

8. On 17 August, the Minister for Public Finance issued a new planning direction stipulating that Scottish Ministers should be notified of planning applications for new data centres within 7 days.

9. On 16 September, the Minister for Public Finance, Hannah Mary Goodlad announced that all applications for data centres with a power capacity exceeding 50 megawatts would require an environmental impact assessment (EIA). During the Scottish Parliament debate that day she also said new guidance for planning authorities would be produced by Christmas.

10. The Committee wrote to the Cabinet Secretary for Climate Action and Rural Affairs and the Minister for Public Finance on 21 September:

    - Letter from the Convener of the Climate Action Committee to the Cabinet Secretary for Climate Action and Rural Affairs and the Minister for Public Finance on the environmental impacts of hyperscale data centres in Scotland

11. The Minister for Public Finance responded on 8 October:

    - Letter from the Minister for Public Finance on the environmental impact of hyperscale data centres in Scotland

12. The Convener also wrote to the Scottish Government on 15 October with further details on the inquiry:

    - Letter from the Convener of the Climate Action Committee to the Cabinet Secretary for Climate Action and Rural Affairs and Minister for Public Finance on the inquiry

Climate Action Committee Inquiry

13. The Committee agreed on 3 September 2026 to undertake an inquiry on data centres. It then agreed an approach to this on 17 September and 1 October.

14. The Committee has agreed an initial phase of work and to write to the Scottish Government on this in November. It will then consider whether to undertake further work and an approach to this at a future date.

Remit

15. The Committee wants to find out:

    - about the potential impacts of the operation and construction of hyperscale data centres on:
        - water quality and consumption
        - air quality
        - nature and biodiversity, including soil quality
        - noise pollution
        - energy use, and associated generation (including of back up generation)

    - emissions, and where emissions could be avoided by, for example, using waste heat
- how any negative impacts, can be mitigated or avoided
- what systems are, or should be, in place to support avoidance or mitigation of negative environmental impacts
- what can Scotland learn from other countries on the environmental impacts of hyperscale data centres
- how building and running hyperscale data centres might impact on achieving climate and nature goals

The inquiry aims to:

- increase public awareness of the environmental impacts of AI use and data centres in Scotland
- contribute to public and parliamentary debate and understanding on this issue from an environmental perspective
- influence Scottish Government action to address the climate and nature crises through its policy on data centres

Call for views

16. The Committee launched a joint call for views with the Economy, Tourism and Energy Committee on 7 October 2026.

17. While the Committee wants to understand the environmental impacts of potential hyperscale data centre construction and operation in Scotland, the Economy, Tourism and Energy Committee is interested in understanding the possible economic and energy implications.

18. Responses are invited via both a detailed call for views and a short survey.

19. The consultation closes on 15 November 2026.

Committee visit

20. On Tuesday 20 October, members of the Committee visited the DV1 data centre in North Lanarkshire, which was opened in 2016, to find out more about how existing data centres in Scotland operate.

Meeting 29 October

21. At its meeting on 29 October, the Committee heard from environmental groups before hearing from a panel from Ireland to hear about the experience of data centres in Ireland.

22. Details of the meeting, including the papers and an official report, can be found on the Committee's website:

- Climate Action Committee – Meeting 29 October 2026

Meeting 5 November

23. At its meeting on 5 November, the Committee heard from witnesses from the technology sector, as well as academics with a focus on emissions.

24. Details of the meeting, including the papers and official report when published, can be found on the Committee's website:

25. Climate Action Committee – Meeting 5 November 2026

Meeting 12 November

26. On 12 November, the Committee will hear from:

Panel 1:

- Colin Lindsay, Developer and Hydrogen Services Manager, Scottish Water Horizons
- Giulio Santori, Reader, The University of Edinburgh
- Professor Mark Parsons, Director, EPCC, The University of Edinburgh
- Ana Valdivia, Lecturer in AI, Government & Policy, University of Oxford

Panel 2:

- Dr Gemma Bone Dodds, Chair, Lothian Heat
- Simon Kerr, Head of Heat Networks, SAV-Systems
- Andrea Marinoni, Associate Professor of Applied Remote Sensing, UiT the Arctic University of Norway and Affiliated Lecturer, Department of Computer Science and Technology, University of Cambridge

Written evidence

27. The Committee has received written submissions from:

- Scottish Water (Annexe A);
- Lothian Heat (Annexe B);
- Alejandro Gallego Schmid (Annexe C).

Next steps

28. The Committee will write to the Scottish Government to notify it of the evidence taken.

Clerks to the Committee
November 2026

Annexe A: Submission from Scottish Water, 2 November 2026

29. Thank you for giving Scottish Water the opportunity to give evidence to the Climate Action Committee as part of its Inquiry into the environmental impacts of hyperscale data centres.

30. Scottish Water has a role in supporting sustainable economic growth across Scotland. For any data centre growth, location and early planning would be critical.

31. Scottish Water would prioritise:

    - Sustainable, non-drinking water sources such as final treated effluent from our wastewater treatment works, where feasible, or raw water from non-operational assets.

    - Closed loop systems to minimise the impact on our water resources. These types of systems are filled once and then continually reused, with only minimal top-ups required.

    - In areas known to have a water scarcity risk, we would work with data centre operators to ensure that any planned maintenance requiring water is carried out at times of year which take account of when water resources are more available.

32. Any waste discharge (effluent) from data centres would be treated as Trade Effluent, similar to other industrial uses in Scotland. This requires a consent to discharge to the sewer which takes account of the strength and volume of any discharge to determine whether the wastewater network and treatment works serving the area can treat this material while protecting the natural environment.

33. In general, any development requiring a connection to Scottish Water's network would need to carry out a strategic development impact assessment to determine the impact on our water and wastewater infrastructure and what mitigation work may be required by the developer to ensure that there is no detrimental impact on existing customers. Any costs for these mitigations and to provide additional water or wastewater capacity would be met by the developer.

Annexe B: Submission from Lothian Heat, 5 November 2026

About Lothian Heat and the scope of this evidence

34. Lothian Heat CIC is a community interest company developing community-anchored, not-for-profit heat networks across Edinburgh and the Lothians. Our focus is existing homes, particularly older buildings, off-gas communities and households in or at risk of fuel poverty. We seek to ensure that the energy systems of the future do not replicate the centralised and privatised mistakes of the past. We strive to ensure that no heat is wasted and no home is cold.

35. **Lothian Heat does not take a position on whether data centres should be built in Scotland, or on how many.** It should not be used as evidence on the acceptability or need for data centres, as there are a lot of current sources of waste heat that could be used. Our evidence concerns what happens to the heat they produce if they are built, and whether that heat helps Scotland's homes move off fossil fuel heating or is lost. The Committee has asked whether waste heat could reduce emissions, how negative impacts can be mitigated, what systems are needed, and what Scotland can learn from other countries. [1] This submission addresses those questions.

36. Our position can be summarised as: **IF and WHEN they are agreed, data centres must ensure they use the heat for wider public good. If heat is used as a reason to get permission, they must share responsibility and cost and work with a consortium to ensure that the heat is used.**

Summary

- Scotland is a long way from its statutory heat network targets. Large sources of cheap or free waste heat are one of the few things that could make heat networks affordable at the scale needed [2]. That will not happen by accident. Adding new sources of waste heat without an integrated push to use this new infrastructure to de-risk heat networks will not lead to positive outcomes for homes and communities and could run the risk of heat being used as an excuse to build data centres, without that heat ever being used.

- Almost all electricity used by a data centre becomes heat. Capturing it is far cheaper if it is designed in from the start; retrofit is costlier and may require shutdown which reduces the likelihood it will happen.

- Large data centres are sited for grid capacity, often far from where heat is needed. Without strategic transmission, the heat will be stranded however willing operators are to release it.

- If data centres are to be ‘green’, provided they are truly using renewable sources, then we propose that a heat transmission plan for Scotland would need to be developed alongside strategic data centre plans alongside a delivery mechanism - a heat utility, or a public body with that function, to

develop and own strategic mains. Denmark offers a working model that secures community wealth building in energy systems.

- Planning, developer contributions and grid connection priority should all be used to secure heat recovery and fund the pipes that deliver it, otherwise the strategic, climate and community benefit of a data centre is, in our estimation, very low.

Getting off gas, oil and LPG will not happen by accident

37. The Heat Networks (Scotland) Act 2021 requires Scottish Ministers to ensure that heat supplied by heat networks reaches 2.6 TWh by 2027 and 6 TWh by 2030. [3] The most recent published baseline we have found, from the Scottish Government's 2022 Heat Networks Delivery Plan, was 1.18 TWh, about 1.5% of heat supply; a further target of 7 TWh by 2035 has since been set. [4] Meeting these targets requires a step change in delivery.

38. The main constraints on heat networks are the high up-front capital cost of pipes and the cost of the heat that flows through them. Large, continuous, low-cost heat sources can change that equation. Scottish Enterprise's strategic review finds that "almost all electrical energy consumed by data centres is ultimately converted to low-grade heat" and that a large data centre "could generate hundreds of gigawatt-hours of recoverable heat annually". [5, p.5]

39. In our view this is a market failure. Without government intervention there is no first mover willing to take on the risk and cost of heat offtake and transmission to local networks. Scottish Enterprise reports that data centre operators "typically prefer 'heat-when-available' arrangements, clear system boundaries, and limited commercial risk", [5, p.6] which leaves the investment risk with whoever builds the network. It warns that, without early and comprehensive coordination, many data centres in the pipeline "will become fully operational before their heat reuse opportunity can be realised". [5, p.6]

Waste heat: a past inefficiency and a future opportunity

40. Scotland's industrial and digital infrastructure has largely been built to reject heat, because low-grade (less than 50 degrees Celsius) heat was treated as having little value. That is an inefficiency, and an inequity, when neighbouring households struggle to afford to heat their homes and amid rising gas, LPG and Oil prices.

41. Some existing data centres use air cooling and vent the hot air outside. This is older technology but also a risk in a heating climate. Scottish Enterprise finds that retrofitting heat recovery to an operating data centre is costlier, and that "the Data Centre may need to be completely shut down temporarily" to integrate it. [5, p.36]

42. Energy recovery from waste shows the same pattern. Viridor's energy recovery facility near Dunbar was designed as a combined heat and power plant able to "export up to 17 MWth of low-grade heat to local heat consumers". Its 2022 Heat and Power Plan recorded that "there are no formal agreements in place for the

export of heat from the Facility". [6] Heat that is available in principle is not the same as heat delivered to homes.

43. The scale of what is coming dwarfs what exists. Scotland's operational data centre base was under 30 MW of IT load in 2025, [5, p.5] while the planning pipeline is "in excess of 4.5GW". [5, p.8] The decisions that determine whether this heat is used are being taken now.

44. **The risk the Climate Action Committee need to be aware of is data centres seeking planning and permissions with a core benefit of offering heat, but without a critical assessment of the likelihood of anyone being able to use the heat**, with the associated infrastructure being developed and supported by said data centre, they (like other past potential waste heat providers) could gain permission because of the potential heat offtake benefit, but never realise this and with no penalty for not doing so.

45. The Committee could look to existing regulation. Under SEPA guidelines, if an Energy from Waste developer cannot immediately export heat upon commissioning, they must produce a heat and power plan showing how the required higher efficiency will be achieved (via heat networks or industrial offtake), normally within five to seven years of the end of commissioning. Permits require the plan to be implemented and reviewed annually, and SEPA will take enforcement action if an operator deliberately fails to act on it. [7]

Design and build for heat capture from the start

46. The temperature of recoverable heat depends on cooling design: around 15-25°C from air cooling, 20-30°C from liquid-air cooling and 30-50°C from direct liquid cooling. [5, p.19, Table 2] Heat pumps are then used to lift heat to network temperature; Scottish Enterprise puts their electricity input at typically 20-35% of the heat delivered. [5, p.34] This implies a heat pump coefficient of performance (COP) of roughly 3-5.

47. It is worth noting that the same design choice that is best for heat also matters for water. Scottish Enterprise finds that "closed-loop cooling systems therefore offer a material reduction in water consumption" [5, p.20] and recommends that planning authorities "consider limiting high-water-use evaporative cooling". [5, p.7]

48. Industry in Scotland already accepts the principle. A data centre charter launched in June 2026 by industry and heat network bodies states that "every new data centre should be district heat-ready". [8] The task for policy is to make this enforceable alongside transmission scale public infrastructure to deliver pipes to transport the heat.

49. A data centre designed for heat recovery should, at minimum, provide:

    - closed-loop liquid cooling, with flow and return temperatures stated at application stage;

- a defined heat offtake interface, with space reserved for heat pumps and safeguarded pipe routes to the site boundary;
- a strategy for summer, when heat demand is low, so that surplus heat can be stored or rejected without compromising later network supply;
- recovery of heat from any on-site generation.

Lessons from other jurisdictions

50. **Denmark**. District heating supplies 64% of Danish households. Heat planning was introduced by the Heat Supply Act 1979 and is managed by municipalities, and heat is priced on a non-profit basis, with many networks municipally or consumer owned. [9] In Odense, Fjernvarme Fyn recovers heat from Meta's data centre: heat at around 27°C is upgraded to around 70°C by large heat pumps, and recovery capacity has grown from 24 MW to around 45 MW. [5, p.62] The scheme was expected to provide heat to more than 12,000 homes in 2023.10 The network operator "owns and funds the heat recovery infrastructure", the data centre "does not charge for the waste heat", and "there is no guaranteed minimum heat supply". [5, pp.62-63] Near Copenhagen, Microsoft and the district heating company VEKS expect heat from a new data centre to warm around 6,000 homes. [11]

51. **Danish heat transmission**. Heat in Greater Copenhagen is moved by dedicated transmission companies. CTR, formed in 1984 by five municipalities, buys surplus heat from waste-to-energy and combined heat and power plants and transports it through a 54 km transmission system it owns to local distribution networks. [12] This is the model of publicly owned strategic heat infrastructure that Scotland and the UK lacks and that could supercharge investment and certainty to heat networks.

52. **Current Danish experience of data centres**. Our Danish partners, Viegand Maagøe, advise that the AI data centres now coming forward are large (500 MW and above), are sited near major grid infrastructure far from urban heat demand, and that data centre location, grid reinforcement and heat transmission therefore have to be planned together. They report that operators seeking sites are offering waste heat free of charge and investing in heat pumps, and in one case have expressed interest in co-financing heat network solutions. [13]

53. **European Union**. Under the recast Energy Efficiency Directive, data centres with a total rated energy input above 1 MW must use their waste heat or other waste heat recovery applications unless they can show this is not technically feasible [14], and new or substantially refurbished data centres above 1 MW must carry out a cost-benefit analysis of heat recovery. Member States must apply these requirements from 11 October 2025. [15]

54. **Germany**. The Energy Efficiency Act requires new data centres to achieve an energy reuse factor of at least 10% if operating from 1 July 2026, rising to 15% from 2027 and 20% from 2028. [16] A draft amending bill adopted by the German Government in June 2026 would retain these thresholds but relax obligations

where a heat network connection is not technically or economically viable. [17] Mandates work only where there is a network to receive the heat.

Plan data centres and heat networks together

55. Scottish Enterprise identifies proximity to heat demand as a key viability factor, typically "<1–2 km straight line distance to major loads or large clusters", [5, p.30] and puts typical pipework costs at £3,000-£5,000 per metre. [5, p.24] Every additional kilometre between a data centre and the homes it could heat therefore adds millions of pounds. These are strategic infrastructure costs beyond the reach of any single community heat network however these costs are a drop in the ocean relative to the cost of the data centres which is why cost sharing in some form should be considered.

56. East Lothian could show a model of how heat could be built from the start, or it could show the size of the gap. East Lothian Council is progressing a proposed data centre on the former Cockenzie Power Station site with Sustainable Development Capital LLP (SDCL). The Council would lease the 70-acre site to a joint venture, and its June 2026 report states that "there will be a framework agreed to secure the community benefits". [18] The report does not address heat, cooling, water use, back-up generation or emissions. [18] Lothian Heat has asked to meet with SDCL to discuss these matters with no luck so far. Importantly, once commercial terms and design are fixed, heat recovery becomes a retrofit problem, and in our opinion unlikely.

57. We see three risks if heat is not addressed at this stage:

    - **Heat that is "available" but never used**, because no network exists to take it, as the Dunbar example illustrates.

    - **Value directed to general community benefit** rather than to the pipes and connections that would deliver lasting, lower-cost heat to households. General community benefit funding is easier, but will not unlock strategic development of a new heat industry.

    - **Tokenism in planning**, where a promise of future heat connection supports a planning case without any mechanism to secure delivery.

58. Scottish Enterprise recommends that local authorities and the Scottish Government consider "a community benefit/heat infrastructure fund or offset mechanism". [5, p.7] We support a heat infrastructure fund, provided enough contributions are ring-fenced for heat transmission and connection development and capital costs, and are not absorbed into general community benefit. We suggest that general community benefits would be better spent ensuring that local homes, most affected by data centres would have a ringfenced pot to ensure a transition to low cost heat with no upfront connection charges and low unit prices.

59. Heat networks must also be realistic about supply. Data centres prefer "heat-when-available" arrangements, [5, p.6] and in Odense there is no guaranteed minimum. [5, pp.62-63] Scottish Enterprise notes that heat networks are long-

term assets of 40-50 years or more, [5, p. 27] while "data centres often plan for 15–25 years". [5, p.6] Networks should therefore be designed to draw on several sources with thermal storage, so that data centre heat lowers overall costs across the portfolio without becoming a single point of failure.

60. There is public support. In GB-wide polling for EnergiRaven, 62% of people said they would be more supportive of a new or expanded data centre in their area if it committed to heating nearby homes and businesses through a heat network (4% less supportive); 74% agreed that businesses such as data centres should be required to share excess heat where heat networks exist; and fewer than 10% said planning permission should be granted without any conditions relating to waste heat. [19]

A heat transmission plan and heat utility for Scotland

61. Without strategic transmission mains, data centre heat will be stranded. One example is the proposed site in the beautiful Lammermuirs near Longformacus - this could heat hundreds of thousands of homes, but not from that location. We propose that Scotland prepares a **heat transmission plan** mapping strategic heat sources (data centres, energy-from-waste plants, industry and large-scale heat pumps), the demand centres they could serve and the corridors between them. It would become the reference against which data centre sites are assessed, grid reinforcement is prioritised, and Local Heat and Energy Efficiency Strategies and Heat Network Zones are aligned, consistent with Scottish Enterprise's recommendations that the data centre pipeline is captured in LHEES and that an organisation is designated to coordinate data centre heat reuse. [5, pp.6-7]

62. A plan needs an owner. We propose a **heat utility** for Scotland, or a public body given that function, able to plan, finance, build and hold strategic transmission mains, and to contract with heat sources on standard terms. Transmission is long-lived, natural-monopoly infrastructure suited to low-cost public finance and public or community ownership, so that the benefit of low-cost heat reaches households. CTR, the transmission company owned by five Copenhagen-area municipalities, shows how this can work. [12] A utility of this kind would be the first mover the market has not provided, and the counterparty data centre operators need. Existing proposals on Regional Heat Partnerships would be complementary to work on regional distribution and ensure that the public sector have the capacity and capabilities to design and deliver heat for public good [20].

63. Grid access is the strongest lever available. The Association for Decentralised Energy has argued that data centres which share their heat with local homes, hospitals and schools "should be first in line for a grid connection", has raised this in evidence to the Environmental Audit Committee at Westminster, and has called for NESO's Regional Energy Strategic Plans to recognise data centres as active system assets. [21] The UK Budget of 28 October 2026 introduced a data centre covenant under which data centres are expected to use waste heat to heat nearby buildings "wherever practical", in return for accelerated grid connection. [22] Grid connection is reserved, but the Scottish Government can press for heat sharing to be an explicit condition of priority, and should ensure

that the Regional Energy Strategic Plan for Scotland integrates data centres, grid and heat. The same risks as outlined in paragraph 24 apply.

Back-up and on-site power

64. The Committee's inquiry specifically includes backup generation. [1] On-site generation is both an emissions source and a heat source. Our Danish partners report that data centres typically come with large back-up generation plant, typically diesel generators. [13] The UK Budget 2026 proposes a tightly controlled route for temporary on-site generation where grid connection is not immediately available; Carbon Brief reports concerns from campaigners that this could mean gas or diesel generation. [22]

65. SDCL has announced a collaboration with FuelCell Energy to explore deploying up to 450 MW of fuel cell power at data centres. [23] FuelCell Energy's carbonate fuel cells generate hydrogen internally "from a methane-based fuel source like natural gas or biogas". [24] Without a renewable fuel supply, such as green hydrogen (many such projects which are delayed), systems run on hydrogen reformed on site from fossil gas, emitting CO2. It is not yet known what is proposed at Cockenzie. On-site generation should be assessed as part of a data centre's environmental impact, should favour options that do not add to grid stress and enable more renewable electricity to be used, and if it is approved and generates heat, then our principle is that its heat should be captured.

66. We want to ensure that the Committee understands that providing heat through further expansion of fossil fuel generation ***should not be seen as a benefit***, there is a lot of existing waste heat, plus greener sources in the ambient environment including water, geothermal or sewers, and that this should not be used as a positive reason to approve non-renewable energy sources at data centres.

Recommendations

67. We invite the Committee to recommend that the Scottish Government:

    1) **Define a "green data centre" in NPF4 and specify the content of the Heat and Power Plan** required with every application, covering cooling type and temperatures, expected heat output and phasing, summer heat rejection, and on-site generation and its emissions. Scottish Enterprise notes that NPF4 does not currently define what a Heat and Power Plan should contain. [5, p.11]

    2) **Make heat offtake readiness a condition of consent** for new and expanding data centres: closed-loop liquid cooling, a defined offtake interface, space for heat pumps and safeguarded pipe routes.

    3) **Require substantial developer contributions ring-fenced for heat transmission and connection**, payable whether or not heat is used immediately, and distinct from general community benefit. This money could fund a heat utility to develop strategic transmission lines.

4) **Commission a heat transmission plan for Scotland**, aligning data centre siting, grid reinforcement, LHEES and Heat Network Zones.

5) **Establish a heat utility, or give an existing public body that function**, to plan, finance and own strategic transmission mains in public or community hands, contracting with heat sources on standard and flexible terms.

6) **Press UK Government, Ofgem and NESO to make heat sharing a condition of grid connection priority**, and ensure the Regional Energy Strategic Plan for Scotland integrates data centres, grid and heat.

7) **Ensure local authorities acting as landowners or joint venture partners secure heat terms before contracts are signed**.

8) **Assess on-site and back-up generation as part of a data centre's environmental impact**, and require its heat to be captured.

References

[1] Scottish Parliament Climate Action Committee, Inquiry into the environmental impacts of hyperscale data centres. https://www.parliament.scot/chamber-and-committees/committees/current-and-previous-committees/session-7/climate-action-committee/business-items/inquiry-into-the-environmental-impacts-of-hyperscale-data-centres (accessed 3 November 2026).

[2] Amazon Web Services provides its surplus data centre heat free of charge to the publicly owned, not-for-profit Tallaght District Heating Network in Dublin. Fortum (2020) 'South Dublin County Council, supported by Amazon Web Services (AWS) and Fortum eNext, create Ireland's first publicly owned, not-for-profit energy company', December 2020. https://www.fortum.com/media/2020/12/south-dublin-county-council-support-amazon-web-services-aws-and-fortum-enext-create-irelands-first-publicly-owned-not-profit-energy-company (accessed 5 November 2026).

[3] Heat Networks (Scotland) Act 2021, section 92(1). https://www.legislation.gov.uk/asp/2021/9/section/92/enacted (accessed 3 November 2026).

[4] Kerr, N. and Berry, K. (2024) 'Decarbonising heating in Scotland: current Scottish and UK policy', SPICe Spotlight, Scottish Parliament Information Centre, 26 February 2024, citing the Scottish Government Heat Networks Delivery Plan (2022). https://spice-spotlight.scot/2024/02/26/decarbonising-heating-in-scotland-current-scottish-and-uk-policy/ (accessed 3 November 2026).

[5] Scottish Enterprise (2026) Waste Heat from Data Centres: A Strategic Review for Scotland. Report authored by AECOM with input from HermeticaBlack; steering group Scottish Enterprise, Scottish Government and Zero Waste Scotland. https://www.scottish-enterprise.com/media/0htbuxzy/data-centre-waste-heat-a-strategic-review-for-scotland_external.pdf (accessed 3 November 2026).

[6] Fichtner Consulting Engineers for Viridor Dunbar Waste Services Ltd (2022) Dunbar ERF Heat and Power Plan, Revision 03, 3 March 2022, published by SEPA. https://sepa.gov.uk/media/594285/appendix-e-dunbar-erf-heat-and-power-plan-2021-ver4_redacted.pdf (accessed 3 November 2026).

[7] SEPA (2014) Thermal Treatment of Waste Guidelines 2014, Annexes 1 and 2. https://sepa.gov.uk/media/28983/thermal-treatment-of-waste-guidelines_2014.pdf (accessed 5 November 2026).

[8] IT Brief UK (2026) 'Scotland data centre charter sets five green principles', 11 June 2026, reporting the charter launched by Prosper, the Renewable Energy Association, Ravenscraig, Heat Network Scotland and Apatura Energy. https://itbrief.co.uk/story/scotland-data-centre-charter-sets-five-green-principles (accessed 3 November 2026).

[9] Dansk Fjernvarme (Danish District Heating Association), 'The Danish district heating model'. https://danskfjernvarme.dk/uk/english/the-danish-model (accessed 3 November 2026).

[10] Ramboll, 'Meta: surplus heat to district heating' (project case study, Fjernvarme Fyn, Odense). https://www.ramboll.com/en-us/projects/energy/meta-surplus-heat-to-district-heating (accessed 3 November 2026).

[11] Microsoft (2024, updated November 2025) 'Surplus datacenter heat will be repurposed to heat homes in Denmark'. https://local.microsoft.com/blog/datacenter_heat_repurposed/ (accessed 3 November 2026).

[12] CTR (Centralkommunernes Transmissionsselskab I/S), English summary. https://www.ctr.dk/english/resume/ (accessed 3 November 2026).

[13] Viegand Maagøe A/S (Copenhagen), correspondence with Lothian Heat CIC, 30 October 2026 (unpublished).

[14] Note: we wish to add that this can be a get-out clause. Developers can simply commission a 'tame' engineering consultancy to say it is not feasible. The real test is the technical ability of the planning authority to challenge such studies.

[15] Directive (EU) 2023/1791 on energy efficiency, Article 26, as summarised in Covington & Burling (2025) The EU's Energy Efficiency Directive and its impact on datacenters, April 2025. https://www.cov.com/-/media/files/corporate/publications/2025/04/the-eus-energy-efficiency-directive-and-its-impact-on-datacenters.pdf (accessed 3 November 2026).

[16] White & Case, 'Data center requirements under the new German Energy Efficiency Act'. https://www.whitecase.com/insight-alert/data-center-requirements-under-new-german-energy-efficiency-act (accessed 3 November 2026).

[17] Gleiss Lutz (2026) 'Data centre update: draft bill to amend the Energy Efficiency Act'. https://www.gleisslutz.com/en/know-how/data-centre-update-draft-bill-amend-energy-efficiency-act (accessed 3 November 2026).

[18] East Lothian Council (2026) Proposed Data Centre at Cockenzie. Report to Council, 23 June 2026 (report dated 11 June 2026). https://www.eastlothian.gov.uk/sites/default/files/2026-06/ELC20260623%2008%20Proposed%20Data%20Centre%20at%20Cockenzie.pdf (accessed 3 November 2026).

[19] Censuswide for EnergiRaven (2026), online survey of 2,330 GB adults (including a boost of 500 in Manchester), fieldwork 13-16 April 2026, data tables Q3, Q12 and Q13. EnergiRaven is a heat network campaign owned by SAV Systems, a supplier of heat network equipment. Data tables available to the Committee on request.

[20] Details of the Regional Heat Partnerships approach are written up at https://dbdh.org/if-you-want-heat-networks-to-work-change-whos-in-the-room/ and https://www.scottishfuturestrust.org.uk/news/how-can-scotland-deliver-heat-networks-at-pace-and-scale.

[21] Data Centre Magazine (2026) 'EnergiRaven and ADE call for data centre waste heat reform', 4 October 2026, reporting statements by Aaron Gould, Interim Chief Executive, Association for Decentralised Energy. https://datacentremagazine.com/news/energiraven-and-ade-call-for-data-centre-waste-heat-reform (accessed 3 November 2026).

[22] Carbon Brief (2026) 'UK budget 2026: key climate and energy announcements', 28 October 2026. https://www.carbonbrief.org/uk-budget-2026-key-climate-and-energy-announcements (accessed 3 November 2026).

[23] FuelCell Energy (2026) 'Sustainable Development Capital LLP and FuelCell Energy forge strategic data center power collaboration', press release, 20 January 2026. https://investor.fce.com/press-releases/press-release-details/2026/Sustainable-Development-Capital-LLP-and-FuelCell-Energy-Forge-Strategic-Data-Center-Power-Collaboration/default.aspx (accessed 3 November 2026).

[24] FuelCell Energy, 'How a fuel cell works'. https://www.fuelcellenergy.com/benefits/how-a-fuel-cell-works/ (accessed 3 November 2026).

Annexe C: Submission from Alejandro Gallego Schmid, 6 November 2026

68. Thank you for the opportunity to clarify the question raised during the Committee's meeting on 5 November 2026 concerning whether rainwater can be used for cooling in hyperscale data centres without additional treatment.

Overall assessment

69. Harvested rainwater can replace part of the freshwater supply used for data centre cooling. However, water collected from roofs and stored in tanks should not be assumed suitable for direct introduction into cooling equipment without treatment or water-quality verification. The necessary treatment depends on the collection surface, storage conditions, measured water quality and cooling technology. The US Department of Energy's guidance on alternative water sources identifies cooling tower make-up as an established application for harvested rainwater, with treatment selected according to its intended use.

70. Rainwater does **not automatically require treatment to drinking-water standards** for this purpose. Nevertheless, its use must address microbial growth, corrosion and equipment fouling.

Why harvested rainwater may need treatment

71. Rainwater acquires contaminants from the atmosphere, collection surfaces and storage system. These can include dust, leaves, bird droppings, microorganisms and chemicals released from roofing or guttering. The initial runoff after a dry period can carry particularly high contamination loads. Clear-looking water therefore cannot be assumed to be microbiologically or chemically suitable. The US Centers for Disease Control and Prevention's guidance on collecting rainwater explains these contamination pathways and the role of first-flush diversion.

72. Rainwater generally has low mineral content, which can reduce the input of scale-forming minerals. However, low mineral content does not guarantee chemical compatibility: pH, alkalinity and the materials in the cooling system also influence corrosion. ASHRAE's guidance on water treatment recognises roof-collected rainwater as a potential cooling tower supply that, where its quality is appropriate, may require only filtration and relatively limited additional treatment, including microbial control.

Treatment and management stages

73. A suitable system would normally consider the following stages. These provide a framework for design; every site would not necessarily require every treatment technology.

Stage	Treatment or control	Purpose
a. Collection	Maintain roofs and gutters; screen out leaves and debris; assess	Reduce contamination before water enters storage.

and source protection	roofing materials; divert initial runoff using a first-flush device.	
b. Managed storage	Use a covered, light-excluding tank with protected openings, access for inspection and sediment removal, and arrangements to limit stagnation.	Limit recontamination, sediment accumulation and biological growth.
c. Particle removal	Use appropriately selected media, bag or cartridge filtration; finer filtration may be needed for sensitive equipment.	Remove suspended material that could foul heat exchangers, obstruct nozzles or impair disinfection.

These measures are consistent with the US Department of Energy's rainwater-harvesting technology review. Filter selection and maintenance should reflect measured water quality and equipment requirements.

d. Microbiological control. Where rainwater supplies an evaporative cooling tower, an effective ongoing microbial-control programme is essential. Depending on the system, this may include controlled dosing of oxidising biocides, such as chlorine- or bromine-based products, and other compatible treatments. Ultraviolet irradiation can provide an additional barrier, but provides no continuing disinfectant residual downstream. HSE's technical guidance on evaporative cooling systems, HSG274 Part 1, notes that UV in cooling systems is more frequently used alongside a chemical biocide. Control must address the operating cooling system, rather than relying solely on treatment before storage or use.

e. Chemical conditioning where necessary. Water analysis should establish whether pH or alkalinity adjustment, corrosion inhibitors or other conditioning is required. More intensive processes, such as reverse osmosis or deionisation, should be specified where justified by measured contaminants or equipment requirements. They should not be assumed necessary simply because the source is rainwater. The principle, reflected in ASHRAE's water-treatment guidance, is to match treatment to the application.

Requirements differ between cooling systems

74. For **evaporative cooling towers**, rainwater is principally a potential source of *make-up water*: water added to replace evaporation and other losses. Evaporation leaves dissolved substances behind, so circulating water still requires monitoring and controlled discharge, known as *blowdown*, to prevent excessive concentration. The US Department of Energy's cooling tower management guidance explains this process.

75. Cooling towers also collect airborne contamination during operation. Side-stream filtration—filtering a proportion of the circulating water—can help control suspended solids and fouling. However, Department of Energy guidance on

side-stream filtration emphasises that filtration does not replace the wider chemical-treatment programme.

76. For **closed-loop liquid cooling serving servers**, the coolant must meet the equipment manufacturer's specifications. Facility water and the fluid circulating through server cold plates may be separated by a heat exchanger and have different requirements. For example, Lenovo's direct water-cooling standards address water quality, chemical treatment and monitoring. Harvested rainwater could only be considered after appropriate treatment and verification against the relevant specifications; suitability for cooling tower make-up does not establish suitability for the server circuit.

Implications for the Committee

77. My assessment is that rainwater harvesting is a credible option for reducing freshwater demand when incorporated into a properly designed and monitored cooling-water system. HSE guidance sets out how risks associated with evaporative cooling should be assessed and controlled through treatment, inspection, cleaning and monitoring. Using rainwater does not remove these responsibilities.

78. Its contribution to supply must also be demonstrated through a site-specific water balance covering collection area, rainfall variability, storage capacity and cooling demand during dry periods. As the Department of Energy's rainwater-harvesting review explains, supply and demand should be compared over time; annual rainfall totals alone cannot establish a reliable year-round supply.

79. I would therefore recommend that any proposal identifies the cooling circuit rainwater will supply, the required water-quality specification, treatment and monitoring arrangements, and the proportion of freshwater demand it can reliably replace.