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knowledge gaps

High five: Ruth Carter's
CIBSE milestones







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Dire strait

The eruption of war in the Middle East has exposed the fragility of the world's global energy system. Closure of the Strait of Hormuz and targeting of oil and gas infrastructure have created an international crisis that is threatening 20% of the world's gas and oil supply, and causing a significant spike in energy prices.

In the UK, a debate is now raging about whether it should drill for more of its oil and gas in the North Sea. The country is a long way from transitioning to clean energy and there are those that say while gas is still part of the energy mix it is better to prioritise domestic self-sufficiency than import. Others argue new oil and gas licences would be a distraction from decarbonisation and the need to meet the legally binding target of net zero carbon by 2050.

Whatever the government decides, it's key that the built environment continues to focus on reducing emissions. A report by Energy Systems Catapult on scaling flexibility to meet peaks in energy demand is a stark reminder of the challenge we face. Without a huge energy efficiency drive, large-scale thermal storage and improvements in heat pump performance, the UK will still be relying on large-scale gas peaking plants in 2050, the report states.

We feature two projects that demonstrate routes to building decarbonisation. The deep retrofit of the University of Auckland's social sciences building B201 was the deserved 2026 CIBSE Building Performance Champion. By retaining the building frame, building services engineer Beca achieved significant reductions in embodied carbon, and the appointment of a commissioning agent ensured there was no drift from design intent (page 28).

Optimising operation was also the goal for the Raymond Chandler Library at Dulwich College, in London. Building services engineer Max Fordham carried out an in-depth evaluation of the building to understand how it was actually working and to ensure the college facilities management team know how to optimise it after handover (page 40).

The remarkable growth of data centres – in size and number – is adding to the UK's energy challenge. On page 44, the CIBSE Data Centre Special Interest Group reveals plans for guidance in seven critical areas of design.

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Editorial

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CIBSE Journal is written and produced by CPL One
Tel: +44 (0)1223 378000
www.cplone.co.uk
 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB.



Editorial copy deadline: First day of the month preceding the publication month

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Contributors



Julie Godefroy
 Analysis of plans for EPC reform through the Home Energy Model, including proposal for four new metrics



Lucie Koháková
 SLL Young Lighter of the Year on the impact of light on children's circadian rhythms



Andy Pearson
 The CPD module explores air-curtain operation for doorways and conditions where applications can succeed or fail



Michel Grabon
 The technical director at Carrier on designing the next generation of hyperscale data centres

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Tel: +44 (0)208 675 5211
©CIBSE Services Ltd. ISSN 1759-846X

Subscription enquiries

If you are not a CIBSE member but would like to receive *CIBSE Journal*, subscribe now! Costs are £80 (UK) and £100 (international). For subscription enquiries, and any change of address information, please contact Nicola Hurley at nhurley@cibse.org or telephone +44 (0)208 772 3697. Individual copies are also available at a cost of £7 per copy, plus postage.

CIBSE Journal, ISSN 1759-846X (USPS 4070) is published by CPL One, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.



Subscription records are maintained at CIBSE, 91-94 Saffron Hill, London, EC1N 8QP, UK.

ISSN 1759-846X (print)
ISSN 2756-1895 (online)

Credits

p10 iStock.com / Kunakorn Rassadornyindee
p37 iStock.com / MadamLead
p44 iStock.com / tiero
p46 iStock.com / Hugo Kurk



ABC audited circulation:
20,023 January to
December 2025
Printed by: Warners
Midlands PLC

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New standard sets path for net zero buildings

Version 1 of UK Net Zero Carbon Buildings Standard published

The first version of the UK Net Zero Carbon Buildings Standard (UKNZCBS) has been launched. Published this month, it creates a unified definition for net zero carbon-aligned buildings in the UK. If all building types adhere to the guidance and recommended limits within the Standard, the UK built environment sector could stay within its share of the UK's national carbon and energy budgets.

The requirements outlined in the UKNZCBS cover a range of topics, such as upfront carbon, operational energy use, avoidance of fossil fuel use on site, renewables and refrigerants.

Version 1 states that the Standard is intended to evolve over time to include the following: life-cycle embodied carbon limits;

whole life carbon limits; space heating and/or cooling limits across further sectors and building types; electricity demand-management limits; and new limits for areas or uses currently classified as additional uses.

Offsets may be used to complement, but not replace, the core elements of the Standard, and may be used to achieve net zero carbon at the asset level defined by the term 'Net Zero Carbon Aligned Building (plus offsets)' within the Standard.

Publication of Version 1 is described as a 'significant step forward' for the industry. Development of its technical content, text and numerical limits has been led by a technical steering group that includes representatives from industry bodies, including CIBSE.

Launch of EPC reforms delayed until second half of 2027

The government has pushed back its Energy Performance Certificate (EPC) reforms, which were due to be launched in October.

The Department for Energy Security and Net Zero published a consultation paper in December 2024, outlining proposed reforms to EPCs, which have been the key benchmark of assessing home energy efficiency since 2007.

However, in an update to the consultation published earlier this week, the Ministry of Housing, Communities and Local Government

said the reforms had been postponed to the second half of 2027.

It added that, after 'engagement with industry on the delivery timeline', the government will work with industry and the devolved administrations to agree a new launch date and shared implementation plan by the summer of this year.

The changes will result in the current single-letter score being replaced by four metrics: fabric performance, heating system, smart readiness and energy cost (see page 14).

Government to manage data centre Grid connections

The government is proposing to align access to Grid connections for data centres with new regional targets, as part of a package to tackle speculative applications for the power-hungry developments.

A consultation paper, issued on 11 March, says a 'strategically aligned' process to manage connections will be introduced. This would involve

coordinating them with regional infrastructure targets set out in the data centre strategy being developed by the Department for Science, Innovation and Technology.

The government will publish a list of strategically important projects, including in its mooted AI Growth Zones, that will be at the front of the queue when network capacity is freed

up or created. There are also proposals to strengthen the conditions for joining and remaining in the queue.

Ofgem will shortly consult on its preferred conditions, which could include increasing the financial requirements for developers in the queue, such as deposits or fees payable if milestones are not met.

Iran war brings forward home upgrade funding

Plug-in solar panels also now permitted amid energy crisis

Secretary of State for Energy Security Ed Miliband has extended the Mayoral Home Upgrade Programme in response to the energy crisis triggered by the conflict in Iran.

He announced a series of measures on 15 March as the Strait of Hormuz remained almost entirely closed to shipping, choking off a fifth of global natural gas supplies.

While the government's energy price cap will keep a lid on bills for the next three months, market analysts predict that a protracted conflict could cause a typical household's annual bill to rise to more than £2,500.

Miliband announced that the next round of the devolved home upgrade funding programme, unveiled in the

recently published Warm Homes Plan, will be accelerated.

The mayors of Liverpool, London and West Yorkshire will receive funding to carry out street-by-street upgrades of low-income homes. They join the mayors of Greater Manchester and the West Midlands, who have already had their slice of the £130m funding.

Low-cost 'plug-in' solar panels – which can be installed rapidly on balconies or in outdoor space, and are commonly used in other European countries – will also be permitted for use in the UK for the first time.

In addition, the next annual Contracts for Difference renewables auction has been brought forward to July, Miliband said.

Heating help for households on oil

Chancellor of the Exchequer Rachel Reeves has unveiled more than £50m of support for low-income families to help tackle surging prices of heating oil.

Reeves announced last month that £53m of targeted financial support has been made available to help households in rural communities with the cost of heating oil.

The price of kerosene, which is the fuel used for heating oil, has been especially affected by the conflict in the Middle East, rising faster than other fuels.

Households in Britain reliant on oil to heat their homes are not covered by the energy price cap, unlike gas and electricity customers, so they are exposed more immediately when such prices are hiked.

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FLUID SYSTEMS

New service to collect smart energy data

Energy Systems Catapult has launched a national service for smart energy data. Called Sense, it was officially unveiled at the University of Oxford on 16 March, and is focused on gathering and providing data to address two key challenges. The first is exploring how public electric vehicle charging infrastructure can support fair and inclusive access for rural and underserved communities. The second is examining how societal behaviours impact energy use in public and commercial buildings, enabling more effective energy management and tax funds to be spent on vital public services, rather than on unnecessary energy bills.

Wales to mandate solar panels

Wales is set to become the first part of the UK to effectively require new buildings to have solar panels fitted as standard. The Welsh government issued a circular on 6 March introducing energy efficiency amendments to Part L of the Building Regulations. The amendments, which are due to come into force on 4 March 2027, require 'a system for renewable electricity generation' to be installed on site – which, in virtually every circumstance, is expected to be rooftop solar power.

Swinney's regret over QEUH infection deaths

Scotland's First Minister John Swinney has expressed his 'regret' to families of patients who died after infections linked to the contamination of water supply and ventilation systems at Glasgow's Queen Elizabeth University Hospital (QEUH). In an interview with the BBC, he said that at an online meeting with bereaved families he had expressed his 'regret for the experiences of families and, in some cases, for the loss of children'. Prosecutors are investigating the deaths of seven QEUH patients, including children who were being treated for cancer.

Heat networks could save UK billions, says research

Report says investment could relieve pressure on Grid

Deploying heat networks instead of air source heat pumps (ASHPs) could save the UK billions of pounds, according to research published on 26 February.

The Clean Heat 2040 report, produced by researchers at Bristol and Newcastle mayoral authorities, estimates that 'ambitious' deployment of heat networks, alongside large-scale, flexible thermal storage, could deliver annual net benefits of £3.5bn.

Commissioned by trade body ADE: Heat Networks, the study identifies three primary sources of savings:

First, shifting investment towards heat networks instead of individual ASHPs in urban and semi-urban areas could generate annual net savings of £1.1bn.

Second, reducing the need for installed electricity generation capacity – particularly offshore wind and solar – could deliver a further £1.2bn of savings annually.

Finally, £0.6bn in yearly savings would come from reduced pressure on low-voltage distribution networks

that carry electricity from substations to consumers.

Together, these benefits could total £86.5bn by 2050, according to the research, which also highlights the potential for greater savings under more optimised conditions.

Annual savings could rise to £5.7bn through the deployment of large heat networks integrated with a smart electricity grid, particularly when combined with building retrofit programmes and lower battery costs.

The report, published on 16 March by ADE: Heat Networks, concludes that communal heat networks can undercut gas boilers in cost when they are connected to thermal storage and able to draw on renewable electricity during periods of low prices.

Chris Unsworth, head of ADE: Heat Networks, said: 'This report proves that clean heat can be cost competitive with gas, but only if the government starts treating heat networks like the essential infrastructure they are.'

Miliband defends data centre emissions modelling

Secretary of State for Energy Security Ed Miliband has admitted the level of future electricity demand from data centres is 'inherently uncertain', but insists that it is accounted for in the government's emissions modelling.

The Minister was pressed by Toby Perkins MP, chair of the House of Commons Environmental Audit Committee, about concerns that the Climate Change Committee's (CCC's) proposed Seventh Carbon Budget (CB7) does not account for data centre emissions.

In a letter responding to Perkins, Miliband said that the government's modelling for CB7 accounts for

potential emissions from data centres through wider projections of overall electricity demand growth.

He added that the CCC's CB7 advice, which was published more than a year ago and sets an envelope for the UK's emissions in the late 2030s and early 2040s, is based on these projections.

The Environmental Audit Committee published Miliband's letter on 26 February, as it announced a new inquiry into data centres' environmental impact. This will examine the effect that the energy and water demands of such facilities may have on the government's net zero goals.

New safety requirements for construction products

White paper says manufacturers will have to assess risks

Construction products must be properly assessed before they can be used in the building process, the government has proposed, in a bid to end the 'dishonest and misleading' practices uncovered by the Grenfell Tower Inquiry.

The new general safety requirement (GSR) is set out in the Construction Products Reform White Paper, published by the Ministry of Housing, Communities and Local Government on 25 February. According to this, only around a third of construction products are currently regulated.

The white paper adds that products falling under designated mandatory standards must continue to comply with these. For products not covered by these designated standards, a

'proportionate, risk-based' GSR will apply that addresses the 'gaps in regulatory coverage that could allow unsafe products to be placed on the market'.

Under the GSR, manufacturers will be required to assess safety risks connected to the intended use and the 'normal or reasonably foreseeable' conditions of use of the product, and take proportionate action to 'eliminate or control' such risks. Further measures will apply where products are 'critical' to safe construction and a risk of 'serious harm' exists if something goes wrong.

Minimum third-party assurance and certification requirements will be introduced to increase transparency and 'restore confidence' in the system.

Compliance failings found at glass makers inspectors find

Not one manufacturer of heat-soaked thermally toughened glass (HSTTG) provided a compliant Declaration of Performance (DoP) for its products – which is required by law – when inspected by the Office for Product Safety and Standards (OPSS).

Following intelligence gathering that indicated 'systemic' failures of compliance, the OPSS inspected manufacturers of HSTTG, which is often used in commercial settings.

None was able to provide a compliant DoP during the initial inspection, and only half were able to provide any form of DoP.

In addition, 93% were not meeting product-labelling requirements and 86% did not demonstrate compliance with those for marking.

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Neil, Technical Director

Embodied carbon consultation opens on use of CIBSE TM65

Insight from practitioners will help inform future updates

The CIBSE Embodied Carbon Working Group is seeking feedback on the use of *CIBSE TM65: Embodied carbon in building services: a calculation methodology* to help shape future updates.

The survey aims to build a clearer picture of current practices for assessing and reducing embodied carbon in building services systems, and to understand the challenges faced by those applying the guidance.

Insights from manufacturers, contractors, sustainability consultants and building services designers will directly inform improvements to TM65, and identify where further embodied carbon guidance would be valuable.

Specifically, this consultation seeks to:

- Understand how CIBSE members currently assess and work to reduce embodied

Embodied carbon in building services: a calculation methodology



TM65: 2021



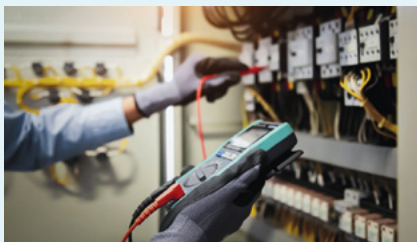
carbon in MEP systems, including the barriers they encounter

- Gather insights into how TM65 is being used in practice to help inform future updates
- Identify topics where additional embodied carbon guidance or support would be beneficial.

To respond to the survey, visit TM65 feedback at bit.ly/CJTM65Fe by 30 April.

TM65 is available at bit.ly/CJTM65

Training



Commissioning Code M: Commissioning management

18 May

This course follows CIBSE Commissioning Code M and is designed to provide an overview of the commissioning management process. The importance of commissioning to deliver a successful project will be discussed, with attendees learning about the role of the commissioning manager, as well as associated tasks and the skill set required to perform this key function. The course will contrast the traditional view of commissioning, as expressed in the previous CIBSE Commissioning Code M, versus the view where commissioning is embedded within all stages of project development.

www.cibse.org/training

For full details and booking:

www.cibse.org/training

BS 9251 Automatic water suppression systems overview
14 April

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Fire safety construction
16 April

Mastering the application of heat pumps
21 April
12 August

Electrical services explained
20–22 April
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23 April

Design of heating and chilled water pipe systems
28 April
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International building services projects
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15 July
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8 May
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11 June

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17 June

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23 June

Principals of hydraulics and control of modern heat networks
30 June
16 July

Understanding the law for engineers
7 July

Energy surveys
17 July

Campaign backs heat pumps and raises awareness

Initiative to focus on best practice for heat pump system design

CIBSE has launched a new communications campaign focused on heat pumps and their role in shaping the future of low carbon heating.

Heat pumps are widely recognised as a critical technology in the transition to net zero, offering an efficient and sustainable way to provide heating, cooling and hot water for buildings and industrial applications.

The campaign aims to strengthen understanding of heat pump technology, promote evidence-based knowledge, and highlight the importance of high-quality system design and installation.

Misconceptions about the performance, application and efficiency of heat pumps persist, despite them becoming mainstream. Through this campaign, CIBSE seeks to provide clear, authoritative information that supports better

decision-making across the sector.

The initiative is designed to reach two key audiences: industry professionals and the wider public. For engineers and designers, the campaign highlights technical best practice, while, for the public, it aims to explain how heat pumps work and how they can help reduce emissions in comfortable, resilient buildings.

The campaign will run across all of CIBSE's online channels, supported by a dedicated section on its website bringing together guidance, insights and resources on heat pumps.

Up until August, a social media campaign will feature animated videos, infographics, myth-busting content and key facts about heat pumps, while highlighting CIBSE's leadership and expertise on the topic within the industry.

To discover more about the campaign, visit cibse.org

Medal nominations open now

CIBSE medals recognise members who have demonstrated outstanding leadership, innovation and commitment across the built environment – including through CIBSE Regions, Special Interest Groups and Societies – and industry expertise.

If you know someone who you think should be recognised for their excellence, nominate them for a medal.

Nominations are open for Corporate Grade Members (Licentiate, Associate, Member or Fellow) of CIBSE and its Societies.

Nominations must be made by Friday 17 April. Review the eligibility criteria and start your proposal at bit.ly/CJNomMe

Call for trainers

Would you like to become a trainer for CIBSE? The Institution is looking for trainers in all subject areas across building services, although there is immediate demand in the following subjects:

- Energy assessor
- Sustainability services
- International services.

Every year, CIBSE Training runs CPD and professional training courses for thousands of delegates. This service is continuously expanding to meet demand from engineers, contractors, manufacturers and building industry clients seeking to acquire new knowledge and skills.

If you are interested and would like to be involved in CIBSE Training, additional information can be found at bit.ly/CJCBTra

Save the date

The CIBSE AGM and President's Address will take place on Wednesday 10 June at CIBSE headquarters, 91–94 Saffron Hill, London, EC1N 8Q.

It will be a hybrid event and a Teams link will be sent to those who are joining online. Members will receive a calling notice ahead of the event, which will include registration details.

In April/May

AI for built environment sustainability: challenges and opportunities

23 April, Hoare Lea, London

Discussions on the role of AI in the future of building design, performance and operation, organised by CIBSE Sustainability Group and Young Energy Performance Group. Speakers include Hoare Lea's Dr Sharon Richardson.

Decarbonisation Conference

29 April, British Library

Bringing together leaders and practitioners from across the built environment to explore the technologies, policies and collaborative actions needed to accelerate the UK's transition to net zero.

14th SoPHE Northern Celebration Dinner

8 May, Manchester

The annual event offers an opportunity to

network and celebrate the industry with peers. Guest speaker is comedian Tom Houghton. To book, email sophe@cibse.org

Skills and Future Workforce Conference

21 May, CIBSE HQ

Framed by the UK's commitment to achieving net zero by 2050, the conference will focus on steps taken to bridge the skills gap, with a focus on renewables, digital tools and sustainability, plus skills relating to technical knowledge, collaboration, problem solving and communication.

Heating the future – CIBSE Scotland Conference

27 May, University of Strathclyde, Glasgow

The conference explores how innovation and cross-sector collaboration are driving the transition to low carbon heat in Scotland. bit.ly/CJHTF26

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Medals



Max Fordham engineers achieve HRB registration

Engineers James Byass and Luke Hadley are the first from Max Fordham to achieve higher-risk buildings registration through CIBSE.

The HRB Register, developed by the Engineering Council, provides clients, residents, employers and regulators with confidence that engineers are competent to work on higher-risk buildings.

CIBSE is one of only five professional engineering institutions licensed to award this registration, offering assessments against the generalist UK-SPEC HRB requirements, as well as the Building Services and Façade annexes.

The register assesses competence and commitment, ensuring UK engineers meet the standards required to design and manage complex, high-stakes projects.

Hadley, director and electrical engineering leader at Max Fordham, has been delivering electrical engineering solutions across a range of building types – from theatres, art galleries and multiple complex residential developments – for nearly two decades. He said: 'I am proud to be one of the first building services engineers to achieve this status.'

Byass, director of Max Fordham's MEP Housing team, has more than 20 years' experience in building services engineering. He said: 'Working on high-risk buildings carries a huge responsibility. HRB registration is a welcome necessary step for the industry.'

£4,000 bursary for lighting research

The Society of Light and Lighting (SLL) Jean Heap Bursary, which provides up to £4,000 of funding, is open for applications.

Applicants should submit a written paper, along with a short video, to outline their research proposal. The entry should include the specific topic to be researched, the methodology, the timescale, and the clearly stated aims and objectives of the research. It should also outline why the applicant needs funding and how the funds will be used in carrying out their research.

The judging panel will be looking for a specific piece of lighting study or research designed to benefit SLL members and industry. Visit bit.ly/46JHBurs

The SLL Young Lighter 2026 competition is also now accepting entries. Open to anyone interested in light and lighting, regardless of background or education, the competition provides a high-profile opportunity to help younger lighting professionals in the early stages of their careers. Enter at bit.ly/CJSLLYL26

A rigorous test of competency



The meticulousness of manufacturers in proving the competency of products for specific applications is a lesson others could follow, says BSB Engineering Services' **David Fitzpatrick**

Since the last column, I have spent a lot of time within committees and CPD training addressing competence, and understanding what manufacturers have to do to get a life-safety product to market.

To put a product onto the market with a CE mark, it must be tested to the relevant standard by an independent, third-party-accredited test facility. This must be done for each of the applications in which you wish to market the product – for example, in different wall types. This could mean a product goes through four or five tests. It is not as if one test fits all.

The same independent third party must then come to the manufacturing facility to assess that you are making the same product that has been tested consistently.

Then, a Declaration of Performance certificate is issued for that product for the application that has been tested. Every 12 months, the same accredited body returns and goes through the process again.

This process shows a level of competence in the manufacturer and the way products are marketed. I understand there is sometimes a lack of trust, with some manufacturers making embellished claims about their products – but these players don't represent the whole sector.

There is a responsibility on designers and contractors to know what questions to ask manufacturers, to ensure they are using the right products – and this is where the Building Safety Act is asking these groups to show a level of competence.

The new PAS 200 is helping manufacturers with the right roadmap and should become mandatory for the industry.

I wonder what our industry would be like if other areas had to go through the same rigorous competency process.

For example, a design or installation had to be assessed by a third party for a certain application (say, a high-rise residential building), and then that same third party had to check if an identical process is in place for every project. A document of competency would then be issued before a tender could be made for a project. Maybe it's an idea that could catch on!

● **David Fitzpatrick is marketing managing director at BSB Engineering Services**

david.fitzpatrick@bsb-dampers.co.uk | www.bsb-dampers.co.uk

BSB
ENGINEERING A SAFER TOMORROW

Home front

While CIBSE broadly supports the government's proposals for reforming Energy Performance Certificates, **Julie Godefroy** says relying on standardised assumptions for fabric energy efficiency misses an opportunity to monitor real-world outcomes

The government's consultation on reforming Energy Performance Certificates (EPCs) through the Home Energy Model proposes significant changes to how existing homes are assessed in England and Wales. CIBSE broadly supports the direction, but makes recommendations to improve consumer confidence and delivery against policy objectives.

A key methodological change is the introduction of a modular approach to data inputs. Assessors could rely on default values (as currently in RdSAP) or use more detailed 'full data' inputs where reliable evidence exists. CIBSE supports this, as information for existing homes varies significantly. The effectiveness of this approach, however, will depend both on default values and the 'full' input alternatives – that is, whether robust measurement methods are widely available.

Further work with industry is required to determine which parameters would be suitable for the 'full data' route, through which measurement methods, and under which conditions, including assessor training.

CIBSE also recommends that EPCs include a confidence rating based on the extent of reliance on default vs 'full data' inputs. This would help consumers understand the reliability of the EPC and would value more detailed assessments, thereby justifying the additional work, costs and training for assessors.

EPC metrics

The consultation also covers the four new proposed EPC metrics.

The first is fabric energy efficiency (FEE). CIBSE strongly agrees that fabric performance should play a central role, to drive reductions in energy demand and costs, improve thermal comfort, and support decarbonisation. However, it has concerns about the FEE: it is a moving target linked to the notional dwelling and is calculated using



standardised assumptions, meaning it cannot be verified in practice. This misses an important opportunity to drive better-quality retrofit works and to monitor outcomes, contradicting the consultation's aim of encouraging measurement and more reliable data.

There is no explanation for why alternative metrics are not proposed. For example, space heating demand has been recommended by the Climate Change Committee¹, and CIBSE is soon to publish a technical memorandum² on the measurement of Heat Transfer Coefficients (HTCs). The consultation proposes that HTCs could be reported as optional information, but it is unlikely this would happen without incentives.

CIBSE proposes that reporting HTCs or other optional parameters be linked to the confidence rating.

The second metric focuses on heating systems, encouraging efficiency and moving away from fossil fuels. CIBSE broadly agrees with this metric and the proposed rating scale. It recommends that heat networks' efficiency and carbon content be assessed on the same basis as onsite systems, without accounting approaches such as sleeving and carbon factors for CHP-produced electricity, which artificially reduce the carbon content of network heat.

Furthermore, while acknowledging

the potential impact of direct electric systems on the Grid and energy costs, CIBSE notes that they may be viable in very efficient dwellings with extremely low heating demand, with the benefit of being low-embodied carbon. When fully developing the metrics, sensitivity analysis should be carried out on how the stock would fare against the full set of metrics, both currently and in its future intended state – that is, with lower demand and decarbonised.

The most innovative proposal is the Smart Readiness metric, intended to recognise the potential for homes to interact effectively with the energy system. CIBSE supports the intent and broadly agrees with the technologies to be rewarded, but thermal mass should also be recognised as smoothing heat demand. Moreover, given the significant capital costs and resource impacts of batteries, we recommend more analysis on how much and where to reward onsite batteries, with a comparison against Grid-located alternatives.

The consultation does not state what the metric would ultimately measure – whether ratings would simply be based on the list of installed technologies or on a quantitative assessment of outcomes, such as annual energy use or peak demand and potential to shift it, the latter being CIBSE's recommendation.

The fourth metric covers energy costs. CIBSE supports it as an important parameter for consumers, but little information is given in the consultation. Without careful design and transparent assumptions on tariffs, the rating could be misleading or become obsolete. ●

● **Julie Godefroy is the CIBSE head of net zero**

References:

¹ Reform of domestic EPC rating metrics to support delivery of net zero, Climate Change Committee, bit.ly/CJEPCCC

² Plans for guidance on Heat Transfer Coefficients, Julie Godefroy LinkedIn post, bit.ly/4shaX1e

NABERS UK aligns with new standard

NABERS UK Energy for Offices ratings, certified by CIBSE and administered through its wholly owned subsidiary CIBSE Certification, can now be used to prove projects meet the operational energy requirements of the UK Net Zero Carbon Buildings Standard (UKNZCBS), as defined in Annex C of the Standard.

Since taking on the role of NABERS UK administrator in 2024, CIBSE has worked closely with NABERS and the Better Buildings Partnership to drive the decarbonisation of buildings through the rapidly expanding NABERS UK Energy for Offices scheme.

CIBSE Certification and UKNZCBS have collaborated to ensure NABERS UK-certified ratings align with the operational requirements of the Standard. A 4.5-star NABERS UK Energy for Offices certification may now be used to demonstrate compliance with UKNZCBS operational energy requirements for existing offices.

The recognition highlights the scheme's growing influence in driving sustainable, low carbon office buildings across the UK. NABERS UK requires 12 months of metered energy data, which means it aligns with the UKNZCBS's requirement for 'real life' reporting.

For more information on NABERS UK Energy for Offices ratings, visit NABERS UK at bit.ly/CJCIBNAB

CIBSE Certification gets brand refresh



CIBSE Certification has unveiled its refreshed brand identity, following a similar updating of CIBSE's brand.

Using a green colour palette, the refresh presents a modern and accessible design. CIBSE Certification is a wholly owned subsidiary of CIBSE, and provides accredited certification, registration and verification services

across the built environment, helping professionals, organisations and products to demonstrate competence, compliance and quality.

Its services cover areas such as energy assessment, building performance evaluation, management systems certification and personnel registration schemes.

While operationally independent to ensure impartiality, CIBSE Certification shares CIBSE's commitment to advancing building performance, raising professional standards and supporting regulatory compliance.

Kieran O'Brien, director at CIBSE Certification, said: 'The brand refresh is a key step in ensuring CIBSE Certification reflects the evolving needs of the industry.'

Low carbon heating takes centre stage



Mitsubishi Electric's new Ecodan CAHV-Z R290 commercial air source heat pump is suitable for a range of applications, including schools and hospitals, says the company's **Graham Temple**

The future of sustainable buildings demands low carbon, renewable heating solutions, which is why Mitsubishi Electric has launched the new Ecodan CAHV-Z R290 commercial air source heat pump.

Available now for project specification, and for installation from this summer, the Ecodan CAHV-Z R290 delivers powerful, low carbon heating and hot water using ultra-low R290 refrigerant, which has a global warming potential (GWP) of just 0.02. This makes it perfect for a wide range of commercial applications, such as schools and hospitals, where it can operate as a standalone unit or in scalable multi-unit systems.

In a multi-unit setup, individual Ecodan CAHV-Z's cascade and rotate to meet demand, with a seven-unit system delivering up to 280kW (at nominal conditions A7W45) of efficient, reliable heating and hot water all year round.

The Ecodan CAHV-Z can supply a wide range of water temperatures, from 24°C to 75°C flow temperatures, without needing electric boosters, thereby reducing energy consumption, running costs and system complexity.

This high-temperature heating performance is delivered even when ambient temperatures fall to -15°C, ensuring reliable comfort in demanding conditions.

The heat pump offers quiet, adaptable operation and low-noise mode to minimise sound levels, along with external static pressure controls, allowing for flexible system design.

The use of ultra-low GWP R290 refrigerant reduces embodied carbon, helping future-proof projects and support ambitious control and communication system profile and sustainability targets. CAHV-Z is also supplied with integrated R290 safety features, including built-in leak detection and an explosion-proof relay support. The pump has a rapid defrost operation, which minimises system downtime, and comes with anti-simultaneous defrost control to prevent a full system shutdown during defrost.

The Ecodan CAHV-Z boasts an array of features that make it the perfect solution for commercial heating and hot-water production.

To find out more, visit bit.ly/CJMEInf and download an infographic, which provides an overview of the benefits of the Ecodan CAHV-Z R20 commercial air source heat pump

● **Graham Temple is marketing manager at Mitsubishi Electric**





Building Performance Award winners 2026

The projects, products and people setting the benchmarks for excellence in building services engineering





Building Performance Champion and Project of the Year – Workplace – International

Sponsor: Crane Fluid Systems Winner: B201 redevelopment – Becca

The retrofit of the University of Auckland's B201 Building has transformed an outdated human sciences building into a state-of-the-art home for the faculties of Education and Social Work, Arts, and Creative Arts and Industries.

Repurposing the existing structure means B201 has half the embodied carbon of an equivalent new building, while low carbon design strategies mean it only uses a third of the energy used by an equivalent new building.

At $66\text{kWh}\cdot\text{m}^{-2}$ per year, the energy use intensity is already well below the 2050 UK Net Zero Carbon Buildings Standard limit of $75\text{kWh}\cdot\text{m}^{-2}$ per year for higher education buildings with one-go retrofit.

The carbon intensity of the building is $8.5\text{kgCO}_2\text{e}/\text{m}^2$, within 5% of the design target. Judges described the project

as a 'greatest hits of benchmarks' that had taken a comprehensive, honest and holistic approach.

As part of the retrofit, the façade's heavy concrete spandrels were replaced by an airtight, lightweight curtain wall that reduced services demand. A new, naturally ventilated atrium, accessible to the public, was created and feature stairs were punched through the walls to improve the campus's connectivity.

A two-stage heat pump system provides heating to B201 and three adjacent buildings, while CO_2 heat pumps provide domestic hot water. A 150kW chiller maintains temperature and humidity in the PC1 laboratories, and energy-saving features include air handling unit heat recovery and CO_2 -based demand-controlled ventilation.



Engineer of the Year

Sponsor: Ideal Heating – Commercial Products

Winner: Miriam Ozanne, independent building performance consultant

'Listening to people, the building and the data' won Miriam Ozanne the coveted title of Engineer of the Year, said the judges.

Ozanne leads the way in promoting and teaching the importance of building performance, helping clients to decarbonise their estates, reduce energy and deliver net zero strategies. Clients value her method of combining deep technical design knowledge with a practical approach, to develop realistic and actionable plans for improving building performance.

Highly commended – Sean Harlow, head of engineering, Savills; Jessica Glynn, associate, Atelier Ten

Building Performance Consultancy (up to 50 employees)

Sponsor: Mitsubishi Electric

Winner: RCDC

'It's clear RCDC lives its mission: to make a positive difference through the work we deliver,' said the judges, who praised the consultancy's 'diverse workforce and commitment to innovation', which 'aligns with the culture of collaboration and team development'.

The company stood out with its drive to improve building performance, demonstrated by its internet of things heat-metering platform enabling the optimisation of heat pump retrofits, and its SmartWindows product, which provides autonomous window control to reduce exposure to CO₂, mould, pollution, noise and heat loss.

Highly commended – Lawler Group



Building Performance Consultancy (51-300 employees)

Sponsor: Airflow Developments

Winner: XCO2

XCO2 continued its winning habit by landing a CIBSE Building Performance Consultancy Award for the fifth year in a row.

The judges praised the company for its 'very forward-thinking approach - the submission proved that building performance was integral to the building culture'.

Now in its 18th year, XCO2 continues to deliver high-performance, low carbon buildings across housing, education, culture and hospitality, with a mission to act as a catalyst for change in the built environment.

Building Performance Consultancy (over 300 employees)

Sponsor: ABB

Winner: Buro Happold

Buro Happold was recognised for its outstanding support not just for clients, but also for its staff. The judges praised the company's pro bono work for projects across the world, and its organised international field trips with clients and collaborators.

The panel was especially impressed by Buro Happold's 'standout' attitude towards its staff, noting the company's 'inclusion and great working environments, plus career development and cohesive teams'.

It also welcomes employee ideas, with an internal innovation fund of £100,000, inviting staff to apply for a £10,000 budget to develop a concept.



Client of the Year

Winner: BBC Workplace

Setting clear targets and defining processes from the outset helped BBC Workplace to win in the Client of the Year category.

With a large portfolio of different building types and uses, understanding performance is key to meeting its commitments to reduce Scope 1 and 2 greenhouse gas emissions by 46% by 2030/31, from a 2019/20 baseline.

The panel of judges commended the organisation's heat decarbonisation efforts. 'In particular, works at Pacific Quay included the replacement of gas-fired boilers and conventional water chillers with 4-pipe air source heat pumps and cascade water source heat pumps for hot-water generation,' they said.



Leadership

Sponsor: Hays

Winner: Hong Kong Science and Technology Parks Corporation

By piloting a wide range of new technologies, Hong Kong Science and Technology Parks Corporation (HKSTP) is providing real-world test beds that give start-ups the support needed to scale innovation.

With more than 7,000 PV panels generating 1.5 million kWh in 2024, HKSTP hosts one of Hong Kong's largest onsite renewable energy networks. Other initiatives include hydrogen-powered electric vehicle charging and AI optimisation. The judges said HKSTP provides 'valuable learning at a national level'.

Highly commended: Shade the UK

Collaboration

Sponsor: CIBSE Life-cycle Carbon Assessment Training

Winner: One Creative Environments

In response to rising energy costs and growing environmental responsibility, One Creative Environments partnered with its landlord, Prime, to transform its shared HQ into a high-performance, low carbon workplace.

An inventive funding model allowed One to encourage the landlord to invest in energy efficiency improvements. The works were financed through the service charge, offset by the resulting savings on energy bills.

Judges praised the joint approach. 'In a market where capital constraints often stall retrofit and renovation efforts, this model provides a powerful demonstration of how aligned incentives and collaborative thinking can unlock progress,' they said.



Project of the Year – Public

Sponsor: Crane Fluid Systems

Winner: Locomotion New Hall – Buro Happold

Buro Happold has balanced conservation, accessibility and sustainability at the National Railway Museum’s new facility for 47 historic railway vehicles in County Durham.

The building features a steel portal frame supporting a wide mono-pitch roof, enclosed in a remarkably airtight envelope. Alongside effective commissioning and building management system tuning, this has helped the building achieve an impressive energy use intensity of just 50kWh-m⁻² per year.

Judges called Buro Happold’s fabric-first strategy – balancing the needs of visitors and conservation – ‘simple and robust’.



Project of the Year – Portfolio

Sponsor: Crane Fluid Systems

Winner: Bourn Quarter – SRE

Judges praised this ‘future ready’ industrial development for the impressive work being done with multiple tenants to reduce emissions during fit-out and operation.

Building objectives at Bourn Quarter included minimising operational energy demand, reducing embodied carbon, and meeting the diverse occupier needs across the 10 commercial and light-industrial units.

All units are equipped with live energy monitoring systems, which provide real-time consumption data and report faults in building services and metering equipment.

Feedback from periodic energy audits enables tenants to intervene to maintain energy intensity within agreed benchmarks.

Project of the Year – Workplace – Existing and Retrofit

Sponsor: Crane Fluid Systems

Winner: Decarbonisation of York House – British Land

York House is a five-floor, multi-occupied office building that is a decarbonisation test bed for British Land.

Interventions included replacing four gas boilers and chillers with two air source heat pump chillers and one water-to-water heat pump.

The strategy has improved whole building energy efficiency by 31% vs 2019, exceeding British Land’s 2030 portfolio reduction target of 25%.

Judges said the project will bring about wider change as a blueprint for the developer’s wider commercial portfolio and other similar buildings.



Project of the Year – Education

Sponsor: Crane Fluid Systems

Winner: Riverside Primary School – Archtype

Riverside Primary School, in Perth, is the first certified Passivhaus school in Scotland. The project included a super-insulated envelope, exceptionally high airtightness, triple-glazed windows and doors, and MVHR ventilation – all working in tandem to achieve an effective and efficient low-energy building fit for 21st-century teaching.

Designed to reduce energy costs by around 70% compared with a typical benchmark school, Riverside performs even better than predicted and closes the performance gap prevalent in today's schools.

The judges praised Archtype's collaborative approach and described it as a 'standout winner in terms of overall building performance'.



Project of the Year – New-build Workplace

Sponsor: Crane Fluid Systems

Winner: 11 & 12 Wellington Place – Ove Arup and Partners

Designed with the highest level of sustainable performance in mind, 11 & 12 Wellington Place became the first building outside of London to achieve a NABERS Design for Performance rating of 5* or above, certifying it as one of the most efficient commercial buildings in the country. A reversible air source heat pump system replaced gas-fired boilers and air-cooled chillers to eliminate onsite fossil fuels, and 700m² of PVs save 407 tonnes of carbon annually.

Highly commended: Project Featherstone – Buro Happold



Project of the Year – Residential

Sponsor: Crane Fluid Systems

Winner: Bluebird Project, Southend-on-Sea – Max Fordham

Bluebird is a Passivhaus scheme that helps homeless people get back to independent living. The judges described the project as 'a quietly outstanding example of how purposeful, well-informed collaboration can deliver lasting social and environmental value'.

Bluebird provides 50 bed spaces within the renovated terraced housing, and has created a high-quality, safe and comfortable environment for residents.

The housing uses air source heat pumps for heating and hot water, and recycled and recyclable materials wherever possible.





Building Performance Evaluation – Practice

CIBSE Next Generation of Building Performance Award

Winner: Willmott Dixon

Willmott Dixon was honoured with two awards for its ‘long-standing commitment to building performance’ with its Energy Synergy building performance service, which is designed to monitor operational energy and close the performance gap between design and in use.

The system actively monitors projects, providing customer facilities teams with AI-supported dashboard data and technical support from building performance experts.

By combining automated monitoring, expert analysis and benchmarking, Willmott Dixon’s Energy Synergy building performance service offers a scalable model for industry-wide improvement, and points the way to the next generation of building performance.

Information from an AI-driven global dashboard allows subsequent learning to be systematically integrated into future design and commissioning processes, improving TM54 modelling accuracy and informing consultant assumptions.

Buildings with 12 or more months of monitoring demonstrate an average 15% better-than-predicted performance compared with TM54 projections.

Judges said: ‘This is a scheme that is showing best practice for building performance in a reliable, replicable and scalable way.’



Facilities Management (FM)

Winner: Hong Kong Children’s Hospital – Hospital Authority

Innovative energy management and infrastructure upgrades have reduced the carbon footprint of Hong Kong Children’s Hospital significantly.

Hot-water supply was switched from gas to heat pumps and the FM team uses an energy management dashboard to identify energy-saving opportunities.

BIM asset management provides technicians with animated repair manuals for efficient equipment repair.

Judges said: ‘The winner delivered evidenced improvements using excellent feedback, knowledge sharing and extensive stakeholder engagement.’

Highly commended: Landsec – BGIS Global Integrated Solutions



Learning and Development

Sponsor: CIBSE Patrons

Winner: Data Academy apprenticeship – Hoare Lea

Hoare Lea's Data Academy was launched in 2023 to ensure engineers and consultants have the data, AI and digital skills needed to drive effective project delivery.

Participants have reported increased confidence in applying data to design, and feedback has demonstrated the strong application of skills in live projects.

Measurable efficiency savings have included £150,000 to £250,000 annually from design software analysis, and a reported 75% time saving.

Judges said: 'Hoare Lea showed that it put in a huge amount of effort to create, produce, maintain and manage its initiative effectively.'



CIBSE Embodied Carbon Award – Products and Systems: for Manufacturers and Suppliers

Sponsor: CIBSE Certification

Winner: Swegon

'Going beyond conventional thinking in terms of low carbon and circular product design' is what impressed the judges with Swegon's winning entry.

They said the indoor environment specialist demonstrated 'the huge potential for embodied carbon reductions in building equipment/systems through the replacement of conventional materials'. Swegon's combination of supply chain engagement, factory process changes and consistent measurement discipline has helped reduce embodied carbon in its products.

Highly commended: GlasCurtain



BURO HAPPOLD

MEP
EMBODIED
CARBON



CIBSE Embodied Carbon Award – Services and Projects: for Consultants

Sponsor: CMR

Winner: Buro Happold

Recognising the lack of detailed information in embodied carbon assessments at early design stages, Buro Happold developed a bespoke 'Rapid Scheduler' to estimate quantities for 200-plus building services items. This allows it to report whole-building embodied carbon with sufficient buffer, avoiding unrealistic targets for clients. Judges were impressed by the consistent way embodied carbon was addressed in Buro Happold's projects, and by the engagement activities raising awareness of its impact.

Highly commended: SCS and Introba Consulting

Product or Innovation of the Year – Air Quality

Product or Innovation of the Year – Wellbeing

Winner: AirDoor – VES

VES won two Building Performance Awards with AirDoor, a bespoke freestanding unit developed to address a widespread problem in commercial buildings: uncontrolled air infiltration through open doorways.

AirDoor is engineered with advanced aerodynamic features, developed through computational fluid dynamics, to control and direct airflow precisely. The technology’s versatility is particularly impressive, said the judges, being equally effective in heating and cooling.

The system counters fluctuating wind pressures and minimises thermal exchange at doorways, ensuring consistent indoor temperatures. This reduces reliance on additional heating or cooling systems.

An intelligent control system, supported by multiple sensors, continuously monitors airflow conditions, inside and out, and a variable-speed fan array dynamically adjusts to create a stabilised air barrier. This real-time modulation prevents unconditioned external air from entering and reduces unnecessary energy loss.

More than 200 AirDoors have now been installed. As well as continued rollouts with John Lewis Partnership and Sainsbury’s, VES has ambitious plans to secure new partnerships and large-scale deployments with major retailers worldwide.

Judges said: ‘Many buildings, for commercial reasons, prefer to have open entrances, or there are reception lobbies with near-constant traffic through the doors. The AirDoor product provides improved comfort and performance with lower heat loss.’



Product or Innovation of the Year – Building Performance Evaluation

Winner: WISE – Swegon

Adaptable to buildings of all sizes, WISE is a smart solution for demand-controlled spaces, where optimal comfort is combined with flexibility and energy efficiency.

The system continuously analyses building performance and directly optimises connected services. It adjusts chiller and heat pump water temperatures to reduce thermal losses, lowers system air pressures to save fan power, and adapts primary air temperatures based on room-level loads.

‘The product demonstrates measurable, repeatable and evidence-based performance improvement from evaluation of building performance data,’ said the judges.

Highly commended: IES Live 2025 – IES



Product or Innovation of the Year – Thermal Comfort

Sponsor: Lochinvar

Winner: Cosysense

Cosysense is a retrofit control system that personalises thermal comfort while reducing HVAC energy use.

The system was tested in a zone with no existing smart control, and tests confirmed substantial efficiency gains, with peak reductions of 82% during spring and average seasonal savings of 34% in HVAC energy use.

The product uses AI to leverage performance and can be deployed in new and retrofit applications.

Judges said: ‘Cosysense stood out for its ease of application, energy-saving potential, cost savings and overall positive effect on the thermal comfort of the spaces in which it is deployed.’



Best Digital Innovation – Organisational Strategy

Winner: Engentica – EMSD, Government of Hong Kong

The judges said Engentica demonstrated ‘true organisational change’, with positive impacts on the performance of all building types.

The Engentica platform integrates a unified digital operations and management system with agentic AI, enabling predictive analytics, energy optimisation and fault diagnosis.

The platform provides a structured, machine-readable representation of electrical and mechanical systems and their interrelationships. This allows frontline staff to quickly identify affected systems and locations.

Best Digital Innovation – Project Delivery

Winner: CarbonMe – Hilson Moran

CarbonMe is a web-based application with a graphical interface, designed to transform how MEP engineers estimate embodied carbon from the earliest design stages. Judges said ‘the extent of the innovation is excellent, simplifying the communication of the impact of decisions on embodied carbon across project life-cycle’.

Clear graphical and numerical outputs let design teams see the impact of each option and adjust system selection or key parameters in real time. Enabling early inclusion of carbon data allows for informed decision-making and, ultimately, lowers environmental impacts.

‘Everyone involved can understand the outcomes, no matter their background or expertise,’ the judges added.



CIBSE BUILDING PERFORMANCE AWARDS 2026

The 2026 CIBSE Building Performance Awards was held on
5 March 2026 at Park Plaza Westminster Bridge, London, UK

1 BEST DIGITAL INNOVATION - ORGANISATIONAL STRATEGY

Engentica - EMSD, Government of Hong Kong

2 BEST DIGITAL INNOVATION - PROJECT DELIVERY

CarbonMe - Hilson Moran

3 BUILDING PERFORMANCE EVALUATION - PRACTICE

Willmott Dixon

4 CIBSE EMBODIED CARBON AWARD - PRODUCTS AND SYSTEMS: FOR MANUFACTURERS AND SUPPLIERS

Swegon

Highly commended: GlasCurtain

Sponsored by CIBSE Certification

5 CIBSE EMBODIED CARBON AWARD - SERVICES AND PROJECTS: FOR CONSULTANTS

Buro Happold

Highly commended: SCS & Introba Consulting

Sponsored by CMR

6 CLIENT OF THE YEAR

BBC Workplace

7 LEADERSHIP

Hong Kong Science and Technology Parks
Corporation

Highly commended: Shade the UK

Sponsored by Hays

8 COLLABORATION

One Creative environments

Sponsored by CIBSE Lifecycle Carbon Assessment Training

9 ENGINEER OF THE YEAR

Miriam Ozanne, Independent Building Performance
Consultant

Highly commended:

• Jessica Glynn, Associate - Atelier Ten

• Sean Harlow, Head of Engineering - Savills

Sponsored by Ideal Heating – Commercial Products

10 LEARNING AND DEVELOPMENT

Data Academy Apprenticeship - Hoare Lea

Sponsored by CIBSE Patrons

11 FACILITIES MANAGEMENT

Hong Kong Children's Hospital -
Hospital Authority

Highly commended:

Landsec - BGIS Global Integrated Solutions

12 PRODUCT OR INNOVATION OF THE YEAR - AIR QUALITY

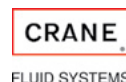
AirDoor - VES

13 PRODUCT OR INNOVATION OF THE YEAR - THERMAL COMFORT

Cosysense

Sponsored by Lochinvar

Sponsors



Congratulations to our

WINNERS

14 PRODUCT OR INNOVATION OF THE YEAR – BUILDING PERFORMANCE EVALUATION

WISE - Swegon

Highly commended: IES Live 2025 - IES

15 PRODUCT OR INNOVATION OF THE YEAR - WELLBEING

AirDoor - VES

16 PROJECT OF THE YEAR - PUBLIC

Locomotion New Hall - Buro Happold

Sponsored by Crane Fluid Systems

17 PROJECT OF THE YEAR - WORKPLACE - INTERNATIONAL

B201 Redevelopment - Beca

Sponsored by Crane Fluid Systems

18 PROJECT OF THE YEAR - WORKPLACE - EXISTING & RETROFIT

Decarbonisation of York House - British Land

Sponsored by Crane Fluid Systems

19 PROJECT OF THE YEAR - EDUCATION

Riverside Primary School - Archtype

Sponsored by Crane Fluid Systems

20 PROJECT OF THE YEAR - WORKPLACE - NEW

11&12 Wellington Place - Ove Arup

Highly commended: Project Featherstone - Buro Happold

Sponsored by Crane Fluid Systems

21 PROJECT OF THE YEAR - RESIDENTIAL

Bluebird Project, Southend-on-Sea - Max Fordham

Sponsored by Crane Fluid Systems

22 PROJECT OF THE YEAR - PORTFOLIO

Bourn Quarter - SRE

Sponsored by Crane Fluid Systems

23 BUILDING PERFORMANCE CONSULTANCY (UP TO 50 EMPLOYEES)

RCDC

Highly commended: Lawler Group

Sponsored by Mitsubishi Electric

24 BUILDING PERFORMANCE CONSULTANCY (51 - 300 EMPLOYEES)

XCO2

Sponsored by Airflow

25 BUILDING PERFORMANCE CONSULTANCY (OVER 300 EMPLOYEES)

Buro Happold

Sponsored by ABB

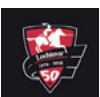
26 CIBSE NEXT GENERATION OF BUILDING PERFORMANCE AWARD

Willmott Dixon

27 BUILDING PERFORMANCE CHAMPION

B201 Redevelopment - Beca

Supporters





B201's innovative retrofit design has given the campus a new central atrium, which forms the social heart of the building

Redefining with retrofit

The University of Auckland's B201 is one of the world's most sustainable academic buildings. **Andy Pearson** explores how CIBSE's 2026 Building Performance Champion used deep retrofit and building services engineering to transform the 1970s campus

Adaptive reuse is widely recognised as one of the most effective strategies for reducing whole life carbon in the built environment, primarily by retaining existing structures and avoiding the significant embodied carbon associated with demolition and new construction.

The redevelopment of the University of Auckland's Building 201 (B201) demonstrates what is possible when a project team treats an ageing asset not as a demolition candidate, but as an opportunity.

The transformation of the 1970s social sciences building into a world-leading low carbon academic facility has delivered a 26,500m² building operating with dramatically lower energy use and carbon emissions, while extending its life by another half century.

Equally impressively, the project has achieved a 6 Green Star rating with 93 points – the highest score ever awarded in the New Zealand Green Building Council's rating system.

These achievements were recognised in the 2026 CIBSE Building Performance Awards, which named it Project of the Year – Workplace and Building Performance Champion. The judges said it was an 'exemplary demonstration of every category in building performance'.



Project team

Building services and environmentally sustainable design consultant: Beca

Building owner and occupier: University of Auckland

PM: Precon

QS: Barnes Beagley Doherr

Architect and interior designer: Jasmox

M&E contractors: Numecon (mechanical) / Aotea (electrical)

MC: Hawkins

Developer: University of Auckland

Constructed in stages during the 1970s, B201 was typical of university buildings of the era: a concrete, nine-storey brutalist structure with compartmentalised spaces, outdated mechanical systems and deteriorating envelope elements. By the mid-2010s, it had become an inefficient workplace with carbon-intensive building services and structural vulnerabilities in a seismically active region.

The University of Auckland initially considered two conventional options: a light refurbishment, followed in 10 to 15 years by eventual demolition; or instant demolition and full rebuild. Instead, the client challenged the design team to explore whether the building could be transformed through adaptive reuse to deliver world-leading sustainability outcomes. What emerged was a comprehensive reinvention.

Retaining the existing structural frame and foundations, the NZ\$200m project avoided the significant carbon and cost associated with demolition and reconstruction, while reducing the overall construction programme.

The structural assessment identified the building's heavy precast concrete façade panels as a key opportunity to transform the seismic rating. Advanced non-linear structural analysis showed that replacing these deteriorating panels

with a lightweight curtain-wall system would unlock the building's structural transformation. Removing 500 concrete façade panels reduced structural loads dramatically and allowed the existing frame to be strengthened more efficiently.

The lightweight façade system incorporates aluminium extrusions manufactured in New Zealand with high recycled content, reducing embodied carbon while enabling slimmer profiles and less material use.

This change also created new architectural opportunities. The reduced structural loading enabled modifications to the internal layout, including new circulation routes and a new central atrium, improving connectivity between the campus and the surrounding city. The atrium, topped by a distinctive glulam timber roof, now forms the social heart of the building.

Perhaps the project's most innovative aspect is its services design. Combining high-performance glazing, improved airtightness and an optimised glazing-to-wall ratio reduces heating and cooling loads significantly compared with the 1970s design. This new lightweight façade enabled Beca, the project's building services engineers, to eliminate fossil fuel combustion for B201, replacing the gas-based heating system with a fully electric solution using a two-stage heat pump system (see panel, 'Heat pump system design').

'A lot of engineering went into the design of the new façade and thermal envelope,' Timothy Howarth, senior associate, Beca, explains. 'We had to balance access to views and daylight with thermal comfort, overheating risk, heat loss and gain, acoustics and airtightness. Getting that right makes a huge difference to the atmosphere and comfort of people in the building.'

The building also includes a 150kW chiller operating 24/7 to maintain the temperature and humidity levels in the social sciences laboratories for biological anthropology and conservation.

Energy modelling was used to support design decisions relating to the specification of the façade performance and to compare the building services options. It informed a whole of life-cycle cost study, which recommended chilled beams for the faculty office levels and variable air volume (VAV) systems for the high-density learning spaces. The building's main air handling units are equipped with heat recovery wheels and demand-control ventilation to further optimise energy. In the naturally ventilated new atrium, heat is delivered through underfloor heating.

Separate electric CO₂ heat pumps are installed to supply domestic hot water from central storage tanks, delivered around the building through a 60°C circulation loop.

This electrification strategy is particularly effective in New Zealand, where approximately 85% of Grid electricity is generated from renewable sources.

A climate change adaptation assessment evaluated potential impacts from temperature increases, extreme rainfall and storm events under multiple climate scenarios for 2040 and 2065. Key risks identified included increased flooding potential, higher ambient temperatures and possible strain on cooling systems.

In response, the design includes: increased stormwater design capacity; oversized chilled water infrastructure to accommodate future cooling demand; and flexible heat pump systems. This enables the building services to respond to future climatic conditions without major retrofit.

B201's heat pump system allowed it and adjacent buildings to transition easily to electric heating

Performance in operation

Energy modelling established operational energy targets of approximately 1,660MWh per year,



Heat pump system design

A two-stage heat pump system – a first for a project of this type in New Zealand – was installed to maintain the heating hot-water service for the neighbouring campus buildings, which historically relied on the same district heating network for their heating hot water.

The system generates 1,500kW of low-temperature heat using three electric reverse-cycle air source R454b refrigerant heat pumps and 600kW of higher-temperature R1234ze refrigerant heat pumps to boost temperatures for the adjacent buildings.

The low-temperature stage supplies heat at 45/39°C to the new building, while the high-temperature stage boosts the water temperature to 80/70°C for the adjacent buildings' existing radiators, air handling units and VAV reheat coils. This approach allowed those buildings to transition to electric heating without requiring extensive modifications to their internal distribution systems, helping to further decarbonise the campus.

equivalent to 8.1 kgCO₂e·m⁻² annually.

The project team placed significant emphasis on ensuring performance targets would translate into real operational outcomes. Although the project did not formally adopt a soft landings framework, many of its principles were implemented throughout design and delivery.

Clear performance metrics were defined and an independent commissioning agent was appointed early. Commissioning planning began during design, and included detailed reviews of operability, maintainability and controllability. The commissioning agent coordinated plans across various trades and oversaw verification of system performance. The facilities management team was involved in the handover process, reviewing the building logbook, user guides and operational manuals. Early contractor engagement also helped refine the design.

The approach worked. Since February 2024, the start of the building's first academic year in operation, it recorded energy use of 1,750MWh and operational carbon emissions of 8.5 kgCO₂e·m⁻² – within 5% of the design target.

At around 66kWh·m⁻² per year, the building's energy use intensity already sits below the 2050 target of the UK Net Zero Carbon Buildings Standard (NZCBS) for higher education retrofits.

Post-handover tuning is scheduled to continue for two years, with quarterly meetings between the project team and facilities staff to

review energy and environmental performance, and optimise system operation (see panel, 'Design vs operation').

'To have the energy use intensity land so closely to our design target was great. It proved a carefully considered building services design that is well built and properly commissioned can eliminate the performance gap,' says Howarth.

The redevelopment was driven not only by sustainability goals, but also by the desire to create a healthier, more attractive environment.

Prior to redevelopment, the building performed poorly. A Building Use Study (BUS) methodology survey conducted in the original building placed it in the seventh percentile of the New Zealand benchmark dataset.

After redevelopment, a post-occupancy survey conducted in 2025 scored the new building in the 72nd percentile of the benchmark dataset for overall comfort satisfaction. This can be attributed to various features, including:

- The new façade allowing daylight to penetrate deeper into the building, giving regularly occupied spaces access to external views (this also enabled smart LED lighting to use daylight harvesting)
- Indoor air quality, with ventilation rates delivering 50% more outdoor air than NZ code requirements, and demand-controlled ventilation adjusting supply according to occupancy, keeping CO₂ levels below 800ppm
- Thermal comfort modelled against ASHRAE Standard 55, with system controls designed to maintain target conditions for more than 95% of occupied hours
- Acoustic comfort, including testing during commissioning to confirm compliance with the university's and Green Star design criteria.

The building also incorporates a variety of workspaces supporting different working styles and learning modes. Feature staircases encourage movement between floors and reduce reliance on lifts, which may explain why lift energy consumption is lower than predicted.

Beyond environmental performance, the project sought to strengthen the building's connection to its cultural and urban context.

Whole life carbon and seismic resilience

In seismically active regions such as New Zealand, the risk of earthquake damage can significantly influence life-cycle carbon outcomes. Extensive structural strengthening can increase embodied carbon, while insufficient resilience risks future demolition and reconstruction. The design therefore aimed to find a 'sweet spot' between improved seismic performance and material efficiency.

Design vs operation

End use	Actual (kWh)	Design (kWh)	Variance %	% of actual
Chillers	142,170	160,000	-11%	8%
Heat pumps	179,659	260,000	-31%	10%
Fans & pumps	582,914	310,000	88%	33%
Lighting	299,774	410,000	-27%	17%
Small power	442,141	430,000	2.8%	25%
DHW	93,783	30,000	212.6%	5%
Lifts	10,246	60,000	-83%	1%
Total	1,751,687	1,660,000	5.5%	

GIA 26,462 m²

Analysis of B201 metered energy use (kWh) from February 2024 to January 2025.

- Beca re-evaluated DHW modelling, resulting in updates to methodology.
- Lift usage was less than design, attributable to a conservative design estimate and popularity of the feature stairs.
- Energy consumption from fans and pumps was almost double Beca's calculations. This discrepancy provided a focus point for tuning activities. Interventions being implemented to improve performance include pressure reset based on zone demand, pinpointing rogue zones and resetting minimum fan and pump speeds.

The resulting building exceeds 67% of New Building Standard (Importance Level 3) seismic performance. Low-damage design principles were incorporated where feasible to reduce the likelihood of major structural repairs following an earthquake. Repurposing the structure also shortened construction by a year and saved an estimated 25% cost compared with replacement.

The approach cut upfront embodied carbon emissions by more than 50% compared with a new building. Overall, the project achieved an embodied carbon intensity of approximately 353 kgCO₂e·m⁻², meeting the 2030 target for higher education buildings under the UK NZCBS.

By choosing adaptive reuse rather than demolition, the B201 redevelopment shows how ageing university buildings can become powerful tools in the transition to net zero.

The transformation has changed attitudes to a building once considered ugly. 'We're delighted,' Howarth says. 'This proves the most sustainable building is the one you didn't need to build.'

The project delivers significant carbon reductions across embodied and operational emissions. Decarbonisation of B201 and the surrounding buildings is expected to reduce

Performance data*

Total energy use: kWh per year	1,751,687
Floor area m ² GIA	26,462
Total embodied CO ₂ kgCO ₂ e·m ⁻²	1,171
Total electricity use kWh per year	1,751,687
Electricity use Grid kWh per year	1,650,634
Onsite renewable PV kWh per year	101,052

operational emissions by 700–900 tonnes of CO₂ annually, equivalent to 14,000–18,000 tonnes over the life of the plant. This represents a reduction of roughly 5–8% of the University of Auckland's natural gas emissions relative to its 2019 baseline. Perhaps more importantly, the project provides a replicable model for other institutions.

Winning Building Performance Champion is great, but Howarth sees it as part of a longer journey. 'There's more room in the trophy cabinet, but, more importantly, our focus is on delivering net zero carbon buildings. This recognition confirms we're on the right path.' ●

For more on the CIBSE Building Performance Awards see page 16

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Leading the charge

In five years, **Ruth Carter** has moved CIBSE from the suburbs to the heart of London, and turned the Institution into a dynamic, global force. As CIBSE's new Skills Hub opens this month, Alex Smith talks to Carter about why she is so committed to driving professional excellence in the UK and beyond



The opening of the new Skills Hub at CIBSE's headquarters is a fitting milestone for Ruth Carter's five-year anniversary as CEO. The extensive refurbishment of the lower two floors of the five-storey building comes only 18 months after she oversaw the relocation of CIBSE to central London after 45 years in the suburbs of Balham.

More than just a new facility, it is the physical embodiment of Carter's central tenets for CIBSE: members, knowledge and commerce. Under her leadership, membership has risen by almost 20% and revenue by 56% over the past five years, the latter making it possible for the charity to make a significant investment in the Skills Hub.

The move from south London was a key objective for Carter, providing CIBSE with a location and building that befits its international

standing. 'If you are one of the fastest-growing professional engineering institutions, whose voice and influence are making ripples around the world, that needs to be represented in its headquarters,' she says. 'CIBSE now has a modern, vibrant building in central London that reflects our profession.'

Carter is keen that non-UK-based members make use of the building, and she says its new location makes it possible for engineers to enjoy a coffee in the members' lounge only an hour after landing at Heathrow airport.

More than 30% of CIBSE Members are now based overseas, and Carter predicts this figure will grow as the Institution's knowledge and professionalism continue to cross borders. 'Engineering transcends politics, religion, geography. The laws of physics are the same in every country,' says Carter. 'One in seven of our members sits in Hong Kong, with an increasing number in the Greater Bay Area and China at large.'

'We have a very vibrant, growing community in the Middle East, and one of our fastest-growing regions is Australia and New Zealand.'

Carter highlights that Ireland is also a key area for CIBSE, in part because of its strategic relationship with the US and the EU. She is clear, however, that CIBSE doesn't want to expand all over the globe – just in key regions where it is already experiencing growth and where engineers need its support.

'It's about having a really clear sense of purpose to what we do,' says Carter.

A good example of targeted support is the publication of regional TM65 guides on embodied carbon for the United Arab Emirates, North America, and Australia and New Zealand.

In explaining the reasons for CIBSE's healthy rate of membership growth, Carter expands on the Institution's purpose: 'CIBSE is very clear on its sovereignty. We are focused on building performance, building safety and



Jennifer Cox

Ruth is an advocate for young engineers and has been a mentor to me since I won Graduate of the Year in 2020. As much as she values the input of her volunteers, she makes sure CIBSE gives back just as much. To me, she has provided invaluable guidance.

Ruth has brought a huge presence to CIBSE and made the Institution visible to its members. This can be seen by the growth that CIBSE has seen over the past five years. Her experience and personality shine through at events.

● **Jennifer Cox ACIBSE, is a member of CIBSE Council and senior electrical engineer at Cundall, and was CIBSE ASHRAE Graduate of the Year 2020**

decarbonisation. We're not trying to be all things to all people. If you want to be part of a 100,000-plus institution, don't join us. We'll never be the biggest, but I promise we will continue to strive to maintain our position as being the best.'

Maintaining the quality of corporate members and their professional engineering levels is also important, says Carter, and delivery of guidance and training is a key objective for CIBSE. Technical integrity is fundamental to its identity and underpins everything it stands for as an institution.

Carter aims to leverage this to increase the pace of knowledge delivery as the industry moves into an era of rapid decarbonisation and technical change.

'People need to be able to access information quickly and easily,' she says. 'There's a huge piece of work in how we increase information provision without compromising the quality and depth.'

One area of rapid change is around artificial intelligence (AI), which Carter believes will enhance, rather than threaten, engineers' roles. She cites a significant development in Abu Dhabi where the design of the services took weeks. With AI, that can now be done in hours and frees up time for engineers to be more creative.

'If we can weather CAD, the internet and BIM, then we can weather AI. It will make engineers' lives easier and faster,' she says.

Carter emphasises that CIBSE training should be directed as much towards mid- and late-career engineers as to those entering the industry. 'Overcoming the skills shortage isn't just about feeding the funnel at entry level; it's about



Dave Cooper
CIBSE FSoVT

The move from Balham to Saffron Hill, making our offices accessible, has had a major impact, along with bringing a 'red Ferrari' dynamic to our organisation, which has seen growth in membership and engagement.

● CIBSE President Elect

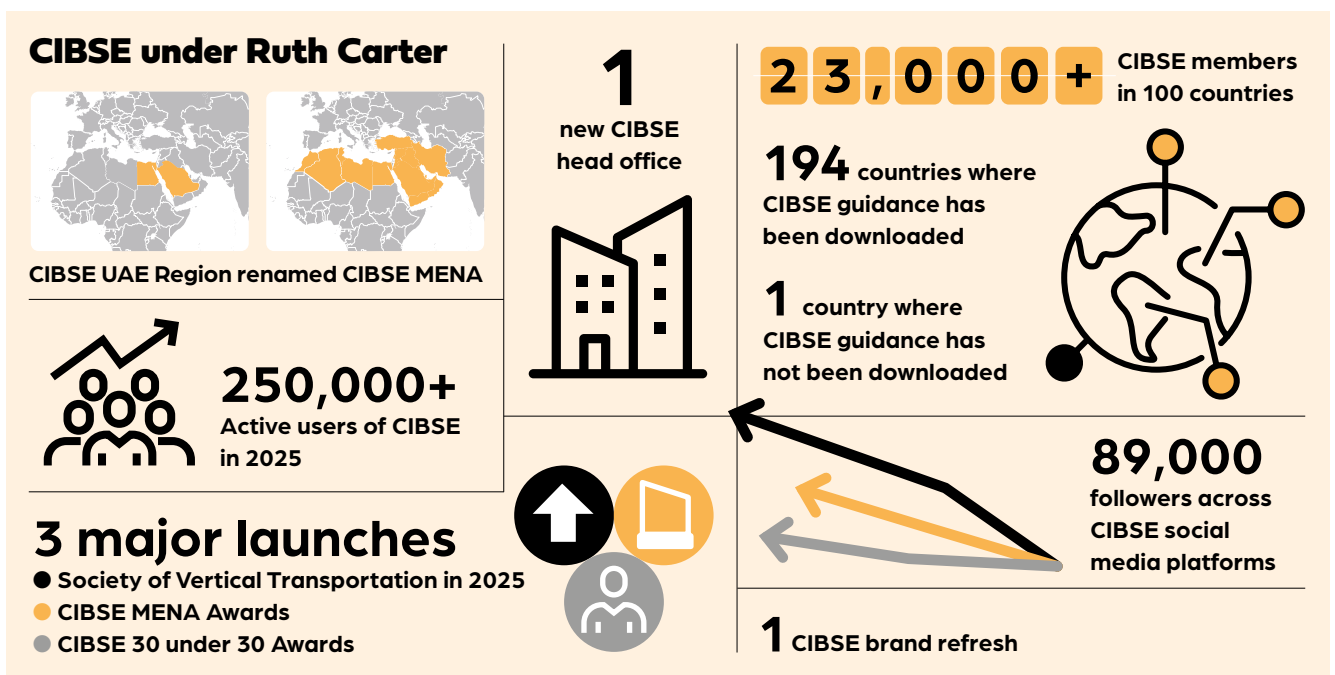
making sure we're retaining people who have really deep skill sets,' she says.

'One of the most unique things about CIBSE is the desire of its members to encourage younger engineers. They are deeply unselfish about wanting to share knowledge.'

Seventeen per cent of CIBSE Members have been chartered for more than 30 years, so it's important their experience is passed on to the next generation, adds Carter, who is very optimistic that the profession can attract a new generation of engineers to close the skills gap.

'Engineering is a fast-paced and continually evolving profession, and that really reflects the mindset of young people coming through now.'

Building services can be promoted as a career that drives decarbonisation and fundamentally changes the way a building performs. It's far more alluring than the language of the past, says Carter, who adds that the number of women entering the sector is



Interview Ruth Carter

encouraging – although more must be done to keep them in the industry after they have families.

‘There’s a discussion being had at CIBSE about how we can help women back into the workplace. This could be through accessible training during maternity leave, so they can keep up to date with technology and standards.’

Carter is proud of the Institution’s drive to be representative of people from all backgrounds and neurodiversities. ‘CIBSE has been really proactive in having different equality, diversity, and inclusion [EDI] groups [neurodiversity, LGBTQ+, women and ethnic minorities]. ‘You can’t just lump EDI together and say “tick, done”. You have to be specific, focused and relevant, and we are quite passionate about that.’

Carter is now working with a team on the next phase of the HQ’s development, including an overhaul of the building services depending on how the building is used in the next year to 18 months. ‘It was really important to me that we didn’t rush in, rip everything out and create a



Imran Shaikh
FCIBSE

Under Ruth’s leadership, CIBSE has evolved into a genuinely international professional institution, with the Middle East positioned as a strategic priority rather than a peripheral market.

She has championed meaningful regional engagement through senior-level presence, strengthened member and student outreach, and revitalised the CIBSE MENA Awards.

● **Imran Shaikh FCIBSE is chair of the CIBSE MENA Region**



Vincent Ma
FCIBSE

Ruth hasn’t just changed CIBSE through its strategy, but through her boundless energy and humanity. She has changed the culture from ‘static’ to ‘dynamic’ simply by being herself, and she has a team that is as passionate about engineering as she is.

She has continued to strengthen its international connections, and helped make CIBSE accessible and agile as membership continues to grow.

● **Vincent Ma FCIBSE is a CIBSE Board member**

finished product straight away,’ she says. ‘We have to live our ethos and the impact on embodied carbon of ripping everything would have been horrendous. We will closely monitor the building and Skills Hub, and use the data captured to start our decarbonisation journey.’

Carter is optimistic about the expanding global role of building services engineers. ‘The role has fundamentally changed over the past few years. It’s no longer the last point of consideration, but has become upstream in its influence and its voice. Take data centres; their technical demands provide the ideal environment for building services engineers to truly thrive.’

Carter is also looking forward to welcoming members to the Skills Hub and is excited that members from across CIBSE’s Groups, Regions and Societies will be able to meet and network there.’

The opportunity for serendipity, as well as all the structured learning,’ she says. ‘I think that’s going to be fabulous.’ ●

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Storing up trouble

The UK's net zero transition depends on solving the 'five peaks challenge' to balance energy supply and demand, according to a new report. **Alex Smith** discovers how flexibility and thermal storage could help unlock a low-cost, decarbonised Grid

A new report by Energy Systems Catapult has concluded that thermal storage will be a key component of the UK's energy system as it continues to decarbonise.

Innovating to net zero 2026: scaling flexibility to meet the five peaks challenge says thermal storage in homes and commercial buildings could increase from around 50GWh in 2024 to almost 200GWh, while thermal storage in heat networks could hit 300GWh.

It adds that flexible storage and power-on-demand dispatchable generation, such as nuclear power, would be necessary to make renewable generation the most cost-effective energy system in the UK.

Five gaps that need to be considered between electricity supply and demand have been identified by the report: peak power and peak energy gaps within a single day; peak daily and peak duration gaps over multiple days; and the peak heat gap during times of extreme cold weather.

It says most intra-day flexible requirements could be made up of static batteries and electric vehicle (EV) batteries, with Vehicle-to-Grid seen as having significant potential as the costs are not carried by the energy system.

The report states that no one flexible technology is most cost-effective in addressing all peak gaps. Smart energy appliances, such as heat pumps, have a potential role to play in managing intra-day flexibility, particularly if EVs do not deliver to their expected potential.

The peak heat gap during sustained periods of cold, calm winter weather

creates up to an additional 2.5TWh per day of heating demand. This puts severe strain on an electrified energy system and presents probably the greatest unsolved challenge to the energy transition, says the report.

While thermal storage (such as hot-water tanks, phase-change materials and sand-based systems) is effective at managing daily fluctuations – bridging the intra-day peak energy and peak power gaps – it falls short for prolonged extreme cold.

A typical domestic hot-water tank can only store about a tenth of the energy required to heat a home on a cold day. Furthermore, thermal storage generally cycles daily and has little role in addressing multi-day duration gaps.

To cut this peak and manage the gap, the report says a combination of broader innovations is required:

- **Large-scale energy efficiency:** upgrading building fabrics and insulation to reduce overall heat demand by around 15–20%.
- **Heat pump innovation:** developing pumps and controls that maintain a higher coefficient of performance in very cold temperatures.

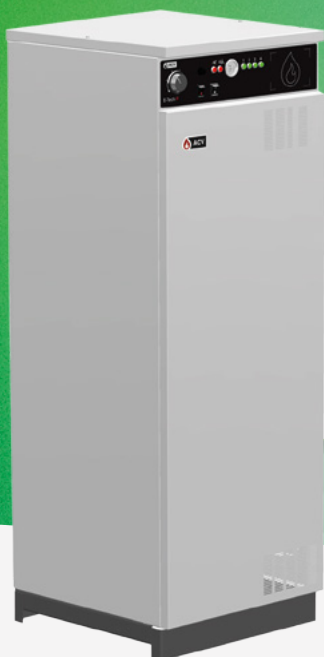
The potential for data centres

The report says data centres are expected to add substantial new load to the energy system, presenting significant opportunities for flexibility. Innovations in load shifting, temporally and geographically, local heat stores and reuse of waste heat could all help manage peak gaps. It says data centres with their own gas-fired generation to overcome Grid constraints could be used as an alternative to replacing ageing gas-peaking plant.

Heating
Data centres

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News Thermal storage

- **Heat network expansion:** significantly expanding district heat networks, which can incorporate large-scale thermal storage to provide up to 300GWh of flexibility by 2040.
- **Industrial flexibility:** using significant flexibility and load shifting from the commercial and industrial sectors.

If these fail to curtail electricity demand sufficiently during the peak heat gap, the energy system will have to rely on more difficult fallbacks. These include deploying up to an additional 50GW of peaking plant, retaining the gas grid to run fallback gas boilers in homes, or relying on behaviour change.

The report says energy efficiency remains an important way to reduce all the peak gaps. It calls for more innovation to develop insulation measures that are easier to install and less prone to poor quality. Existing technologies and approaches to measure in situ energy performance need to be integrated into policy and matched with attractive customer propositions.

Thermal storage

Thermal storage can be used to bridge the peak energy and peak power gaps in homes, particularly those connected to heat networks where large hot-water stores are practical.

While the report predicts almost 200GWh of fully connected smart thermal storage by 2040 (with 150GWh provided by commercial buildings), it notes that thermal storage today is mainly through hot-water tanks that are not smart, are limited by space, and are constrained in their ability to offer thermal storage for the system by their primary function to provide hot water. Alternatives such as phase-change materials, thermochemical storage and the thermal mass of buildings could provide similar benefits, it says.

'Base load' heat sources, such as geothermal and 'waste heat' from processes including nuclear cogeneration, are of most value to the system when paired with thermal storage systems, says the report. They provide a continuous heat source that can be flexed depending on the wider pressure on the electricity system.

District heat networks can be a valuable and flexible asset on the system, helping to reduce strain on electricity networks, electricity storage and low-use electricity peaking assets.

The commercial sector has the potential to provide 8GW of electricity flexibility, as well as 150GWh of thermal storage. 'Commercial flexibility can take the form of peak reduction (ie, moving processes such as smart charging of EV fleets to periods of lower demand) or using energy storage to shift energy consumption without changing processes and behaviour,' the report says. The sector represents 19% of energy consumption and 30% of electricity consumption, and there is potential to provide high levels of flexibility. Barriers include uncertain payback periods and organisations focusing on their core business rather than flexibility.

The Innovate UK-funded GridFlex programme found many factors influence commercial organisations' decision to provide flexibility, including interaction between facility managers, building management system (BMS) providers, aggregators, suppliers and market operators. It highlights the BMS's vital role in enabling smart participation in flexibility markets. ●

The report is available at bit.ly/4dzNp2O



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A new chapter

Designed by alma-nac, with engineering by Max Fordham, a striking three-storey junior library combines aesthetic elegance with a proven net zero carbon strategy. **Alex Smith** speaks to project engineer Hareth Pochee about the design principles and lessons learned after 12 months' operation

Dulwich College's new Raymond Chandler Library (completed in July 2024) is an oasis of quiet concentration for the school's pupils aged 11–13. Generous levels of natural light and views over sports fields provide an ideal backdrop for reading and studying.

Designed by architect alma-nac, the library is a striking three-storey building featuring a sand-coloured brick façade with deep-set, angled windows and a distinctive top floor clad in scalloped, glass-reinforced concrete panels.

A double-height atrium connects the ground floor, housing the main book collection and digital facilities, to a mezzanine level via an oak-topped concrete spiral staircase. The design features warm timber-slatted ceilings, reading nooks, and a top-floor ICT and robotics suite with glulam beams.

The elegant form of the library belies the level of engineering consideration in designing a net zero carbon building that is also resilient and comfortable.

Max Fordham was appointed by the client at concept design stage and worked with the design team to develop a brief for the net zero strategy. Initially

Measured operational energy breakdown 2025 (kWh·m⁻² per year)

Heating	9.6
Hot water	0.6
Heating and cooling	11.5
Comms room cooling	0.6
Fans and pumps	8.3
Other plant	11.9
Lighting	5.6
Small power	16.4
Comms room ICT	4.8
Lift	0.7
Total	70.1

aligning targets with the Paris Climate Agreement, Max Fordham switched to RIBA 2030 Climate Challenge (RIBA CC) and LETI targets, and then the UKGBC Net Zero Carbon Buildings Framework.

'We had to develop our own methods to determine the limits of operational energy and embodied carbon. It was before the RIBA CC or LETI targets were published,' says Max Fordham principal engineer Hareth Pochee. 'It was encouraging to see that, while we used different methods, we came to similar conclusions.'

Max Fordham didn't just set carbon

standards for the building. It also used RIBA CC to set limits for a range of other environmental factors, including potable water use and indoor air quality. It ran a 12-month evaluation of the building in 2025 to ascertain how successful it had been in meeting its objectives.

Net zero strategy

To meet their design targets, the project team undertook thermal comfort, embodied carbon and operational energy/carbon analysis, while assessing structural systems, façade performance and building services options.

The resulting hybrid lightweight steel frame with composite decks provided the optimal balance of low embodied carbon, buildability on a constrained school site, long-term adaptability and cost (see article at www.cibsejournal.com for embodied carbon strategy).

Passivhaus design shaped the environmental strategy as the team pursued a low heat-loss form factor, optimised glazing ratios, high airtightness and thermally efficient façades. The heat-loss form factor – the ratio of external envelope area to floor area – was just 1.8, which is

very efficient for this type of building. Less surface area also means fewer materials, minimising embodied carbon.

To avoid the aesthetic monotony often associated with high-performance form factors, the team used façade articulation to add visual depth. 'It's not a shoe box,' says Pochee. 'It proves it's possible to have an efficient shape that's not trivial and boring.'

Services strategy

Although the school has an existing heat network, it is gas-fired, so the design team specified heat pumps for heating and cooling needs.

Thermal modelling against future CIBSE weather files revealed it was not possible to cool the building using natural ventilation alone. Overheating in an adjacent building, due for upgrade and reconfiguration in another phase of the project, highlighted the issue.

'We paid close attention to the potential for overheating, and found passive ventilation and cooling was just not feasible,' says David Montgomery, senior engineer at Max Fordham.

Relying on openable windows for cooling and ventilation would have been problematic because of noise. 'An acoustic survey showed that, at certain times, road noise was significant and there was also noise from the playground,' Pochee adds.

The building has MVHR throughout. The main air handling unit (AHU), serving all areas except WCs, provides around 8 Ls⁻¹ per person of fresh air with a

(clean filter) design peak flow specific fan power (SFP) of 1.4 W·L⁻¹·s⁻¹. The AHU incorporates a plate heat exchanger with heat-recovery efficiency of around 80%, having two direct expansion (DX) heating and cooling coils to pre-heat and pre-cool supply air as needed. The coils are used in series to improve turn-down capacity, with a much lower output than maximum design capacity.

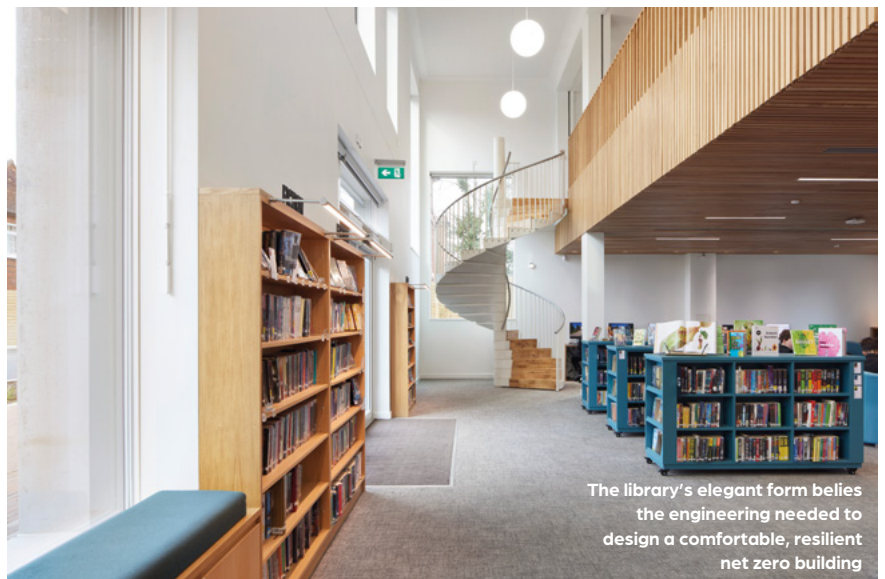
The coils are served by two DX air source heat pumps (ASHPs). These use R410A refrigerant, which Max Fordham says was all that was available when the project was specified. Now a lower global warming potential refrigerant option would be selected, says Pochee.

All the main spaces have CO₂ parts per million (ppm) sensors, and AHU

flowrate is modulated on the worst-case sensor reading, with a minimum value of about 40% maximum flowrate.

General-purpose classrooms, staff rooms and circulation areas are heated with radiators served by a 12kW roof-mounted R32 ASHP. Radiators are sized to meet peak loads with a water flow temperature of 55°C. The ICT classrooms and library spaces are heated and cooled with an R32 variable refrigerant flow (VRF) reversible heat pump serving ceiling-concealed fan coil units.

Careful detailing of the controls hardware and (cause and effect) logic was developed with the client's estates and sustainability teams, which required some areas to have local user control



The library's elegant form belies the engineering needed to design a comfortable, resilient net zero building

Evaluation of selected health and comfort factors

- **Overheating:** The RIBA CC health metric for avoiding overheating suggests limiting internal temperature so that 28°C is not exceeded for more than 1% of occupied hours. BMS data (from 2025) shows this criterion is met in 10 out of 11 occupied spaces. For one classroom, the data shows the criterion is exceeded in 2% of hours.
- **Potable water:** The metered potable water use is 1.7 m³ per pupil per year, 63% less than business-as-usual and close to the RIBA CC

- target of 1.5 m³ per pupil per year.
- **Indoor air quality:** For CO₂ concentration in schools, CIBSE TM40 recommends that daily average CO₂ levels should be less than 1,000ppm during occupied hours. For the one-year monitored period, nine of 11 occupied spaces met this criterion 100% of the time. The other two rooms exceeded it for only 0.5% of occupied hours.
- **Formaldehyde:** The RIBA 2030 CC air quality health metric for formaldehyde is to limit

- concentration to less than 100µg m⁻³. Post fit-out testing confirms the building achieved 28µg m⁻³.
- **VOCs:** The RIBA CC air quality health metric for (the eight-hour average) total VOCs is to limit concentration to less than 300µg m⁻³. The testing during fit-out did not meet this, but the relevant Breeam credit was achieved by implementing a post-testing VOC dilution (by ventilation) plan.
- **Air permeability:** 2.2 m³·h⁻¹·m⁻² @ 50Pa

Case study Dulwich College library

and others to have central control.

Hot water is provided by point-of-use electric heaters with no storage.

Lighting is high-efficiency LED throughout, with a centralised automatic controls system that implements daylight dimming along with absence and presence switching.

Around 30 electricity meters are used with other BMS data, such as internal temperature, CO₂ ppm, plant operating data and time schedules, to implement an energy (and health and wellbeing) optimisation plan during commissioning, de-snagging and seasonal commissioning. 'The metering

requires a great deal of attention to be commissioned properly,' says Pochee.

Results of building evaluation

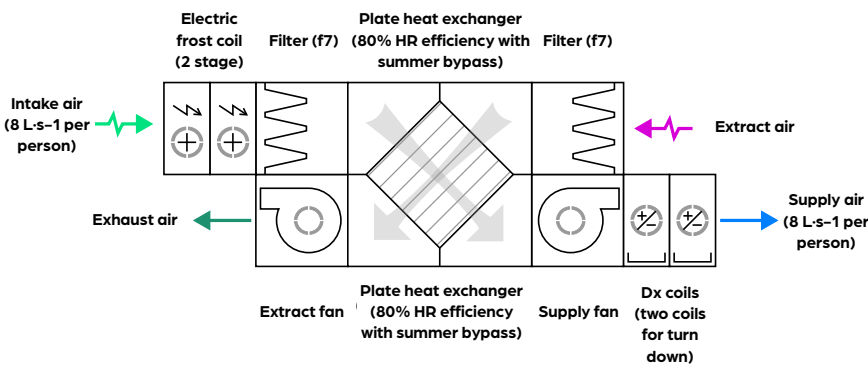
Energy consumption is 70kWh·m⁻² per year, of which 80% is based on metered data and the rest on assumption, as some data is missing. This meets the RIBA CC new-build schools target. Energy consumption slightly exceeds the LETI-based net zero carbon (NZC) target of 65kWh·m⁻² per year. However, energy optimisation is to be implemented via seasonal commissioning in the next year.

The calculated as-built upfront embodied carbon is 570 kgCO₂e·m⁻² (A1-A5), 5% less than the LETI NZC-compatible target of 600 kgCO₂e·m⁻².

One finding from monitoring was the difference in the designed peak flow SFP of 1.4W·L⁻¹·s⁻¹ for the AHU versus the actual peak flow SFP of 2. This means fans are working harder than they should be for the same amount of air.

'It is thought this discrepancy has

Schematic of main air handling unit with two DX heating and cooling coils



Notes

1. Fan flowrates controlled by CO₂ sensors in rooms
2. Dx coil output controlled using weather compensation supply air temperature set point control

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been caused by underestimating the system pressure drop at design stage, combined with sub-optimal ductwork layouts in the installation,' says Pochee. 'We expect this type of performance gap is common and goes unseen, because SFPs are not normally tested.'

Max Fordham suggests including

as-built SFP tests as standard and says industry guidance is needed in this area.

The SFP was one of many valuable insights gained from the performance evaluation. Dulwich College will now benefit from an energy use optimisation plan, and it employs the BMS specialist on an ongoing basis for

the whole campus, giving it the 'tools and knowledge to make adjustments if it wishes', says Pochee.

Max Fordham is applying lessons learned on subsequent projects, but, as Pochee points out, 'there are loads of challenges and problems that never come up again'. ●

Selected M&E specifications			
	Application	Product	Duty
DHW	WCs + kitchenette	Water heater: Zip In Line DEX12NEXT	9kW
Heating	Whole building: radiators	Heat pump: Clivet ELFOEnergy Edge EVO	13kW
Heating/cooling	Library/ICT classrooms: serving VRF fan coil units	Heat pump: Mitsubishi PURY-EM	Heating: 32kW Cooling: 28kW
Heating/cooling	Comms room: serving VRF fan coil unit	Heat pump: PUZ-ZM	Heating: 3kW Cooling: 4kW
Heating/cooling	All areas except WCs: main AHU supply air	Heat pump: Daikin ERQ-AV1	Heating: 2 x 13kW Cooling: 2 x 11kW
Ventilation	All areas except WCs: supply and extract with heat recovery	Air handling unit: Daikin D-AHU Modular P	1.7m ³ .s ⁻¹
Ventilation	WCs: supply and extract with heat recovery and electric preheat	Air handling unit: Nuair XBOXER XBC	0.14m ³ .s ⁻¹

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Rewiring the future

As data centre demand surges, engineers are racing to redesign power, cooling and infrastructure systems.

Molly Tooher-Rudd finds out how CIBSE's Data Centre Special Interest Group is tackling these challenges

The rapid digitisation of society is driving remarkable growth in the data centre sector.

Data centre IT power capacity in the UK is projected to more than double by 2030, rising from around 2.9GW in 2024 to 6.2GW. Over the same period, data centres are expected to represent 8.8% of electricity demand, up from 2.5%.

These figures demonstrate the urgency of developing a new era of resilient and sustainable data centres, and building services engineers will be tasked with designing the infrastructure to power this new industrial revolution. Highlighting the stakes, Mohammad Royapoor, head of R&D, RED Engineering, says the next wave of data centres 'are expected to bring the golden age of humanity'.

To meet this challenge, CIBSE's Data Centre Special Interest Group (DCSIG) is working to bridge critical gaps in what Iain MacDougall, head of sustainability at RED Engineering, calls a 'relatively unregulated area'.

Austin Williamson, technical director at Foreman Roberts and chair of the CIBSE DCSIG, adds: 'Data centres are some of the biggest buildings in terms of load and size; it's on an industrial scale. We need to evaluate everything, from cooling and distribution to water usage and power usage, and it's got to be looked at from an ethical perspective. I'm not saying that what we're doing

now is wrong, but it needs to evolve.'

The group identifies three massive sector challenges: regulation and technical guidance; recruitment; and speed of change. The technical demands are evolving rapidly, particularly with the rise of AI.

'There is a massive gender issue in the sector, where females are significantly underrepresented at only 8% of the workforce. There is a critical need for inclusivity; data centres rely on teamwork and collaboration, its key we bring a wider range of voices into these conversations,' says Shabna Hayes, regional director, Aecom.

Modern data centres will require a complete rethink of traditional engineering. 'The power systems, for example, are going to have to be designed differently to handle these types of loads,' says Williamson. 'We can't keep working to the current models, with the amount of energy use – the embodied energy of the systems

“Modern data centres will require a complete rethink of traditional engineering”

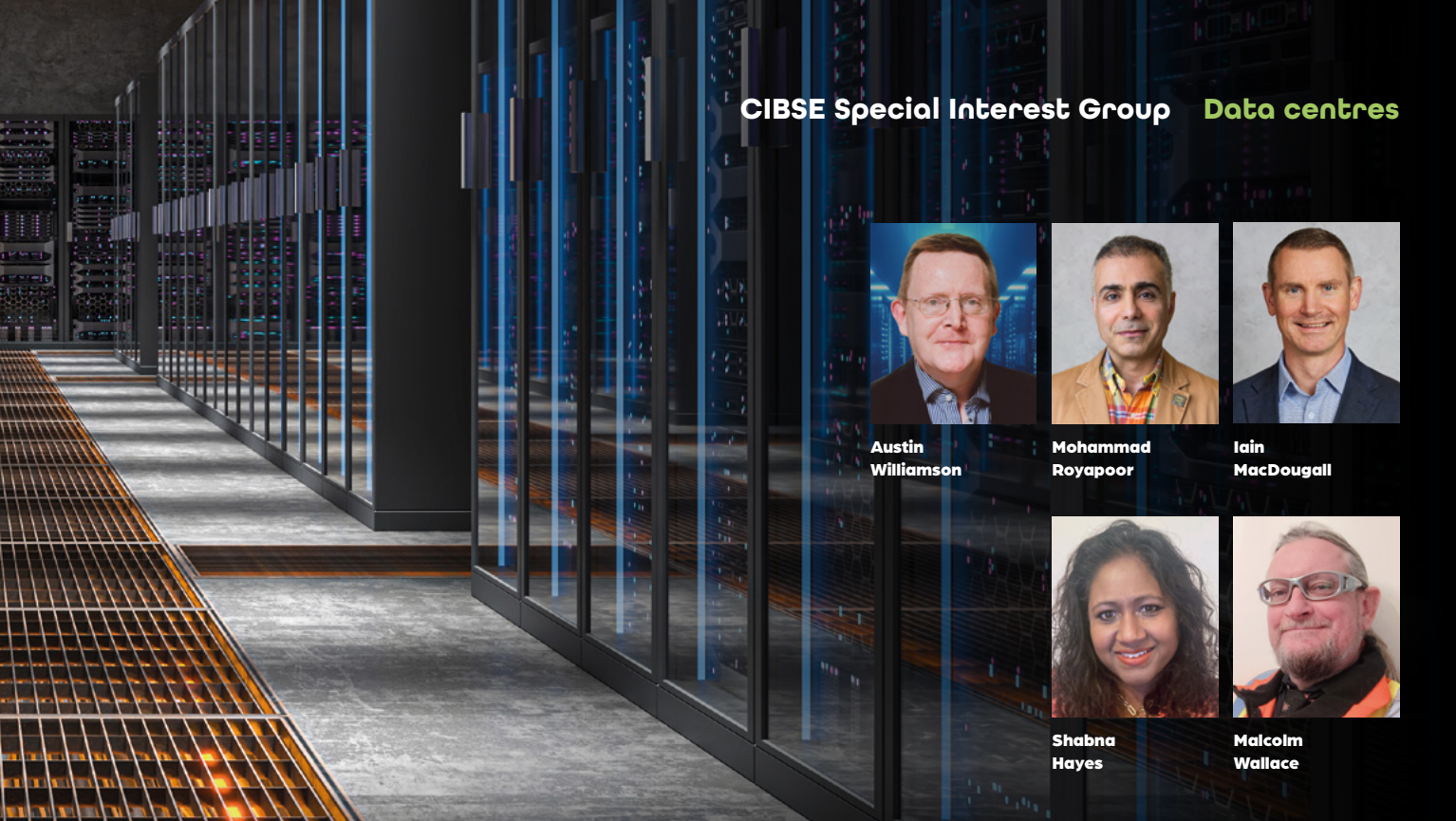
required would be off the charts.'

Sustainability and ethics are central to the DCSIG's mission. 'We have to have faith that what we're building is going to be incredibly useful and powerful for humanity,' says Royapoor.

The SIG is gaining momentum with specific workstreams, including a dedicated group for commissioning – a process that it aims to standardise where no such standard currently exists. Its other workstreams are: heat recovery; TM65 (embodied carbon); power systems; zero generation strategies; CFD; liquid cooling; and commissioning (see panel, right).

'The data centre sector is small, with a limited pool of consultants, operators, and suppliers who often collaborate. The formation of the CIBSE Data Centre Group attracted attention across the entire sector', MacDougall says. As co-chair of the ASHRAE DC SIG, MacDougall has helped to create strong alignment between the two organisations. 'This shared involvement is already opening the door to peer reviews, knowledge exchange, and broader collaboration between CIBSE and ASHRAE,' he says.

A further Data Centre Lighting group is being planned via the Society of Light and Lighting (SLL), while the CIBSE MENA Data Centre Group and SLL UK are setting up a working group with help from Neethu Susan George, Trilux and the DCSIG via SLL.



**Austin
Williamson**



**Mohammad
Royapoor**



**Iain
MacDougall**



**Shabna
Hayes**



**Malcolm
Wallace**

Data centre workstreams

Members of the CIBSE Data Centre Special Interest Group are developing guides in seven critical areas of database design

Heat recovery

Lead Iain MacDougall

Heat export from data centres (DC) is one of the largest untapped energy sources (heat) in the UK. However, the current regulatory and technical frameworks in the UK do not assist in realising the energy source.

Guidance is needed so multiple DC operators and district heating operators can align to a common approach and standardised solutions, which can help create efficiency and effective low carbon heating.

TM65 for data centres

Lead Mohammad Royapoor

The group is developing a specialised TM65 for data centres, to provide a standardised methodology for calculating the embodied carbon of MEP equipment in data centres when Environmental Product Declarations are unavailable.

This initiative is a data-centric package of work to establish much-needed benchmarks. As Royapoor explains, the goal is to 'aggregate vast amounts of data, tabulate them, visualise them, and say this is what a good data centre would look like and what best practice looks like.'

A key priority is ensuring the guidance is 'location specific', as Royapoor notes that 'a data centre in Singapore is very different from the one in Frankfurt'.

The SIG plans to start with Britain, to focus on UK-specific heat-rejection technology. While learning from a previous logistical TM65, 'this will be a very different product altogether, because a logistics centre is just an empty shell... a data centre is an entire machine', Royapoor says. The ambition is to have a working draft by the end of this year.

Power systems

Lead Austin Williamson

Power systems design is undergoing a fundamental shift as engineers move beyond traditional, steady-state models to address the dynamic demands of AI and large language models (LLMs).

Until now, designs relied on resilient Uptime Institute tier classifications and distribution topologies, but these must now evolve to follow system loads more effectively across various operational scenarios.

Future infrastructure must align with increased power densities without

compromising the resilience of critical cooling and power systems. This must include evaluating embodied energy of the systems, designing to optimum of power network performance and distribution, and maintaining resilience to control system level and to chip level.

Because AI and LLM loads are often extremely dynamic compared with earlier steady-state IT loads, power systems are going to have to be designed differently to handle these.

The group's research will consider developing design philosophies that embrace network criticality and evaluate the embodied energy of the systems. Ultimately, CIBSE aims to develop guidance notes and white papers linked to education and research and development, to support the next generation of data centre professionals.

Zero-generation strategies

Lead Shabna Hayes

Generators have been a critical part of the electrical infrastructure supplying data centres, ensuring resilience, stability and business continuity. Environment regulators,

operational limitations and initiatives for greater sustainability are putting more pressure on clients to clean up their infrastructure. The drive for carbon-neutral initiatives has led to a push for alternative cleaner power supplies, and to eliminate a reliance on fossil fuels.

There is, therefore, a need for best practice and guidance, to provide a technical memorandum to ensure designs are adopting innovation and technology while maintaining a consistent design strategy towards sustainability and environmental challenges. 'It would be really great to get more support from those with electrical knowledge,' Hayes urges.

CFD

Lead Mohammad Royapoor

Computational fluid dynamics (CFD) is a critical tool for visualising the behaviour of air (or a liquid) through a space before building the facility. It can predict and resolve problems such as the removal of hot spots in data halls and entrainment with external heat-rejection assets. Space planning and building form optimisation can also be supported by CFD.

In the absence of robust CFD analysis, the design is often overengineered, which leads to capital expenditure and embodied carbon penalties. The densification of DCs resulting from AI and high-density compute, as well as rising climatic temperatures, make CFD a key solution.



Data centres are expected to represent 8.8% of UK electricity demand by 2030

Liquid cooling

Lead Mohammad Royapoor

Historically, data centres have adopted air-cooled solutions. However, a move to liquid cooling is being driven by a combination of factors, such as high-density AI machinery, space optimisation, easier heat reuse, and better efficiency at the compute and data-hall levels.

Most current designs rely on manufacturer-led consultations. CIBSE is addressing this by developing a technical memorandum to provide a holistic, product-agnostic approach. This guidance will allow designers to create scalable, flexible solutions that are adoptable across various rack densities, without manufacturer bias or risk of future compliance failure.

Commissioning

Lead Malcolm Wallace

The goal of this working group is to write a definitive standard for the commissioning of data centres, which can be used to help standardise procurement of DC commissioning and define the scope of the specialist commissioning agent. It will include a full workflow, from concept through

construction to operation, with a detailed description of every activity along the way. The intention is that this can be easily scaled to all project sizes, highlight where strategic decisions must be made, and identify a list of add-on and value-add options.

The group comprises eight members, and we hope to have the structure and bones of the document ready in spring 2026. Then the serious authoring process begins as we discuss, develop and review every work stage, activity and table. ●

Call to action

As the sector continues its rapid ascent, the Data Centre SIG's 'call to action' is clear: the industry must collaborate now to ensure the digital backbone of the future is resilient and responsible. The group's committee is looking for authors who are willing to volunteer their efforts and use their knowledge and experience to write publications. Visit bit.ly/CIBSEdgroup to join.

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The topic of designing the best data centre cooling system can easily become a heated one, with everyone seeming to have a different opinion.

Optimising for the maximum IT load, the most efficient use of the white space and the least energy-consuming cooling system regardless of the IT power density is an ongoing challenge for developers.

With the rise of AI data centres, liquid cooling is the preferable option, providing high-density cooling with less energy required than traditional air cooling. However, a common and often overlooked element of a liquid-cooled system is the fan wall.

Fan walls are a great way of boosting a cooling system's efficiency

for high-density cooling loads. They handle the residual heat produced from the liquid cooling systems, drawing in the warm air through the top, passing it over a chilled water coil, then releasing the now cooled air back into the system to lower ambient temperatures.

CRAH units are what most people would associate with air cooling. Despite their common use, CRAH units are far from the best chilled water air cooling system available. Excool's Fan Stack unit, our precision engineered air cooling fan wall, is 25% more efficient than its CRAH counterpart, reducing operational costs and improving PUE.

The Fan Stack boasts a capacity of 250kW-700kW, able to support high-density AI compute, unlike CRAH units that have lower, limited capacity.

Alongside a liquid cooling system, the Fan Stack enables infinite scalability.

When managing a liquid-cooled system, especially an AI system, security and reliability is of the upmost importance. The Fan Stack has built-in electrical redundancy through its dual power feed connections with built-in Automatic Transfer Switch (ATS). What's more, the Fan Stack's redundant fan arrangement provides extra capacity, reducing the load on each fan. The layout protects the unit in case of fan failure; the other fans can easily ramp up while also meaning the fans run at a more efficient part of the fan curve.

Another unique feature of the Fan Stack is its v-bank filter arrangement on the front, which creates a very low pressure drop via its extended surface area, making it removable during unit installation and reducing unit input power. This means the mechanical corridor can be made smaller as the unit's footprint is smaller.

As part of Excool's ModulR line, the Fan Stack units are highly customisable, allowing for greater capacity and alternative footprint arrangements. Fan Stacks have high-quality welded frames, regardless of footprint configuration, maximising the unit's longevity while minimising maintenance requirements. Furthermore, the unit's intelligent controls system continually monitors inbuilt variables, reducing day-to-day maintenance while forecasting and resolving issues before failings occur.

As the industry continues to grow, prioritising the most efficient and reliable cooling solutions is the key to creating a commercially resilient data centre.

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Integrated liquid cooling: rethinking the MEP's role in the data hall

The briefs are arriving differently now. A few years ago, an MEP consulting firm on a data centre project would work through cooling requirements methodically, with reasonable lead times and the supply chain organised around fully air-cooled infrastructure. What we are seeing increasingly now is consultants handed a density target in excess of 100kW per rack and asked to validate a solution before many of the project constraints are fully defined. The IT hardware technology is evolving faster than the data centre infrastructure and the supply chain.

With the latest advancements at chip level, direct liquid cooling is no longer a specialist solution. For high-density AI and high-performance computing environments, direct-to-chip cooling through a technical cooling loop, typically constructed of stainless steel piping, has become the predominant solution, largely because of its simpler transition and increased cooling performance. But the coordination burden it introduces is real. Manifolds sourced and installed separately from the rest of the cooling

infrastructure create immediate design questions: how is the piping in the data hall supported; where are the valves located; is the pipe sizing sufficient for the cooling capacity required? Get those decisions wrong upstream and they quickly ripple into issues. By the time these surface, unpicking earlier oversights becomes costly.

This is where early engagement changes the outcome. When Tate is involved from the start, we can consult on pipe sizing, material selection and load implications, and how those decisions interact with the broader system, before anything is fixed. Bring us in late and our ability to influence the elements that matter most is reduced. The projects that run smoothest have always been those on which conversation happens from the outset.

This industry-wide shift towards direct liquid cooling, as well as deployment demands, has led us to develop Konnect by Tate. Here, the manifolds ship pre-integrated into the hot aisle containment (HAC) as a single configured system. Rather than coordinating containment, electrical distribution, telecom equipment and

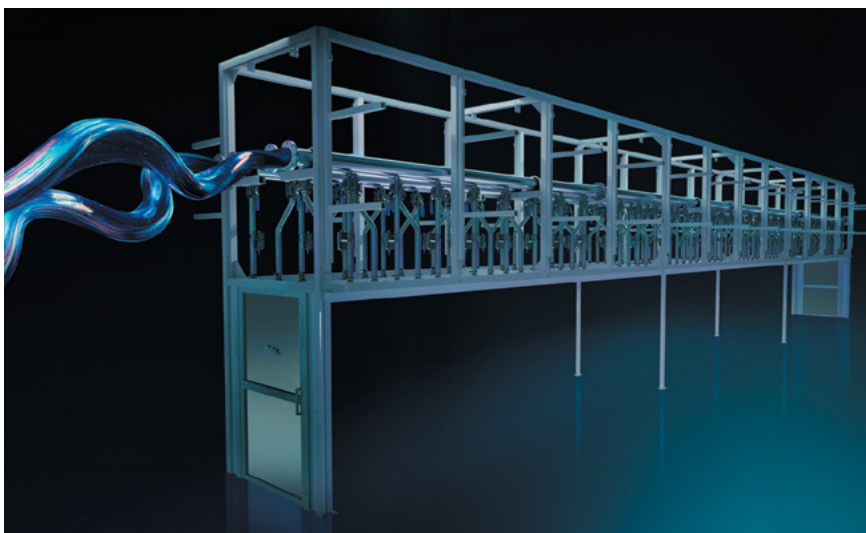


liquid cooling across separate suppliers, the MEP receives one solution, engineered to their specific brief. This approach can deliver up to an 80% reduction in onsite labour hours across large HAC installations, thanks to electrical installation being completed in a controlled manufacturing facility, rather than the data hall. Telescopic legs and folding arms on the HAC reduce working at height, simplifying logistics and keeping the programme on track. Thousands of hours of avoided site work and a path to a live date that is far more predictable from the outset.

For MEP consulting firms navigating this shift, Tate's specification team works directly with consultants through CPDs, while our design team is on hand for project-specific support, covering liquid cooling system design, load implications and product selection. The intention is straightforward: to make sure the right decisions are made early, when they are still easy to make.

● For more information, contact Tate at www.tateglobal.com

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Engineering at scale

As the data centre industry shifts to facilities featuring 5,000-plus servers, Molly Tooher-Rudd speaks to Carrier's **Michel Grabon** about the challenges the industry faces to hyperscale infrastructure with high power demands, rapid cooling and holistic thermal management

The data centre industry is witnessing a seismic shift in scale, moving from a landscape of 20MW facilities to 1GW-scale developments that demand huge increases in power. Michel Grabon, technical director at Carrier, says this transition marks an era of high-stakes execution driven by the rapid solidification of AI.

'The scale of development is accelerating dramatically. The capacity of the incoming hyperscale facilities is unprecedented,' he adds.

The scale of change

Just a couple of years ago, a large-scale data centre in Europe typically operated at a capacity of 20–80MW. Today, the industry is talking in gigawatts. While 800MW projects seemed 'crazy' only a few years ago, Grabon notes, 1,000MW (1GW) projects are now common in the United States, and Europe is rapidly following suit, with new projects ranging from 150–300MW.

This scale presents a big challenge for construction timelines, warns Grabon. 'Traditionally, data centre projects have followed a rough rule of thumb: around one month of build time per megawatt of capacity,' he explains. 'If you go to 100MW, you can't afford 100 months. Technology will change long before you finish building.'

The rapid pace of technological development – particularly around AI hardware – means operators must design facilities that can adapt to change. 'Every six months you have new AI components,' Grabon adds. 'For data centre customers, it becomes very difficult to keep up.'

As a result, cooling infrastructure is being redesigned for speed and simplicity of deployment. Rather than assembling systems piece by piece on site, manufacturers are integrating more functionality into equipment before it arrives.



'In the past, we were providing components,' Grabon says. 'Now, customers need whole solutions. They expect you to bring equipment to site that can be connected in one day.'

That shift is particularly important at hyperscale, he adds. When hundreds of megawatts of cooling are needed, even small delays multiply quickly. 'You cannot have three days of commissioning per unit. Everything needs to arrive ready.'

To achieve this, Carrier is pushing the physical limits of size, designing chillers as large as a truck can transport – aiming for 3.2MW of capacity in a single movable piece – to reduce the number of units required on site.

Assessing thermodynamics

The heat produced by these increasingly powerful processors must be removed more efficiently than ever.

Rising power densities are driving the transition from air cooling to liquid cooling. However, removing heat from the chip is only part of the challenge. Ultimately, heat must still be rejected into the environment. 'Today, we consider the air like an infinite sink,' Grabon explains. 'But when you have one gigawatt of heating in a space, the atmosphere around you becomes hotter and hotter.'

This is pushing the industry to explore alternative approaches,

such as district heating or water-based heat-rejection systems. The technologies are not new, Grabon notes, but adoption has been slow.

Regulation may accelerate that shift, particularly in Europe. Germany, for example, already requires that 20% of data centre waste heat be reused. 'Sometimes, regulation is the only way to get industry to do the right thing,' says Grabon.

As data centres scale towards gigawatt capacities, their impact on the global energy grid is becoming impossible to ignore. Grabon believes this shift requires dense, decarbonised power sources, stating: 'The only decarbonised energy that is available, dense and cheap is nuclear; it looks to me that this is the direction people will go.'

Manufacturers are increasingly developing integrated control strategies that coordinate chillers, pumps and fans across the whole cooling system. Rather than treating these elements as discrete components, such approaches seek to optimise performance at a system level, using supervisory controls to respond to variations in IT load and ambient conditions. Grabon highlights the inefficiency of the traditional, fragmented approach: 'You can consider those elements independently and achieve a certain level of effectiveness, but if you consider all those systems not as silos, but as one body working together with smart controls and optimisation layers, you can really reduce energy consumption with the same output.'

Carrier's QuantumLeap is one example of this type of system-level approach, bringing together plant and controls within a unified framework. Reported benefits include reduction in overall energy consumption, although realised performance will depend on system configuration, control strategy and operating conditions. ●



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Air curtains and doorways as dynamic thermal boundaries

This module explores air curtain operation for doorways and the conditions under which applications can succeed or fail

Doorways represent one of the most complex and least predictable elements of the building thermal envelope. While walls, roofs and glazing are designed as static thermal boundaries with defined U-values and airtightness targets, an open doorway behaves very differently. When a door is open, the separation between indoor and outdoor environments is no longer defined by insulation or airtightness but by fluid flow driven by pressure differences and buoyancy forces.

In this sense, a doorway should be understood as a dynamic thermal boundary. Airflow through the opening is governed by the interaction of temperature differences, wind pressure, and building ventilation systems. In buildings with frequent door use – including retail units, restaurants, logistics facilities and transport hubs – these flows can dominate heat loss and significantly influence local thermal comfort.

Air curtains attempt to control this boundary condition by generating a high-velocity air jet across the doorway. This jet forms an aerodynamic barrier, reducing the exchange of air between two environments while maintaining visibility and unobstructed access.

However, their performance is fundamentally governed by building physics: the behaviour of turbulent jets, pressure-driven infiltration and the interaction between airflow and thermal gradients.

This CPD explores the physics underlying air curtain operation, the forces driving airflow through doorways, the conditions under which air curtains succeed or fail, and the challenges associated with modelling their performance in building energy simulations.

Jet behaviour and aerodynamic sealing

The performance of an air curtain depends primarily on the behaviour of the air jet it generates. The jet is typically discharged from a narrow slot along the head of the doorway at relatively high velocity.

From a fluid mechanics perspective, this flow behaves as a turbulent plane jet. Its velocity is highest at the discharge grille and gradually decreases as the jet travels downward toward the floor.

The jet typically passes through three distinct regions as follows:

Discharge region: immediately after the nozzle, the airflow is influenced by the internal geometry of the unit. Turbulence generated by the fan and grille affects the structure of the emerging jet.

Established jet region: further downstream, the jet becomes a coherent downward airflow. As it travels, the jet entrains surrounding air from both sides of the

doorway. This entrainment process increases the jet thickness and reduces its centreline velocity.

Floor interaction region: when the jet reaches the floor, the airflow decelerates and splits horizontally. The air then returns to each side of the opening, completing the circulation pattern that maintains separation between the two environments.

For an air curtain to operate effectively, the jet must reach the floor while retaining sufficient momentum to resist external forces acting across the doorway.

Jet force and momentum

The ability of an air curtain to resist infiltration depends on the momentum of the air jet, rather than simply the volume of air delivered. Resistance depends on the momentum flux of the jet rather than simply volumetric airflow rate. For a plane jet issuing from a slot, the approximate momentum flux per unit width can be expressed as:

$$F_0 = 0.5\rho v^2 B b_0$$

where:

ρ = air density

v = discharge velocity

B = doorway width

b_0 = jet thickness at discharge

This relationship highlights an important design principle: jet force increases with the square of velocity. Consequently, small increases in discharge velocity can significantly increase the resistance of the air curtain to external pressure differences. Conversely, systems designed purely around volumetric airflow ($\text{m}^3\cdot\text{h}^{-1}$) may deliver insufficient jet momentum if discharge velocities are too low.

This distinction explains why two air curtains with similar airflow rates can exhibit very different sealing performance.

As the jet travels downward, entraining surrounding air from both sides of the doorway, turbulent jet theory shows that this entrainment rapidly increases the total airflow within the jet. Therefore, much of the air in the curtain originates from the surrounding environment rather than the supply air from the unit.

Importance of velocity optimisation

Air curtain performance depends strongly on the discharge velocity.

If the velocity is too low, the jet loses



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momentum before reaching the floor. The airflow then becomes unstable and may be deflected either inward or outward. Under these conditions, the unit behaves more like an over-door heater than an aerodynamic barrier.

If the velocity is too high, the jet strikes the floor with excessive force, generating strong turbulence and mixing between the indoor and outdoor air masses. This turbulence disrupts the separation effect and can actually increase air exchange.

Effective design therefore requires optimisation of jet velocity, balancing sufficient momentum against excessive turbulence. Correct commissioning is essential to achieve this operating condition. Energy codes, such as ASHRAE 90.1, mandate that the air curtain must be commissioned to maintain a jet velocity of not less than $2\text{m}\cdot\text{s}^{-1}$ 150mm above the floor.

Infiltration through open doorways

When a doorway is open, airflow across the opening is primarily driven by two physical mechanisms: buoyancy (stack effect) and wind pressure. These forces generate pressure differences that cause air exchange between the two environments.

Buoyancy-driven airflow

Warmer air is less dense than cooler air so buoyancy forces cause it to rise and escape through the upper portion of the doorway, while denser cooler air enters at low level. This creates a bi-directional flow pattern. At some point within the doorway height, a neutral pressure plane exists where the airflow velocity is zero. Above this plane, air flows outward from the warmer space; below it, cooler air flows inward. This can be represented in the equation:

$$\Delta P_{stack} = \rho g H \frac{\Delta T}{T}$$

where

- ρ = air density $\text{kg}\cdot\text{m}^{-3}$
- g = gravitational acceleration ($9.81\text{m}\cdot\text{s}^{-2}$)
- H = doorway height (m)
- ΔT = indoor - outdoor temperature difference (K)
- T = absolute indoor temperature (K)

Although the net volumetric airflow across the opening may be close to zero, the thermal energy exchange can be significant because conditioned air is continuously replaced by unconditioned air. The magnitude of this exchange increases with:

- Temperature difference between indoor and outdoor environments
- Doorway height and width
- Frequency of door opening



Figure 1: air curtains can be used as a solution to control the dynamic thermal boundary presented by doorways (Source: JS Air Curtains)

Wind-driven infiltration

Wind introduces additional pressure differences across the building envelope. The resulting airflow through an open doorway depends on:

- Local wind speed
- Building exposure
- Façade pressure coefficients
- Building airtightness

Wind pressure varies approximately with the square of wind speed¹:

$$\Delta P_{wind} = \frac{1}{2} \rho V^2 C_p$$

where

- ρ = air density
- V = local wind speed
- C_p = pressure coefficient

As a result, even modest increases in wind velocity can produce significant pressure differences across an opening. In practice, the air curtain must overcome the combined pressure effects of wind and stack to maintain its separation function.

Performance limits and failure modes

There is some evidence to show that air curtains can provide significant energy savings when correctly applied. For example, field studies in retail buildings have reported HVAC energy reductions exceeding 30% in high-traffic entrances.² Several common failure modes exist:

- **Incorrect discharge velocity:** if the jet

velocity is not correctly set, the curtain may collapse before reaching the floor or generate excessive turbulence at floor level.

- **Incorrect discharge angle:** most air curtains are installed to discharge air at an angle of between 10° and 20° outward from the vertical, directed slightly toward the exterior side of the doorway.
- **Building pressure imbalance:** if the mechanical ventilation system produces excessive negative pressure, outdoor air will be drawn into the building, potentially overwhelming the air curtain jet. Similarly, strong positive pressure may push indoor air outward through the doorway.
- **Poor building airtightness:** large openings elsewhere in the building envelope can create internal cross-draughts. These flows can deflect the air curtain jet and significantly reduce its effectiveness. Examples include open doors on opposite façades or open roof vents.

Environmental limits

Even under ideal conditions, air curtains operate within defined environmental limits. Typical commercial air curtains are designed to resist modest façade pressure differences, often corresponding to wind speeds of around $3\text{m}\cdot\text{s}^{-1}$ to $5\text{m}\cdot\text{s}^{-1}$ at the doorway. At these velocities, the dynamic pressure is typically in the range 5Pa to 15Pa, depending on local pressure coefficients and building exposure.

Air curtains are also subject to practical size limits. Standard products typically cover openings up to around 8m in width or height, with larger installations requiring custom systems.

Thermal comfort considerations

At pedestrian entrances, air curtains must also satisfy comfort requirements. People passing through the doorway briefly experience the high-velocity airflow generated by the curtain. Exposure velocities typically range from 3m·s⁻¹ to 10m·s⁻¹, usually lasting less than one second.

To maintain acceptable comfort, discharge air temperatures are typically limited to around 40°C, while air velocities and turbulence within the occupied zone must remain low enough to avoid draught discomfort, consistent with the comfort criteria described in CIBSE Guide A and ASHRAE Standard 55.

Noise must also be considered, particularly where air curtains are installed above frequently used pedestrian entrances. These units typically contain high-speed fans and discharge air at relatively high velocity, so sound levels close to the doorway can be noticeable if the unit is poorly selected or operated at excessive speed.

CIBSE Guide B provides recommended background noise criteria for different building types. For retail areas, restaurants and circulation spaces these typically fall in the range NR 50–60. In practice, air curtains should be selected and controlled so that their contribution does not significantly exceed these background levels within the occupied space.

Energy modelling considerations

From a building physics perspective, modelling air curtains presents a significant challenge.

In the UK, Building Regulation compliance calculations are usually performed using the Simplified Building Energy Model (SBEM) within the National Calculation Methodology.

SBEM does not explicitly model airflow through open doors or the aerodynamic separation created by air curtains. As a result,

the reduction in infiltration provided by an air curtain cannot usually be represented directly in standard SBEM calculations.

Instead, designers typically represent the air curtain as a heating or cooling device and ensure that its mechanical performance is accurately defined. Key parameters include: seasonal efficiency (seasonal coefficient of performance (SCOP) or seasonal energy efficiency ratio (SEER)); specific fan power (SFP); and system control strategy.

Where air curtains incorporate heat pumps, the system should be modelled accordingly to avoid default assumptions that may underestimate efficiency.

Dynamic simulation and airflow modelling

Where more detailed analysis is required, designers may use dynamic simulation models (DSMs). These tools can incorporate airflow network modelling, which allows pressure-driven air movement between zones to be simulated. Doorways can be represented as large openings with defined flow coefficients, while wind pressure and stack effects can be included explicitly.

More advanced studies may use computational fluid dynamics (CFD) to analyse the behaviour of the air curtain jet, including entrainment, turbulence and interaction with wind. Although these methods require more detailed modelling effort, they can provide valuable insight into: local comfort conditions near entrances; infiltration heat losses; and optimisation of air curtain velocity and placement.

Integration with low carbon heating systems

Air curtains can operate with several heat sources, including electric heaters, hot-water coils and heat pumps. Increasingly, air curtains are being integrated with low-temperature heat pump systems. This can be achieved using either direct expansion (DX) coils connected to variable refrigerant flow (VRF) or split heat pump systems; or low-temperature hot-water (LTHW) coils supplied by air source or ground source heat pumps.

Air curtains supplied by heat pumps can operate more efficiently than units using

electric resistance heating, because the heat pump provides heat at a higher coefficient of performance (COP). Hybrid designs are also available, combining a heat pump coil with a small electric heater that provides supplementary heat during defrost cycles or peak loads.

Control strategies

Control systems play a critical role in achieving efficient operation. Older air curtain installations often relied on manual switches with fixed fan speeds and heating outputs. This approach can lead to unnecessary energy consumption and inconsistent performance.

Modern systems use automated control strategies. Door sensors activate the air curtain when the entrance is open, while temperature sensors monitor indoor and outdoor conditions. Advanced control algorithms can then adjust airflow velocity and heating output independently to maintain optimal jet stability and thermal performance.

Integration with building management systems enables coordination with the wider HVAC system. Communication protocols such as Modbus and BACnet can allow monitoring, diagnostics and remote optimisation.

Meeting the challenge of open doorways

Open doorways represent a highly dynamic component of the building envelope.

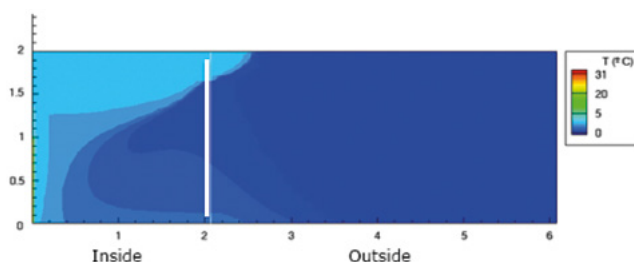
Air curtains attempt to manage this interface by generating a turbulent jet that acts as a dynamic aerodynamic boundary.

Understanding the underlying building physics – jet behaviour, pressure differentials and airflow interaction – is essential for effective design.

When properly selected, commissioned and integrated with ventilation systems, low carbon heating technologies and intelligent controls, air curtains can significantly improve environmental control at building entrances and reduce energy losses at one of the most challenging points in the thermal envelope. ●

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Situation without an air curtain



Situation with an air curtain

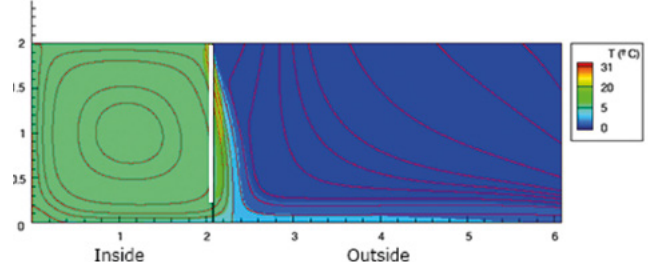


Figure 2: Heat map illustrating air curtain effectiveness, showing temperatures with or without

Module 262

April 2026

1. What is the primary mechanism by which an air curtain reduces air exchange through an open doorway?

- A Increasing the internal air temperature near the entrance
- B Increasing building airtightness around the doorway frame
- C Creating a high-velocity jet that forms an aerodynamic barrier across the opening
- D Increasing ventilation airflow rates inside the building
- E Reducing the internal humidity level

2. Why is discharge velocity a critical parameter when selecting an air curtain?

- A Because airflow rate alone determines jet stability
- B Because jet force increases approximately with the square of velocity
- C Because velocity determines the heating output of the unit
- D Because velocity determines electrical efficiency of the fan motor
- E Because higher velocity eliminates all infiltration through the doorway

3. Which airflow pattern typically develops across an open doorway due to buoyancy (stack effect)?

- A Uniform inward airflow across the entire opening
- B Uniform outward airflow across the entire opening
- C Alternating airflow that changes direction every few seconds
- D Bidirectional flow with warm air leaving at high level and cooler air entering at low level
- E No airflow occurs unless wind is present

4. Why can the performance of air curtains be difficult to represent accurately in SBEM calculations?

- A SBEM cannot model electric heating equipment
- B SBEM assumes fixed monthly heat loads and does not allow airflow modelling
- C SBEM assumes static infiltration rates and does not explicitly model airflow through open doors
- D SBEM does not include fan energy in calculations
- E SBEM cannot include heat pump systems

5. Which modelling approach can provide the most detailed analysis of airflow behaviour around an air curtain installation?

- A Degree-day energy estimation
- B Steady-state heat loss calculations
- C Simplified Building Energy Model (SBEM)
- D Seasonal equipment efficiency modelling
- E Computational fluid dynamics (CFD)

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References:

¹ ASHRAE Handbook chapter 16. Ventilation and Infiltration
² Gil-López, T et al (2013). Experimental analysis of energy savings and hygrothermal conditions

improvement by means of air curtains in stores with intensive pedestrian traffic. *Energy and Buildings*.




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Product or service of the month

Natural refrigerant heat pump range expanded with new 65kW model

Ideal Heating Commercial has expanded its Ecomod 290HT natural refrigerant heat pump range with the launch of a 65kW model. The addition increases the Ecomod 290HT lineup to four chassis sizes and six outputs, ranging from 15kW to 65kW. The monobloc air source heat pumps use R290 natural refrigerant, which has an exceptionally low global warming potential of just three.

The new 65kW unit delivers a maximum flow temperature of 70°C, making it suitable for a wide range of commercial buildings, including retrofit projects where higher water temperatures may be required. With a coefficient of performance of up to 4.6, the heat pump can produce up to 4.6 units of heat for every unit of electricity consumed, helping to improve system efficiency while

reducing operational carbon emissions. For projects requiring greater heating capacity, multiple units can be cascaded. Up to seven 65kW models can be combined to deliver significantly larger system outputs, providing flexibility for applications such as schools, offices, healthcare facilities and larger commercial developments.

An integral control unit is included as standard to simplify installation and system management. Optional control solutions are also available for cascade applications or in projects where a building management system is not present, enabling efficient coordination of multiple units.

The new model integrates with other Ideal Heating Commercial products, including the Evomax 2 and Imax Xtra 2 condensing boilers,



to create flexible hybrid solutions that combine heat pump technology with high-efficiency boilers.

All Ecomod heat pumps have a five-year warranty when commissioned by Ideal Heating Commercial, which also continues to provide free commissioning across its Ecomod heat pump and commercial boiler ranges, helping contractors ensure optimal system performance from day one.

● Visit: [idealcommercialheating.com/products/ecomod-290ht](https://www.idealcommercialheating.com/products/ecomod-290ht)



Hamworthy's hybrid heating upgrade for health centre

A hybrid heating system from Hamworthy Heating has been installed at Grantham Health Centre, in Lincolnshire. Three ageing gas boilers have been replaced with Stratton mk3 condensing boilers and a Tyneham 50kW high-temperature air source heat pump. Delivered with contractor Arthur Pollard Ltd, the system uses the heat pump in milder weather with boilers providing winter backup. Completed in seven weeks while the site remained operational, the upgrade improves efficiency and cuts carbon emissions

● Call 01202 662 552 or visit www.hamworthy-heating.com

Energy-efficient ventilation installed at health hub

Vent-Axia's Sentinel Apex HR21 commercial heat recovery units have been specified for Carmarthen Health and Wellbeing Hwb, in Wales, a major redevelopment of a former department store building.

Twenty units will provide energy-efficient ventilation across the three-floor, 245,000 sq ft complex, which will house healthcare services, a gym and leisure facilities. Selected for low noise, high heat recovery and strong indoor air quality performance, the system aims to deliver a comfortable, low carbon community hub.

● Visit www.vent-axia.com



Breathing Buildings celebrates 20 years of innovation

Breathing Buildings' 20th anniversary marks two decades of innovation in low-energy ventilation.

Founded in 2006 as a University of Cambridge spin-out, the company has grown from a research start-up into a recognised provider of natural, hybrid and mechanical ventilation systems for education, commercial and public sector buildings.

With 47 industry awards, and major projects including the Bloomberg European Headquarters, the firm continues to expand manufacturing and strengthen its team to support growing demand for low carbon building solutions.

● Visit www.breathingbuildings.com



Connected fire-safety solutions on show

Advanced will showcase its latest intelligent fire- and life-safety technologies at The Fire Safety Event 2026, taking place at the National Exhibition Centre from 28–30 April.

Visitors will see connected solutions, including SmokeGo, EvacGo and the AdvancedLive monitoring platform, designed to improve visibility, compliance and response in modern buildings.

Demonstrations will highlight how integrated fire detection, smoke control and evacuation systems can support safer, smarter building management across a wide range of applications.

● Visit advancedco.com



Liquid cooling CDU targets high-density data centres

Tecnair, a Panasonic company, has launched a new liquid-cooling coolant distribution unit (CDU) for high-density AI and HPC data centres.

The CDU range supports both direct-to-chip and immersion cooling architectures, and rack loads exceeding 50kW, with scalable 400kW and 800kW options.

Designed for 24/7 reliability, the CDU delivers high energy efficiency, advanced monitoring and integration with free-cooling chillers, helping operators transition to sustainable, high-density computing environments.

● Visit bit.ly/TecnairCDU

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Mechanical Electrical Clerk of Works Ltd is offering bespoke mechanical and electrical (M&E) clerk of works services tailored to client requirements across construction and building services projects.

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Additional services include site surveys and wider M&E site support.

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Free commissioning offer returns for 2026

ACV UK has confirmed the return of its free commissioning promotion for 2026, alongside a refreshed customer loyalty scheme. Installers fitting three or more ACV products in a single plantroom can receive free commissioning on qualifying systems.

The updated tiered loyalty programme will offer additional rewards and benefits to regular customers. The initiative aims to support installers while ensuring systems are commissioned correctly, helping deliver optimal performance and reliability from the start.

● Visit www.acv.com/gb



Optimising water quality in closed-loop heating systems

Magnetic International offers a solution for optimised heating water quality in closed-loop systems that is suitable for new plant or maintaining existing assets.

Water condition is critical to efficiency, reliability, and compliance with manufacturer and industry guidance, such as VDI 2035 and upcoming BSRIA guide BG89, focusing on a chemical-free approach to heating water treatment that also complements BG29 and BG50.

Magnetic's premier-class filling stations enable in-operation desalination (demineralisation), providing accurate electrical conductivity readings, integrated digital water metering and modular scalability for larger heating systems, helping maintain consistent water quality and long-term system performance.

● Email info@magnetic-online.com or visit bit.ly/MagneticProducts

Q&A

The SLL Young Lighter 2025 presents her award-winning project on biologically appropriate lighting for healthier sleep in childhood

Lucie Koháková was named SLL Young Lighter 2025 for her Luna project on the impact of light on human circadian rhythms – especially in early childhood – and how design can support healthier sleep through biologically appropriate lighting.

Q What first sparked your interest in lighting design?

A My route into lighting design stems from a long-standing interest in how light influences human experience, behaviour and overall wellbeing.

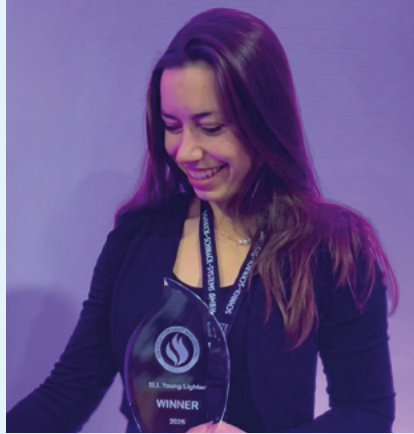
I began to focus on light during my studies in industrial design at the Czech Technical University in Prague. There, I started to see design not only as a visual or functional discipline, but as a tool that can actively influence health. While working on my Bachelor's project, which later developed into Luna, my attention increasingly centred on light as a medium that operates on both physiological and emotional levels.

Q How did your studies shape your approach to lighting?

A During my studies, I began to connect design with broader scientific perspectives, particularly biology and behavioural science. This shift happened while developing the Luna project, when I explored the relationship between light and circadian rhythms in early childhood. Lighting design quickly became a natural intersection between my design background and my growing interest in wellbeing and the biological effects of light on the human body.

Q What inspired the creation of your winning project, Luna?

A Luna emerged from a very personal experience. The initial impulse came from the sleep difficulties of my niece, Luna, and from observing how profoundly a child's sleep quality affects the life of my older sister and those around her. When a child wakes frequently during the night, parents often experience chronic sleep deprivation and the night-time routine



becomes fragmented and stressful. It quickly became clear to me that this was not an isolated case, but a common reality for many families.

Q What problem does Luna aim to solve?

A Luna is a portable light designed specifically for infant care during the night. It is not a conventional lamp, but an object conceived as a biological tool that respects the natural rhythms of the human body. The goal is to provide enough light for parents to care for their child while minimising disruption to sleep for the infant and caregiver.

The core principle of Luna lies in its spectral composition. It emits a narrow spectrum of orange light that is entirely free from blue and green wavelengths, which are known to suppress melatonin production. Research shows that even very low levels of short-wavelength light can significantly impair the body's ability to fall back asleep. By eliminating these disruptive wavelengths, Luna supports the body's natural ability to maintain sleep and return to rest.

Q Why is circadian rhythm so important in early childhood?

A During the prenatal period, an infant's circadian rhythm is regulated through maternal hormones. After birth, however, the child must gradually develop their own biological clock, a process that usually stabilises around the third to fourth month of life.

During this sensitive phase, environmental cues – particularly the alternation of light and darkness – play a crucial role. If the night-time environment is too bright or biologically inappropriate, the development of a healthy circadian rhythm may be delayed or disrupted.

Q What did you learn from user research with parents?

A Many parents rely on their mobile phones as a light source during night-time care, even though they are aware of the negative impact of screens on sleep. This contradiction between knowledge and behaviour became a key insight. It showed that education alone is not enough – design must embed the solution directly into the object itself. With Luna, users do not need to remember rules about healthy lighting, as those principles are already built into the design.

Q What did winning the Young Lighter Award mean for you?

A Taking part in the Young Lighter competition was an exceptionally valuable experience. Beyond the award itself, having Luna recognised by the Society of Light and Lighting (SLL) was a pivotal moment for me. It showed me that it was time to fully commit to the project and take it all the way to market. Engaging with the SLL community was deeply motivating, and reinforced my desire to continue working in lighting design and be part of this inspiring global network of designers and architects.

Q How has the project changed the way you think about light?

A For me, Luna represents a shift in perspective. Light is no longer only about how much illumination we add to a space, but about understanding when and how light should step back. By respecting the body's rhythms and letting darkness remain an important part of the environment, lighting design can support rest, health and wellbeing in a more meaningful way. ●

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The FGG Flowgrid has been designed to measure air volume in ventilation ducts. The Flowgrid consists of a standard duct section with a length of 200 and 300 mm and is available with a 20-30 or 40mm duct connection flange to suit standard duct work

The CMR sensing probes are fitted across the internal duct frame area in predefined spacing. Each probe has a number of pressure inlet points to measure the impact and static pressure at the same time and provide an average velocity measurement.

The result is a velocity pressure which ultimately provides a total air volume measurement. Both static and impact pressure have an independent pressure averaging tank which provides a smooth pressure signal of the whole measured area.

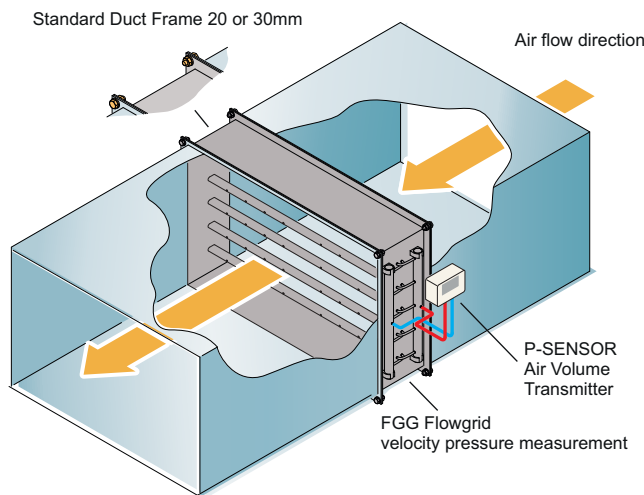
Another great advantage of the FGG Flowgrid is, that it can measure bi-directional as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-SENSOR.

The Flowgrids are manufactured in standard height increments of 100mm going up to a maximum height of 1200mm. Custom sizes can be made 3000 x 3000mm

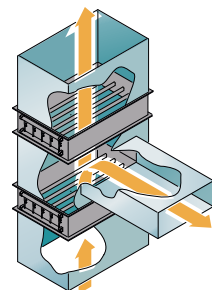
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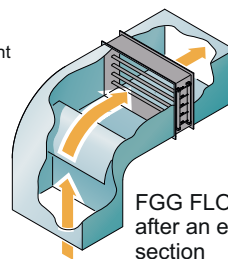
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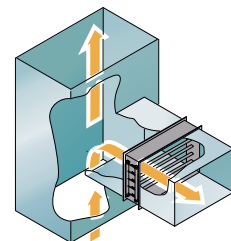
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FGG FLOWGRID before and after a T- duct section



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