cibse Journal

November 2024
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The magazine of the Chartered Institution of Building Services Engineers

CPD Special

Net Zero Carbon Buildings Standard Pilot

Proper job: Cornwall's net zero housing plan

Green heat

Greenpeace says yes to heat pumps as it strives to decarbonise its buildings

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Green piece

The slogan 'No new gas' is part of a prominent Greenpeace campaign and, as you can see from the organisation's eye-catching stunt on the cover, it is keen to draw attention to the damage being done to the Earth by burning fossil fuels.

The environmental campaigner has been practising what it preaches with the recent replacement of a gas boiler with a heat pump at its headquarters in London. Our article on page 28 looks at the challenge of retrofitting a heat pump at Greenpeace UK's 100-year-old office building – an installation that will have to become mainstream if the UK is to meet its carbon-reduction targets.

The release of the pilot version of the UK Net Zero Carbon Buildings Standard takes us one step closer to having a firm basis for decarbonisation in the built environment sector, as Julie Godefroy explains on page 20. CIBSE was closely involved in the standard, and its new Saffron Hill head office will be testing it in the new year. The standard is a stupendous example of collaboration across the built environment sector, involving everyone from the architect and building services engineer to the contractor and facilities manager.

Working beyond silos was very much the theme of the CIBSE Building Performance Reimagined conference (page 17). Inspired by Fiona Cousin's presidential address, which asked 'what is the future of building performance and how do we get there?', the conference featured a diverse range of speakers presenting on the themes of readiness, emergence, variety and connectedness. A common thread was that the industry must be focused on nature and the needs of humans, not just carbon reduction.

Finally, awards and honours have been presented to young engineers, employers and those making outstanding contributions to CIBSE. Details of the Young Engineers Awards winners are on page 18, while recipients of Gold, Silver and Bronze medals are on page 16. Awards were also presented to the best papers in CIBSE's *BSER&T* journal, including the Dufton Silver Medal for research done on internal air quality at mass gatherings. Lead author Dr Liora Malki-Epshtein describes how this work led to the creation of the Cave laboratory on page 40.

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CIBSE Journal is written and produced by CPL One
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Editorial copy deadline: First day of the month preceding the publication month

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The official magazine of the Chartered Institution of Building Services Engineers

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***CIBSE Journal* newsletter**

www.cibse.org

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Tel: +44 (0)208 675 5211
 ISSN 1759-846X

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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 monthly by CPL One, 1 Cambridge Technopark, Newmarket Road, Cambridge CB5 8PB, UK.

Subscription records are maintained at CIBSE, 222 Balham High Road, London, SW12 9BS, UK.

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

Credits

Cover Chris Grodotzki / Greenpeace
P8 iStock.com / monkeybusinessimages
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ABC audited circulation: 18,351 January to December 2023
Printed by: Warners Midlands PLC

Energy efficiency targets for rented homes by 2030

Move would lift one million people out of fuel poverty, claims government

All rented homes will have to meet minimum energy efficiency standards, Ed Miliband has pledged.

In his speech at the Labour Party conference in September, the Secretary of State for Energy Security and Net Zero announced that the government will consult by the end of this year on proposals for all rented homes to achieve Energy Performance Certificate (EPC) 'C' or equivalent by 2030.

Currently, private rented homes can be rented out if they meet EPC 'E', while there is no minimum energy efficiency standard for social rented homes.

Labour promised to introduce minimum energy efficiency standards for private renters in its election manifesto. However, Miliband told the party's conference that the government is going further by ensuring that every family living in poorly insulated social housing will benefit from such upgrades, too.

He claimed that the government's move would lift more than one million people out of fuel poverty.

Private tenants will be able to receive support for home upgrades through the Warm Homes: Local Grant scheme, which replaces the local authority–delivered Green Homes Grant.

Upgrades of social housing will also be supported by the Warm Homes: Social Housing Fund. All homes with an EPC rating of D or E will be eligible for the scheme, which replaces the previous government's Social Housing Decarbonisation Fund.

In addition, the government has confirmed the continuation of the Public Sector Decarbonisation Scheme, which supports the switch to green heating in public sector buildings such as schools and hospitals. The aim is to cut carbon emissions by 75% by 2037, compared with 2017 levels.

Half of Brits will ration energy this winter amid rising costs

Almost half of all adults in Britain say they are likely to ration their energy use this winter, according to a new survey.

The poll, carried out by YouGov for charity National Energy Action (NEA), found that 46% of adults in Britain are likely to use less energy than they should for maintaining comfort and wellbeing this winter.

The survey of 2,301 adults also revealed that 27% have found it difficult to pay for their energy over the past year, rising to 45% among those on a low income.

Nearly half (48%) of those polled said they have turned off more lights than they wanted to, 23% have had cold meals rather than use the oven, and 40% have reduced their use of baths.

The findings emerged as the price cap on the typical energy bill increased on 1 October. A typical household will now face an annual bill of £1,717, up from £1,568, the NEA said.

Have your say on the Invest 2035 industrial strategy

CIBSE is inviting input to inform its response to the government's draft Invest 2035 industrial strategy, which was issued on 14 October. The deadline to contribute to the CIBSE response is 17 November, ahead of the consultation closing a week later, on 24 November (bit.ly/CJIS35).

The government is asking for views on its approach, including evidence, analysis, and policy ideas. It wants input from a range of partners, including businesses, experts, unions, local and regional actors, and other interested parties. The final industrial strategy is due to be published next spring, alongside the government's multi-year Spending Review.

Certified UK heat pump installations at record high

More than 42,000 installed in first nine months of the year

New figures show that the number of certified heat pump installations reached an annual high with three months of the year left to go.

According to the latest monthly snapshot from the Microgeneration Certification Scheme (MCS), which covers small-scale renewable energy installations, more than 42,000 heat pumps had been installed by the end of September this year.

This surpasses the previous annual record of 40,426 certified heat pump installations last year.

According to MCS data, average monthly heat pump installations have risen by 39% since 2023. This increase has been spurred by a surge in uptake of Boiler Upgrade Scheme (BUS) grants, with 2,890 applications submitted in August 2024 – more than double the number in August 2023.

Increased appetite for the grants, which are worth up to £7,500 per household, has prompted Secretary of State for Energy Security and Net Zero Ed Miliband to increase the cap on this year's programme by £50m, to £200m.

The MCS figures are backed up by recently published statistics from the Department for Energy Security and Net Zero, which show that –in the second quarter of this year – there was highest deployment rate of government supported heat pumps since early 2022.

The previous government increased the BUS grants from £5,000 to £7,500.

New CEO for Climate Change Committee

Emma Pinchbeck has been appointed as the new chief executive of the Climate Change Committee (CCC).

She will take up the position on 11 November, and joins the independent, non-departmental advisory body from Energy UK, where she has been chief executive since early 2020.

Prior to working at the energy sector trade association, Pinchbeck was deputy chief executive of Renewable UK.

The CEO position at the CCC has been vacant since Chris Stark, left the organisation in April.

Pinchbeck will oversee publication of the Seventh Carbon Budget early next year and the fourth Climate Change Risk Assessment in 2026.

Arup to assess impact of extreme heat on human health

The Climate Change Committee (CCC) has appointed Arup to assess the future impact of extreme heat on human health and productivity in the UK's urban areas.

The consultancy has been tasked with identifying and developing a set of implementable solutions to mitigate overheating and minimise the negative health and economic impacts of extreme heat.

The exercise will inform the CCC's *Well-adapted UK* report, which is designed to accompany its fourth Climate Change Risk Assessment, due to launch in 2026.

Ordnance Survey will manage register for underground assets

Ordnance Survey has been announced as the future operator of the National Underground Asset Register (NUAR), a map of underground water, gas, electricity and telecommunications pipes and cables across England, Wales and Northern Ireland.

Eligible asset owners, contractors and accredited surveyors will have instant access to the NUAR, ending the current situation where workers must contact multiple organisations and wait, on average, more than six days for information. The NUAR will be accessible by spring 2025.

Landmark solar project commissioned by British Library

The UK's largest solar heat project has been installed on the roof of the British Library, which commissioned Naked Energy and CBRE Global Workplace Solutions to carry out the work. A total of 950 Virtu solar collectors now cover 712.5m^2 of the building in King's Cross, London. The system will provide hot water and space heating, and maintain ideal conditions for preserving the library's collections.

Heat network users face regular outages

New report reveals wide range of performance between the best and worst networks

The latest report by consumer protection scheme Heat Trust has revealed that heat network customers suffer regular power outages.

Covering the period from October 2021 to September 2023, the report says consumers experienced an average of four unplanned supply outages per year, each of which lasted five to six hours on average.

However, this average masks a 'wide range' of performance, with the best heat networks experiencing no interruptions to supply and the worst, almost 20 a year.

The report also shows that just less than one-fifth of customers were more than two months in arrears with bill payments. However, the proportion of trust members identified as vulnerable has increased, with 9% of consumers on a Priority Services Register in 2023 compared with only 4% in 2021.

Complaints raised by consumers increased to 4.4% in 2023, compared with 3.2% in 2022. However, this was down from a high of 7.4% in 2021.

The Heat Trust report says membership of the scheme has increased to more than 80,000 consumers, as heat networks expand and operators seek to register ahead of regulation. Currently, 28 heat suppliers, covering 129 heat networks are signed up to Heat Trust.

Construction falling short on energy efficiency

The construction industry is not on track to meet its commitment to improve the energy efficiency of the UK's existing housing stock, according to the latest report, by the Construction Leadership Council (CLC), on the sector's response to the net zero challenge.

Launched during Construction Week last month, the CLC's quarterly Construct Zero Performance Framework provides a sector-level dashboard on progress around nine identified net zero priorities. It says the sector is not on track to deliver the framework's target for 11.13 million homes to reach an Energy Performance Certificate C rating by 2035.

The report states that 'more work is needed' to meet targets that all new buildings will be designed with a low carbon heating solution from 2025, and that half of all housing stock will be connected to such heat sources by 2035.

It also gives a mixed verdict on the industry's performance on shifting the construction workforce to use zero-emission vehicles and onsite plant. The sector is not on track to deliver the target of 70% of new vans being electric vehicles by 2030.

Industry urged to adopt pilot version of NZCBS

Standard will be used for CIBSE's new London head office

A pilot version of the UK Net Zero Carbon Buildings Standard (NZCBS) has been launched. The free-to-access methodology defines what 'net zero carbon' means for buildings in the UK, and has been developed so that the built environment stays true to the country's carbon and energy budgets.

The pilot version contains technical details of how a building can comply with the standard, including limits and targets it must meet, the evidence needed to demonstrate this, and how it should be reported. CIBSE will test the standard at its new Saffron Hill head office in London, and the wider industry is being encouraged to use the pilot to prepare for the process of verifying buildings as net zero carbon aligned.

More than 350 experts from across the sector supported the Technical Steering Group (TSG) during the standard's development. Its mandatory requirements for building performance and construction cover areas such as upfront carbon, operational energy use, avoidance of fossil fuel use on site, renewables, and refrigerants.

Katie Clemence-Jackson, chair of the TSG, said: 'It has been created not only by using data on what is achievable, but also by cross-referencing this with modelling of what is needed to decarbonise in line with 1.5°C-aligned carbon and energy budgets.'

Read about the pilot version at www.nzcbuildings.co.uk/pilotversion

Billions pledged by government for UK's first CCUS clusters

The government has awarded £21.7bn in funding over the next 25 years for the UK's first carbon capture use and storage (CCUS) clusters in Teesside and Merseyside.

The East Coast Cluster will capture emissions produced across the Humber and Teesside, piping them to stores under the North Sea. The Hynet North West projects will produce 'blue' hydrogen from natural gas, and store emissions under Liverpool Bay.

Some environmentalists criticise CCUS as a commercially unproven technology, promoted by gas and oil companies to continue their polluting activities. However, the Climate Change Committee has said it is vital for decarbonising the UK's heavy industry and a 'necessity' for reaching its net zero targets.

CIBSE BUILDING PERFORMANCE AWARDS 2025

TABLE BOOKINGS ARE NOW OPEN

Make sure you secure your table to celebrate and reward excellence in building performance on 27 February 2025 at the Park Plaza Westminster Bridge.

cibse.org/BPA

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Elizabeth Line wins 2024 RIBA Stirling Prize

London's newest Tube line beats five other projects

The Elizabeth Line rail service has been named winner of the 2024 RIBA Stirling Prize. The line boasts 10 new stations, handles around 700,000 passengers every weekday, and spans 62 miles of track and 26 miles of tunnels.

A team of designers and engineers, led by architects Grimshaw, received the award for the project, which directly connects central London with destinations in Berkshire, to the west, and Essex, to the east.

The winning scheme comprises platform architecture, passenger tunnels, escalators, station concourses, signage, furniture, fittings, finishes, and supporting technology. Its new stations were designed by separate architects.

Other projects on the 2024 shortlist were: an 11-home council development in Hackney; the second phase in the regeneration of Sheffield's listed Park Hill estate; the masterplan for the regeneration of King's Cross; the transformation of a Dorset dairy farm into holiday lets; and the remodelling of the National Portrait Gallery.

Aecom director Mike Burton FCIBSE, who helped judge the Stirling Prize, is also chair of the National British Council for Offices Awards, which took place on 8 October

These celebrate excellence in office design, operation, sustainability, and engagement. Read his article on office design trends at **bit.ly/BCOawards** and to find out more on his experience as a Stirling Prize judge visit **bit.ly/CJRibaMB**

Google taps nuclear energy to power AI

Technology giant Google has commissioned Kairos Power to build several small nuclear reactors to power its increasingly energy-hungry artificial intelligence (AI) data centres.

Unlike traditional, water-cooled reactors, Kairos Power's reactors use molten fluoride salt as a coolant. The first reactor is expected to be operational this decade, with more planned by 2035. In July, Kairos began building a demonstration reactor in Tennessee, but its plans have yet to receive approval from the US Nuclear Regulatory Commission.

The deal follows news that Amazon is re-opening the Three Mile Island nuclear plant in Pennsylvania, which has been closed since a catastrophic accident in 1979.

CIBSE reveals best technical papers from *BSER&T*

Medal-winning papers selected for their impact, international interest and relevance

Technical papers exploring overheating criteria in homes, heat pump demand response, whole life carbon in supermarket construction, and rapid assessment of indoor air quality (IAQ) at events have been recognised at the CIBSE President's Awards dinner in October. The winning papers featured in *Building Services Engineering Research and Technology* (*BSER&T*).

The Dufton Silver Medal, for papers relating to fundamental research in building services and technology, was awarded to Liora Malki-Epshtein, Filipa Adzic, Ben Roberts, Elizabeth Abigail Hathway, Chris Iddon, Murat Mustafa, & Malcolm Cook, for their paper *Measurement and rapid assessment of indoor air quality at mass gathering events to assess ventilation performance and reduce aerosol transmission of SARS-CoV-2*. It defines a methodology for measurement and rapid assessment of IAQ during live events.

The Carter Bronze Medal, for the most highly rated paper, was awarded to Ali Bahadori-Jahromi, Agha Hasan, Anastasia Mylona, Augustine Blay-Armah, Golnaz Mohebbi, and Mark Barthorpe, for *Comparative analysis of the whole life carbon of three construction methods of a UK-based supermarket*. It explores the relationship between embodied carbon and operational carbon, and provides a framework for future assessment of the whole life carbon of supermarket buildings.

The Barker Silver Medal went to Jenny Crawley, Clifford Elwell, Adria Martin-Vilaseca, Michelle Shipworth, Jez Wingfield, and Zachary Gill, for their paper *Demand response with heat pumps: Practical implementation of three different control options*. This compared three early adopters of heat pump demand response in occupied homes and aimed to reduce heat pump electricity consumption during the same peak period, but each used a different control strategy.

The Napier Shaw Bronze Medal was awarded to Kevin J Lomas and Matthew Li, for their paper *An overheating criterion for bedrooms in temperate climates: Derivation and application*. This proposes a new criterion for bedrooms, with thresholds between 26 and 29°C.

CIBSE members can read the *BSER&T* and *Lighting Research and Technology* for free at www.cibse.org/knowledge

Training

Introduction to the Building Safety Act

Upcoming dates: 27 November

This course provides an overview of the scope and major provisions of the Building Safety Act, and will outline the regime for the design, construction and operation of higher-risk buildings in England. Hywel Davies, independent consultant on building safety and building regulations, will provide the training, which will help delegates understand the full extent and implications of building safety reform, the Building Safety Act, Fire Safety Act, and supporting regulations.

For full details and booking:
www.cibse.org/training

Low carbon consultant building design
19–20 November
4–5 December

Understanding the law for engineers
8 November

Fire safety building regulations: Part B
26 November

Introduction to the Building Safety Act
27 November

The electrification of heat
11 November

Mechanical services explained
12–14 November
10–12 December

The importance of energy-efficient buildings
12 November

Energy efficiency-related building regulations: Part L
13 November

Building Regulations Part O Overheating
14 November

Standby diesel generator
15 November

ISO 5001:2018 Energy management system/low carbon consultant
2–3 December

Commissioning Code M: Commissioning management
20 November

Low and zero carbon energy technologies
21 November

Advanced simulation modelling for design for performance
21–22 November

Energy surveys
25 November
26 November

Heat networks code of practice (CP1)
26–27 November

Low carbon consultant building operations
27–28 November

Energy Savings Opportunity Scheme
9 December

Design of ductwork systems
3 December

Introduction to heat networks code of practice
3 December

Design of heating and chilled water pipe systems
5 December

SI Sealy scoops overall Employer of the Year Award

AtkinsRéalis and ChapmanBDSP also win awards

S I Sealy & Associates was named CIBSE Employer of the Year at this year's Young Engineers Awards, after impressing the judges with its focus on making its engineers the best they can be, while upholding the highest standards of professional conduct.

SI Sealy & Associates, which also won in the small company category, is a specialist building services engineering design consultancy, with 37 staff. It offers a structured career path, runs regular training seminars and CPD workshops, and funds all of its staff to join a professional industry body. It also rewards and celebrates its engineers' academic achievements.

ChapmanBDSP won the medium company category, impressing the judges with its early careers training and development, and its commitment to Revit training for all apprentices and graduates.

In the large company category, AtkinsRéalis took the prize, impressing with its Graduate Development Programme, which is designed to help develop skills and knowledge, and achieve professional registration, and includes more than 30 hours of masterclasses across two years.

The judges noted some core themes from the entries this year, with lots of progress on digital learning and skills, and a top-down proactive approach to training and support. Many submissions also demonstrated the importance of wellbeing and supporting a work-life balance. Other common threads were community engagement and support in schools, and an increase in support, from apprentices through to directors.

Simon Steed, chair of the Employer of the Year judges, said: 'Size is no obstacle to innovative ideas and support for young and emerging engineers. These companies' commitment to creating programmes and training that puts their engineers' development at their core is evident in the passionate statements from their young engineers, who thrive on the support and encouragement from their employers.'

The CIBSE Employer of the Year Awards celebrate companies that actively support and nurture young engineers, promoting their development through training, mentoring and initiatives that prioritise them within the business.

The winners were announced at the CIBSE Young Engineers Awards at BMA House, London, on 10 October. For more on the awards see p.18

www.cibse.org/yea

In November

Awards
The SFE Façade 2024 Design and Engineering Awards
6 November, Old Billingsgate, London
The awards recognise excellence and achievement in façade engineering, with new categories to include Digital Innovation, and Special Structures UK and International.
www.cibse.org/facadeawards

Exhibition and conference
Build2Perform Live 2024
13-14 November, ExCeL London
Join forward-thinking industry professionals, visionary speakers and leading exhibitors at this year's Build2Perform Live – which will include a new area for facilities management, Maintain2Perform, and the return of Light2Perform, curated by the Society of Light and Lighting.
www.build2perform.co.uk

Webinar
Home Counties North West: UPS systems battery technologies
26 November
This webinar, hosted by CIBSE Home Counties North West region, will include a presentation by Kohler Uninterruptible Power on UPS systems battery technologies..
Register at bit.ly/UPSbatWeb

Events
CIBSE Careers Fair
5 November, Here East UCL, Queen Elizabeth Park, London
The Careers Fair will provide an opportunity for students to meet employers, and firms to showcase career opportunities and inspire the next generation of engineers.
www.cibse.org/what-s-on/search-events/cibse-careers-day-2024

Fiona Cousins made Trinity Hall, Cambridge Fellow

CIBSE President Fiona Cousins has been appointed an Honorary Fellow of Trinity Hall, Cambridge. Cousins, who graduated from Trinity Hall with a degree in engineering science, is currently chair of the Arup Americas Region and a member of the Arup Group board. Her portfolio includes high-profile projects such as the US Embassy in London and the Frick Chemistry Building at Princeton University. The Fellowship reflects Cousin's exceptional contribution to engineering. She said: 'I loved my time at Trinity Hall – studying, growing, and becoming myself. It's a great pleasure to be renewing the connection.'

Institution launches Embodied Carbon Verification Scheme

A new Embodied Carbon Verification (ECV) Scheme, based on TM65:2021 and governed by ISO 17065:2012, has been launched by CIBSE to provide assurance around manufacturers' claims and better support users in their selection of building services products.

CIBSE's TM65 methodology is helps estimate the embodied carbon associated with products in the absence of Environmental Product Declarations (EPDs). Its universality, simplicity and suitability for comparing data makes it attractive to users when undertaking product evaluation and selection.

EPDs provide assurance, but use a range of methodologies, making comparison of data difficult. They are considered better suited to mass-produced products, where costs can be easily amortised.

The new ECV scheme, developed by CIBSE's Certification Body subsidiary, allows manufacturers to demonstrate their green credentials and commitment to sustainability. It also addresses questions of competency, and covers product process and material changes over the three years of certificate validity.

Retrofit centre-stage at CIBSE Scotland Conference

Presentations available to download from region's leading technical event

Presentations and videos from CIBSE Scotland's annual Retrofit2Perform conference are available to view online.

David Stevens, CIBSE vice-president, gave the opening address at the University of Strathclyde in May, followed by a keynote from Kerry Alexander, director of infrastructure, finance and programme at Scottish Futures Trust. Other sessions included Arup senior engineer Lindsay Adams, Harry Sharples, associate director of building performance engineering at Aecom, discussing the LETI non-domestic retrofit guide, and Sarah Peterson, director, Horizon M&E, and ACE Scotland chair, looking at pathways to decarbonise existing campus buildings. The conference ended with a panel discussion, chaired by Gerry Brannigan, partner at HKA.

The conference also honoured a dear friend and colleague of CIBSE Scotland, Dr Jeremy Cockroft, who died in November 2023. In his honour, the CIBSE Scotland committee has named its student competition the Jeremy Cockroft Award.

CIBSE Scotland thanks all the speakers, delegates and sponsors for their contribution. View the videos and presentations at: bit.ly/Ret2per

CIBSE members made RAE Fellows in 2024 list

Four CIBSE members have been awarded honorary Fellowships of the Royal Academy of Engineering (RAE), in recognition of their significant contributions to the engineering profession and the built environment. Chris Cole, Honorary FCIBSE CEng, Professor Hussam Jouhara FCIBSE CEng, Professor Xudong Zhao FCIBSE CEng, and Professor Ian Ritchie, affiliate member of the Society of Façade Engineering, received their Fellowships last month.

In total, the RAE awarded 71 Fellowships to those making outstanding contributions across engineering and technology, driving innovation, advancing business and academic progress, and offering expert advice to government.

New TM65 embodied carbon guide aimed at North America

CIBSE has published new guidance for assessing embodied carbon in building services systems, with assumptions tailored to the North American market.

Embodied carbon in building services: a calculation methodology for North America (TM65NA) was developed in collaboration with ASHRAE, and emphasises the importance of assessing the embodied carbon in building services systems, covering emissions across a product's life-cycle – from manufacturing and installation to maintenance and end of life.

While operational aspects and recycling potential are excluded, the methodology provides a comprehensive framework for calculating the embodied carbon impact, which is vital for managing a building's lifetime emissions.

TM65NA supplements CIBSE's TM65, with specific assumptions and guidance tailored to the North American market, covering the United States, Canada, and Mexico.

The publication continues CIBSE's efforts to advance industry knowledge on embodied carbon through a series of publications, digital tools, and webinars.

There will be a panel discussion on experience using TM65 at CIBSE Building2Perform Live on November 13 at London ExCeL.

TM65NA is available on the CIBSE Knowledge Portal. www.cibse.org/knowledge

Sustainability Group hosts NZCBS debate

The newly established CIBSE Sustainability Group will host its first technical event, 'Where does net zero fit in the context of sustainability?', on 27 November, at Hoare Lea's office in London, and online.

There will be a range of expert speakers providing insights on the new Net Zero Carbon Buildings Standard (NZCBS) and what this means for a sustainable built environment.

The panel will explore how the focus on net zero is complementary to, or can distract from, other sustainable development objectives.

Register here: bit.ly/SusNZCBS

Targeting hot water key in university's net zero strategy

Two CO_2 heat pumps were the ideal solution for the provision of hot water at a new sports pavilion in Leeds, says Mitsubishi Electric's Graham Temple

A community grassroots sports hub in Leeds is getting its hot water from low carbon heat pumps. Bodington Football Hub (designed by low carbon consultancy Couch Perry Wilkes) includes three full-size, artificial 3G floodlit football pitches, car parking, and a pavilion with changing facilities and a café.

The new pavilion has changing and shower capacity for four teams at a time – which is just as well, as the centre can host more than 100 community teams across the year. The building also includes a café and meeting spaces.

As well as supporting the local community, the scheme is an important home for the University of Leeds' sports programmes, and supports the Leeds United Foundation and West Riding County FA to deliver a range of recreational activities for the wider community.

'We needed to create this facility while taking into account the university's detailed net zero plans, so it was important that it met low carbon targets,' explained Bob Douglas, mechanical services manager at the University of Leeds. 'We really needed an all-electric solution that would cope with the high demand for showers.'

The answer was two QAHV heat pumps, providing domestic hot water for the showering facilities, toilets and kitchen. Specifically designed for commercial sanitary hot-water applications, the QAHV can produce water up to 90°C and uses R744 or CO_2 as a refrigerant, with a global warming potential of 1.

This makes the QAHV eligible for up to three Breeam points and the ideal low carbon solution for leisure centres, hospitals, hotels, student accommodation and other applications where renewable, high-temperature water is required.

In the Bodington Football Hub, the University of Leeds and wider community have a fantastic, state-of-the-art facility. Use of renewable, high-temperature heat pumps ensures that the Hub can deliver the hot water needed, while helping the university hit its carbon-reduction targets.

For more details on the installation at the Football Hub, visit bit.ly/BodFCHP

Graham Temple is marketing manager at Mitsubishi Electric

Recognition for great service

Eight Gold, six Silver and eight Bronze medals were presented to CIBSE Members at the Savoy last month

CIBSE Members' outstanding contributions and dedication to the Institution and the wider building services industry were recognised last month at the 2024 President's Awards Dinner at the Savoy in London.

Eight Gold medals, six Silver, and eight Bronze medals were presented in acknowledgement of the contribution the members have made through long and loyal service, helping to raise the profession's profile.

Fiona Cousins, CIBSE President, said of the medal winners: 'Their dedication, commitment and support for CIBSE, and the wider building services community – together with their expertise and knowledge – have, without doubt, strengthened our industry and raised standards.'

Gold medals

Colin Ashford has served on the CIBSE Council for 37 years, and has been on the Technology Committee since 2012. He has given more than 800 presentations to the regions and was a contributing author to *CIBSE Applications Manual 15: Biomass heating*, and *TM57 Integrated school design*.

John Aston was president of the Society of Light and Lighting (SLL) in 2014–15, and chair of the SLL Membership committee and of the CIBSE CPD Panel, as well as a mentor to many.

Patrick Bellew's career spans more than four decades, four continents, and countless high-profile projects and collaborations. Atelier Ten was born in 1990 and, under his leadership, worked to persuade clients of the benefits of integrating systems and challenging conventional approaches.

Steve Hennessy joined CIBSE as a student in 1982 and joined the ANZ New South Wales committee after moving to Australia. He became Chapter chair in 1994, and was ANZ chair from 2003–05 and again from 2013–14.

Florence Lam started her career at Arup while studying engineering at the University of Cambridge. She won the SLL Young Lighter of the Year award. Her vision for specialised lighting design led her to co-found a dedicated lighting design team at Arup.

Stuart McPherson has dedicated much of his working career to CIBSE, serving in diverse roles, including chair and honorary secretary of the Scotland Region committee, honorary treasurer on the CIBSE Board, and CIBSE President 2020–21. (He was awarded the Gold medal in 2023, but was presented with it at this year's event.)

Geoffrey Prudence was chair of the CIBSE Facilities Management (FM) Group for 21 years, and has given 50 years of active service to the building services industry and CIBSE, helping the Institution to be recognised as a leader in the FM sector. He served on the CIBSE Council, founded the CIBSE Fellow's Network, and was lead author on CIBSE Guide M.

P L Yuen has served on the CIBSE Hong Kong Region committee for many years, including as chair, and on the CIBSE Board, including as CIBSE vice-president. He is the senior manager of Hong Kong's Hospital Authority, overseeing the design, construction and operation of public hospital building services. ●

Silver medals

Silver medals were awarded to:
David Cheshire, Steven Hunt, Patrick Lehane, Saverio Pasetto, Ewen Rose and Jarrod Tandy.

David Cheshire has helped generate and lead important CIBSE publications including Guide L Sustainability, TM56 and TM54.

Steven Hunt has contributed more than 20 years to the Merseyside and North Wales Region committee, serving as chair, vice-chair and secretary.

Patrick Lehane has served on the CIBSE Ireland committee since the late 1970s, acting as secretary, vice-chair and treasurer.

Saverio Pasetto was chair of the Society of Façade Engineering, advocating for recognition of the importance of façade engineering in the construction industry.

Ewen Rose is a prominent advocate for the industry and established the CIBSE ASHRAE Graduate of the Year Award to highlight young engineers' talent.

Jarrod Tandy has been involved with the CIBSE East Midlands committee for more than 22 years, in various roles, including treasurer and chair. He is well known for his dedication to CIBSE.

Bronze medals

Bronze medals were awarded to:
Jocelyn Brownlie, Katie Clemence-Jackson, Peter Cotter, Michael Curran, Mona Duff, Neil Duffy, Gita Maruthayanar and Philip Oliver.

Designing for change

A diverse range of voices discussed the future of building design at the Building Performance Reimagined conference. **Molly Tooher-Rudd** reports

A new CIBSE conference, in central London, has challenged building professionals to adopt a more holistic approach to design and come up with new perspectives on building performance.

Building Performance Reimagined, held at the Royal College of Surgeons, brought together developers, architects, planners, surveyors, researchers, facilities managers, and contractors. It was centred on the *Building Performance Reimagined* report commissioned by CIBSE, and panel discussions covered the four critical performance metrics in the document: variety, readiness, connectedness, and emergence.

In her keynote, CIBSE President Fiona Cousins emphasised the need to question whether we are solving the right problems. She said that buildings of tomorrow must respond to new needs, some of which we may not yet be fully understand.

In the first session, on readiness and emergence, consulting trainer and facilitator Wolfgang Wopperer-Beholz highlighted the imperative to reconsider human needs in light of climate change and inequality. 'There will be instances when we will need to go back to basics – buildings as shelter, creating social and physical resilience,' he said. Dr Emma McIntyre, senior fire safety engineer at Arup, said there had to be a shift towards more people-centric design, and to understanding emerging risks, to ensure spaces can continue to be safe havens. She highlighted the need for flexibility within standards and regulations, and said it was crucial to understand the intent behind regulations. CIBSE's chief technical officer, Anastasia Mylona, noted that the industry's requirement for complete certainty before making changes often stifles innovation.

In a discussion on skills, the Department for Energy Security and Net Zero's Dr André Neto-Bradley advocated for people from a wide range of backgrounds. 'We need more than engineers and architects; we need to bring in art students and social scientists to broaden perspectives.' Dave Richards, director of technical infrastructure at Google, suggested that everyone involved in design should experience building operations to better understand performance.

In session two, on variety and connectedness, the panel discussed the importance of design, data and technology in creating resilient, energy-efficient buildings for the future. 'Variety means having spaces that are flexible today and adaptable to future needs,' said Richards, adding that data must drive design decisions.

The packed auditorium at the Royal College of Surgeons

A design from the *Building Performance Reimagined* report made real

Mission steward at Dark Matter Labs Indy Johar stressed the importance of engineering for multiple options for an uncertain future, where temperatures may range from -20°C to 40°C in the UK, for example.

UCL doctoral researcher Emma Gibbons called for better knowledge of human and ecological systems. 'The "mother of all feedback loops" is coming back to kick us,' she warned, advocating for the reuse of materials.

Future skill requirements was the topic of the third session. Jo Harris, hard FM ambassador at Sodexo, said young people often learn more from videos than lectures or books. The panel agreed there needed to be a move away from linear, static guidance and towards multifaceted guidance that cultivates human and soft skills. However, Ted Pilbeam, building services and sustainability director at VolkerFitzpatrick, said sound engineering knowledge was still crucial to ensure designers ask the right questions.

The fourth session brought together young engineers and the panel discussed the role of technology, specifically artificial intelligence (AI), in engineering and design. They emphasised moving beyond short-term, box-ticking regulations to a broader, more sustainable view of design, with Cundall senior engineer Lauren Davies suggesting nature should be considered a stakeholder when designing spaces. ●

‘The future is in safe hands’

The 2024 Young Engineers Awards celebrated the brightest emerging talent in building services, with prizes for the best university students and apprentices

A spotlight was again shone on the brightest and best emerging talent in building services engineering at the CIBSE Young Engineers Awards (YEAs) 2024, held at BMA House in London.

The CIBSE ASHRAE Graduate of the Year award went to Helen Meutermans, a graduate mechanical engineer at AtkinsRéalis and alumna of the University of Sheffield. She captivated the audience with her compelling speech on how modern office environments must evolve to meet the needs of increasingly diverse occupants.

For the graduate award, the shortlisted contestants had to present on the theme of ‘What do you consider as the main implications for building performance of changing demographics, lifestyles, and the need to keep people safe, healthy and productive?’

It was the 34th running of the annual YEAs, which recognise exceptional young engineers, as well as the employers who nurture and support the next generation of industry leaders.

This year’s event was hosted by Ewen Rose, director at McGowen Rose Associates, with prizes also presented to the best undergraduate and best apprentices at Level 3–4 and Level 5–7.

Karolina Prusicka, studying architectural engineering at the University of Sheffield, was named CIBSE Undergraduate of the Year 2024.

In the apprentice categories, Taylor McLaughlin, an HVAC service and maintenance engineer apprentice at CubicWorks, won the Level 3–4 award, while Dan Robins, a senior trainee at Aecom, claimed the Level 5–7 prize. These winners demonstrate how hands-on experience and technical expertise drive innovation within building services.

The awards event also featured a panel discussion, with early career engineers sharing their confidence and vision for the future (see panel, ‘Vision for the future’, for more).

ASHRAE President Dennis Knight’s speech at the ceremony stressed the need to attract more talent to the field by promoting its rewarding career opportunities and impacts. ‘Lifelong learning has to be available to all of us, whether you’re a young engineer or a senior engineer,’ he said.

Knight had warm words for the finalists, saying they represented the next generation of leaders, thinkers and innovators in our field. ‘The future is in capable hands,’ he told the packed auditorium. ‘Thanks to each of you for being here; let’s celebrate your achievements, our industry’s achievements; and what we will do to solve the climate crisis and build better buildings for every human on this planet. We’ll do it together.’

Graduate of the Year Helen Meutermans, with CIBSE President Fiona Cousins and ASHRAE President Dennis Knight

Taylor McLaughlin, Apprentice of the Year Level 3–4

CIBSE ASHRAE Graduate of the Year 2024

1st place: Helen Meutermans won first place with a thought-provoking speech on the evolving requirements of modern office environments to keep people safe, healthy and productive. She believes the ‘one size fits all’ approach to designing buildings is outdated, as every occupant is unique, and focused on three often-overlooked groups: neurodivergent individuals, women going through menopause, and those experiencing mental health challenges.

She noted that noise sensitivity in neurodivergent people can make open-plan offices overwhelming, while women experiencing menopause may struggle with temperature control, leading to discomfort and reduced productivity. Designers should consider not only sustainability, but also comfort, Meutermans said, adding: ‘Why are we designing typical buildings when the typical person does not exist?’

She proposed cost-effective solutions, such as anti-glare lamps and biophilic design, and more advanced options, such as individual temperature control at desks. Her vision for the future includes offices where personal comfort is prioritised and tailored to users’ specific needs.

2nd place: Zoe Dickson, BMS project sales engineer at SSE Energy Solutions, took second place with a speech on the importance of building controls in shaping the future of smart buildings.

She emphasised how building controls are central to improving performance, safety and comfort in buildings, especially with the changing demographics and evolving needs of occupants. She also discussed the role of building management systems (BMS) in connecting systems such as lighting, air quality and occupancy, and how emerging technologies such as artificial intelligence and the Internet of Things are revolutionising the field.

In addition, Dickson highlighted challenges including an ageing workforce, lack of regulation, and the need for more awareness about the value of BMS. She urged industry leaders to prioritise building controls as a key way to improve building performance.

3rd place: Ikechukwu Umeokoli, a graduate mechanical engineer at AtkinsRéalis, came third with his speech on the impact of changing demographics and lifestyles on building performance. He highlighted how schools, among other sectors, are adapting to accommodate diverse cultural, religious and ethnic backgrounds, and the growing trend for homeschooling, which has risen by 80% in the UK in the past five years.

He said: 'Building performance is not just about sustainability and energy efficiency, but about meeting the needs of its occupants.'

Umeokoli proposed several solutions, including the use of acoustic panels to reduce distractions, smart thermostats for maintaining a comfortable environment, and proper ventilation to ensure good air quality. ●

The Young Engineers Awards also presented accolades for the best employers (see page 13).

Dan Robins, Apprentice of the Year, Level 5–7

Karolina Prusicka, CIBSE Undergraduate of the Year

Vision for the future

CIBSE CEO Ruth Carter led a panel discussion with early career engineers on the future of building services engineering and how it can achieve net zero goals.

Arup's Lewis Turner highlighted how sustainability was driving his generation and that it was at the 'heart of all the work we do'.

The variety of ideas in the industry was exciting Jess Sargent, a degree apprentice at AtkinsRéalis: 'There's such a broad range of solutions and innovation in our industry; it is really inspiring.'

Ruairi Devlin, engineering consultant at ESC, agreed, and drew attention to the critical role of engineers in achieving net zero: 'Engineers have so much influence in design when it comes to energy performance and carbon emissions.' He was optimistic about the future. 'It's never been so easy to network with people... we're very lucky,' he said.

Sargent also stressed the importance of collaboration, saying 'we're going to need to involve lots of different people at earlier stages to ensure that buildings have the ability to be flexible'.

Max McCone, vice-chair of CIBSE Global YEN and mechanical building services engineer at Mott MacDonald, highlighted the industry's shift towards innovation and collaboration 'We're seeing many more fantastic new trends coming through in the industry,' he said, before asking the more senior engineers in the audience: 'What are you doing in your organisations to enable the young generation to contribute their ideas and take those forward into your projects?'

The NZCBS will be tested at CIBSE'S new head office in Saffron Hill

The blueprint for net zero

The UK's Net Zero Carbon Buildings Standard sets a performance benchmark for buildings that aligns with the country's net zero goals. **Julie Godefroy** explains how cross-industry support for the standard will drive widespread adoption

The UK Net Zero Carbon Buildings Standard (UK-NZCBS) Pilot was launched in September, after 2.5 years of effort from hundreds of volunteers, and widespread participation through calls for evidence, consultations and engagement workshops. The standard responds to demand from the market to limit greenwashing, ensuring clarity and providing a single reference on what it means for buildings to be 'net zero'. It is a collaboration by leading organisations the Better Building Partnership, BRE, Carbon Trust, CIBSE, IStructE, LETI, RIBA, RICS, and UKGBC.

Top-down and bottom-up approach

The requirements of the NZCBS are science-led and aim to enable the UK built environment to stay aligned with its share of the national carbon and energy budgets, adhering to the 1.5°C trajectory. These requirements have been informed by what is needed to be achieved by the UK built environment – the 'top down' approach – and what is technically feasible now and in the future: the 'bottom up' approach.

To do this, a model of the UK building stock was created, expanding on the 2021 UKGBC roadmap. Scenarios from today to 2050 were applied to represent factors such as the performance of new and existing buildings, retrofit uptake levels, and future trends in embodied carbon – for example, materials decarbonisation, efficiency of materials use, and switching to lower-carbon materials. These scenarios were informed by the bottom-up analysis – that is, an assessment of the performance that can be achieved now and in the future. The outputs from these scenarios, in terms of embodied and operational carbon and energy use, were then measured against top-down carbon and electricity budgets, reflecting UK legal commitments to 2035 and 2050.

When defining budgets for embodied carbon, data from the Climate Change Committee was used, also taking into account extra-territorial embodied carbon emissions – that is, emissions abroad from products used in UK buildings. For electricity use and operational carbon, budgets are based on the National Grid ESO (now ESO) Electric Engagement scenario, assuming the Grid becomes near-zero carbon by 2035[1].

The NZCBS limits were then positioned within this UK built environment model, to represent ambitious, but achievable, levels of performance.

Independently from the NZCBS, this model is a highly valuable piece of work in itself, for identifying trajectories for a net zero UK built environment and to test the impact of trends and measures, such as materials decarbonisation, retrofit uptake, housebuilding targets, and so on.

The standard is dynamic, and requirements will evolve over time to reflect technical developments

The standard's requirements

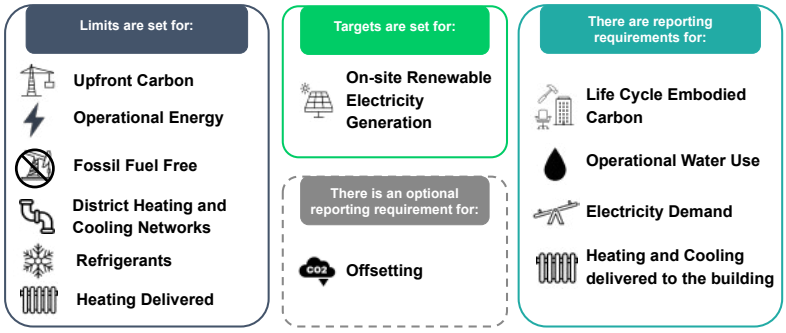

Figure 1: The requirements cover whole-life carbon

What do the NZCBS requirements cover?

The standard has several requirements covering whole life carbon (see Figure 1). These will have to be demonstrated by actual performance – measured embodied carbon and metered energy use in occupation.

Requirements will evolve over time to reflect technical developments (for example, materials decarbonisation) and improvements in practices (for example, better operation of buildings).

For energy use, existing buildings can either meet the 'end goal' 2040 limit immediately or start with a less ambitious energy-use limit, accompanied by a compliant retrofit plan with gradual improvement to eventually meet the 2040 limit. The retrofit plan must comply with PAS 2035/8 and show that the step-by-step retrofit works meet the relevant upfront carbon limit. This is intended to encourage retrofit uptake and planning, and to support the development in skills and practices associated with the PAS, benefiting projects beyond the NZCBS.

NZCBS requirements and other schemes

The NZCBS has been informed by substantial analysis from 13 sector groups, considering the achievable performance of factors such as energy use, upfront carbon, refrigerant global warming potential, and onsite renewable electricity generation. This includes evidence from individual projects and large datasets, sectoral expertise, and a comparison with initiatives such as Passivhaus, Nabers, LETI, the RIBA Climate Challenge, the Scottish Futures Trust, and many others.

Where possible, the NZCBS has sought to align or provide a similar trajectory. For example, the 'day 1' NZCBS energy-use requirements for new-build homes are less ambitious than LETI and the Climate Challenge, but become more ambitious over time. From 2040, these will be aligned with LETI and the Climate Challenge, which is broadly equivalent to the performance of a Passivhaus home with a heat pump.

In other cases, the NZCBS differs because of its bottom-up analysis and industry feedback. For example, the NZCBS energy-use limit for new-build offices is less onerous than LETI and the Climate Challenge because of feedback that they were too onerous.

More information will be published on how the NZCBS requirements compare with other schemes, and with buildings whose performance has been used in the bottom-up analysis.

Future development

The pilot marks just the beginning, with several areas expected to evolve. Future developments will include new requirements informed by data, such as limits on life-cycle embodied carbon, and more specific guidelines that differentiate between landlord and tenant responsibilities, rather than focusing solely on whole-building performance.

The standard will recognise equivalence with existing schemes, allowing projects that meet comparable standards to satisfy NZCBS requirements, reducing the need for multiple verification processes. Metrics may also evolve to reflect energy use intensity.

Now is the time to get involved; access the pilot, provide feedback, and help shape the future of net zero buildings (see panel below).

CIBSE is leading by example, testing the standard in its new offices at Saffron Hill, with results to be reported in the *Journal*. As the standard evolves with emerging data and technical advancements, it aims to be a cornerstone for ensuring the UK's built environment aligns with national carbon goals – fostering a more sustainable future for all. ●

Julie Godefroy is a sustainability consultant and CIBSE head of net zero policy

Reference:

[1] Further analysis may be carried out to represent Grid decarbonisation by 2030, as targeted by the new government.

How to get involved

The pilot details all requirements of the standard, such as performance, reporting, and evidence requirements. Verification bodies and processes are now being put in place, for a full v1 release in late 2025. The pilot programme is expected to start Q1 2025, with registrations of interest open. The standard is available for free, alongside an overview document

Anyone can, today, engage with the standard through resources available on its website, www.nzcbuildings.co.uk/pilotversion, where there is a feedback survey

A launch webinar will take place on 31 October, and the recording will be available.

Kilowatts to Kernow

In developing a decarbonisation strategy for housing in Cornwall, Etude is recommending a heat pump–first approach for the majority of properties, as **Chris Worboys, Naomi Grint, Kate Millen** explain

Having introduced a net zero energy requirement for new homes in 2021[1], Cornwall Council is now developing its strategic plans to end greenhouse gas emissions from existing homes. Etude, alongside Currie & Brown, provided the evidence for the 2021 targets and has been working with Cornwall on its follow-up retrofit strategy.

Although local authorities have generally adopted a 'fabric first' approach to their housing decarbonisation strategies, we felt there was a need for greater focus on the importance of rapidly decarbonising heat, and how to do this in an affordable way.

With this in mind, we recommend, as the first step, retrofitting a heat pump alongside basic fabric efficiency improvements, adequate ventilation, and photovoltaic panels. This delivers an immediate emission reduction of around 80% to 90%, while operational costs should be similar to, or much lower than, a fossil fuel boiler.

We recommend further fabric efficiency improvements over time, as parts of the building naturally need to be repaired or replaced, to eventually reach levels recommended by LETI.

YEN Takeover

This article was commissioned by the CIBSE Young Engineers Network

This approach mirrors that of the Association for Environment Conscious Building's (AECB's) step-by-step retrofit programme, the Superhomes programme in Ireland, and the UK Passivhaus Trust in its recent paper *The right time for heat pumps*.

How much, how fast?

Required rates of heat pump deployment were modelled by applying the Climate Change Committee's (CCC's) Sixth Carbon Budget recommendations to Cornwall's housing stock. These include an end to the replacement of off-gas grid boilers from 2028 and on-gas grid boilers from 2033. We did not apply the CCC's assumption that 11% of homes will use hydrogen boilers, as we could not find evidence to support this approach.

We also reduced the proportion of district heating to account for the lower density of heat loads in Cornwall, compared with the national average. There could be a future role for geothermal heat via heat networks, if it turns out to be cheaper than individual heat pumps.

We also expect individual heat pumps

connected to ambient temperature borehole arrays to play a role. The modelling indicated that, by 2030, 16% of existing fossil fuel heating systems will need to be replaced with heat pumps, increasing to 46% by 2035, and 77% by 2040.

Understanding heat pump readiness

A key question with a heat pump–led approach to retrofit was whether existing homes would be 'heat pump ready'. A common misconception with heat pumps is that they won't work efficiently, or at all, in poorly insulated homes.

The reality is that a heat pump is indifferent to its surroundings; it just moves heat from one place to another and will work as long as it, and the heat emitters, are large enough to meet the dwelling's peak heat load at the design flow temperature.

For each retrofit, three levers can be applied to achieve heat pump readiness: reduce the peak heat demand through fabric efficiency; increase the heat emitter size; and increase flow temperatures. The optimum balance between them will be different for each home, depending on the desired split between upfront cost versus operating costs.

The main physical constraint facing most homes in Cornwall is their electrical supply capacity. This is determined by the electricity cable that runs from the street to the house, the electricity meter, and the main fuse. While a domestic single-phase supply can, in principle, supply a maximum of 24kW of electrical capacity, some distribution network operator (DNOs) only offer up to 19kW as standard, and older homes may have as little as 7kW. Upgrades are often paid for by the DNO, but can take some time to complete, which can be an issue in the case of emergency boiler replacements.

The largest single-phase heat pumps draw about 6–8kW of electricity under peak demand conditions, which corresponds to a heat output of around 14–18kW. This means that, even with a modern electrical supply, homes with a peak heat load of more than 16kW will need fabric retrofit work, a secondary heating system, and/or a three-phase supply.

Heat pump readiness in Cornwall's housing stock

To predict the heat pump readiness of Cornwall's housing stock, we used stochastic Passive House Planning Package (PHPP) modelling – which accounts for variability and uncertainty – and calculated 5,000 versions of each building typology with a range of parameters that affect the peak heat load.

We adapted the PHPP calculation to adopt

key elements of the MCS heat pump sizing methodology, such as the external and internal design temperatures, airtightness and ventilation assumptions. Parameters were varied for different levels of fabric performance, shading, orientation and form (detached, semi-detached or mid-terrace). This enabled us to predict heat pump readiness more effectively, by understanding best- and worst-case scenarios for typical building types. The results of the PHPP modelling indicated similar ranges of heat loss to industry heating load tools from organisations such as Panasonic and Heat Geek, for different age properties.

Combining this with Energy Performance Certificate data on floor area and age, we were able to determine that 70–80% of homes are expected to be heat pump ready. Some upgrades to the electricity supplies may be necessary, while upgrades to heat emitters and fabric may be desirable. (See Figure 2).

What about costs?

Ensuring good efficiency is the foundation of achieving low operational costs and is an

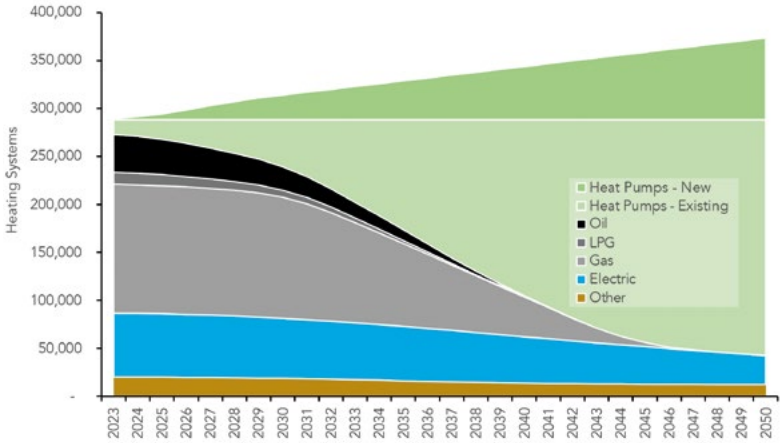

Figure 1: Deployment of heat pumps in Cornwall needs to accelerate significantly in the late 2020s to reach around 12,000 systems a year by 2030, before levelling out at around 18,000 systems a year from 2033 onwards

effective approach for all homes. The Electrification of Heat Demonstration Project reported an average efficiency of 290% across around 740 homes with heat pumps. However, the best installers are routinely delivering efficiencies of 340% on their systems, while mature markets in Europe are doing even better.

Dynamic tariffs and solar

While efficiency is important, a heat pump's superpower is that it can use dynamic electricity tariffs and solar. Unlike gas, wholesale electricity prices vary constantly throughout the day, as demand and the generation mix change.

Use of tariffs that take advantage of this can result in cost reductions of 45% compared with a gas boiler. The addition of solar generation further reduces costs and, where sufficient space is available, can completely eliminate energy bills on an annual basis.

With suitable financing, a large proportion of net zero retrofits can be cash positive for residents on a monthly basis, as reductions to energy bills exceed loan repayments.

What about Grid capacity? This comes up a lot when heat pumps are discussed, but our experience is that, in many cases, electric vehicle charging will draw far more electricity than heat pumps, which means that supply upgrades are often required anyway.

Cornwall's DNO, National Grid Electricity Distribution, explained to us that it is actively planning for the rollout of heat pumps.

National Grid's Distribution Future Energy Scenarios are regional versions of its national Future Energy Scenarios. Its two most ambitious heat pump deployment pathways align well with the pathway we calculated for Cornwall based on the CCC's Sixth Carbon Budget, which provides reassurance that the Grid will be ready.

Building a workforce to decarbonise homes

We see training of adequate numbers of heat pump installers as the foundation of this transition. Our modelling indicates that around 500 installers will be required by 2030, increasing to around 800 by the mid-2030s before levelling out at around 900.

When someone's boiler fails, they are far more likely to switch to a heat pump if their heating engineer recommends it, as they are a trusted source of information. However, a heating engineer is only going to recommend a heat pump if they understand and can install it, so training heat pump installers becomes a key step to increasing awareness.

Training in good-quality fabric and ventilation measures is also a key part of the strategy, with a focus on a long-term 'whole house' approach, where upgrades are carried out in line with the building's natural life-cycle.

The decarbonisation challenge is significant, but also provides a great opportunity to create permanent reductions in the cost of heating and reskill the workforce.

Commercially available technologies such as heat pumps, fabric upgrades, ventilation, and solar are scalable and ready to deliver. Dissemination of knowledge through sustained training to a consistently high standard will be key to delivering the transition effectively, and must be accelerated. ●

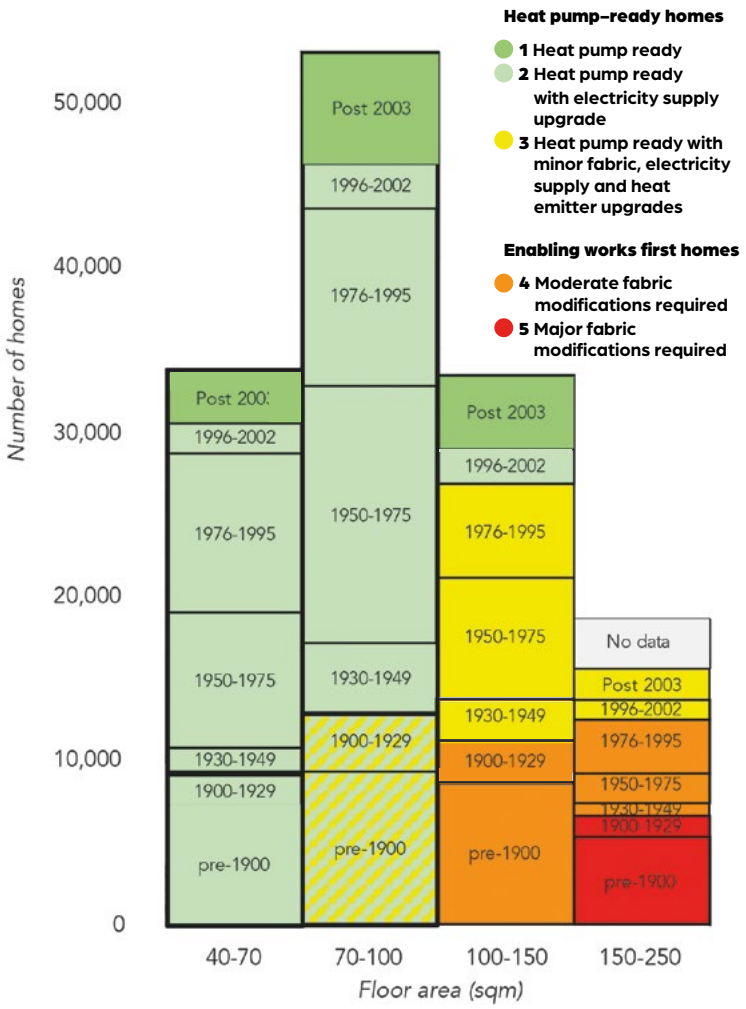

Figure 2: A visual representation of the likely proportions of heat pump-ready homes, using the floor area and age distribution as an indicator of heating load, using industry heating load tools and modelling in PHPP (darker outline). Flats and maisonettes are not included.

References:

[1] The requirement for new homes is to achieve a space heating demand of less than 30kWh·m^{-2} per year, a total energy use of less than 40kWh·m^{-2} per year, with a net zero energy balance on site achieved through the use of solar photovoltaics

[2] Electrification of Heat Demonstration Trials

Chris Worboys is a senior sustainability consultant, Naomi Grint a Passivhaus certifier and Kate Millen a sustainability engineer at Etude

Build2Perform Live returns

CIBSE Build2Perform Live returns to London ExCeL on 13–14 November. Don't miss out on the industry's biggest conference and exhibition, featuring the latest technology, guidance and regulation in building services

The 2024 CIBSE Build2Perform Live conference is set to return to London's ExCeL centre on 13–14 November.

It promises a packed agenda, featuring the launch of new technical guides such as the highly anticipated TM59, and discussions on key issues affecting the built environment, including energy efficiency, sustainability, cybersecurity, and compliance with evolving regulations.

With more than 100 exhibitors, the event is expected to bring together engineers, designers, sustainability experts and key stakeholders for two days of discussions, presentations and networking opportunities.

Highlights will be the keynote speech by Vince Arnold, CIBSE President Elect, who will open the conference with an exploration of the pressing challenges facing the building services industry. His address will set the tone for the event, emphasising the need for innovation and collaboration.

The Influence Theatre, sponsored by YGHP Kozonlar, will host a session on the transformative journey of Nabers UK (National Australian Built Environment Rating System UK). Originally developed in Australia, Nabers has revolutionised building performance through its rigorous energy efficiency and sustainability standards. This session, chaired by Kieran O'Brien, director of CIBSE Certification, will provide an in-depth look at how Nabers is being adopted in the UK under CIBSE's administration.

A session from last year's Build2Perform Live

Another highlight will be a session covering the updates to *TM59: Overheating risk in homes*, which will be unveiled in a dedicated session on 14 November. TM59 has become a critical resource for addressing overheating in residential buildings, an issue of increasing concern as global temperatures rise. The updated guide, along with new CIBSE weather files based on UKCP18 Met Office weather projections, will be essential tools for designing climate-resilient buildings.

Experts will discuss strategies to minimise overheating and improve sustainable cooling solutions, providing an essential update for anyone involved in designing or managing buildings in a changing climate.

Another hot topic at Build2Perform will be the rising importance of cybersecurity in building management. A session on practical strategies for managing cybersecurity risks will be hosted in the Synergy Theatre, where speakers will explore practical solutions and best practices for safeguarding building systems. Recognising that cyber threats are a major concern for building performance, there will be insights from manufacturers, integrators and end users about how to work together to ensure robust cybersecurity measures.

Other highlights include a session on Building Regulations, in which Julie Godefroy, head of net zero policy, CIBSE, will give an update on recent changes, and a panel on creative lighting and compliance in the Light2Perform Theatre. The result of the Society of Light and Lighting (SLL) Young Lighter Award will also be announced, showcasing the brightest emerging talents in lighting design (see panel, left).

The conference promises to offer valuable insights and solutions to shape the future of the built environment. ●

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Lighting up proceedings

The SLL Young Lighter 2024 winner will be announced on 13 November, at Light2Perform, with the chance for the winner to present their project.

The Young Lighter Award is open to anyone who has an interest in light and lighting, regardless of their educational background. Participants can explore any topic related to light – whether that be sunlight, shadows, biorhythms, sustainability, product design, or photography. The competition encourages creative and diverse interpretations, allowing participants to showcase their talent and unique vision.

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Baxi boosts training

Heat pump and boiler supplier aims to train 2,000 engineers by 2025

Baxi welcomed key industry stakeholders to its new Solutions Academy at its Warwick headquarters, as part of its ongoing efforts to address the heating industry's skills gap.

The event was attended by representatives from the Department for Energy Security and Net Zero, MCS, and the Chartered Institute of Housing, among others, who explored how the supply chain can support sustainable heating in buildings.

Baxi's, 10,000 sq ft facility aims to train 2,000 heating engineers by 2025, equipping them with the skills to help customers decarbonise their heating systems. Ian Trott, head of training solutions, led a tour that showcased the company's hands-on training rooms and digital learning tools.

Presentations were led by Baxi's managing director, Jan Rijnen, and product and solutions director Paul Haynes, on the company's continued commitment to developing training for the energy transition.

Rijnen stressed the importance of industry-wide cooperation in closing the skills gap, saying: 'We are looking forward to continuing this collaboration to ensure the right training infrastructure is in place for the energy transition across the UK and Ireland.'

The event also featured the launch of Baxi's 2024 Installer Skills Survey, conducted with consultancy Gemserv, which highlighted the slow uptake in heat pump training and the need for collaboration to drive demand for low carbon technologies.

Letter

Insulating heat networks

I am writing in response to the article 'Best practice guide addresses pipe thickness levels' in *CIBSE Journal,* October 2024. I believe its recommendations are missing a critical point regarding how insulation thickness should be determined.

The article references the challenges posed by limited space in retrofits and suggests following 'enhanced levels' of insulation thickness as per BS 5422. However, this approach overlooks the essential process of conducting a heat-loss assessment, as outlined in the Heat Network Optimisation Guide (**bit.ly/40e2ukd**).

Instead of adhering to a blanket minimum thickness, the guide emphasises that designers should calculate the W/dwelling heat losses and adjust insulation levels across the network to ensure heat loss remains within acceptable limits. This approach is important with the upcoming Heat Network Technical Assurance Scheme regulations, which will set maximum permissible heat losses for new and existing networks. By only following guidance on insulation in CP1 and BS 5422, operators risk being non-compliant.

Tom Naughton, FairHeat

From gas to green

By swapping a boiler for an air source heat pump at its North London HQ, Greenpeace UK is leading by example in saying 'no to gas'. **Andy Pearson** reports on the challenges of converting the 1920s premises

A large, louvred rectangular box is the latest addition to the garden of Greenpeace UK's London HQ. Within the grey enclosure is the organisation's smart new air source heat pump, which, despite its utilitarian appearance, is the key to the environmental non-governmental organisation's latest initiative to end its reliance on gas to heat its offices and domestic hot water.

The heat pump is one in a series of steps taken by Greenpeace UK to cut the energy used servicing the 1920s former printworks that it calls home.

Its decarbonisation journey started in 2010, with a commitment to reduce the office's CO_2 emissions by 42% in 10 years. This undertaking resulted in the installation of photovoltaic panels on the roof of the office building and on Greenpeace's adjacent warehouse and upgrades to the lighting systems, along with presence detection to improve control. The organisation also migrated its IT systems to the cloud to benefit from its improved efficiency.

In addition, the organisation undertook thermal imaging surveys of the building envelope. This led to the installation of additional draught-proofing, replacement of the external doors, and the renewal of some of the building's glazing. A new building management system (BMS) was also installed to optimise operation of the building's gas-fired heating and hot-water systems.

Despite the Covid pandemic, the organisation succeeded in meeting its initial 42% carbon-reduction target, albeit nine months later than planned. 'The interventions did make a big dent in our carbon emissions,' says Andrew Hatton, Greenpeace UK's resource and technology director.

Having succeeded in stage one of its plan, which Hatton describes as tackling 'the low-hanging fruit', Greenpeace UK set about determining the next step in its carbon-reduction journey. 'It was evident from crunching the numbers that the number one thing we could do, by quite a large margin from a CO_2 reduction perspective, was to come off gas,' Hatton says.

The organisation duly set about modelling the building to see if ditching its gas boilers was feasible. It worked with a third party and its own in-house energy analyst to model the building to understand its energy demands. Alongside the digital model, data from the BMS, installed a few years earlier, proved invaluable in showing the rate at which the brick-built building heats up and cools down.

Occupancy numbers were also factored into the modelling. This proved to be a tricky exercise in the midst of the pandemic. 'Before Covid, we might have 180 to 200 people in the building, 30 of whom would be cyclists using the showers, but post-Covid – with hybrid working – we were not sure what the new working pattern would be,' Hatton explains.

A 'new normal' of 60% occupancy was assumed to be a realistic scenario – a guesstimate that has subsequently been shown to be fairly realistic, with actual occupancy numbers fluctuating around this figure.

The modelling did prove that it was feasible to replace the building's two commercial gas boilers with one or more electric heat pumps. 'We needed a total heating capacity of about 80kW, so we set about exploring heat pump options and looking at where we could locate the unit, given the constraints of our site,' says Hatton, who adds that he realises this particular solution was not the only way of doing things.

'We could have spent hundreds of thousands of pounds on greater thermal insulation for the envelope so we could put in a lower-output heat pump, but the solution we opted for was the most

It was evident that the number one thing we could do from a CO_2 reduction perspective was to come off gas

Greenpeace UK's headquarters in London was the site of an old printworks

appropriate and sensible at the time.'

Although keen to replace its ageing gas boilers, the NGO was equally keen to avoid a major retrofit of its existing low pressure hot water radiator heating system, given the additional costs and disruption this would cause.

Most radiators on the system were low-level, double-panel units, which, Hatton says, had been 'performing well' with the gas boiler system, which operated with a flow temperature of around 80°C. Knowing that a heat pump would run more efficiently at a lower flow temperature, Greenpeace UK experimented with running the existing gas boilers at a lower system temperature during the winter, to understand the impact on the office spaces and to garner occupant feedback. 'Thermal comfort of staff was our top priority, because we didn't want them saying "great, you've reduced emissions from the building but now my office is too cold for me to work".'

The exercise proved that the existing radiator system could be used, albeit with a slightly reduced flow temperature of 65°C, which Hatton says is still high, compared to most ASHP systems'.

Greenpeace UK was also concerned about the choice of refrigerant for the heat pump. Its policy team had been involved in campaigns to raise awareness of the global warming potential of refrigerants, so the organisation was keen to be seen to walk the talk.

'It was a steep learning curve,' recalls Hatton. 'We started to look seriously at R290 [propane], which is a natural non F-gas refrigerant and has a low global warming potential [GWP 3] compared with fluorocarbon-based refrigerants.'

At the same time as it was researching refrigerants, the organisation was talking to the London Borough of Islington's planning department, to discuss potential placement of the heat pump. 'It became clear that noise from the unit was something we were going to have to consider seriously, given our location in a moderately built-up residential neighbourhood,' Hatton explains.

'We ended up in a situation where we knew we needed a low-noise unit; we knew we needed a natural refrigerant with a low GWP; and we knew we needed an air source heat pump, or heat pumps, that would deliver 80kW.'

It was at this point that Greenpeace UK approached Pure Thermal.

'We'd just launched our Palladium range of air source heat pumps, which were a nailed on fit for the site because they are R290 units with ultra-low noise operation,' recalls Garry Broadbent, Pure Thermal's operations director. 'It's not always practical to use R290, because it has a maximum output temperature of 70°C, but it was perfectly suited to this application, which runs at a maximum of 65°C.'

The challenge of using propane as a refrigerant

The heat pump contains 9.6kg of R290, which is about 50% more propane than is contained in the gas cylinder used by most domestic gas barbecues and patio heaters.

The heat pump installation has to comply with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), the rules that apply to all refrigerant installations, albeit with a higher level of diligence because of this being an A3-class refrigerant.

Broadbent says the Palladium unit doesn't present an ATEX (explosive atmospheres) risk during operation because it has built-in leak detection, automatic shut-off and, importantly, forced airflow. In addition, before the unit is enabled to start, integrated fans draw air through it to ensure a high-volume flow through the compressor housing, to effectively purge the unit.

The unit will only operate once it senses an air-pressure differential. In addition to meeting DSEAR demands, a 1.5m Zone 2 area is required around the heat pump, to prevent any uncontrolled access and remove any flammability risk.

DSEAR is, effectively, a risk-assessment process. In the case of A3 refrigerants, it is particularly important in ensuring that issues of non-compliance do not emerge at the end of the job. Broadbent says it is good advice to have a DSEAR review carried out at the start of the design stages, to pick up on any obvious issues before the unit position is finalised.

Peace garden

The heat pump was to be located externally, in a courtyard area of the garden behind the office building. A Palladium 120.4 model, optimised for R290, was selected. Manufactured by Italian propane specialists Enerblue, it has a seasonal coefficient of performance of 3.58 and is capable of delivering up to 80kW of heat at an outside air temperature of -5°C.

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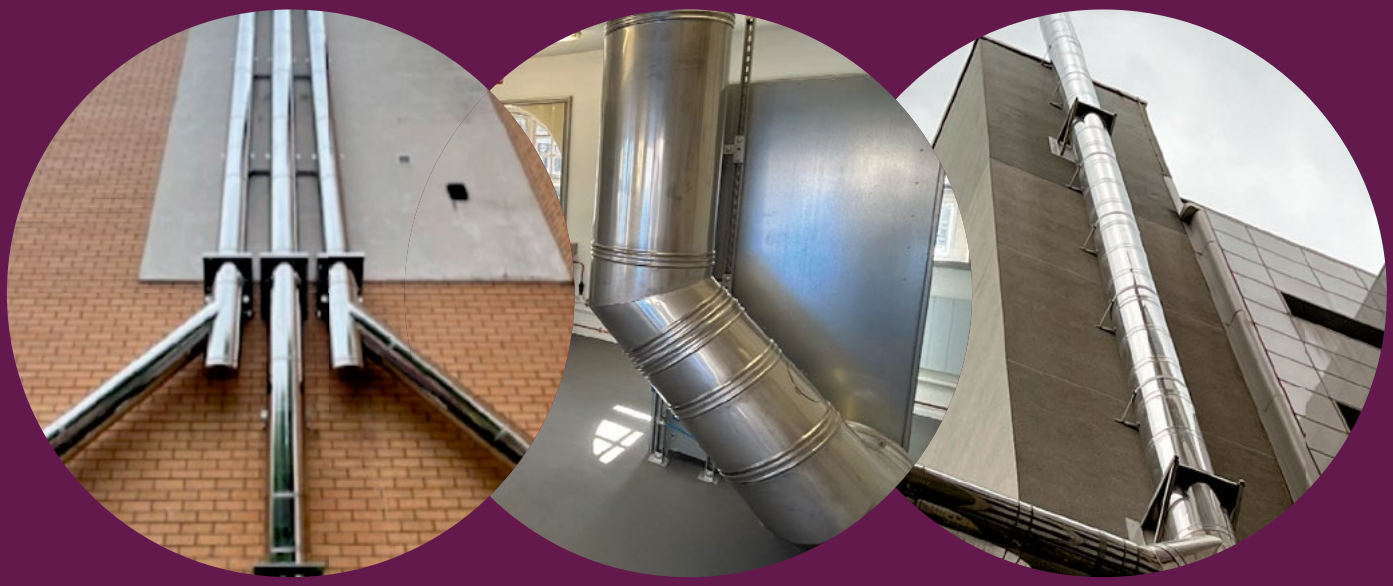

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The unit is also ultra-quiet, with a sound power level of 73dBA. This is the standard specification, without any secondary acoustic measures, which is very relevant where a challenging location such as this is considered.

The unit features twin refrigeration circuits, with each circuit served by two scroll-compressors to provide operational resilience. Having four compressors also ensures efficient load management, by enabling the unit to progressively bring each compressor online only when load demands. Importantly, its twin circuit configuration enables one refrigeration circuit to remain in operation while the other is operating in defrost mode, removing ice from the unit's coils. This means that the flow temperature remains neutral through the defrost cycle without reducing in temperature, as would be the case without this unique Enerblue defrost feature. In a further eco-friendly touch, the defrost melt-water is collected and used to irrigate the Greenpeace garden, rather than being dumped down the drain.

Having four compressors enables the unit to progressively bring each one online only when load demands

To maximise its operational efficiency, the heat pump is load compensated. This ensures it operates at the lowest system temperature possible to deliver the required space heating for the building.

The system will run at 65°C when it is -5°C outside, but it will decrease to 50°C when the outside temperature is, say, 8°C. The BMS dictates the system temperature that the heat pump needs to deliver; if space temperature is not being maintained, the BMS will signal to increase or lower the system temperature.

Of course, the big challenge in retrofitting an electric heat pump to a system previously served by gas boilers is in raising the output temperature to a point where it is able to heat the building's domestic hot water (DHW). Broadbent notes that heat pumps should provide hot water on an 'accumulated, rather than instantaneous' basis, to minimise the specified heat pump capacity.

To accumulate hot water, the Greenpeace UK system incorporates two insulated 2,000-litre hot-water storage vessels, which the heat pump maintains at a temperature of between 55°C and 60°C. 'The rationale for this application is for the hot-water tanks to recharge after the cyclists have had their morning showers and demand drops significantly,' Broadbent explains.

When the hot-water tanks need heat, valves switch to divert the system flow and the heat pump will switch from the load-compensated space heating temperature to DHW heating mode, and increase the system temperature to 65°C so that the hot-water tanks can then accumulate heat.

As soon as the thermal stores are up to temperature, the heat pump will return to heating mode and drop the system temperature again. 'To increase system operational efficiency, the system is load compensated with prioritised hot-water production,' says Broadbent. 'For 95% of the time, it has the ability to run at a lower temperature than is required to heat the hot water, which means that the temperature of the double-panel rads will be well below 65°C a lot of the time.'

The hot-water tanks were installed, along with the heat pump, by contractor VWG Mechanical. The retrofit took approximately six months to complete, including the heat pump lead time, with the heat pump commissioned in August 2024.

Hatton says that, now the system is operational, Greenpeace UK is monitoring and managing it carefully to

Greenpeace wants to be seen to be walking the talk when it comes to gas

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Photovoltaic panels have been fitted to the roof of Greenpeace UK's headquarters and an adjacent warehouse

ensure the system runs as optimally as possible, but it is still 'too new' to report any carbon savings. 'We did some initial modelling based on desktop research, which showed that the carbon savings should be substantial,' he adds.

While the carbon savings are potentially significant, will the switch from gas to electric heat come at a cost premium? 'Unfortunately, at the moment, the answer to that question is yes,' Hatton says, although he expects that to change in the years ahead when gas and electricity costs become more balanced.

'The heat pump will cost broadly about the same to run – maybe a tiny bit more – than the gas boilers; we're not saving money at the moment, but I would expect that to change over the next five years.'

As Greenpeace UK becomes familiar with its new heat pump, Hatton says it might focus operation of the unit to those times when the Grid has the lowest carbon intensity. 'At the moment, we are not doing anything around that because we're not experienced – and because of the tariffs we are on currently.'

Now that the unit is up and running in the Greenpeace UK garden, it is much quieter than Hatton had expected. Perhaps more unexpectedly, he describes the grey box 'as having a certain charm' and says that his colleagues want it to be seen. 'It's doing such a noble job, we are going to leave it on display for all to see.' ●

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Leeds Town Hall, City Art Gallery and Central Library are connected to the Leeds Pipes heat network

Laying the ground for heat networks

The rapidly growing Leeds Pipes heat network connects to diverse building types and is an industry exemplar, says Vital Energi Utilities' **Lee Moran**

In six years, Leeds City Council has developed one of the UK's first modern city-wide heat networks.

Taking heat from the nearby Leeds recycling and energy recovery facility (RERF), the Leeds Pipes heat network, delivered by Vital Energi and developed by Ener-Vate, has expanded at an average rate of 5km of pipework a year, to reach 30km this year.

There are two energy centres. The Cross Green energy centre takes waste steam from RERF and converts it into low-temperature heat and hot water and a second at Saxton Gardens houses gas boilers and is designed to meet peak demand and add resilience.

Leeds Pipes recently celebrated its 2,500th residential connection and, in 2023, was calculated to have cut carbon from buildings by 6,000 tonnes.

Leeds Pipes has pioneered many of the concepts that are now becoming standard and it offers a glimpse into the potential future for such networks – the delivery of which will be turbocharged over the next two years, when the Energy Act 2023 gives the government powers to implement zoning in England and remove much of the red tape that can hold up such projects.

One of the core tools Leeds Pipes uses to facilitate delivery across the city centre is a local development order (LDO). It works with council planning policy to mandate the connection of buildings to heat networks (see panel).

Leeds Pipes was one of the first in the UK to follow the CIBSE CP1 Heat networks: Code of Practice (HNCOP) (2020); all developments will need to adhere to this once the Heat Network Technical Assurance Scheme (HNTAS) is published in 2025. This scheme will ensure mandatory compliance with minimal technical standards.

By meeting the requirements of the CP1, the 30km of pipework at Leeds Pipes has proven reliable, and planned expansion has been simple. The process of integrating other networks in the future is also anticipated to be relatively straightforward.

David Wilkinson, design director, pre-construction, at Vital Energi Utilities, is on the HNTAS steering group. He says the scheme will ensure all heat networks are designed, delivered, operated and maintained to the same high level, bringing increased consumer confidence.

'The ambition is that, if all projects are delivered to the same standard and similar specifications, then smaller networks can connect to each other, or be absorbed into larger networks,' Wilkinson adds.

This was the case on the Torry Heat Network in Aberdeen, which saw the Heatnet system connect to the city-wide scheme.

'Crucially, where the CP1 relied on

consultants and clients to be conscientious, HNTAS is legislation, and there are likely to be serious consequences for failing to adhere to its standards,' says Wilkinson.

150 years of building variations

Older generations of district heating schemes thrived on consistency, proving themselves ideal for new-build projects. However, there was a worry in the industry that they would be unsuitable for older buildings with poor thermal insulation and high infiltration rates.

The Leeds Pipes network has demonstrated the versatility of third-generation heat networks, providing heat between 100°C and 70°C.

At one end of the spectrum, there is the Grade II-listed town hall, completed in 1853, and, at the other end, there are numerous buildings that were erected in the past few decades, as well as new builds constructed more recently.

Add commercial buildings – including Leeds Beckett University, St James's University Hospital and the Combined Court Centre – and more than 2,500 homes, and it would be hard to find a network with more diversity of demand.

Connecting a Grade II-listed building and a new office block is challenging; consideration has to be given to everything from thermal characteristics to current heating systems.

Designers were able to meet this challenge by ensuring that those requiring the highest temperatures influenced the network generation and distribution temperature. Some had their existing heating systems modified to make them more suited to a district heating connection, such as reducing low-temperature hot water (LTHW) flow temperatures to serve heat emitters, while still offsetting heat losses and ensuring thermal comfort.

Some buildings also required: the conversion of constant volume systems to variable volume, to ensure low LTHW return temperatures; the replacement of pumps with inverters; amended controls logic; and the installation of pressure-independent balancing control valves.

There is a push to create more optimised systems and, in particular, deliver optimally sized projects. When it came to sizing, the old British standards could put you on the right street; then there was a big step forward with the HNCOP, which put you in the right house.

By using benchmarks, combined with Vital's database of real-world use, models are more accurate, effectively eliminating the risk of oversizing.

A key factor in heat network optimisation is the use of diversity in design. By focusing on the maximum expected load, rather than the maximum possible load, Vital has been able to create better-sized projects across all components, including pipework, pumps, heat exchangers and energy-centre footprint. Crucially, this was all done while maintaining resilience.

By understanding usage patterns of more than 30,000 connected heat users on 100+ heat networks, an evidence-based diversity calculation can now be applied to fully optimise network design.

Furthermore, this data-driven methodology is encouraged in the latest CP1. The approach avoids the common pitfalls that come with oversizing, such as unnecessarily large equipment, under-used assets, higher heat losses and the associated capital and operational expenditure that entails.

The Leeds Pipes network was sized for future phases based on the council's plans for expansion. Now that the system has additional heat loads, exceptional efficiencies are being achieved .

As the UK strives to meet its net zero targets, Leeds Pipes illustrates what can be achieved with the tools already at our disposal. Other initiatives, such as HNTAS and heat network zoning, have the potential to usher in a revolution in the way we design, deliver and operate such networks. ●

Lee Moran is design director – operations at Vital Energi Utilities

Local development orders

Local development orders (LDOs) benefit developers and building owners, who no longer need to apply for planning for below-ground and small above-ground works associated with their connection.

The Leeds LDO, covering 1,045 hectares, is restricted to land within the adopted public highway, council-controlled land, and other large institutions, such as universities and hospitals. In total, the length of public highway incorporated within the LDO is 1,914km.

The LDO can be renewed to facilitate future phases, a process that Leeds has already undertaken.

It was designed to work in lockstep with the council's EN4 Planning Policy, which mandates that a district heating network solution must be considered for developments of a certain scale. This policy has resulted in various buildings being required, through their planning approval, to connect to the network.

The approach used by Leeds Pipes will be incorporated into heat network zoning and the planning process will be used to encourage new developments to connect to a network where practical.

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From Covid to Cave

Research into airborne transmission risks during Covid-19 played a pivotal role in re-opening the UK safely and led to the creation of a living lab that promises to reshape our knowledge of indoor environments, says UCL's **Dr Liora Malki-Epshtein**

On 15 May 2021, Leicester City beat Chelsea 1-0 to win the FA Cup final in front of the UK's biggest crowd since the coronavirus pandemic began. As well as 21,000 fans, officials, and dignitaries (including Prince William), there was a busy team of academic researchers at Wembley that day.

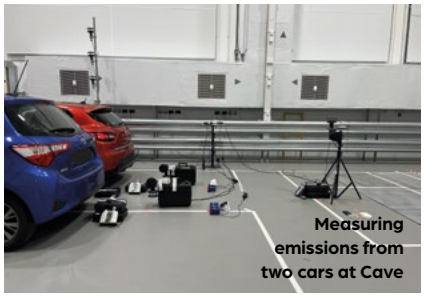
The researchers were part of the government's Events Research Programme (ERP), which was evaluating the risks of airborne transmission of viruses associated with attendance at large-scale events.

During the pandemic, there was significant concern that poor ventilation could put key workers, passengers, and attendees at mass-gathering events at risk of airborne infection.

The Wembley final was one of 90 live events – including the Euro 2020 men's football championships – monitored at 10 indoor and outdoor venues under the environmental study of the ERP between April and July 2021.

The team had started setting up the environmental study a month earlier, as part of the ERP. It was designed to collect data related to risk of airborne transmission of viruses. This involved observing people, collecting data on IAQ and movement of air, and testing surfaces for SARS-CoV-2.

The real-world evidence on indoor air quality formed the basis of ventilation advice to government and industry that minimised risks at events and enabled the country to reopen public venues in July 2021.



Measuring emissions from two cars at Cave

The work was published in the *BSER&T* article 'Measurement and rapid assessment of indoor air quality at mass-gathering events to assess ventilation performance and reduce aerosol transmission of SARS-CoV-2' (bit.ly/CJDSM24). This was awarded the Dufton Silver Medal for research at last month's CIBSE President's Awards.

The research has led to a valuable and lasting legacy – UCL's Controlled Active Ventilation Environment (Cave) laboratory, a facility designed for the study and evaluation of the effects of ventilation, air quality and thermal comfort in built environments. (See panel, 'The emergence of Cave'.)

The ERP studies followed on from work done by the air quality and fluid mechanics groups at the Department of Civil Engineering, UCL who had

Dr Malki-Epshtein (right) receives the Dufton Silver Medal from CIBSE President Fiona Cousins (centre) and CIBSE CEO Ruth Carter

previously done research on ensuring the safety of bus drivers and waste disposal operatives, who worked throughout the pandemic. Our team was approached because we were part of a consortium that had just been awarded an EPSRC rapid Covid-response grant to research airborne infection reduction through building operation and design (Airbods) for SARS-CoV-2, led by Loughborough University's Professor Malcolm Cook.

There was pressure to quickly develop a way to evaluate ventilation provision in the leisure sector and to assess the risk of transmission among large groups of people who weren't necessarily in close proximity to each other. The field studies work originally proposed by UCL was not designed for the scale of the ERP, but by assembling a wider team of researchers from the Airbods consortium, and with the help of additional funding from the DCMS, we managed to carry out the study.

Undertaking the environmental study was daunting – there was no prior research into how well-ventilated the venues typically were, and the challenge was made greater by the sheer pace of the ERP; from conception to reporting took only three months. The goal was to evaluate as many locations as possible, give evidence on the state of venues around the UK, and provide guidance on improving safety at events. We boiled the problem down to one of air quality, which was assessed by measuring CO_2, a proxy for exhaled breath.

We installed rapid and temporary environmental surveys throughout the venues, with data reporting directly to an online dashboard and database, allowing us to analyse data quickly.

As well as measuring CO_2 at a large scale, we needed to develop: a classification system for the venues; a set of air quality metrics benchmarked against industry guidelines and government advice; and an understanding of key types of spaces to identify vulnerabilities.

Finally, we considered how much time people spend at an event, as longer events increase the likelihood of encountering infected people and spending significant time breathing in air containing virus particles.

We monitored 189 spaces and, for most of the time, air quality was good or excellent, even at occupied events. Typical problem areas included toilets, stairwells, corridors and concession stands. These may not have been designed for prolonged occupancy, so became IAQ hot spots when occupancy was increased – because of long queues, for example. Spaces where ventilation could be improved were identified and mitigations tested to reduce the risk of airborne transmission of respiratory diseases.

The study proved that high-resolution CO_2 monitoring is inexpensive, can be deployed rapidly, and can quickly identify areas where exhaled breath is building up in indoor spaces. However, this is more useful as a temporary survey to identify issues with ventilation effectiveness and occupancy rather than a long-term monitoring solution.

There is growing evidence that a wide range of building types may not always be ventilated adequately, especially in the winter months. This may be because of operation, maintenance, design, or refurbishment and repurposing of existing buildings in operation. Additional consideration of the ventilation requirements in Building Regulations may be needed to improve IAQ and build resilience against future infectious diseases.

Teams from the Airbods consortium are still working on research relating to these studies, aiming to improve ventilation effectiveness further. ●

● **Dr Liora Malki-Epshtein is director at Cave, associate professor at the Department of Civil, Environmental and Geomatic Engineering (CEGE), UCL, lead of the ERP environmental study and lead author of the Dufton Silver Medal-winning paper**

The emergence of Cave

One consequence of the Covid-19 research has been the creation of the Controlled Active Ventilation Environment (Cave) lab at UCL's Dagenham site.

It enables research to take place on indoor and outdoor air quality, ventilation and resilience to airborne hazards in the built environment.

UCL's Department of CEGE in the Faculty of Engineering Sciences was handed over the 216m², 9.5m-high laboratory last summer. Over the past year, the Cave team has been trialling the ventilation facility, and installing more than £300K worth of air quality and airflow monitoring instruments, databases and dashboards. The team are now preparing for the installation of a full-scale two-storey modular building in the new year.

Experiments have already taken place, including one on the suitability of art-storage facilities and the impact on air quality of idling cars.

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A healthy balance

There is growing awareness of the synergies and conflicts between IAQ and zero carbon. Foster + Partners' **Jiannan Luo** looks at optimal strategies

People spend approximately 80–90% of their time indoors[1], so indoor air quality (IAQ) is a critical consideration in human-centric building design. Simultaneously, there is increasing pressure to achieve net zero carbon by 2050 – and operational net zero by 2030, according to the World Green Building Council's roadmap.

With the recent launch of the pilot version of the UK Net Zero Carbon Buildings Standard, balancing IAQ while hitting carbon-reduction targets will be a significant challenge for designers.

In 2021, Foster + Partners' Environmental Engineering Group initiated a study to understand the energy penalty of implementing key IAQ control strategies, and found that, for a number of them, there was a penalty, as described below.

The Well Building Standard v2 summarises key indoor air pollutants, their sources, and general design strategies for mitigating them to recommended targets. From this summary, the key IAQ control strategies can be grouped as:

- **Source control and separation:** smoking and combustion ban; healthy entry-way design; negative pressurisation in polluted areas; healthy material specification; pesticide control and policies
- **Air filtration and treatment:** high-grade filtration; biophilic design; ultraviolet germicidal irradiation (UVGI) technology
- **Ventilation and distribution:** increase ventilation rate; demand-controlled ventilation (DCV); displacement ventilation or underfloor air distribution in large-volume spaces.

Some of these control strategies require additional thought, because of possible increases in energy use, and consideration of a project in its locality and nearby outdoor pollution sources.

Mainly based on the above strategies, Foster + Partners' 2021 study analysed the impact of Well Building Standard v2 on the office building[2]. The study assessed wellbeing strategies on operational energy performance in three distinct climates. Table 1 shows a summary of its key findings related to IAQ and associated projected energy impact for the modelled office building in London's climate. Note, embodied

Category	Strategy	Energy impact
Source control and separation	Smoking and combustion ban, (simulated as replacing boilers with air source heat pump)	Significant energy saving
	Healthy entry-way design (simulated as ~35% reduction in infiltration rate because of using revolving doors and vestibules)	Significant energy saving
	Negative pressurisation control	Negligible (standard practice for commercial buildings)
	Healthy material specification	Negligible
	Pesticide control and policies	Negligible
Air filtration and treatment	High-grade filtration (simulated as MERV 8+16 grade filters)	Limited energy penalty
	Biophilic design	Depending on the planting and landscape design
	UVGI technology and carbon filtration (UV lamp in cooling coil and activated carbon filtration technology)	Limited energy penalty
Ventilation and distribution	Increase ventilation rate (+30%–60% over ASHRAE 62.1)	Moderate to high energy penalty
	Demand-controlled ventilation (target 600–900 CO_2 PPM)	Moderate energy saving
	Displacement ventilation (VAV control with dehumidification)	Moderate energy penalty (because of dehumidification demands)

Key:
Green: Energy saving; Grey: Negligible energy impact; Orange: Unknown; Red: Energy penalty.

Table 1: Key findings from a study on the impact of Well Building Standard v2 on a London office building.
Energy impacts of less than 1% are categorised as 'Limited' impact, 1–5% as 'Moderate' impact, and more than 5% as 'Significant' impact.

carbon impact was not assessed in this research, but should be carefully studied.

Many air quality management strategies have become standard practice in commercial building design, and are often regulated by local codes or regulations, such as prescribed extraction rates in highly polluted areas. As a result, these measures typically have a negligible impact on energy consumption. Additionally, policies related to interior finishes and operational protocols often have minimal or no energy implications.

These low- or no-energy strategies, alongside some that contribute directly to energy savings, offer an effective balance between health, wellbeing and energy/carbon reduction. For example, even advanced air filtration systems used in commercial settings can be optimised through proper specification and regular maintenance, ensuring maximum health and wellbeing benefits without increasing energy use significantly.

High-energy impact strategies, such as increasing outdoor air rates, can be balanced by employing DCV systems. These ensure pollutants generated in the indoor environment (typically CO_2 and volatile organic compounds) are diluted during fully occupied hours, while allowing the building to scale down ventilation, fan use and air conditioning during non-peak periods, moderately reducing energy consumption. This allows designers to prioritise IAQ while minimising the overall energy impact.

The industry has realised synergies and conflicts exist between the net zero vision and health and wellbeing. Environmental assessment standards such as Well, Breeam and Leed have made efforts to include both topics or enable crosswalk between standards.

The upcoming Leed v5 draft[3] places stronger emphasis on health and wellbeing, including performance-based IAQ criteria and monitoring requirements as optional credits. Similarly, Breeam v7[4] has expanded its focus on health and wellbeing significantly, introducing new credit intentions and requirements.

On the legislative side, a revision of the European Commission's Energy Performance of Buildings Directive came into force in May 2024[5]. It sets ambitious targets to achieve zero emissions and decarbonisation by 2050, while also supporting better IAQ, and requires the implementation of devices for measuring and controlling IAQ ●

● **Jiannan Luo is associate partner and senior environmental design analyst in the EEG team at Foster + Partners.**
Thanks to UCL PhD student Emma Gibbons and Hoare Lea senior associate Christelle Escoffier for their input

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Concerns about airflow contamination in AHUs were prominent during and after the Covid-19 pandemic. In response, the REHVA Federation of European HVAC Associations underlined the importance of ventilation for indoor air quality, occupant health and reduced risk of virus transmission.

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Controlling infectious aerosols

In response to Covid-19, ASHRAE produced a standard aimed at reducing airborne disease transmission. **Tim Dwyer** looks at minimum requirements and recommendations in Standard 241 *Control of infectious aerosols*

While the Covid-19 pandemic brought infectious aerosols into the spotlight, controlling airborne contaminants remains a critical concern for health and wellbeing, making indoor air quality (IAQ) a priority in all built environments.

To manage IAQ effectively, it's essential to strike a balance between adequate ventilation and energy efficiency. Overventilation can lead to unnecessary energy consumption and costs, while insufficient ventilation can increase the risk of disease transmission.

Published in 2023, ASHRAE Standard 241 *Control of infectious aerosols* establishes minimum requirements to reduce the risk of disease transmission through exposure to infectious aerosols in buildings. As well as providing planning and operational management procedures to minimise risks of transmission through aerosols in ventilated spaces, the standard aims to improve the wellbeing of occupants.

It introduces the equivalent clean airflow index (ECAi), which quantifies the amount of clean air needed to reduce the risk of disease transmission (see panel, 'What is the ECAi metric?').

As recently reported[1] in the *ASHRAE Journal* by Kottapalli *et al*, the standard outlines an aerosol tracer decay test as a reliable method for assessing the effectiveness of air filtration and ventilation systems in controlling infectious aerosol concentrations in indoor environments. Kottapalli highlights that traditional methods, such as theoretical calculations, computer simulations, and measurements using surrogates such as CO_2, often fail to capture accurately the combined effects of dilution, filtration, settling and air distribution on exhaled respiratory aerosol particles in the breathing zone.

The aerosol tracer decay test addresses these limitations by directly measuring the removal rate of key aerosol size ranges, giving an accurate assessment of a single zone's true equivalent clean airflow.

It involves introducing a controlled amount of a harmless, detectable aerosol (saltwater solution) into the test space, where optical particle counters measure its concentration change over time. By analysing this data, the decay rate of the tracer can be determined, which reflects the space's air filtration and ventilation effectiveness.

This method is simple to conduct and can be performed in near real time. It can also be used under actual operating conditions and in occupied spaces, providing actionable data for immediate adjustments to HVAC systems or in-room air cleaners. Tests can assist in the effective placement and optimisation of ventilation and filtration systems for occupant health and building energy use. ●

References:

[1] Kottapalli K *et al* 'Aerosol tracer testing comes of age in ASHRAE Standard 241', *ASHRAE Journal* September 2024

● **Tim Dwyer is *CIBSE Journal* technical editor and UCL honorary professor in building services systems**

What is the ECAi metric?

The equivalent clean airflow index (ECAi) is a metric used to assess the effectiveness of air filtration and ventilation systems in controlling the concentration of airborne contaminants, including infectious aerosols. ASHRAE's Epidemic Task Force played a key role in developing the concept.

Comprised of experts in public health, engineering and infectious disease, the task force worked to establish a metric that represents the equivalent amount of clean air that would need to be introduced into a space to achieve the same level of contaminant removal as the existing ventilation and filtration system.

ASHRAE Standard 241-2023 establishes target ECAi values based on health considerations, depending on the type of space – for example, office, classroom, or healthcare facility.

A higher ECAi value indicates a more effective ventilation system in removing contaminants and generally corresponds to a lower risk of airborne infection transmission.

By measuring ECAi, building operators can assess the performance of their ventilation systems and make informed decisions about improvements or adjustments, to ensure optimal indoor air quality.

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Air source heat pumps

Foundations for transitioning from boilers to air source heat pumps

This module considers some of the early preparations required for a successful transition to air source heat pumps

The transition from traditional boilers to heat pumps provides an opportunity to improve building thermal performance, increase energy efficiency and reduce carbon emissions. However, successfully replacing boilers with air source heat pumps (ASHPs) involves a detailed and methodical process to ensure optimal performance and deliver energy savings. Based on the experiences of a 'solutions engineer', this CPD suggests the early stages that can lead towards a successful transition, focusing on understanding heat usage, measuring and recalculating demands, and experimenting with system options.

The phrase 'fabric first' is frequently mooted when discussing ways to improve the environmental performance of buildings. It emphasises designing buildings with appropriate thermal characteristics to increase the opportunity of delivering a building that maintains acceptable, year-round internal conditions with minimal requirements for heating and cooling systems. When discussing renewables – and particularly heat pumps – for existing buildings, 'fabric first' typically means enhancing the building envelope to reduce heat losses. This is crucial, because any heat loss contributes to the total load and, despite the impressive efficiencies of heat pumps, achieving cost-neutral operation compared with gas boilers remains challenging. Reducing heat loss can also lower the required size of heating systems significantly, thereby cutting capital and installation costs associated with the building systems refurbishment.

A key reason heat pumps are closely linked with a 'fabric first' approach is because of flow temperatures. ASHPs are more efficient when the source temperature is higher and/or the sink temperature is lower. While the source temperature (ambient temperature) is highly variable in the UK (and not controllable), the sink temperature (flow temperature) can be reduced wherever possible. Lower flow temperatures will reduce the output from emitters that have been designed for higher mean water temperature – so, if less heat is needed because of fabric upgrades, the net result may well be a heating system output that matches the building load.

If the prospect of potentially high costs and unacceptable payback periods, or heritage considerations, prevent changes to the building envelope, a 'fabric first' approach may not be feasible, leaving the existing thermal envelope of the building practically unimproved. For owners of such buildings who wish to decarbonise their heating, a hybrid solution – for example, to maintain the existing gas boilers for peak loads and domestic water generation, and install heat pumps to cover the base load – is often a fast, efficient and affordable approach. However, there is a desire by many owners and operators to skip hybrid solutions and move directly to the full electrification of heat.

High temperature ASHPs (HT ASHPs) have been developed to address this challenge, but the solution is not as straightforward as it seems. Swapping boilers for heat pumps in existing buildings often involves aiming for familiar operation ranges, such as 82/71°C or 80/60°C. However, achieving an 80°C flow temperature all year round with acceptable efficiencies is optimistic, as even the most advanced R290 (propane) heat pumps are operating at the top end of their performance envelope at 80°C flow. (A high temperature heat pump is classified by BS EN 14825:2022[1] as delivering 65°C at -7°C dry bulb, -8°C wet-bulb ambient conditions, with the medium and low classifications required to deliver 52°C and 35°C respectively, at the same conditions.)

Even when HT ASHPs can deliver 80°C, this falls slightly short of the 82°C flow required by 82/71°C circuits. Additionally, most heat pumps operate most effectively within a 5K to 10K supply/return temperature differential, making a direct swap into 80/60°C circuits challenging. In any case, boilers in 82/71°C circuits are typically set to operate at a flow temperature of around 85°C to mitigate hydronic inefficiencies, such as temperature dilution.

The challenges involved in the detailed design of replacing boilers with heat pumps should not be underestimated and, before starting a project, significant investigative engineering is

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recommended. The first stage should be to develop a comprehensive understanding of installed, calculated and actual heat usage. A familiarisation site visit to meet current operational staff and gather information on the original installation can provide intelligence for later desktop studies, including: determining the original design temperature and loads; hydronic inefficiencies, such as exposed, poorly insulated pipework or temperature dilution; and whether the building has been extended, reduced, zoned or had alternative heating systems installed. It is important, at this early stage, to ascertain the expectations of the building user/owner around the outcome of the current project, as well as to discover any plans for the coming years that may impact the building's thermal loads and usage.

The process to ascertain current loads should ideally start early in the heating season, to allow for a full season's measurement and develop a comprehensive understanding of the building's heating demands. Detailed sketches and drawings should be created to represent the existing heating generation and distribution systems. Aside from helping to understand the layout, these will be essential for any subsequent nodal analysis. The sketches may be compared against available onsite schematics or operation and maintenance (O&M) manuals, to identify any interim additions or changes to the system. It is important to understand the operational temperature ranges and frequencies, and the load requirements, for each heating circuit. Existing heat meters or temporary ultrasonic heat meters may be used to gather usage data. This requires at least a transitional and winter season to build enough data for extrapolation, and this can be validated with other calculated data.

Heat demands should be recalculated, particularly if the property has undergone remedial works to the thermal envelope. (Original calculations, if available, may be used for comparison.) For space heating, room-by-room heat loss calculations will provide the load requirement to establish the parameters for the distribution circuits, and will be vital for experimenting with novel flow temperatures. Historic data, such as gas utilisation and building management system (BMS) data, can assist in building a comprehensive picture of current building demands. (Historic meter readings must be treated with caution as, for example, they may include gas used in catering and other processes.) BMS logs can provide invaluable intelligence on variable temperature (VT) circuits and the application of weather compensation curves that can assist in the interpretation of the heating demands.

Experimenting with flow temperatures can reveal new options to decarbonise, reduce capital costs and lower running costs. For most buildings with a setpoint of 21°C, internal emitters do not require flow temperatures of 80°C to 82°C year round. Reducing flow temperatures during heating months, while carefully monitoring internal comfort temperatures, may yield insightful results. Careful modelling of the building can also provide information for updated emitter requirements and intelligence for optimising weather-compensated flow temperature curves.

After initial investigations and experimentation, it is important to understand the weighting of each circuit in terms of overall demand. The initial step is to assess the peak power demand for each circuit and then establish the usage profile over time to ascertain an overall power profile. This can then be used to inform the determination of the minimum flow temperature that will deliver the required performance using current, or modified, heat emitters.

Circuits should be organised with others that have very similar attributes. For example, a priority VT load operating almost continuously at 55°C should not be grouped with a sporadic constant temperature (CT) load requiring 82°C. In such cases, separating the CT load (sometimes referred to as 'bracketing' – see boxout) to be supplied by a heat generator independent of heat pump-supplied circuits may provide greater overall efficiency. Care should be taken, however, when evaluating potential medium/low-temperature circuits. Even if these circuits represent only a small percentage of the overall peak heating demand, they may still contribute significantly to the overall energy usage.

Although CT circuits nominally maintain a constant temperature, it may be possible to reduce flow temperatures while maintaining the required levels of performance and comfort. This can lead to significant energy savings and improved efficiency. Specific needs of high-temperature CT circuits may be addressed by advanced heat pump technologies or hybrid systems that can manage varying temperature requirements efficiently. For example, when the CT is serving loads such as calorifiers, the higher temperatures required may be delivered by employing a 'divergent' cascade heat pump system, as shown in Figure 1.

A common application is where an existing building heating system includes gas boilers operating at 82/71°C. For example, a particular existing application

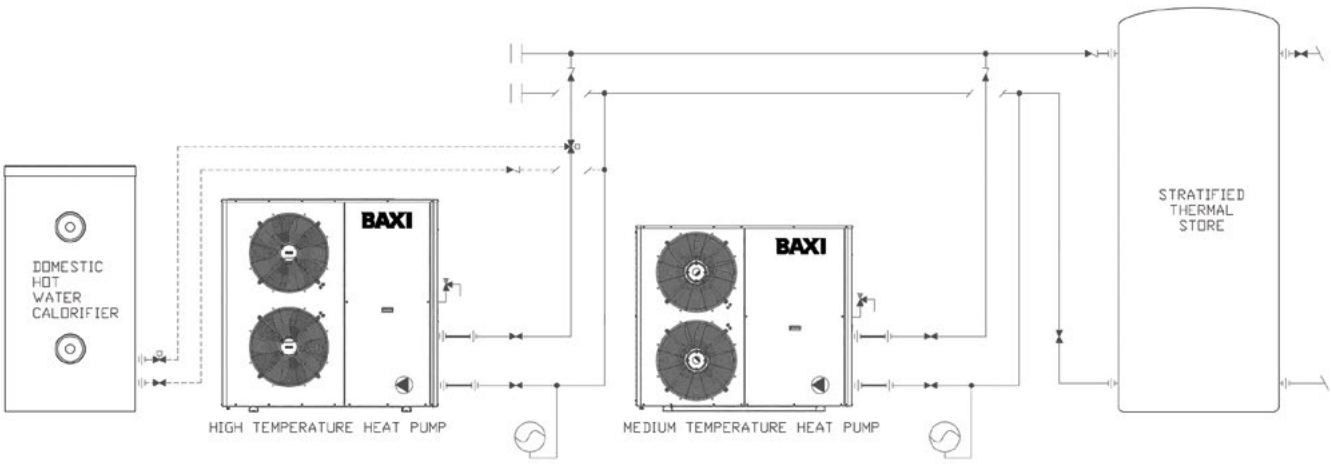

Figure 1: A 'divergent' cascade system – where part of the cascade can be diverted to satisfy a HT load while the rest of the cascade remains in LT/MT operation. When the HT load is satisfied, the system operation reverts to the default LT/MT (Source: Baxi)

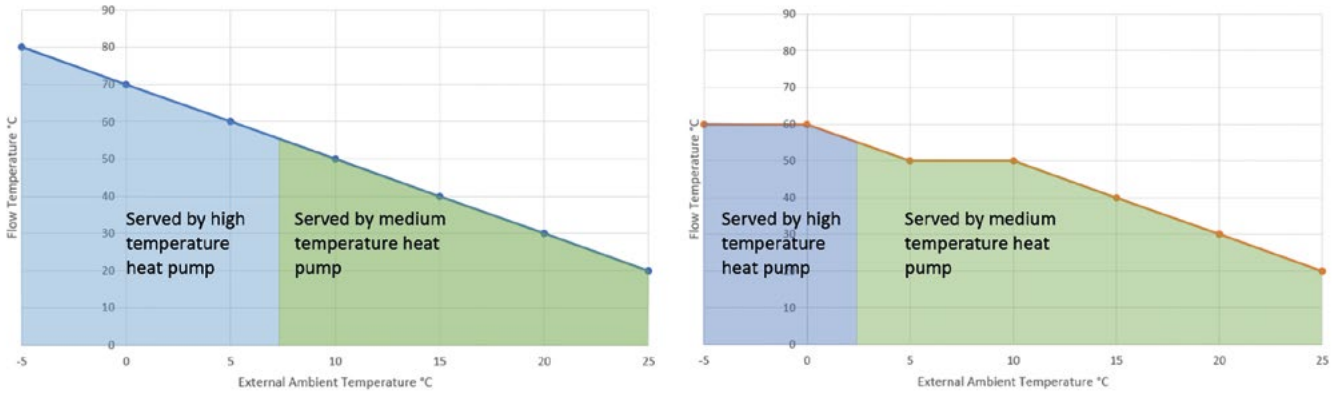

Figure 2: Examples of traditional and modified weather compensation curves for a variable temperature heating circuit. The modified weather compensation curve (on right) has been established by experimentation, recalculation and/or emitter upgrades. The change can enable a LT/MT heat pump to run for longer, reducing the requirement for a HT heat pump (or potentially a boiler) (Source: Baxi)

has a 300kW CT distribution system and a 100kW VT distribution system, both running at the same boiler flow temperature (the VT system being indirectly weather-compensated). Cost and operational constraints mean that replacing CT components to reduce the required flow temperature is not feasible. Through experimentation and recalculations, it transpires that the VT distribution circuit can still operate successfully at 55/45°C.

Three solutions might be considered. The first solution involves replacing the gas boilers with high-temperature heat pumps on a kW-for-kW basis, maintaining the 82/71°C requirement year round. This has the advantage of not requiring significant modifications to the existing circuits, making project execution relatively straightforward. However, the capital costs are extremely high, and the high-temperature heat pumps would be operating at the limit of their operating envelope throughout the year.

The second solution divides off the VT circuit and allocates it to medium- or high-temperature heat pumps, while retaining the gas boilers for the CT distribution. This hybrid solution requires less capital outlay and reduces electrical demand. Additionally, lowering the flow temperature broadens the range of heat pump technology options. The downside is that this approach only partially decarbonises the peak load.

The third solution builds on the second by adding a pre-heat tank for domestic hot water (DHW) served by an ASHP. This configuration retains the gas boilers for the CT distribution while allocating the VT circuit to medium or HT ASHPs. The advantages include a reduction in electrical demand, a broader range of heat pump technology options, and a larger portion of the heat being decarbonised. However, this solution also has its drawbacks, such as the need for additional space for a DHW pre-heat tank and more complex controls and valving.

In refurbishment projects, it is crucial to assess whether there is sufficient electrical capacity to support new systems and, if necessary, to evaluate the financial implications of upgrading electrical systems. Exploring potential options, such as integrating photovoltaic (PV) systems, can help offset higher electrical loads.

As building owners and operators explore boiler replacement projects and the various options for decarbonising their heating systems, priority should be given to fabric improvements. Replacing emitters to deliver low-temperature heating generally results in higher overall efficiency compared with employing high-temperature heat pump systems. Space and noise constraints are often unavoidable, and the ultimate selection of heat pumps will typically require a compromise, but, in any case, a key engineering consideration is to ensure that the heat pumps are not oversized in terms of load.

Achieving perfection in decarbonisation can be difficult when fabric upgrades are limited, but a thorough understanding of the building's thermal profile helps guide informed decision-making and ensures realistic expectations are set. ●

We thank Ryan Kirkwood of Baxi Solutions for sharing his notes and expertise, which formed the basis of this article.

Bracketing

Bracketing is used to organise the system into manageable sections based on known and weighted data. For example, considering a significant CT circuit dedicated solely to an air handling plant. In such a case, the decision might be made to 'bracket' this circuit out of the main heating system. By isolating this circuit and connecting it directly to its own heat pump plant, the heating coils may be adjusted to accommodate a flow temperature of 55°C or lower. This adjustment alone has the potential to boost the heat pump's efficiency by up to 150%, compared with a design temperature of around 80°C.

The same concept applies to VT circuits when the CT circuit cannot deviate from its current design flow temperature. Bracketing VT circuits can lead to significant efficiency gains, as weather compensation can be managed directly at the plant without the need for mixing valves. With direct weather compensation on HT ASHPs, the flow temperature can vary between 35°C and 80°C. If it is feasible, heat emitters may be modified to allow for a more aggressive weather-compensated temperature curve, as illustrated in Figure 2. The periods when the HT ASHPs must maintain an 80°C flow can be balanced out in terms of overall efficiency by the times when lower flow temperatures are sufficient.

The weighting aspect of bracketing involves understanding the capacity requirements for each circuit. For instance, if VT circuits account for 80% of the total load, addressing them independently while keeping the CT circuit at an 80°C flow might enhance the building's overall efficiency without necessitating the replacement of air handling unit (AHU) coils.

Module 242

November 2024

1. What is the key benefit of adopting a 'fabric first' approach when transitioning to air source heat pumps?

- ☐ A Enhances building envelope to reduce heat loss
- ☐ B Increases reliance on gas boilers
- ☐ C Lowers external noise from heat pumps
- ☐ D Reduces maintenance requirements
- ☐ E Reduces the need for air conditioning

2. Why is achieving a flow temperature of 80°C challenging for high-temperature air source heat pumps?

- ☐ A Boilers can't be retrofitted to support such temperatures
- ☐ B Heat pumps overheat at such temperatures
- ☐ C It exceeds regulatory limits for heat pumps
- ☐ D Most advanced heat pumps operate near their performance limit at this temperature
- ☐ E The ambient temperature must remain constant

3. Which method is suggested to reduce capital costs and reduce electrical demand when transitioning to heat pumps?

- ☐ A Decrease the number of heat emitters
- ☐ B Employ reduced amount of thermal insulation
- ☐ C Increase the flow temperature to 90°C
- ☐ D Install larger gas boilers
- ☐ E Use a hybrid system combining heat pumps and gas boilers

4. What is the purpose of 'bracketing' in the context of heat pump installation?

- ☐ A To align weather compensation curves
- ☐ B To balance electrical load in the system
- ☐ C To organise circuits based on temperature demands
- ☐ D To reduce system pressure
- ☐ E To separate boilers from heat pumps

5. What method is suggested for gathering current heating demand data in buildings?

- ☐ A Customer surveys
- ☐ B Employing sensors from solar panel installation
- ☐ C Thermal imaging
- ☐ D Use of heat meters and BMS logs
- ☐ E Visual inspections of systems

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[1] BS EN 14825:2022 *'Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling, commercial and process cooling. Testing and rating at part load conditions and calculation of seasonal performance*, BSI 2022 – under review.

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Revolution Bars Group adopts heat recovery for net zero goal

Revolution Bars Group is embracing heat recovery technology from Beijer Ref to cut energy costs and boost its goal of net zero by 2030. The Sustainable Energy Controller (SEC)-100 system was installed at Revolution Leeds to repurpose waste heat from refrigeration to generate hot water. A projected run time of 14 hours per day is 26,444kW/year of recoverable heat.

● **Call Andrew Slater on 07554 995334 or visit www.beijerref.com**

Pump Technology to start sharing insights on LinkedIn

David Johnson, marketing and business development director at Pump Technology, is to share monthly updates on Jung Pumpen wastewater and sewage pumping equipment via his LinkedIn account. The posts will cover essential details such as low-level float design and tank construction. He is also organising a factory visit and training session at Jung Pumpen on 11-13 December.

● **Email davidj@pumptechnology.co.uk**

Panasonic launches Aquarea M Series heat pumps with R290

Panasonic's new Aquarea M Series heat pumps, featuring R290 refrigerant, have modular options, including standalone controllers, hydro boxes, and all-in-one units. With Panasonic's T-CAP technology, the heat pumps maintain efficiency even in temperatures as low as -28°C, providing high-temperature water output while offering sustainable and space-saving solutions.

● **Visit: www.aircon.panasonic.eu**

Chisnall joins Condair as area sales manager

Condair has appointed David Chisnall as the new area sales manager for northern England. With more than 25 years' experience in the HVAC sector, he brings extensive expertise in air filtration and air handling unit manufacturing. 'It's amazing how many industries Condair works across, for humidification and dehumidification,' said Chisnall, 'and I'm keen to start engaging with our partners.'

● **Visit www.condair.co.uk**

Fujitsu's new mini VRF system on R32 refrigerant

Fujitsu General Air Conditioning UK's latest J-Series mini VRF heat pump system uses eco-friendly R32 refrigerant. The compact AIRSTAGE J-VS has a seasonal energy efficiency rating of up to 8.27 and a seasonal coefficient of performance of 5.37 – boosting energy efficiency by up to 36%.

● **Email sales@fgac.fujitsu-general.com or visit www.fujitsu-general.com/uk**

Vent-Axia launches fire-safe Pyrocheck airbricks

Vent-Axia's new Pyrocheck Fire Airbrick is a range of non-combustible, low-resistance metal airbricks. Compliant with Part B of the Building Regulations and the Scottish Building Handbook, the airbricks ensure fire safety in multi-storey developments. Manufactured from electrogalvanised steel, they are designed for robust fire performance, corrosion resistance, and high airflow.

● **Call +44 (0)344 856 0590 or visit www.vent-axia.com**

CIBSE LIVE BUILD2 PERFORM
13-14 November 2024
ExCeL Centre, London

The UK's leading event on climate resilience and the future of building services

Preliminary Programme Highlights:

13 November

NABERS UK: Transformation
13:45 – 14:45, Influence Theatre

Evolving Landscapes of ESG (Environmental, Social and Governance) Related Disclosure - Climate and Nature
14:00 – 15:00, Synergy Theatre

Light2Perform
10:30 – 17:30

LIVE LIGHT2 PERFORM

14 November

Sustainable Cooling, CIBSE TM59 and Weather File Update
11:15 – 12:15, Influence Theatre

Society of Digital Engineering (SDE) Presents the Golden Thread and SDE Digital Awards 2024
15:00 – 16:15, Synergy Theatre

Maintain2Perform
10:00 – 16:45

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Drinks Reception sponsor: CIBSE PATRONS

Influence Theatre sponsor: YGHP Yates Group Heating Products

VIP Area sponsor: KOZANLAR Heat Interface Units

AUTODESK

FLOWGRID AIR VOLUME SENSOR

- Accurate average air volume measurement
- Multiple differential pressure sensing points
- Averaging velocity pressure tank
- Suitable for bi-directional volume measurement
- Low velocity detection from 0.5 m/s
- Frame made in galvanised metal or stainless
- Standard mounting flanges 20-30-40 mm
- Height manufactured in 100mm increments
- Width manufactured in 50mm increments
- Length 300 mm to fit the CMR Dampers
- Sizes 3000 x 3000mm have been manufactured
- Custom made sizes can be manufactured
- 35 Years field application experience

CMR FLOWGRID

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.

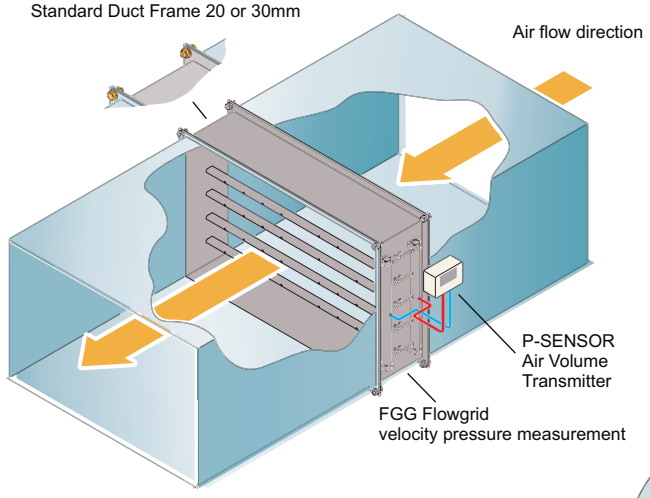
Another great advantage of the FGG Flowgrid is, that it can measure bi-directional as it is manufactured equally on both sides. This means, the air flow is measured in one direction and should there be a reverse flow, this can be detected and measured when using the CMR P-SENSOR.

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

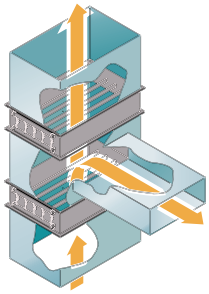
The Flowgrids are installed in many projects such as

Commercial Buildings - Industrial Production Plants - Pharmaceutical Production - Validated Monitoring Systems Hospital Isolation Rooms - Operating Theatres - Data Centres

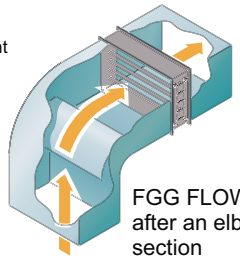
FGG FLOWGRID and P-SENSOR providing accurate average air volume measurement in ducts.



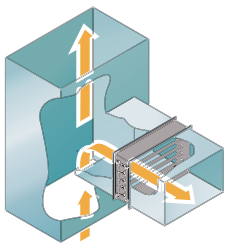
P-SENSOR
With LCD display
and keyboard



FGG FLOWGRID
before and after a
T- duct section



FGG FLOWGRID
after an elbow duct
section



FGG FLOWGRID
in a T- duct section

CMR is ISO 9001 and UKAS accredited

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