CIBSE JOURNAL

The official magazine of the Chartered Institution of Building Services Engineers

February 2011

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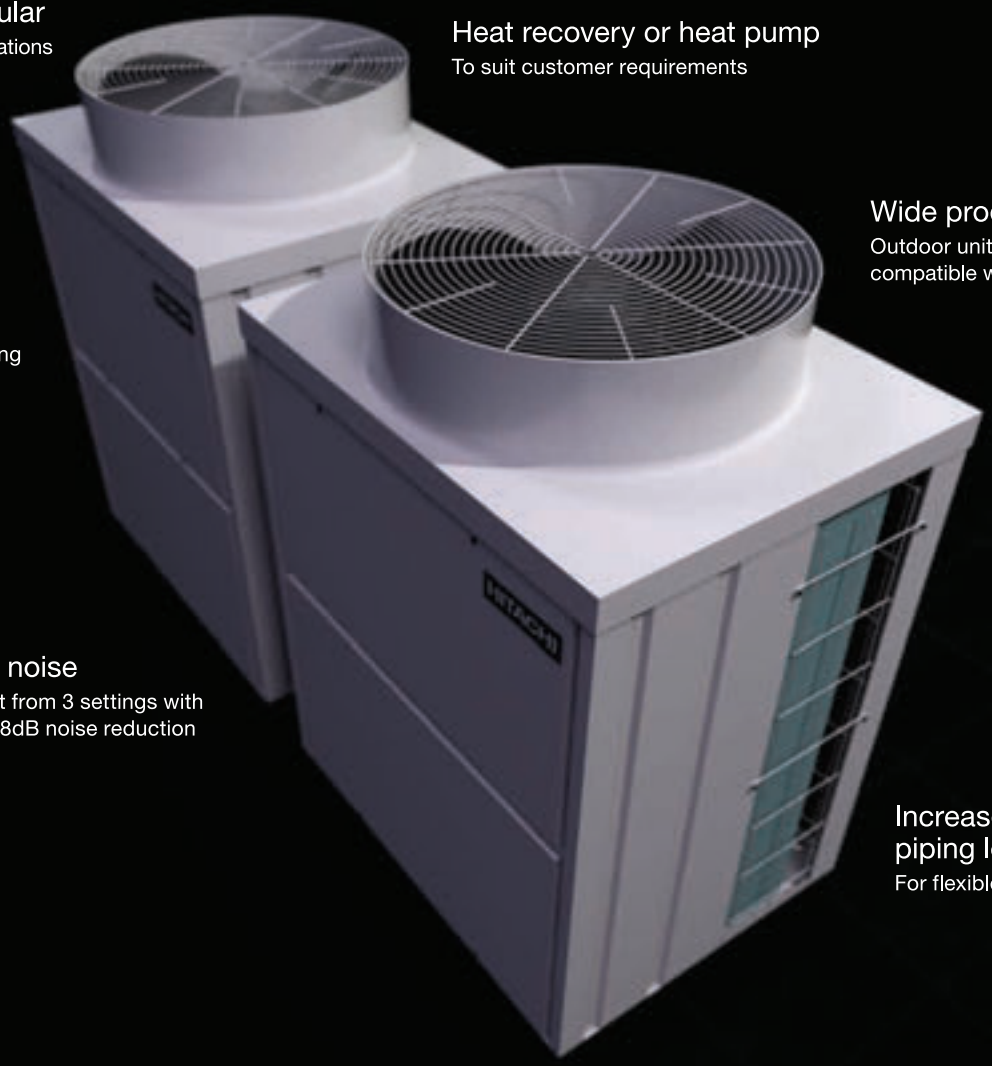

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From the editor

Less grandeur, more nuts and bolts

Whatever happened to the 'Great British Refurb'? The campaign for a mass home-improvement plan, launched a few years ago, seems to have fizzled out. Or rather, it's got sucked up into the arty design-and-build movement spearheaded by programmes such as *Grand Designs*. This movement is laudable, but it's in danger of missing a couple of essential points. One is that very few people are going to undertake a major overhaul of their existing properties in a hurry. Most people simply don't have the resources or incentives to do this (even with feed-in tariffs and subsidised cavity wall insulation), let alone design and build a whole new property.

Arguably, a much better approach is to try to persuade home owners to improve the energy efficiency of one room at a time, over the long term. In this way it is just conceivable that many of the 26m already-built homes will be much improved by 2050 – the magic target date for achieving an 80% cut in carbon emissions.

The second issue that is in danger of being lost in the Great British Refurb is that we also need to focus our attention on existing industrial and commercial buildings, if we are to have any chance of meeting the 2050 target. Developers and owners of these buildings need to be persuaded of the merits and benefits for them of carrying out energy efficiency reviews and overhauls of their property.

This is a commercial as well as a sustainability issue: with new projects drying up in the construction sector, the industry is increasingly relying on refurbishment projects. Such projects can also be fertile ground for developing innovative and effective green solutions that can achieve good-practice status and bear fruit for years to come.

CIBSE recognises the importance of this issue by focusing its national conference theme this year on commercial refurbishment (see page 16). The agenda rightly highlights the importance for industry suppliers of showing to clients the benefits that green refurbishment can bring to them. Crucially, this means identifying the payback on investment that comes from assessing and appropriately improving a commercial property.

> **More clients need to take longer-term views of property improvement – and the payback from this**

Examples of how this type of investment can be a no-brainer for clients are highlighted in this issue of the *Journal*, in two very different case studies. An energy assessment of a 1930s fire station in London shows how a range of simple improvement measures can bring major cuts in emissions and pay for themselves in limited timescales (page 35). And the case study showing more complex solutions applied to an expanded supermarket store (page 47) underlines the commitment that exists among leading retailers to exploring innovative solutions for improving existing outlets.

These examples bode well for the goal of promoting commercial as well as domestic refurbishments. Forget 'grand designs': the real work is being done on everyday buildings of all ages and types. What we now need is for more clients to take the lead by adopting a longer-term view on property improvement and the payback that can accrue for them financially – and for the nation in terms of reduced carbon emissions.

Bob Cervi, Editor
bcervi@cibsejournal.com

ONE LESS THING TO WORRY ABOUT.

News in brief

Low carbon progress 'slow'

The UK government has been criticised by the CBI for falling behind with its efforts to build a low-carbon economy. The business lobby group's Climate Change Tracker charts progress in decarbonising four areas – power, buildings, transport and industry. It says the coalition government's pledge to become 'the greenest government ever' was being undermined by uncertainty over planning rules and changes to the Carbon Reduction Commitment Energy Efficiency Scheme.

Renewables plan under fire

A report by the Commons Public Accounts Committee says the UK government needs 'a greater sense of urgency and purpose' after missing its 10% renewable energy target by the end of 2010. The UK agreed to the EU target, the report says, despite a lack of 'clear plans, targets for each renewable energy technology, estimates of funding required or understanding how the rate at which planning applications for onshore wind turbines were being rejected might affect progress'.

Clean energy consultations

The Department of Energy and Climate Change and the Treasury have jointly launched consultations on reforms to the electricity market, aimed at ensuring the UK can meet its climate goals and have a secure, affordable supply of electricity.

Work to begin this year on Part L 2013

A new consultation on Part L of the Building Regulations will be issued by the end of this year in preparation for the changes scheduled to take place in 2013.

It is expected that the next amendments to the regulations in 2013 will deliver the next steps to zero carbon for homes and non-domestic buildings, and will support a wider policy for retrofitting existing buildings.

Building Regulations Minister Andrew Stunell set out plans for consultation alongside the results of the informal one that took place last year.

The informal consultation highlighted a number of issues, the main one being how concerned industry is with the growing complexity of guidance relating to Part L, which was considered to be 'beyond the understanding of many'. A number of respondents said they feared that compliance ultimately suffers as people fail to understand what is required.

The software used to calculate energy performance was also deemed too complex, with many requiring input from a third party specialist. One of the solutions suggested was to adopt the German Passivhaus standard.

Other points raised included renewed calls for the introduction of consequential improvements and issues surrounding the frequency of changes to Part L.

As regards other parts of the Building Regulations, no further work is expected in the short term on Part G (sanitation) and Part J (combustion appliances and fuel storage systems), but Part F (ventilation) will be looked at in conjunction with Part L (conservation of fuel and energy).

Further, consultations are proposed on Part P (electrical safety in dwellings) and M, K and N (access to and use of buildings; protection from falling, collision and impact; and glazing, respectively).

The consultation on Part L is expected to be published by December 2011, with amended regulations and Approved Documents to be published in October 2012, six months prior to the provisions coming into force in April 2013.

Double-win for Young Lighter

Christopher Knowlton was named overall winner at the SLL Young Lighter of the Year Awards. He was also awarded the ILP award for the best written paper. He is pictured second from right with the other finalists and SLL president Alan Tulla. Kerem Asfuroglu (far left) won the Worshipful Company of Lightmongers Best Presented Paper award.

Off-site solutions 'need to be trialled sooner'

The government should move quickly with plans to trial off-site low-energy solutions in the public sector, if it hopes to hit its own zero carbon target in 2018.

CIBSE's technical director Hywel Davies said the government needs to be trialling such 'allowable' solutions far sooner than 2015 to evaluate and monitor their success in time for its own 2016 deadline, when public buildings should be zero carbon.

His comments came as the government released its summary of responses to its zero carbon consultation, *Zero Carbon for New Non-domestic Buildings: Consultation on Policy Options*. The feedback showed that 82% of respondents agreed that the public sector should start trialling allowable solutions from 2015.

Several respondents reiterated the need for good monitoring, reporting and publication of data for lessons learnt in the public sector to be used in the private sector.

Davies said: 'It's all very well stating a target for zero carbon, but we've actually got to hit it, and I don't mean hitting it on the drawing board, I mean hit it on the ground.

'When we design a building to be zero carbon, we've got to go out and build it to be zero carbon. That's going to require monitoring and quality control and, dare I say it, good old enforcement.

'I think the key thing we have got to bear in mind in doing all of this is delivering buildings that meet the standards.'

www.communities.gov.uk

School building cuts challenged in court

Legal action by six local authorities against the government's decision to scrap the Building Schools for the Future (BSF) programme started as the *Journal* went to press.

Sandwell Council went to the High Court seeking a judicial review of the legality of the BSF abolition, after the coalition cancelled more than 700 projects worth £55bn in the summer.

In Sandwell, nine projects worth £138m were cancelled. Legal action by five other local authorities was expected to be considered at the same hearing.

Council leader Councillor Darren Cooper said: 'We decided last year – along with a handful of other councils from around the country – to go to the courts to challenge Education Minister Michael Gove's decision to scrap Building Schools for the Future projects.

'As far as I'm concerned, few things are more fundamental than this. Giving young people the best possible environment in which to learn and develop their skills and talents has to be a top priority.'

Two BSF projects in Sandwell are due to be completed this year. The first phase of Smethwick Learning Campus has already opened, while the first phase of Rowley Learning Campus is nearing completion.

Industry leaders recognised in New Year Honours

Four leading representatives of the building services industry have been been included in the New Year's Honours list for 2011.

Keith Clarke, chief executive of engineering consultancy Atkins, has been awarded a CBE for services to engineering and the construction industry. He has 30 years' experience in urban regeneration, policy development and the implementation of large-scale projects. He also has extensive international experience, having worked in the USA, Asia, India and Europe.

Clarke said: 'It is a privilege to be in the engineering sector and to be honoured in this way. I believe it is engineering's decade, as deep technical expertise will help this country take a leadership position in finding engineering solutions to help deliver low carbon economies. I am proud to be part of it.'

Arup chief **Peter Head** was also awarded the CBE, for services to civil engineering and the environment. This represents his second royal honour – in 1998 he was awarded an OBE for services to bridge engineering after delivering the Second Severn Crossing as Government Agent.

Lynne Sullivan, founder of SustainableBYdesign and a leading light in the zero-carbon and Passivhaus movements, has been awarded an OBE for services to architecture, while **Trevor Hursthouse**, chairman of the Specialist Engineering Contractors' Group, received an OBE for services to construction.

News in brief

Arup confirms job cuts

Arup has made 280 staff redundant and shed 230 temporary and agency posts. In addtion, around 80 vacant posts will not be filled. The engineering and design company, which blames economic conditions for the cuts, has also been able to find positions for a few affected staff in its overseas operations.

RIBA takes on design review

The Royal Institute of British Architects is reported to have approached Housing Minister Grant Shapps to request that it take control of design reviews, which are currently under the remit of architecture quango Cabe. No one at RIBA was available for comment.

Call for industry papers

CIBSE is inviting individuals to send in abstracts of papers for possible presentation at a 'Knowledge Forum' event being held later this year. CIBSE says the event will be an opportunity for the research and development community to showcase their work to industry. Visit **www.cibse.org** or email **nhughes@cibse.org**

Correction: wind turbines

In the 'Wind turbines' feature in January *CIBSE Journal*, the captions for the individual turbines pictured on pages 39 and 43 were the wrong round – the caption for p39 should have been on p43, and vice versa. We apologise for the error.

Task group seeks reform of energy certificates

A new task group has been launched by the UK Green Building Council to investigate ways to encourage non-domestic building owners and occupiers to reduce carbon emissions using Display Energy Certificates (DEC).

The group will look at issues such as merging DECs with Energy Performance Certificates, the legal implications of the new certificates, dealing with multi-tenanted commercial buildings and addressing 'separables', which are parts of buildings with large energy uses, such as regional server rooms.

Paul King, chief executive of the UK Green Building Council said: 'Government policy in the non-domestic buildings sector needs urgently sorting out. We've got Energy Performance Certificates that haven't really taken off and we've got Display Energy Certificates that only apply to some buildings.

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Non-domestic building owners need 'encouragement' to cut energy use

'Businesses are also trying to get their heads around the Carbon Reduction Commitment following a moving of the goalposts in the Comprehensive Spending Review.

'We think government could simplify regulations to both reduce the burden on business and achieve greater carbon reductions, cost effectively.'

Currently, only public buildings with floor space of more than 1,000 sq m need to have a DEC. The certificates are based on the actual energy usage of a building, showing scores of A to G, with A being the most efficient and G the least.

The task group, which is sponsored by British Land, will consist of around 30 different UK-GBC members, including some of the industry's largest companies, such as Balfour Beatty, Sainsbury's and Aviva. It will make detailed recommendations in March.

Call for mandatory aircon inspections

CIBSE has called for the mandatory lodgement of air conditioning inspections as part of its ongoing compliance campaign.

The lower threshold for air-conditioning inspections, which includes all systems with an output of 12KW or more, came into effect from 4 January 2011. This means that most air-conditioned spaces of more than 2,000 square feet should now have an air-conditioning certificate.

'With the recent changes in the threshold, a lot more buildings now require an inspection,' said Hywel Davies, CIBSE's technical director.

'CIBSE believes it is the ideal time to introduce the mandatory lodgement of air conditioning inspections to help monitor compliance. It will enable us to build up a national picture of air conditioning installations.'

The government has announced that it will move ahead with proposals to make it mandatory to lodge air conditioning reports following an industry-wide consultation, but the timescales are still to be determined.

Under the European Performance of Buildings Directive, air conditioning inspections have the lowest compliance rates, currently thought to be below 5%. The purpose of air conditioning inspections is to provide owners and operators with information on the performance of their air conditioning so that they can improve them and cut costs if they are using too much energy. Mandatory lodgement will provide a central register enabling much better information on air conditioning installations to be logged, says CIBSE.

David Churchill

First Gold for London

The new UK headquarters for Westpac Banking has been awarded the first Gold Ska Rating for a building in the City of London. Co-ordinated by the Royal Institution of Chartered Surveyors, Ska Rating is an assessment process to help organisations achieve more sustainable fit-outs. AECOM assessed and accredited the fit-out. Ska assessor Richard Hollis, said: 'The project's success lay in the client's prioritisation of sustainability as the main objective for the design team. It made a real difference to the final score of the development.'

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News in brief

Tide turns for Scotland

Support for tidal energy creation in Scotland should be increased, according to the results of the Renewables Obligation (Scotland) Orders Consultation. More than 90 per cent of respondents said the current funding levels should be increased to match that given to wave energy. The Scottish government will now review the situation in 2011.

Tearing down barriers

Housing minister Grant Shapps has promised to 'tear down' barriers such as 'a complex and bureaucratic planning system, regulatory burdens, and a lack of access to land and finance' to encourage a self-builders revolution. More than 20 per cent of all new homes in the UK are self-built – one of the lowest in Europe.

Support for Green Deal

A letter has been written to industry by the UK government requesting expert advice into how well the energy performance of buildings regime is working in England and Wales. The move is in preparation for the introduction of the government's Green Deal, which will offer consumers energy efficiency improvements to their homes, community spaces and businesses. **www.decc.gov.uk**

New boss for MottMac

Keith Howells has taken over as chairman of the employee-owned Mott MacDonald Group, following Peter Wickens' retirement. Howells first joined the board in 2002. Meanwhile, Richard Williams has taken over as managing director of Mott MacDonald's transportation business, following the retirement of Ron Williams.

Minimum carbon price

Multi-disciplinary consultancy Atkins has welcomed government plans to set out further details of a minimum price for carbon, believing it will encourage the UK's engineering and design sector to boost its nuclear and renewable energy skills.

Plan to boost take-up of local microgeneration

The UK government has set out its aims for helping communities become more self-sufficient in the way they use heat and power, by launching a consultation on its microgeneration strategy.

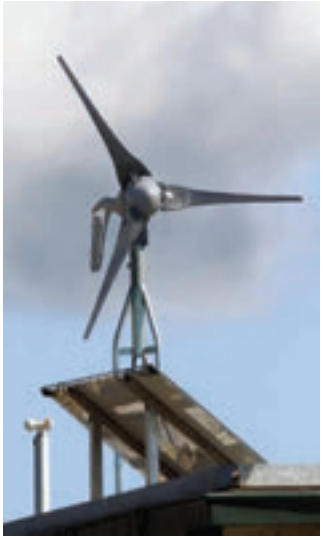
Climate Change Minister Greg Barker said that empowering communities to generate their own energy could create an income for them, as well as saving money on fuel bills and increasing domestic energy security.

Homes, schools and businesses are already guaranteed cash payments through the 'feed-in tariff' for producing their own green electricity through technologies such as solar panels or small wind turbines, as well as for selling it to the national grid.

Barker said: 'I want to see more homes, communities and businesses generating their own energy. We can literally bring power back to the people. Microgeneration is a key part of this vision.'

The consultation on the strategy will look at four key areas for development. These are:

- Quality: ensuring consumers have confidence that equipment and installation is reliable and adheres to the highest standards;
- Technology: examining how to improve products through more trialling of new technologies;
- Skills: developing the microgeneration supply chain to ensure it is properly equipped with the right people to meet the expected rise in demand, as well as creating and sustaining jobs in the UK; and
- Advice: providing more accessible advice and information about microgeneration to homeowners, communities and small businesses.



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Ministers say they want to see homes and businesses generating energy

The chief executive of the Micropower Council, Dave Sowden, welcomed the development: 'We're delighted the government is embarking on the development of a new vision for a true mass market UK microgeneration industry and bring sustainable energy self-production in reach of every citizen.

'We look forward to working closely with the government on a new policy framework to allow every citizen, business, school, hospital, community and other organisations to grow their own energy.'

The consultation ends on 16 March. **www.decc.gov.uk**

BREEAM excellence up for award

The BREEAM Excellent Bristol Civic Justice Centre has been nominated for a Civic Trust Award. The design included daylight modelling to create good lighting conditions, and to minimise energy consumption and carbon emissions. The building's services were designed by engineering consultancy Hillson Moran. The awards will be announced on 4 March.

World tunes into BIM

Putting Building Information Modelling (BIM) to use when designing buildings is expected to become the norm in Europe, according to a webinar organised by the CIBSE/ASHRAE Group at London South Bank University.

Dennis Knight, of Whole Building Systems, delivered his presentation live from the US, and delegates tuned in from Australia, Abu Dhabi, Canada, New Zealand and Vietnam.

BIM has already been widely adopted by architectural and design practices across the US, said Knight. This was because the 3D visualisation offered by BIM software dramatically reduced the number of clashes in a building design. 'BIM will not only change how we design and operate buildings, but also how we communicate with our clients and supply chain partners.'

The webinar recording can be found at **www.cibseashrae.org**

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CIBSE news

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President: Rob Manning BSc (Hons) ENg FCIBSE **Chief executive:** Stephen Matthews

Looking east

President-elect Andy Ford and chief executive Stephen Matthews visited five cities in the Middle East and Asia last November as part of an official international visit.

The trip started in Doha, Qatar, with a site visit to the SIDRA Hospital project – a new-build, international-standard facility comprising a 10-storey hospital. The new build will incorporate 428 beds and 12 operating theatres, a seven-storey outpatients clinic, a three-storey central services building, plus tunnels and link bridges. It promises to be the most technologically advanced medical centre in the world.

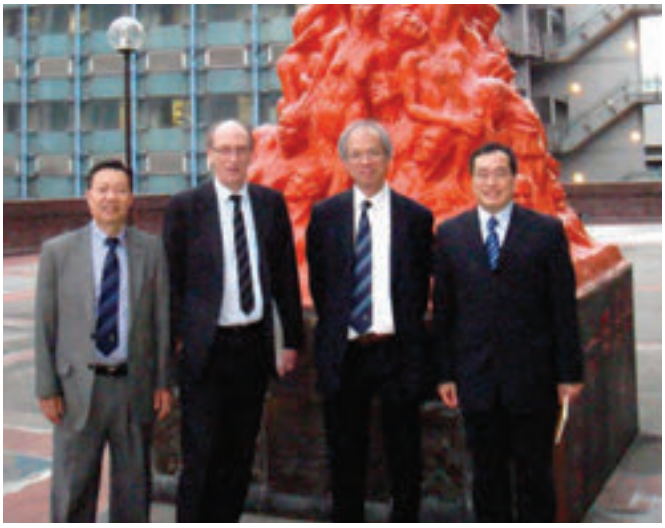
The site visit was followed by a CIBSE seminar, where Ford and Matthews both gave lectures and engaged local members in a lively discussion on the role of CIBSE in Qatar and the wider region.

From Doha they travelled to Hong Kong, taking part in a joint symposium and one-day seminar. They then visited the Hong Kong Institution of Engineers, where they signed the Reciprocal Recognition of Professional Qualifications.

In Singapore they attended a CIBSE seminar and networking event, where Matthews spoke on the topic: 'CIBSE – Engineering Excellence', while Ford gave a presentation about thermal storage. The pair also visited the impressive Marina Bay Sands complex.

Andy Ford then travelled to Shanghai and Dubai, attending the CIBSE Core Group UAE meeting.

These international visits aim to help develop and improve the services that the institution offers to its international members.



Widening the reach... from left: KK Lam, Andy Ford, TM Chung and Benjamin Ho

Through this active engagement we also hope to be able to widen our reach in these countries and increase international membership – thereby helping to make these regions stronger and more valuable to the members within them.

We would like to thank everyone who helped make this visit such a success, in particular: Mike Daly, CIBSE Qatar representative; Dr TM Chung, chair of the CIBSE Hong Kong branch; Hsieh-Min Loy, Singapore representative; and Ivan Brinkley, UAE representative.

Search for top employer

CIBSE and the Young Engineers Network (YEN) is calling on companies to enter the 2011 CIBSE Employer of the Year Award. Previously named the YEN Champions Award, it recognises those employers who have shown excellence and innovation in developing the engineers of the future.

The award rewards those organisations who proactively champion young people in the industry, whether through a commitment to young people in employment or by supporting those in education.

This is your opportunity for your company to get the recognition it deserves for its commitment to supporting the engineers of tomorrow.

Speaking at last year's event Rob Manning, CIBSE president, said: 'For our industry to be successful in meeting our targets we must attract the brightest and best to the industry and retain them. To do so needs the pledge of support from our industry leaders. These awards reward those who are supporting and encouraging young talent, and allow those organisations shortlisted to cement their reputation as a champion of young engineers.'

Once again there will be three categories to enter: Large company; Medium company; and Small company – as well as one overall winner.

The awards ceremony, presented by the CIBSE YEN, will be held in July in central London, where winning companies will receive a trophy and £1,000 of CIBSE training vouchers. The awards will be sponsored by Baxi Commercial Division.

For more details and to enter, visit **www.cibse.org/awards**

BSRIA's Soft Landings launched Down Under

The Australia and New Zealand region has just completed a successful series of workshops introducing Soft Landings, a new approach to the design and delivery of sustainable buildings.

The seminar series was conducted by Roderic Bunn, principal consultant with the Building Services Research and Information Association (BSRIA), and included a video presentation by Bill Bordass, of the Usable Buildings Trust.

The seminar toured nine cities across the region, with the audience representing a wide cross-section of the Australian and New Zealand construction industries. One of the key messages delivered was that sustainable design doesn't automatically equate to sustainable performance.

Bunn said: 'Construction industry professionals need to learn from what they do, focus their design on operational outcomes – not just design inputs – and follow through after completion to both assist the occupants to understand their new workplace, and to take greater custody of the building's environmental performance.'

Bunn and Bordass are championing a detailed manual for the practical application of this new approach, called the Soft Landings Framework, complete with worksheets that can be tailored to a specific project.

While in Sydney, Bunn launched the Australian Soft Landings User Group, which will bring together representatives from all stages of the design, supply and occupation chain to drive the process of making future buildings work more sustainably.

New electrical book is full of current advice

A new title on electrical services engineering, written by Dr Tony Sung, leading expert and chairman of the institution's Electrical Services Group, is now available from the CIBSE Bookshop.

Advanced Electrical Services Engineering – Volume 1: Fundamental Theory & LV Electrical Installation Design aims to provide the reader with the underlying principles needed for them to understand the practical treatment of the design and analysis of electrical services systems in buildings.

The text takes the reader from the early stages of student knowledge to the advanced considerations that a professional designer must be familiar with.

This is the first volume of two, and sets out the fundamentals of electrical circuits and components, moving on to the practical considerations that a designer must take into account.

The books are intended to be suitable course texts for both undergraduate and postgraduate degree courses. With volume one being used for the first and second years of an electrical power engineering module, as well as being a useful reference text for practising designers in engineering consultancies.

Priced £52 for members and £62 for non-members, the book can be purchased at **www.cibse.org/bookshop**

Young engineers enjoy launch event

The newly formed Merseyside and North Wales Young Engineers Network recently held a launch event.

The group – formed in 2010 – held the event in Liverpool, with support from sponsors, Thorlux, Lochinvar, and Mitsubishi. The event introduced students from local education establishments to the industry and the people who work in it.

The Merseyside and North Wales regional chairman, together with representatives from each of the sponsors, spoke to attendees about their careers and how they reached their positions within the industry.

The event was a great success, helping to forge a strong relationship between the YEN and the regional committee, with many new members signing up to the regional YEN.

New members are always welcome; contact the group at **cibse_yen_mnw@live.com**

New Building Regs set logbooks soaring

Since the introduction of the new Building Regulations Approved Documents Part L, there has been a steep rise in sales of CIBSE's building logbook templates.

The new regulations' paragraph L1(c) of schedule 1, requires the building owner to be given 'sufficient information' about the fixed building services, and their operation and maintenance to help ensure 'no more fuel and power than is reasonable in the circumstances' are used.

Ideally, buildings should be designed so that their operation is self-evident. But in practice, this is very difficult to achieve.

This is where the CIBSE logbook templates come in. They allow building designers and contractors to pool the necessary information in a concise form, providing the necessary overview of how to use and maintain the building.

CIBSE Technical Memoranda TM31 – building logbook toolkit – gives further details of the requirements and provides templates for logbooks in line with the statutory requirements of the building regulations.

To buy logbook templates visit **www.cibse.org/bookshop**

Mikrofill leads the way in the Midlands

The West Midlands Young Engineers' Network has arranged a set of CPD accredited technical presentations.

The first presentation, from Mikrofill, will be held on 10 February at 6.15pm. It will focus on pressurization equipment. Three further technical presentations will be held every other week, and cover condensing boilers and domestic hot water generation. The venue will be at Mikrofill's premises in Redditch, Worcestershire.

The network supports young engineers in the region, providing networking opportunities, seminars and social events. They are always keen to hear from any young engineers in the area who are keen to join.

For more details on the network, and the event, email **helen.payne@hulley.co.uk**

Keeping on top of technology

A new bulletin to help share knowledge and keep members up-to-date with policy and legislation changes was launched in December.

The CIBSE Technical Bulletin is a monthly email to all members and aims to disseminate building services technical information and updates, while also raising awareness of key issues affecting our industry.

The first issue included a look at the key changes in the Building Regulations 2010, along with details of the future schools technical memorandum in the CIBSE special interest groups' section. The bulletins will also give details of current consultations that CIBSE is seeking views on.

We are keen to make this a useful tool for members and to include new topics that are of interest, and therefore welcome suggestions for future topics for inclusion. Please email **anenadovic@cibse.org** with suggestions.

Copies of all the technical bulletins will be posted on the CIBSE website at **www.cibse.org/knowledgebank**, where you can also find news about current consultations.

FINAL CALL – Travel and Learn with Ken Dale Travel Bursary 2011

The closing date is fast approaching to get your applications in for this year's Ken Dale Travel Bursary. The Bursary makes an award of between £1,500 and £4,000 to a CIBSE member in the developmental stage of their career to research an aspect of building services outside their home country.

The closing date is 28 February – don't miss your chance to enter!

For more information and an application form, visit **www.cibse.org/bursaries**

Time for a great British refurb

One building every minute will need to be refurbished between now and 2050 in order to meet Britain's carbon reduction targets. This year's CIBSE national conference focuses on the refurbishment challenge being faced by all parts of the sector

The CIBSE national conference in 2010 included a panel discussion chaired by the then president-elect, Rob Manning (standing)

The UK government's tough targets for reducing carbon emissions by 80% by 2050 have focused environmental targets onto new buildings, but the real challenge is the existing building stock, says CIBSE, whose national conference on 7 April in London this year focuses on refurbishment.

The title of the conference, 'One building a minute – the great refurbishment challenge', highlights the fact that there are around 26m homes and about 2m commercial and non-domestic premises that will need to be refurbished if the government target is to be met. That gives us around 21m minutes – so we need to refurbish more than one building a minute over the next 39 years, even if we start today.

The recent Final Report from the UK Low Carbon Construction Innovation and Growth Team emphasised that producing eco-friendly new buildings from now will not go far enough (see January's Journal). The 2050 target will only be achievable if existing buildings have their energy efficiency improved, too.

As much as 150m tonnes of carbon dioxide are released into the atmosphere from the UK's housing stock each year, according to the government. Most buildings in existence today will still be standing in another 40 years and a sizeable proportion of them will be more than a century old by then. And so the opportunities for 2011 look set to be in refurbishment rather than new build, CIBSE argues.

However, says the institution, some building services companies will have to change their current offering to optimise their chances of winning profitable work in refurbishment – a highly competitive area. And it is not yet clear how clients will rise to the challenge of improving their existing commercial and industrial buildings. The sector as whole – right across the supply chain – faces a major challenge to help meet the 2050 target.

The CIBSE national conference will explore how this target can be achieved and the way in which the building services industry can provide the knowledge, expertise and skills necessary to make it possible for clients and owners to undertake these refurbishments and make the hoped-for savings.

The conference aims to enable delegates to understand the value propositions that will appeal to clients, and to cost and win tenders with the minimum of risk – and the event will seek to explain where to gain knowledge about strategies to achieve real energy savings for clients.

CIBSE president Rob Manning is to chair the one-day event in the morning and will be giving the opening address. The afternoon will

Delegates take part in the 2010 conference dinner debate

Atkins chief Keith Clarke gives a keynote speech in 2010

Young engineers from different disciplines, which included architecture, debated key industry issues at the conference dinner in 2010

be chaired by president-elect Andy Ford.

Says Manning: 'We must be ready to undertake the refurbishment task where building owners require it, either because they are driven by simple economics or they are driven by legislation, such as the Carbon Reduction Commitment Energy Efficiency Scheme. 'The building industry needs to create mechanisms which bring all the construction professions together to deliver this scale of change to our new and existing stock.'

Manning is a big supporter of the need to undertake large-scale refurbishment of Britain's buildings to improve energy efficiency and is keen to spread the word. 'There will be an increasing demand for CIBSE members to build long-term relationships with owners and their buildings in order to improve environmental performance,' he says.

The conference will feature a mixture of speakers and panel discussions on different elements of green refurbishment.

Kate McCormack and George Adams of SPIE Matthew Hall will speak on 'The value proposition for clients needed to win refurbishment tenders'. This session will seek to help building services engineers to demonstrate to clients the value that can be achieved via refurbishment projects.

A session by David Frise of the Heating and Ventilating Contractors Association will look at how to access the practical information needed to achieve low-carbon refurbishment, and David Hucker, from Cyril Sweett, will be giving a talk entitled 'Cost planning for refurbishment projects', which will provide current cost information on refurbishment and its component parts.

Other topics to be covered at the event will include a look at how district heating systems can help make refurbishment more cost effective. There will also be a look at using wireless control technologies in the refurbishment process, and an overview of the new Passivhaus standard for commercial refurbishments. Real-life case studies will alert delegates to some of the risks they may not have encountered themselves.

The event will end with a panel discussion entitled 'Knock it down and start again', in which a developer, a building services engineer, an architect and an energy expert will debate the merits of refurbishment versus new builds. Representatives from RIBA and the Technology Strategy Board are expected to be among the panel members.

After the one-day conference – which will be held at the Grand Connaught Rooms in Covent Garden – a dinner hosted by the CIBSE Young Engineers' Network will be held. To find out more, and to book your place at the conference, visit the CIBSE website at **www.cibsetraining.co.uk/conferences**

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Letters

Carbon guzzling isn't the answer

Martin Gage's letter 'Scaremongering over peak oil' (November *Journal*, page 22) offers a simple acceptance of the refilling of the Eugene Island oilfield as 'truth'. If Martin had done better research he would know that the estimated reserves in the oilfield, and many others globally, have increased over the past two decades because we now have better exploration and recovery technology, so more oil is capable of being recovered. I agree with Martin on one thing: we need to be prudent with our use of energy before it's too late; but this means waking up into a carbon zero world, not a carbon guzzling one. As for oil being a 'freely available' and 'trusted' resource, you just have to look at the Deepwater Horizon disaster and the impact it has had on many thousands.

Stephen Knowles, MIMechE, Affiliate CIBSE

No complacency over peak oil

Peak oil is not about running out of oil, it is about the peaking of global oil production. The International Energy Agency warns that our consumption is unsustainable. The IEA knows the reality: oil discoveries peaked in 1964, and since 1983 we have been using around three times as much oil as we discover each year. Of the 98 oil-producing countries, 64 have now peaked, including Russia. Oil will be around for many decades yet; but as engineers, we can understand the likely scenario that global oil supply will fail to meet demand in the next two to five years, followed by a plateau in production; and then perhaps in five to eight years the onset of ever-declining global oil production. In the wake of the credit bubble, the issues are complex with no room for complacency. It's time for transparency, dialogue and above all, a global strategy.

Chris Jones MCIBSE

Put entropy in its rightful place

It was gratifying to see the promotion of the Second Law of Thermodynamics within the design processes of the built environment ('Design Masterclass', December *Journal*, page 42). One derivative of the Second Law is entropy, which identifies the irreversibilities within design processes. As entropy is a thermodynamic property (unlike exergy), it can be measured and assessed. Its analytic use would therefore form a more comprehensive measure of the 'sustainability' of the built environment than is presently adopted. Perhaps we may see entropy taking an equal role with the other five thermodynamic properties that are currently referred to in design processes.

Dr Brian Atkins

CIBSE Journal welcomes article proposals from any reader, wherever you are – whether it be letters, longer opinion pieces, news stories, people or events listings, humorous items, or any ideas for possible articles.

Please send all letters and any other items for possible publication to: bcervi@cibsejournal.com, or write to Bob Cervi, Editor, *CIBSE Journal*, Cambridge Publishers Ltd, 275 Newmarket Road, Cambridge, CB5 8JE, UK. We reserve the right to edit all letters. Please indicate how you wish your letter to be attributed, and whether you wish to have your contact details included.

Opinion

Deliver on the promise

Don't get hung up on climate change science – as engineers we must make low carbon solutions a daily practical reality, says **David Frise**

Mike Hulme, Professor of Climate Change at the University of East Anglia, delivered the latest CIBSE Annual Lecture and, effectively, told us to stop obsessing about the mass of learned documents being produced on his subject. There is no magic bullet, no definitive answer to the 'mother of all issues', he said.

It is highly significant that it is one of the world's leading climate change scientists urging our industry to look beyond the science for answers. He is right: we need to focus on what we have been promising our clients for years and, largely, failing to deliver.

On average, more than 9,000 scientific papers a year and a book a day are produced on the subject of climate change. This enormous volume of material has stoked controversy and created confusion without bringing us any closer to an answer. Endless debate about errors and the manipulation of science has simply delayed our response to society's greatest challenge.

People can be easily swayed by scientific arguments and accept there is a major problem caused by climate change, but that does not mean they will actually do anything about it. Take the recent 'cold snap'. People may well have a 'green' outlook, but when the temperature plummets they are fully focused on keeping warm, getting to work and looking after their families. Any thoughts about energy efficiency and reducing emissions go out the window.

We must make behavioural change as easy as possible, and that means creating systems that bring it about automatically. We must deliver easy to use, self-adjusting systems that will adapt to changes around them – temperature, occupancy, patterns of use, etc – without the need for an intelligent user. In fact, the end-user becomes greener without any significant effort or inconvenience.

That technology already exists in the shape of smart phone applications – web-enabled measuring and monitoring and remote diagnostics that allow us to give and take control where necessary. It is, clearly, a huge opportunity for our industry. 'Smart' technologies are relatively easy and cheap to apply. The engineering challenge is working out how best to apply them and then persuading clients of the long-term benefits.

As Professor Hulme said, people will always find ways of making the science fit their own pre-conceived ideas. Some people consider it to be a financial problem: the 'greatest market failure' that requires a reshaping of financial markets to be more closely linked to the cost of carbon. Others see it as a technology issue: we have misused and abused our technology and now we need new ones to get us out of the mess.

But whatever your own particular interest or theory, the key is delivering the promise of improved performance and reduced emissions. Clients are no longer buying products, they are buying performance – if they can find suppliers who can actually deliver it. This is the big prize for building services contractors and consultants.

> **Clients are no longer buying products, they are buying performance – if they can find suppliers who can actually deliver it**

The systems being designed and installed today must deliver what they promise without expecting end-users to take a degree in building services to be able to understand them. Funding for sustainable refurbishment will be loans secured against future savings from energy and building operating costs – the UK's Green Deal being the obvious example. If we don't deliver, the whole edifice collapses, taking all the potential carbon savings with it. That is why it is vital for consultants and contractors to communicate regularly and openly. They must say: 'if we can't install what you design, we will not deliver on the promise.'

So, in response to Professor Hulme, we can put the science to bed and get on with our part of delivering some of the technological responses. The fact there is no one big solution to climate change should not encourage despair – the chaos around climate change science is far more desperate. Rather, we must distance ourselves from the prejudice and vested interests to focus on what can be done simply, cheaply and quickly because, put simply, whatever we do must work. ●

David Frise is head of sustainability at the Heating and Ventilating Contractors Association. **www.hvca.org.uk**

CONFERENCE ROLE
David Frise will be speaking at the CIBSE national conference in April. See pages 16-17 of this issue. Full details of the event can be found at www.cibsetraining.co.uk/conferences

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Financial commitment

With changes announced in the carbon reduction scheme, building services providers have an opportunity to help their clients save money, writes **Hywel Davies**

The Carbon Reduction Commitment Energy Efficiency Scheme (CRC) is the UK's mandatory climate change and energy saving scheme. After much consultation and development, the scheme finally started in April 2010 in the dying days of the Labour government that created it.

CRC was intended to be central to the UK's strategy to improve energy efficiency and reduce carbon dioxide emissions under the Climate Change Act 2008. It was designed to raise awareness among senior managers in large organisations, and to encourage changes in both the behaviour and the physical assets of those organisations by taking money from poor performers to reward those reducing emissions, as defined by the scheme's rules.

Under the previous plans, all organisations using more than 6,000MWh of electricity per year, and not already in an emissions trading scheme, would purchase allowances to cover their anticipated emissions and report their actual emissions annually. The reports would be used to create a league table, with top performers getting their allowances back, plus a premium, while those at the bottom would get back only a portion of their allowances.

The scheme was originally designed, and all the consultations undertaken, on the understanding that the scheme was to be 'revenue neutral': money from the sale of allowances would be recycled to the participants. What was not so widely discussed was that the scheme provided a significant interest-free loan to government by large energy-using bodies, who were required to buy allowances a year or more in advance of the league table and allocation of repayments.

In October's Spending Review, the UK Chancellor announced that revenue from CRC will be used to support the public finances, including spending on the environment, rather than recycled to participants. This revenue is expected to amount to £1bn a year by 2014-15. The Spending Review states that retaining the money raised from selling allowances will 'clarify the price signal [the cost of using the carbon] to participants'.

At the same time the government announced a 12-month delay in the initial sale of allowances; it said that the scheme 'will be simplified to reduce the burden on businesses, with the first allowance sales for 2011-12 emissions now taking place in 2012 rather than 2011', although this may not be the simplification that the British Property Federation and others had been seeking, which was administrative simplification and greater recognition of the role of tenants in energy consumption.

A formal consultation on changes to the CRC Energy Efficiency Order 2010 was undertaken before Christmas 2010. It proposed an initial amendment to come into force by 1 April 2011, to extend the introductory phase and delay the initial sale of allowances to 2012 and postpone the start of Phase 2 until 2013. Following this 'a broader simplification review' will identify further amendments.

The performance league table is retained as the main reputational driver, starting in October 2011, with metric weightings and publication dates as envisaged in the original legislation.

The Department of Energy and Climate Change (DECC) website reminds us that the 'CRC remains in place as a mandatory scheme, and the Environment Agency continue to provide support to participants with their CRC compliance. Organisations who fail to comply will be subject to enforcement action. Participants should continue to fully comply with the scheme and use the introductory phase to gain experience on reporting, complying and surrendering allowances in CRC.'

> **Everyone involved in the CRC should now think urgently about how they ensure they measure their energy use and emissions accurately**

The introductory phase also enables participants to gain experience in handing over a lot of money to government. Everyone involved should now think urgently about how they can ensure they measure their energy use and emissions accurately, to ensure that they pay the right amount, but also find ways to cut energy use and reduce not just bills and emissions, but payments to Treasury.

The 'clear price signal' to industry is that energy will cost more, in utility bills and through CRC. It should also be a signal to CIBSE members to work with clients or employers who are in the CRC to find ways to reduce the commitment and save themselves money.

DECC are inviting suggestions about simplifying CRC. CIBSE will be submitting suggestions shortly: you can send comments to us at **cbreslin@cibse.org**. ●

Hywel Davies is technical director of CIBSE

WEBLINKS

- www.decc.gov.uk
- CRC is administered by the Environment Agency http://www.environment-agency.gov.uk/business/topics/pollution/98263.aspx, the Scottish Environment Protection Agency http://www.sepa.org.uk/ and the Chief Inspector (Northern Ireland Environment Agency) http://www.ni-environment.gov.uk/

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Fit for purpose?

The UK won't meet its carbon-cutting targets unless the industry's green-skills deficit is plugged, says **Doug King**, who urges readers to respond to a joint CIBSE/RAE sector survey

Above and facing page: the key challenges for the built environment sector are to dramatically increase the skills set, and to establish much closer collaboration across the supply chain

It is well known in our industry that buildings account for around 45% of UK carbon emissions, whilst our national goal is to achieve a reduction in emissions across the economy of 80% by 2050. Recent governments have set out a range of strategies to achieve emission reductions, but one wonders whether they have considered the impact of their decisions and the industry's ability to deliver against them.

Clearly it will be vital to the future health of our economy to address the reduction of carbon emissions from the built environment in the most cost-effective way, and not simply to adopt the path of least resistance. Warm Homes, Greener Homes, the government strategy for cutting carbon emissions through eco-upgrades in existing housing, sets out a plan that could potentially cost up to £200bn between now and 2050 in this sector alone. Further, the Carbon Trust, in *Building the Future Today*, estimates that retrofitting the non-domestic sector could require investment of £50bn between 2020 and 2050.

It has been repeatedly demonstrated through contemporary projects that reducing energy demand through energy efficient design costs little more than conventional, inefficient design; and the scale of reduction that can be achieved by these means substantially exceeds that which could be generated by expensive onsite renewables.

However, we have already seen problems in implementing Part L 2006 due to a lack of awareness of how to achieve fabric insulation and air tightness standards, both among those who build and those that are supposed to enforce the regulations. Now evidence is starting to emerge that the skills required to achieve zero carbon new buildings, or even the eco-upgrades of existing stock, are simply not prevalent in our industry as it stands.

Low Carbon Housing: Lessons from Elm Tree Mews, the study of the Joseph Rowntree Foundation's pilot project for CSH Level 4 housing (see December *Journal*, page 7) highlights numerous difficulties in achieving low carbon housing. These range from unjustified claims for product efficiencies by manufacturers to the failure of designers to follow through the consequences of their decisions.

Similarly, in *Getting Warmer*, the report on the first large-scale field trial of domestic heat pump installations, the Energy Savings Trust identifies the importance of appropriate design, good installation and commissioning, without which many systems were found to be operating at only a fraction of the expected efficiencies.

The challenge of reducing fossil-fuel dependency in the built environment is vast and will require far more effective policy and a dramatic increase in skills and awareness across the construction industry. It will also require a major rethink about supply chain relationships.

We will need to see much closer collaboration between manufacturers, consultants, installers and operators in the future to establish a chain of custody for energy efficiency. We must ensure that buildings and systems are designed and installed to allow energy consuming components to operate at their maximum efficiencies.

Warm Homes, Greener Homes also estimates that upwards of 65,000 new jobs will have to be created to provide the domestic eco-upgrades required. Clearly all these people will require a thorough training in low carbon skills. As these retrofits are new work for the industry, these jobs will be in addition to the annual recruitment of 48,000 new people that the Construction Skills Network (see its *Blueprint for UK Construction Skills 2010 to 2014*) estimates will be required for each of the next four years to support an industry coming out of recession.

Given that during this period we will see the implementation of both the 2010 and 2013 revisions to Part L, presumably these 192,000 new workers will >

> also need to be skilled in low carbon construction, as will a significant proportion of the existing 2.3m people presently employed.

Clearly there is presently a vast gap between the government's ambitions to make dramatic cuts in UK carbon emissions and their understanding of the range and quantity of new skills that will be required to deliver these cuts. This represents a huge challenge for both construction businesses and training providers.

Government's failure to recognise the need for such a vast expansion in low carbon skills is largely due to the industry's own lack of understanding in this area. The sector skills councils are making some inroads into filling this knowledge gap, but they only address their specific areas and so lack an overview of the challenge.

"There's a vast gap between government ambitions on making carbon cuts and their understanding of the new skills that will be required to deliver on this"

Work by SummitSkills, the sector skills council for building services, has identified that the growth in low carbon skills is predominantly related to training on the installation of specific technologies such as micro-generation.

Furthermore, as the industry has not itself identified the skills required to address low carbon construction, the institutions and educational establishments are not sufficiently geared up to provide new skills. Whilst the accreditation bodies that represent the professional institutions – CIBSE and the RIBA – promote sustainability, the specific design and analytical skills that are essential to achieving cost-effective low carbon designs are rarely covered in university courses.

During a discussion at a recent CIBSE council meeting, it was felt that at present there are probably not even enough people in the UK industry with sufficient knowledge of low carbon construction to train all of the people now needed to form the new low carbon workforce that we need.

Without a clear plan to tackle low carbon in construction, it is little wonder that, to date, the majority of UK government funding for low carbon skills and training has been focused on supporting industrial approaches. Moreover, these approaches almost exclusively address the supply side of the equation, such as carbon capture and storage and off-shore wind power – which are some of the most expensive ways of reducing carbon emissions compared with energy conservation in the built environment.

To try to address this gap, CIBSE, together with the Royal Academy of Engineering and the University of Bath, is presently engaged in a skills survey of the construction industry. The survey, to be conducted by Ipsos MORI, aims to establish the extent of skills that are presently available to deliver low carbon construction and the additional skills that will be required to deliver our ultimate commitment.

This is the first time that such a comprehensive survey has been attempted, and the results should be of great value in determining future directions for institution policy, training and education and to inform government policy on the low carbon built environment.

The survey will be sent to all practices registered in the CIBSE Directory, CIBSE Patrons and a range of other consultants and contractors. If you receive a survey questionnaire from Ipsos MORI in the next couple of months, please do make an effort to provide a complete and accurate response.

If you don't receive a questionnaire, but have specific experiences relating to low carbon skills which you think should be included, please contact the author at the email address below. The better the quality of the responses we receive, the more persuasive will be the arguments that we can put to government to support the vital work of upskilling our workforce. ●

WEB LINKS

www.cibse.org

www.raeng.org.uk

For Low Carbon Housing: Lessons from Elm Tree Mews, visit the Joseph Rowntree Foundation at **www.jrf.org.uk/publications**

Blueprint for UK Construction Skills 2010 to 2014, visit the Construction Skills Network at **www.cskills.org/supportbusiness/businessinformation/csn**

Building the Future Today, visit the Carbon Trust at **www.carbontrust.co.uk/publications**

UK government departments: **www.decc.gov.uk www.communities.gov.uk www.bis.gov.uk**

Doug King is principal of King Shaw Associates

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BSkyB/Arup

This computer-generated 3D image shows the flow of natural ventilation within the new BSkyB television studios within the Harlequin 1 development

Getting on the air ...naturally

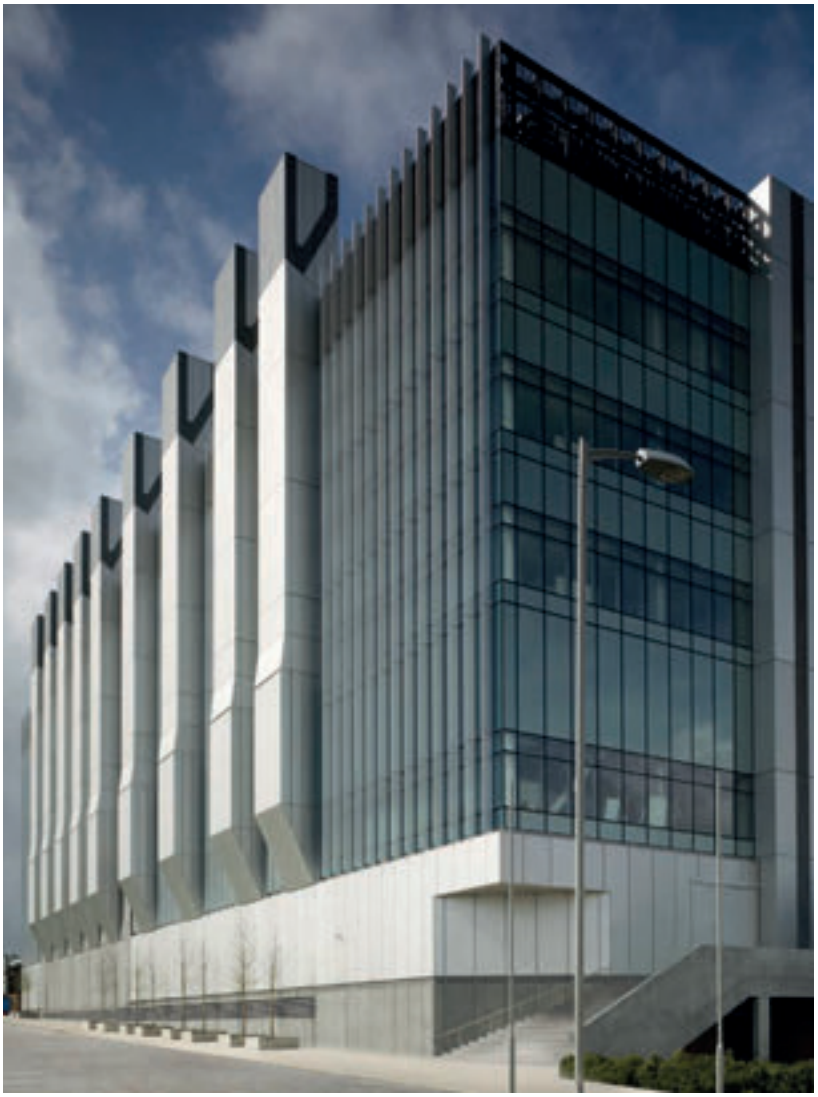
Broadcaster BSkyB's new London base can boast the world's first naturally ventilated television studios, whose concrete boxes within boxes offer an innovative solution to combat the influx of noise and heat. **Andy Pearson** reports

A grim industrial estate in Osterley, West London, is not the most obvious location for a building claimed to set an international benchmark for sustainable architecture. Nevertheless, located between the catering suppliers, bearing distributors and storage depots is BSkyB's new broadcast facility. The satellite television company is known for its live sports coverage. It is less well-known for its environmental commitment; yet BSkyB has been carbon neutral since 2006, and it has committed to cut its CO_2 emissions by 25% by 2020. Its new £250m production centre, Harlequin 1, is an important part of this plan.

Designed by Arup Associates, the centre is currently being fitted out and is expected to be fully operational by 2012, using a third less energy than a conventional facility. As a result, the four-storey structure features all kinds of low carbon technologies, including: a biomass-fuelled combined cooling and heating plant (CCHP); heat-recovery systems on every possible application; wind turbines; and a rainwater-harvesting system for toilet flushing. But what makes this scheme different from any other TV production facility is that it houses the world's first naturally ventilated television studios.

'This is the first time a studio can be used for open-mic recording while being naturally ventilated,' says Mike Beaven, head of building services and environmental engineering at Arup Associates.

There are good reasons why television studios are not usually cooled using natural ventilation – the amount of heat generated by the studio lights means vast quantities of air are needed. And with the air comes another problem – the noise that is both generated by movement of the air itself and by break-in from outside the studios. It is a task made all the more challenging



Christian Richters

> BSkyB's new £250m production centre in west London will be fully operational by 2012

Christian Richters

Ventilation chimneys and air-handling units in the roof serve the studios. Below: the chimneys rise prominently from the structure

Christian Richters

> because of the site's proximity to Heathrow.

The building's eight studios have strict acoustic criteria of Noise Rating 25, which makes them significantly less noisy than the NR 38 of a typical office. To eliminate external noise, the studios are housed within a large concrete box that is enclosed within a second, larger concrete box but isolated from it on rubber mounts. Arup's ventilation solution has been to use the studio's box-within-a-box construction to its advantage. From street level, air is supplied through a giant, acoustically lined labyrinth constructed between the underside of the studio's concrete floor and the floor of the surrounding box.

This form of construction allows the air paths to be big enough to minimise resistance to air movement. To eliminate all noise, the labyrinth is designed to ensure sufficient attenuation before the air enters a studio. Air is supplied through grilles mounted on up-stands at the foot of three of the studio's walls; a solution that will ensure the ventilation will still function even if a set is positioned in front of the wall. 'We did a lot of computational fluid dynamic stuff to demonstrate how the solution would work,' says Beaven.

Exhaust air is less of a problem. Once inside the studio, air is warmed by the lights (which emit up to 500 W/sq m of heat), four cameras and other equipment. This waste heat drives the system. The warmed air rises to the ceiling, seven metres above, from where it is drawn 40 metres up to the building's roof by one of 13 giant chimneys. As the air rises, it pulls in cool fresh air through the attenuated underfloor ducts.

Nine ventilation chimneys line the building's eastern

elevation, with four on the west, adding some relief to the building's otherwise nondescript facade. The chimneys have a concrete base section to prevent noise break-in at studio level. Higher up, concrete construction gives way to more conventional cladding.

It is not possible to use natural ventilation all of the time. When it is too hot or cold outside, the system can be flipped to mechanical ventilation mode at the flick of a switch. In this mode, a conventional ducted system pushes cooled air into the studios through adjustable high-level diffusers, with the chimneys now functioning as return air ducts. Dampers at the top of each chimney return the air to the roof-mounted air-handling units for energy recovery, rather than allowing it to escape into the atmosphere.

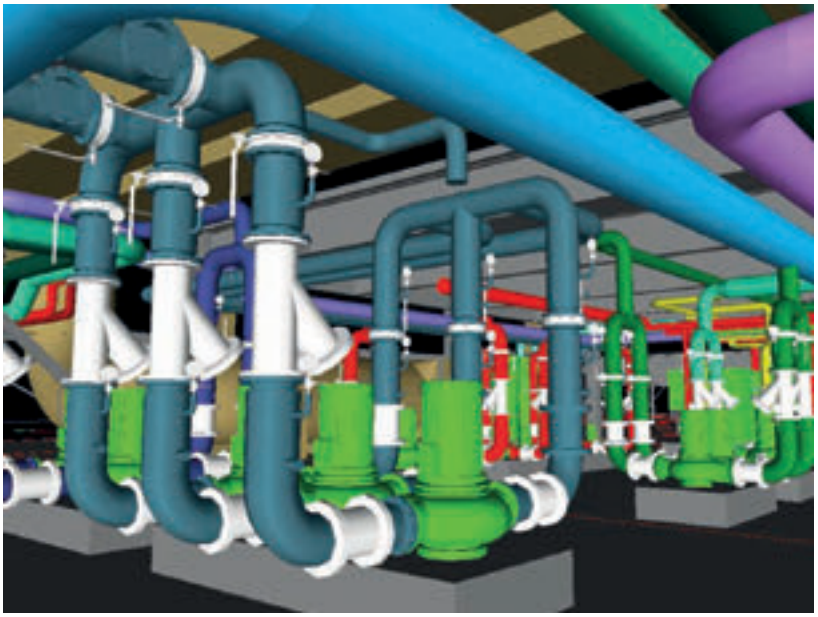
Between the mechanical and natural ventilation modes is an intermediate mode. This has been introduced to solve a common stack ventilation problem: air cooling in the flue and dropping back into a room, caused by the flue lining being too cold. To stop the warmed air cooling on its roof-ward journey, the flues are lined and insulated on the inside. In the intermediate mode the system will run on extract only, pulling the air up the chimney to warm it. Once the flue reaches the correct temperature the system will turn off and the air's natural buoyancy will take over. 'We took a lot of care over the flue design and its insulation to ensure we maintain the right surface temperatures,' says Beaven.

> National Air Traffic Services objected to the turbine's location on the flight path into Heathrow

The studios are not the only space in the 20,000 sq m building to use outside air for cooling: the building's offices feature a natural ventilation mode, while the eight data centres make extensive use of fresh air for cooling. The naturally ventilated studios occupy most of the building's ground floor. In the centre of the two middle floors are the main data centres, production facilities and editing suites, while wrapped around the perimeter of these floors is office space for the broadcaster's 1,370 staff. The upper floors contain the transmission platform for Sky's 160 channels. A glazed atrium at the south end of the building allows access between levels, and it houses a series of meeting rooms, a cafe and breakout spaces. 'BSkyB was clear that it wanted people on the outside of the building, and for the "dark" spaces to be used for editing suites and data processing at the centre of the floors,' explains Beaven.

The building's initial design was adapted to enable the first and second floor office areas to be naturally ventilated, as part of a process led by BSkyB's non-executive chairman James Murdoch to enhance the building's environmental credentials. The office areas on the west elevation are only eight metres deep, and are ventilated using single-side natural ventilation, which works by opening high-level windows and low-level louvres. At 15 metres, the offices on the eastern side are too deep to ventilate using this system. Instead, three atrium-like chimneys have been punched through the centre of the building to help draw air across the floor plates. Glazed rooflights fitted with modulating louvers allow the air to be exhausted. These louvres are acoustically lined to prevent noise from low-flying aircraft, roof-top plant and the building's wind turbines from entering the offices. This unusual solution has the additional benefit of allowing natural light in.

Like the studios, the offices are fitted with a mechanical ventilation system, with air supplied through an underfloor displacement system. A traffic light adjacent to the window and internet alerts will let staff know when the mechanical system is off and windows can be opened manually. >



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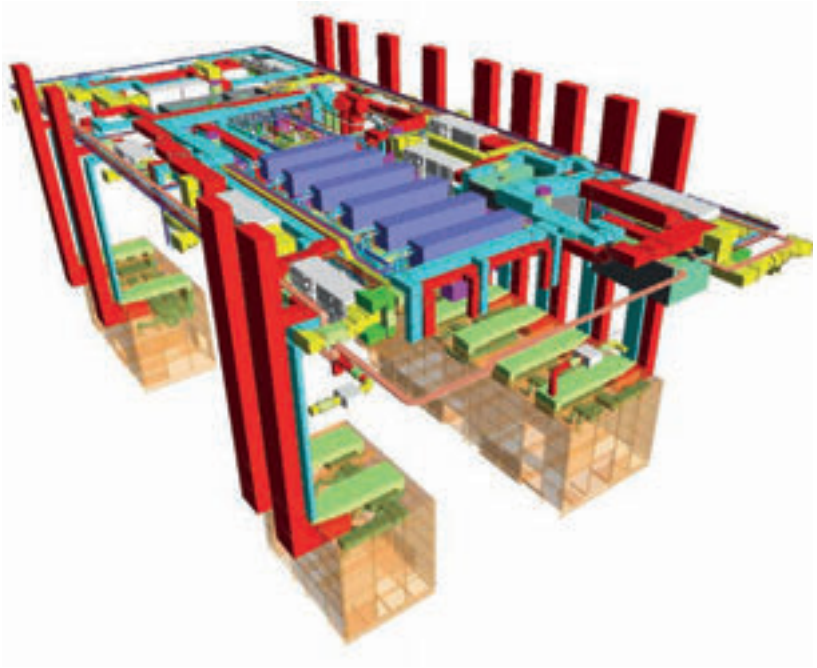

The computer image above shows the services in the plant areas on the roof. The one below shows the connection between studio services and the roof air-handling plant. Arup says that using 3D designs were essential to being able to coordinate the roof services

> The building's data centres will also use outside air for cooling. Unlike conventional data centres, which use minimum amounts of fresh air to keep the loads constant, BSkyB has specified more than 400 servers able to cope with minor temperature variations to enable the rooms to be cooled using outside air whenever possible. It is a simple solution, with fresh air ducted to a mixing box on the computer room air conditioning (CRAC) units' intake. A pressure relief duct and extract fan allows the system to remain balanced when operating in full fresh-air mode.

All this natural ventilation has helped the building's design to exceed the minimum requirements of Part L2A, 2006, by 67%. It has been awarded an Energy Performance Certificate A rating, which Beaven expects to rise to A+ once the CCHP and wind turbines are installed (see box). On paper it is an impressive achievement, and the solution appears to be robust, but will it live up to expectations? The big question is whether or not Sky's studio operators will utilise the natural ventilation option, or whether they'll default to the safe alternative of mechanical ventilation. If they do embrace the natural ventilation system, without a similar scheme for comparison, it will be a steep learning curve for the users to get the best out of the system under both summer and winter conditions. ●

"All this natural ventilation has helped the building's design to exceed the minimum requirements by 67%"

Christian Richters

Energy Keeping the studios running round the clock

Wood

BSkyB was keen for the building to exceed the 10% renewable energy target in place at the time, even though the site is outside the GLA's jurisdiction. This will be achieved using a 1MWe CCHP system, currently being installed close to the site's perimeter. The solution is compatible with the building's 24-hour operation and its continuous demand for electricity and cooling. All the power, heat and cooling are utilised by the building which, as a result, does not have boilers or a gas supply.

Mike Beaven, of Arup Associates, says that there is no point in having on-site generation 'if it is going to produce much more carbon than buying power from a wind farm'. As a result, the CCHP will derive its energy from biomass, which should ensure the building's carbon emissions are reduced by at least 20%. However, like every other system on the site, the CCHP is backed up with a full contingent of generators and chillers.

Wind

In addition to CCHP, the site will also make use of wind power. The scheme has planning permission for two giant wind turbines situated in front of the building's northern facade. It was touch and go whether these would actually be given planning permission. An extensive planning process addressed concerns including light-flicker from the turbines, birds, bats and noise, but the biggest challenge was National Air Traffic Services (NATS). It objected to the turbine's location on the flight path into Heathrow on the basis that turbine blades reflect radar. NATS was eventually persuaded to withdraw its objection and permission was finally granted.

At 100kW each, the two turbines are expected to provide enough energy to meet the building's lighting load. However at 56 metres high, the turbines are also significantly taller than a standard turbine to ensure 10 metre clearance beneath the turbine's blades and the building's roof. The turbine bases have already been built and Arup has produced a sculptural design for the extended towers. All that remains is for the manufacturer to finalise the turbine's design for this unique application.

Electrical

The building's entire power supply system is designed as an N+N installation – everything is doubled. Two 11kV ring mains serve the building, so that if one fails the other will pick up the entire load. There are eight transformers; four will support the building's 8MVA maximum load. Should the power supply fail, the in-line UPS system has double the number of units needed to support all the equipment, and more than is needed to continue broadcasting until the standby generators kick in. There are four 2.5 MVA generators, three to support the building load, plus a spare in case a generator should fail – and space for two additional generators should the building's load increase further.

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Wembley fire station underwent a major refurbishment

Measuring change

A London fire station underwent an energy efficiency improvement programme two years ago. So how has it fared? In the third in a series of CIBSE-sponsored building-performance case studies, **John Field** and **Alexandros Balaskas** assess the outcomes and what more can be done to improve performance

The London Fire Brigade (LFB) put in place an energy initiative in the 1990s, and set itself a target of radically reducing carbon emissions. As part of the programme, in 2005 the LFB injected £4.4m into improvements to energy efficiency across all the fire stations. Under this scheme, Wembley fire station in north-west London underwent a major refurbishment in 2008.

The original three-storey Wembley station was erected in 1939 and is classified as a Grade II-listed building. The station shares the site with two additional buildings, both constructed in 1960: the Borough Command Headquarters and a training block known as the Life Building. The gross internal area of the whole site is 2,429 sq m.

As part of the refurbishment, a photovoltaic (PV) system was installed to provide renewable electricity for the running of the station, including lighting and space heating. A solar hot-water heating system was installed, and changes were also made to pumps and lighting to increase their efficiency.

In 2010, CIBSE commissioned Power Efficiency, >

Existing measures, with projected energy savings made	Electricity savings estimate (kWh/yr)	Gas savings estimate (kWh/yr)	Carbon dioxide saving (te CO_2/yr)	Cost saving (£/yr)	Guide price (£)	Simple payback period (yrs)
Photovoltaic (PV) or solar generation	10,000		5	1,000	27,500	27.5
Solar water heating		2,900	1	80	5,000	62.5
Installation of variable speed drives on selected pumps	1,000		1	100	250	2.5
Lighting level review and reduction	11,800		6	1,060	3,500	3.3
Staff engagement – estimated outcome	**4,500**	**10,000**	**4**	**3,600**	**1,000**	**0.3**
Totals	**27,300**	**12,900**	**17**	**5,840**	**37,250**	

Figure 1: Measures in operation, with projected energy savings made, projected payback periods and expected savings to be made

Recommended further measures, with estimated energy and cost savings	Guide electricity savings (kWh/yr)	Gas electricity savings (kWh/yr)	Carbon dioxide savings (te CO_2/yr)	Cost saving (£/yr)	Guide price (£)	Simple payback period (yrs)
Installation of ground source heat pump	–33,000	176,000	14.8	1,900	50,000	26
Voltage optimisation	**9,000**		**4.8**	**900**	**9,000**	**10**

Figure 2: Recommended further initiatives. The figures shown are estimates of what savings could be made through the adoption of these measures

	Metered energy		Benchmarks	
	Actual	Adjusted	Good practice	Typical
Electricity kWh/sq m	75	79	55	80
Non-electricity kWh/sq m	184	184	385	540
Carbon kg CO_2 emissions/sq m	74	76	101	143
Building total Kg CO_2	**180,511**	**185,729**	**244,746**	**347,007**
Building total cost (£)	**31,626**	**32,597**	**41,414**	**58,782**

Figure 3: Comparison of electricity use and carbon emissions with benchmarks

> an energy management consultancy, to conduct an assessment of the impact of these improvement measures on the energy efficiency and carbon footprint of the Wembley site. The commission was the result of CIBSE's ongoing programme of investigations into real-life building performance. The detailed analyses of the overall energy use and performance of heating, ventilation and other systems were undertaken using the CIBSE TM22 procedure.

The energy saving measures taken as a result of the refurbishment have been shown to have produced substantial projected savings – see Figure 1, above. These measures were the installation of photovoltaics and solar-powered water heating. In addition, a staff-engagement programme was introduced to help improve energy management, which produced notable estimated savings.

Together, these three changes have produced assessed annual cost savings of nearly £6,000, within a range of identifiable payback periods (Figure 1).

Power Efficiency also recommended a range of further energy saving measures that could be undertaken at the site. These were the installation of a ground-source heat pump and the application of voltage optimisation. Projected savings are shown in Figure 2.

Below, we look in more detail at the impact of the refurbishment measures taken at the site. We also explain our recommendations for further improvement. But first, let's look at the metering arrangements.

Energy consumption

Metering arrangements at the site comprise one non-half-hourly meter for imported electricity and one meter for gas used on site. In addition there are four non-half-hourly sub-meters dedicated to metering the Life Building, the main boiler plant and appliance bay space heaters, and associated gas consumption. A single non-half-hour meter logs the imported consumption from the PV installation. Fiscal metering data is uploaded to the supplier's web portal and can be interrogated remotely by the LFB.

Energy generated on site by the PV system has reduced the amount of imported electricity. Electrical energy generated by the PV system since installation in 2008 was, at the time of the study, 20,900 kWh, therefore averaging in the order of 10,000 kWh per year, representing a contribution to the electrical income of 6.2%.

The total electricity consumption for 2008 was 194,728 kWh plus the estimated 10,000 kWh, which resulted in a combined total of 204,728 kWh, whereas the total electricity consumption for 2009 was 180,968 kWh plus the estimated 10,000 kWh, thereby resulting in a combined total of 190,968 kWh. The above totals indicate an overall reduction in the sites' total electrical consumption of 13,760 kWh (6.7%).

Gas is consumed on site by five gas-fired boilers, two space heaters, and the kitchen appliances. The total gas consumption for 2008 was 477,182 kWh. In 2009 it dropped to 446,067 kWh, a fall of 6.5%.

A comparison of the metered energy use at the site with 'Good Practice' and 'Typical' benchmarks is shown left (Figure 3).

Existing improvements

Photovoltaics: The fire station has a photovoltaic (PV) system which generates 11.3 kW of renewable electricity, and has a predicted average annual output of 10,000kWh. This represents an annual emissions saving of 5 tonnes and an annual cost saving of £1,000, increasing to nearly £5,000 with the benefit of electricity feed-in tariffs. These figures are based on an electricity charge of 10p per kWh.

Half the cost of the system was covered by an Energy Efficiency Loan, leaving the LFB with a bill of £27,500. This produces a payback period of 27.5 years, but this timescale has been reduced considerably as a result of the introduction of feed-in tariffs in April 2010.

Solar heating: The site has a solar-powered water-heating system, using evacuated tube collectors covering an area of 5 sq m on the roof of the Life Building. The system has not been monitored, but it is capable of cutting annual gas consumption by 2,900 kWh, saving an estimated £80 a year. This would also reduce CO_2 emissions by 0.5 tonnes a year. With these cost savings, the payback period for the system is estimated at 36 >

years, based on the installation cost of £2,900 (which was also subsidised by a 50% Energy Efficiency Loan).

Staff engagement: The London Fire Brigade recognised that the co-operation of staff at all levels was vital in order to maximise the full potential of the energy efficiency initiative through actions such as correct operation of equipment, reporting of faults and providing suggestions for further energy saving measures. It therefore developed a formal Green Champions training course covering the broad theme of saving energy. This staff-engagement initiative is estimated to make potential energy savings of about 2.5% of electricity consumption per year. No gas savings are attributed to this measure because gas savings are associated with improved boiler control and scheduling which is not in the control of the occupant.

Variable speed drives: The LFB's site refurbishment overview confirmed that the primary heating pumps were not fully loaded and spent a significant amount of time running part-load. This was avoided by installing variable speed drives that would match pumping with demand. Operating a fan at 50% volume flow at time of low occupancy saves virtually nothing with conventional drives but typically 75% of energy use with variable speed drives – on this basis, and with low occupancy occurring for six hours out of 24, the average energy use of the fans would reduce by 25%. Achieving a 25% reduction results in a saving of 950 kWh of electricity a year, which would save an estimated £95 a year. The measure would also cut annual CO2 emissions by 0.5 tonnes.

Lighting: This was largely provided by ceiling mounted fluorescent lamps, which used older switch start control gear. On the advice of the lighting designers, it was decided to completely rewire the site's lighting installation and fit new modern efficient fluorescent fittings (T5) with automatic movement detection. The new installation provides considerable energy savings compared to switch start units, which also reduces replacement costs as lamp life is extended. The changes have saved about 11,800 kWh per year and the associated saving in carbon dioxide emissions is 6.3 tonnes per year. Energy use by the new lighting installation for the Wembley site is assessed at 118,000 kWh per year. Consequently the lighting upgrade together with motion detection has delivered a saving of around 20%.

Recommendations

The following two measures were recommended by Power Efficiency as additional improvements that could be undertaken in the longer term (see Figure 2).

- **Ground source heat pump:** GSHPs are used to extract heat from the ground to provide space and water heating to both individual houses and any type of non-domestic building. The potential savings from a GSHP are strictly associated with its coefficiency of performance (COP); assuming a COP of 3.2 for a GSHP, the potential savings could be estimated at 40% of the fuel consumption. A change from gas boilers to a GSHP at the Wembley site would result in an increase in the annual electricity consumption by about 42,250 kWh. However, annual savings in gas usage would total 176,000 kWh, saving £5,280 a year. With installation costs of £50,000, the payback period would run to 10 years. Estimated CO2 emissions cuts would be 34 tonnes a year.
- **Voltage power optimisation:** VOP is managed reduction in the supplied voltage at the recipient site, to reduce energy use, power demand and reactive power demand.

The potential savings at Wembley fire station are strictly associated with the current site voltage and the scope for reduction. Consequently, assuming a potential saving of 5% was available, this could produce an overall annual saving of 9,000 kWh, or £900 a year. The estimated £9,000 cost of the system would have a payback period of 10 years. There would also be a cut in annual CO2 emissions of 4.8 tonnes.

Power Efficiency

A range of energy saving measures at the fire station site have produced a number of projected savings

Conclusion

The energy and carbon-saving measures adopted at the Wembley fire station site since 2008 have clearly had a major impact. For CIBSE, the lessons learnt from these findings will provide key insights for both energy assessors and the wider engineering community involved with such green-building developments.

In 2009, the fire station achieved a Display Energy Certificate grade of D. Power Efficiency has found that additional improvements would also help to reduce cost and emissions further – albeit with considerably longer payback periods. The installation of a ground-source heat pump would produce substantial extra savings from reduced gas consumption. A second new measure, voltage power optimisation, would notably cut the electricity bill.

The findings and recommendations will, hopefully, provide engineering professionals and low carbon building assessors with insights that will help them to provide effective energy efficient solutions in future. ●

John Field and **Alexandros Balaskas** work for Power Efficiency, which gratefully acknowledges the valuable support of Niel Roake, energy consultant, and the helpful co-operation of Ian Shaw of London Fire Brigade and the Wembley Fire station staff.

Get the full report

For the full survey report, go to the digital version of the February 2010 *CIBSE Journal* at **www.cibsejournal.com** Previous survey reports can be found with the June and October 2010 digital editions. To obtain a copy of CIBSE's TM22: Energy Assessment and Reporting Methodology, visit **www.cibse.org/bookshop**

Battersea power station on the banks of the River Thames in south London – which went out of use many years ago – once supplied heating to the local district

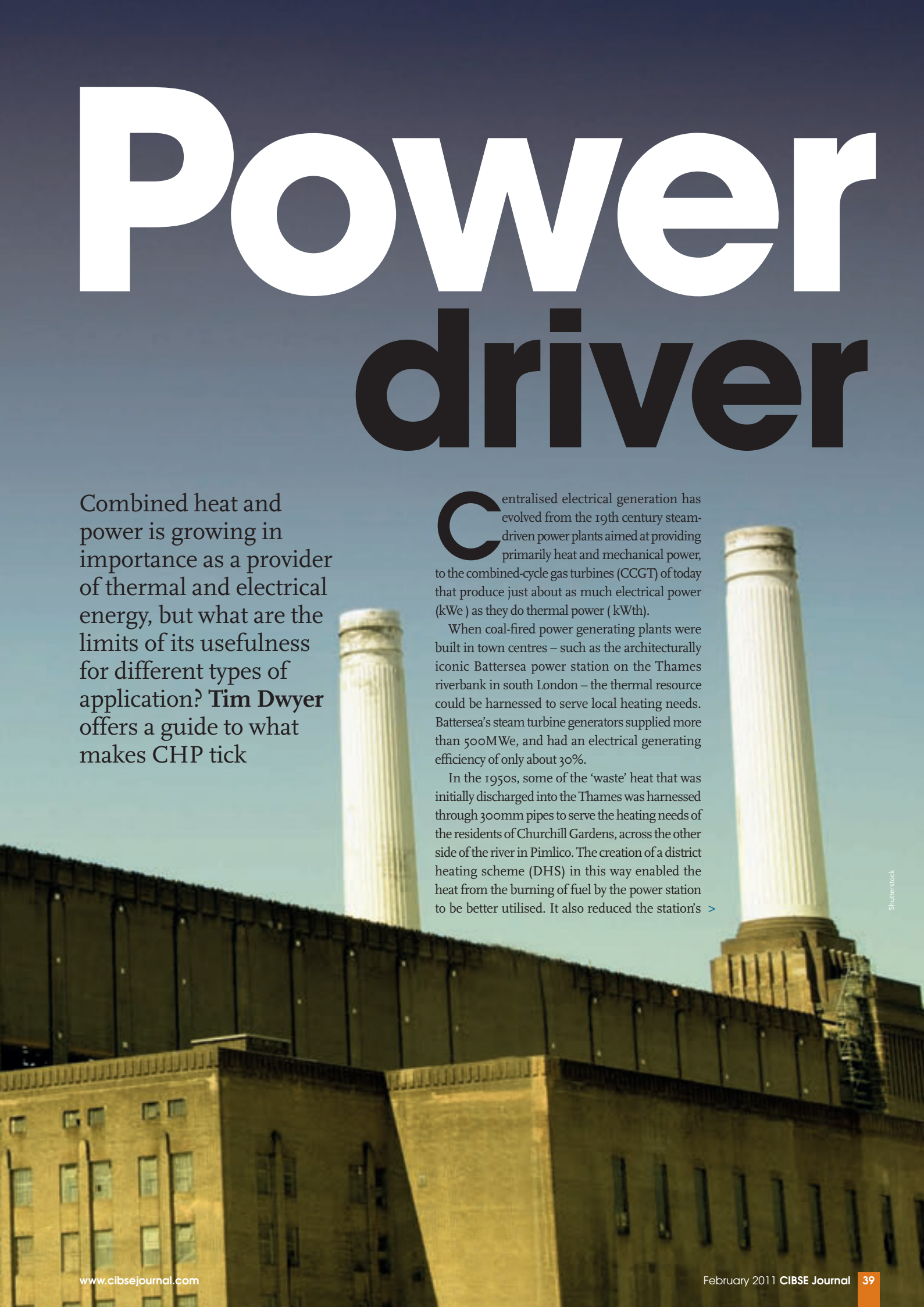
Power driver

Combined heat and power is growing in importance as a provider of thermal and electrical energy, but what are the limits of its usefulness for different types of application? **Tim Dwyer** offers a guide to what makes CHP tick

Centralised electrical generation has evolved from the 19th century steam-driven power plants aimed at providing primarily heat and mechanical power, to the combined-cycle gas turbines (CCGT) of today that produce just about as much electrical power (kWe) as they do thermal power (kWth).

When coal-fired power generating plants were built in town centres – such as the architecturally iconic Battersea power station on the Thames riverbank in south London – the thermal resource could be harnessed to serve local heating needs. Battersea's steam turbine generators supplied more than 500MWe, and had an electrical generating efficiency of only about 30%.

In the 1950s, some of the 'waste' heat that was initially discharged into the Thames was harnessed through 300mm pipes to serve the heating needs of the residents of Churchill Gardens, across the other side of the river in Pimlico. The creation of a district heating scheme (DHS) in this way enabled the heat from the burning of fuel by the power station to be better utilised. It also reduced the station's >



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environmental impact. These twin aims – efficient fuel use and reduced environmental impact – have driven the development of smaller-scale energy and heat generation systems that have become variously known as combined heat and power (CHP), cogeneration or total energy systems. (See CIBSE Guide F 2004, *Energy efficiency in buildings*, section 5.3.)

The use of CHP has grown steadily in the UK in the past 20 years, mainly in industrial plants. This growth followed the Energy Act of 1983, which encouraged the use of decentralised electricity generation. The 1986 Gas Act and the 1989 Electricity Act also opened up the market for the reselling of electricity and gas to end-users.

Uses of CHP

A CHP plant would typically be sized to meet the base heat load of the buildings that it serves; it would also act as the 'lead boiler'. The operation of the plant may be optimised with the use of appropriate controls and equipment so that heat and power can be applied usefully above the base load. The key principle for efficient operation is to ensure that there is a useful application for the heat.

Large-scale CHP systems – generally defined in the UK as those above 2MWe – employ reciprocating engines or gas turbines, and can be used to serve a group of buildings, industrial applications, or a district scheme.

Big industrial facilities such as factories may be powered by steam boilers and turbines primarily providing power and steam at the temperature and pressure required by the industrial process. By contrast, high-efficiency electricity-generation plants can use condensing turbines that convert the maximum practical power to electricity by only rejecting low-grade heat.

The efficiencies of electricity-generating CCGT power plants are significantly higher when used on a large scale for supplying electricity to the national grid, compared with the use of smaller, local CCGT schemes that supply (local) CHP plants: the thermodynamic efficiency of electrical generation in these smaller, localised schemes will be reduced because some of the heat will leave the process at a higher temperature in order to serve the heating loads being met by the CHP system – and this will reduce the thermodynamic efficiency.

However, this does not mean that the high efficiencies of CCGT in centralised power production cannot be achieved when CCGT is used locally for CHP systems. The use of

Analysis Challenging times for CHP specifiers

Why use a CHP plant at all to generate electricity if electricity is readily supplied by the grid? This is a reasonable question, particularly if your evaluation of the efficacy of specifying a CHP includes a financial assessment of the installation and its ongoing operations/maintenance costs; and if space requirements and carbon-footprint considerations are taken into account.

The comparison on space requirement again will be reasonably clear, with the CHP plant and distribution equipment replacing at least some of the traditional local heat generation boilers and storage. In the case of a bio-fuelled CHP plant, space and access for fuel storage and delivery would also need to be included.

However, assumptions made in predicting the 'utilisation factor' – the hours when a CHP may effectively be used to both supply heat as well as generate electricity – can significantly affect the assessment. The density of the heat demand will also influence how effectively the heat may be distributed.

The methodology for financial calculations – by comparing net present value (NPV) of whole lifecycle cost – is well understood. The CHP costs would include the plant and associated infrastructure of, for example, fuel supply, district heating scheme and consumer heat exchangers. Basic operating costs will be dominated by fuel prices and electrical-generation efficiency. Maintenance also must be taken into account. Despite all these calculations, uncertainties arise from presumptions of utilisation and distribution inefficiencies – in other words, how and when the CHP plant will be operated.

Determining comparative carbon footprints of centralised electricity generation compared with local CHP systems, appears to be one of the most challenging issues facing engineers. Not only is this a function of several assumed efficiencies in the fuel-to-power/heat transformation, it is also related to the utilisation factor.

It is difficult to be precise as to the 'real' CO_2 emissions of the grid as, for example, at the point of generation, the carbon impact of gas turbines is around 0.37 kg CO_2/kWe, whereas coal is 0.87 kg CO_2/kWe and wind and nuclear are (nominally) 0 kg CO_2/kWe.

The currently accepted representative value (of annually averaged grid fuel use) for UK electricity (at the point of use) is 0.54 CO_2/kWe. Well-operated natural gas-fuelled CHP plant would have a similar value but would additionally be providing a local supply of heat.

Further clouding attempts to compare CHP installations with the average grid CO_2 emissions is the mechanism to assure 'good-quality' CHP: the CHPQA scheme and its applicability to EU legislation. The implementation of the European Cogeneration Directive that regulates CHP performance should involve comparing the efficiency of a CHP plant with the 'same fuel categories'. This would appear to require that the performance of gas-fuelled CHP plant be compared directly with gas-fuelled grid generation.

As seen in Huw Blackwell's article 'Sustainability without the hot water' in the August 2010 issue of *CIBSE Journal*: 'local CCGT CHP + end-user heat pump' is comparable with 'grid CCGT + end-user heat pump' systems. This is due to the utilisation of the heat in the local plant that would otherwise be rejected back into the environment.

So, if the grid was able to produce electricity with an average CO_2 footprint approaching that of CCGT, then the case for local natural gas-fired CHP could be considered as being marginal. However, the basket of fuels that are currently serving the grid produce almost 50% more CO_2 than this grid CCGT example; and so it could be argued that whilst the grid is in its current state, such an application of CHP is clearly preferable in CO_2 terms.

Until the grid is 'decarbonised', appropriate application of CHP can continue to provide opportunities for effective energy production, together with potential social and economic benefits. However, this will need informed pragmatic integration into systems, and should not be driven or precluded by preconceptions and dogmatic positions.

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> appropriate innovative design can ensure that generated heat is utilised. But, without such innovation, there remains the risk that the loss in heat efficiency of a local CCGT system could negate the efficiency gains of the CHP installation.

Heat-to-power ratio

CHP is normally 'heat led', operating when there is a demand for the heat. CHP systems have evolved from systems predominantly used as a heat engine supplying steam and the hot water needs of manufacturing processes. The heat-to-power ratios of these steam turbine machines would have typically been in the order of 6:1 (if not greater). This means that, for every kWe of electrical energy produced, there would have been at least 6kWth of heat.

For industrial processes where there may be a need for heat or large amounts of hot water, this can provide a suitable solution. However, when considering modern building developments that are highly insulated and have low heating demand, many require heat-to-power ratios far closer to 1:1. This shift in application of CHP, combined with the lowering of costs and improved manufacturing capabilities, has significantly altered the profile of CHP installations in the past 30 years.

It is generally quoted that, to provide a return on investment in the capital plant and maintenance of a larger CHP installation, the CHP plant needs to operate for at least 4,500 hours per year (just over 50% of the hours in a year). The challenge is to ensure that there is sufficient demand for heat over that period so that the CHP plant will operate effectively.

Manufacturing facilities account for about 90% of CHP installations, in terms of installed capacity. Applications such as hospitals, leisure centres with pools and manufacturing facilities where there has been a particular need for steam or heat, account for most of the remaining 10%.

To extend the number of useful operational hours, installations can shift the load. The Pimlico housing scheme, mentioned earlier, now uses dedicated local CHP plant. This is combined with a 2,500 tonne water thermal store to level out the heat demand and to improve utilisation.

A recent example of a large-scale CHP plant installation – comprising two, linked energy centres – is that supplying the new Olympic Park in east London. Part of the heat output for the Olympic Park scheme will be used to drive absorption refrigeration systems, making this a trigeneration scheme: combined cooling, heating and power (CCHP).

The CHP plant will provide 9.3MWe of electricity using gas-fuelled CHP. High utilisation will be maintained by supplying a mix of building types (leisure, residential and retail). This provides a solution to the challenge that all CHP systems face: to find an application for the heat when there is a reduced need for local hot water or heating in specific individual building types.

Well-operated modern CHP installations such as these should be able to operate at around 35% electrical efficiency and 45% thermal efficiency.

It could be argued that CHP plants predominate in new developments, and in existing ones such as hospitals and leisure centres, because these are the 'low-hanging fruit', the easy pickings, for CHP installations: brand-new >

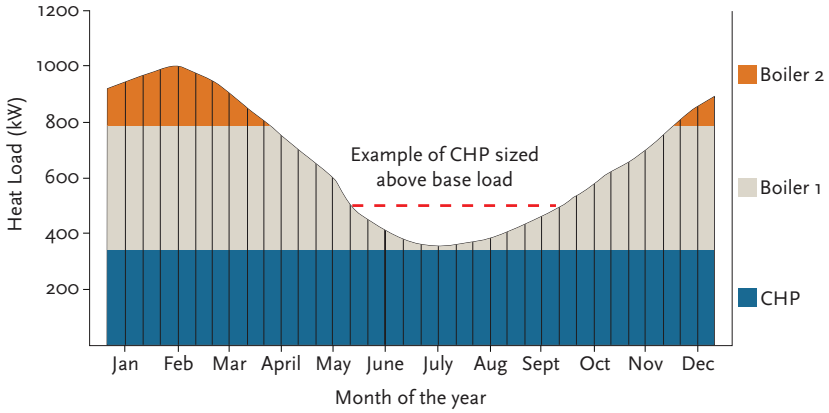

Figure 1: Sizing a CHP plant. ***(Source: GPG 176: Small-scale combined heat and power for buildings, BRECSU 1996)***

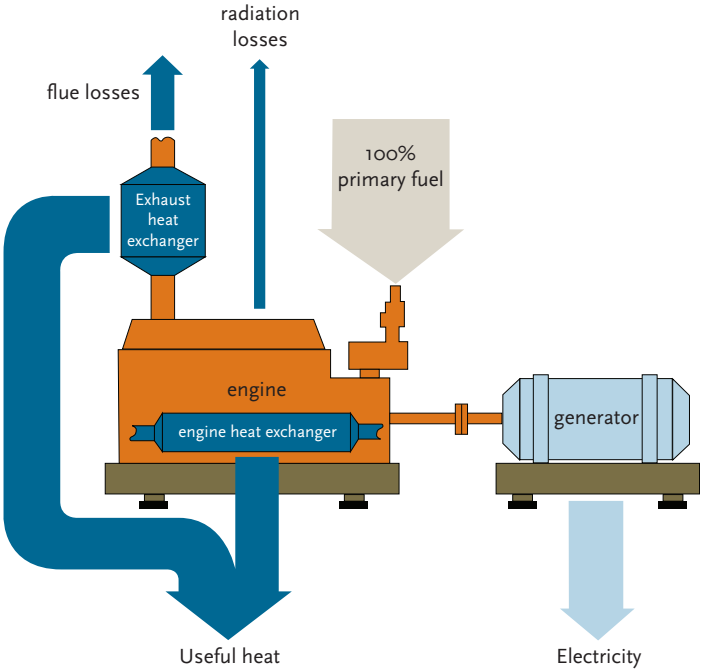

Figure 2: Simplified schematic of a CHP plant

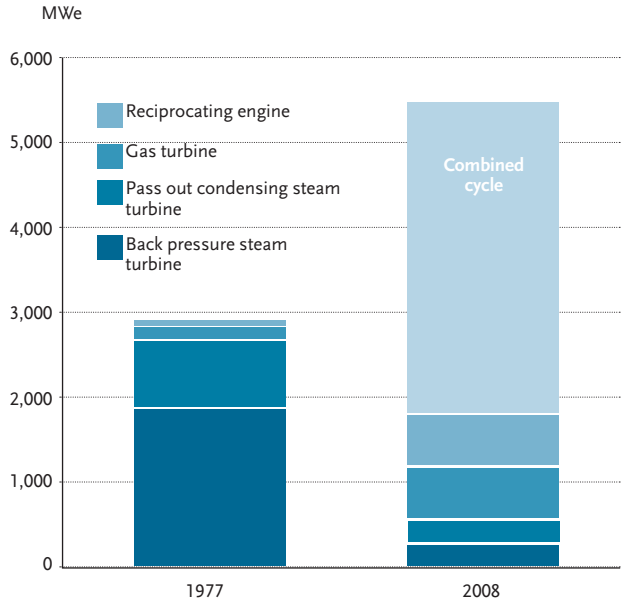

Figure 3: Types of CHP Installations 1977 and 2008 (60th Anniversary Digest of UK Energy Statistics, DECC 2009)

or already-installed infrastructure, alongside high water loads, which help to make CHP a cost-effective solution. However, when considering long-term 'life-cycle' costs, CHP may be economically less attractive for large-scale district heating systems for existing small towns or larger communities, which can require a great deal of investment in new infrastructure. There is also the question, here, of the potentially huge social disruption arising from the construction work that may be needed for such district heating installations. Having said that, with appropriate planning and integration, DHSs are being successfully installed in Britain – one example being a scheme in Sheffield that serves around 130 buildings in and around the city centre. One could say it comes down to 'horses for courses': if the capital costs can be borne, the infrastructure is successfully developed, and the loads are appropriate, CHP can be an ideal solution for district heating.

Micro-CHP

In recent years, micro- and mini-CHP has entered the marketplace. Mini-CHP based on, for example, Stirling Engines or microturbines, can provide small (up to 5kWe) systems for use directly in homes and small commercial applications. Larger mini-CHP systems (up to 50 kWe) typically use gas-fired reciprocating engines for bigger installations such as residential schools, hotels and leisure centres. However, these developments are still small in number, and it will be some time before the efficacy of these can be assessed in terms of performance, cost and efficient use of energy.

Conclusion

CHP systems are being widely applied, from industrial factories to homes. There are also various combinations of mixed users, local communities and major developments. It seems that the challenge for engineers and specifiers of CHP is to design a system where the application is using up as much heat as possible when it is generating electricity. This would suggest that the bigger and more diverse the 'basket' of users of the CHP installation, the more 'flat' the thermal load will be compared with the electricity load.

Sometimes there is pressure to use a CHP or CCHP system to satisfy planning requirements. It is important that this is done while taking full account of the engineering requirements, as it is possible to install a CHP system to meet 'low carbon' targets and find that the operating profile undermines the 'low carbon' performance.

The extent to which designers will be able to undertake a full design evaluation of a new CHP installation will often depend on the time and resources available – which will sometimes be down to how much the client or end-user is prepared to pay or listen. Ideally, though, designers should be in a position where they are able to stand back and undertake a proper engineering appraisal of a CHP's efficacy and appropriateness for the scheme or development they are involved with. ●

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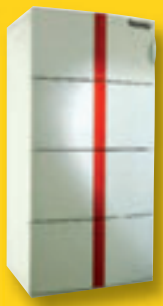

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Digging deep for a solution

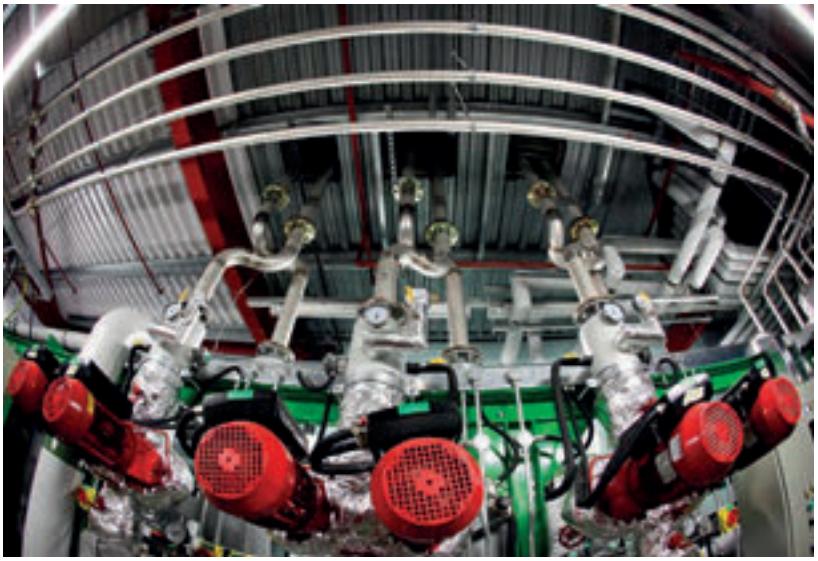
A supermarket has adopted an unusual process for providing energy for instore cooling. **Kevin Stickney** of Greenfield Energy explains how the technology works

The Sainsbury's store in Crayford, Kent, became the supermarket group's largest after the outlet underwent a major refurbishment programme last year that included a range of measures to increase energy efficiency and cut carbon. Following the extension work that was done on the store, it more than doubled in size to 100,000 sq ft. As part of its remit to grow its business but not its carbon footprint, Sainsbury's decided to adopt borehole technology at the enlarged site, which has been fully operational since September.

The 'geo exchange' system uses a series of closed loop boreholes drilled to depths of around 200 metres to access the site's natural geothermal potential. The boreholes provide cooling for the stores CO2 refrigeration systems – which are also the largest in the Sainsbury's estate – then capture and store this otherwise waste heat for space heating and domestic hot water. This is believed to be the first time that a closed loop borehole system has been integrated with a carbon dioxide refrigeration system.

A control system ensures efficient heat rejection (and savings) for the energy-intensive refrigeration processes that run the chillers and freezers. This 'rejected' thermal energy is carried by a vegetable-based glycol and water fluid in the pipework manifold to the closed loop boreholes to transfer this heat to the underground rock strata, which are used as a massive natural thermal storage buffer. The thermal energy is then later released to provide heating and hot water – via high efficiency heat pumps – throughout the building.

The thermal management system comes as a packaged element designed to provide a fully integrated system throughout its design, installation, commissioning and operation. The retail area 'cooling' process involves no separate comfort cooling or air conditioning. The frozen-food, chilled-food and fresh-produce cabinets represent a 24/7 load on the refrigeration packs. Cooling to the store is a 'by-product' of these refrigeration systems. The process provides a stable and energy-efficient heat rejection 'sink' (condensing medium) for the CO2-based refrigeration packs, instead of a traditional air-based gas cooler, which would work to reject this energy into the air.



Greenfield Energy

Circulation pumps manage the thermal energy from refrigeration packs

Liquid returned from the boreholes is sent firstly to the CO2 refrigeration packs, where it provides the necessary cooling (condensing the refrigerant from a gas to a liquid). This additional energy is added to the borehole liquid – which generally adds up to 10K to its temperature. This pre-heated fluid then travels to the heat pump circuit to supply an enhanced energy source for the heat pump evaporators. This is 'recycled' energy that would otherwise be rejected to atmosphere.

Once the heat pumps have extracted the energy they require – which varies generally from 10% to 100% of the waste heat from refrigeration throughout the day – the residual energy is sent to the boreholes. This could mean energy extraction from the boreholes if the heating load is greater than the refrigeration load, or energy rejection to the boreholes if the heating load is lower. If the energy to and from these circuits is 'balanced', the fluid can be re-circulated at the surface, bypassing the boreholes: in other words, the system has the ability to recycle thermal energy at the surface before using the borehole array (where appropriate). The specialist design and install team's predictions – >

> borne out by actual performance to date – are that the store will save nearly 900 tonnes CO2 equivalent per year, compared to standard air-cooled refrigeration and gas-fired boiler systems; this is 300 tonnes CO2e more that the alternative renewable technologies considered prior to the refurbishment.

Under the terms of the installation at the site, the specialist installer not only assumes the installation risks, but owns and operates the system and is responsible for ongoing maintenance throughout its 20-year installed life. The benefit to the client lies in the fact that 'specialists' are operating the system, leaving local store personnel free to focus on their core business activities.

The system incorporates continual monitoring, showing actual energy savings achieved compared with original forecasts. Since September the store's energy performance has been on target – that is, in line with the initial energy modelling predictions – and in the four months since its installation, the client is happy with the results.

While commercial details of costs and savings are confidential, the fully financed structure of the agreement is such that real-terms payback to the client is achieved from the first year of operation. Moreover, the agreement includes built-in incentives for both parties to keep working together to achieve continuing improvements in energy reductions.

The store is also meeting the wider environmental targets for it set by Sainsbury's. These targets are:

- Zero increase in operational carbon emissions (energy and refrigerant gas);
- Zero use of gas for heating and hot water;
- 60% reduction in electricity demand from the national grid versus a standard store in 2005-06;
- 30% of energy demand met from on-site renewable energy;
- 50% reduction in mains water usage per sq ft sales area versus the standard store; and
- Minimum 90% reduction in construction waste to landfill.

These have been achieved by the store's range of environmental features, which include high levels of insulation, rainwater harvesting, LED lighting and sun pipes, and automatic light dimming.

There were many challenges in bringing this project to life – integration of hitherto very discrete disciplines (borehole construction, commercial, refrigeration and M&E), adoption of a new technology on a flagship retail store under very tight time frames, and adoption of a business model not normally associated with this technology. Sainsbury's were willing to break down traditional barriers and embrace an integrated system that addresses, and actively manages, all of their thermal energy needs to provide guaranteed energy and carbon savings over the life of the installation.

It's early days, certainly, but not only is the system hitting year-one targets for energy saving (despite the coldest December on record), there are strong mutual incentives to make year-on-year energy reductions, over and above initial targets, to ensure it keeps benefiting both the end-user, the supplier and ultimately the environment. ●

Greenfield Energy

The borehole array lies beneath 15 manhole covers in the car park

Digging deep for earthly energy

The 200m-deep boreholes are drilled at angles away from the surface location to ensure sub-surface separation. This ensures that there is no thermal interference for the majority of the length of each borehole.

At surface, all that can be seen are 15 manhole covers within a small area of the car park. The borehole array at surface extends under about 30 car-parking spaces, out of a total of 700.

Coaxial borehole design rather than traditional U-tube is employed, with steel used as the heat exchange interface between the working fluid and the ground. Steel has a high conductivity to readily transfer energy between the fluid and the ground, increasing the rate at which energy can be transferred to/from the ground compared to plastic.

The geology for the area is predominantly chalk. Although chalk has one of the lowest thermal conductivities, our design process ensured this proved no hindrance in this application, both in terms of drilling/implementation and ongoing long-term thermal performance.

There is a significant aquifer below the site, through which some of the boreholes extend, which changes the thermal reaction of these parts of the system. This can be detected through monitoring of system performance, and can be controlled to optimise for these conditions in conjunction with the building's actual demand requirements. The drilling programme was reviewed in consultation with the Environment Agency and Thames Water, to ensure no environmental risk at any stage, either during installation or in operating the system.

Kevin Stickney

Kevin Stickney is technical director of Greenfield Energy

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Avoiding overdesign

Masterclass

Professor Doug King

This month we look at how we can use statistics to determine suitable design parameters for efficient systems

If we want building systems to be efficient in their use of materials and operational energy we must avoid over-designing them. There is constant pressure on the building services engineer to over-design, which must be countered at every turn. This comes in part from a culture of risk avoidance in the industry and in part from a client or developer being unclear on how the building is to be used with the engineer responding by designing for all eventualities. However, operational flexibility beyond a provision that can be reasonably expected always leads to over-design and inefficiency.

As intelligent engineers we are able to exercise judgment based on experience or precedent. However, when presented with a new circumstance, which all projects do to some extent, we need to be extremely careful to avoid trying to eliminate all risk. It is not possible to completely avoid the risk that, under extreme circumstances, the systems will not be able to perform to the desired level. What we need is a way to establish an acceptable level of risk given the consequences of failure of the system to perform as required.

The consequence of occasionally being unable to deliver the full design flow of hot water is very different to the consequence of a major international airport being unable to function because of a predictable weather occurrence, and so we must evaluate the risk and service levels accordingly. In order to solve these questions we need a basic understanding of statistics, but the reward can be considerable savings in terms of initial investment and running costs with a small, acceptable level of risk of non-performance.

These types of statistical analyses are applied widely in the building services field, although we often don't realise it. The 'demand units' method for sizing piped services is based on a statistical analysis of the simultaneous occurrence of a number of independent events. If we understand the fundamental approach we can estimate diversity factors for a wide range of design problems.

If, for example, we were asked to design an office for a firm of estate agents, should we design the air conditioning (assuming that we have not achieved our design by passive means) for 100% occupancy or some lesser number based on the knowledge that estate agents are frequently out of the office.

If we discuss the working patterns with the client we might discover that on average each viewing lasts for half an hour and that visits are entirely randomly distributed between the agents and throughout the day. So we can be fairly certain that the office will not be fully occupied, but the derivation of occupancy is not >

Even in an entirely conventional office it is unlikely that there will be continuous 100% occupancy due to absences, breaks and meetings. How, therefore, should we determine the optimum design level for building services without over-designing?

Doug King

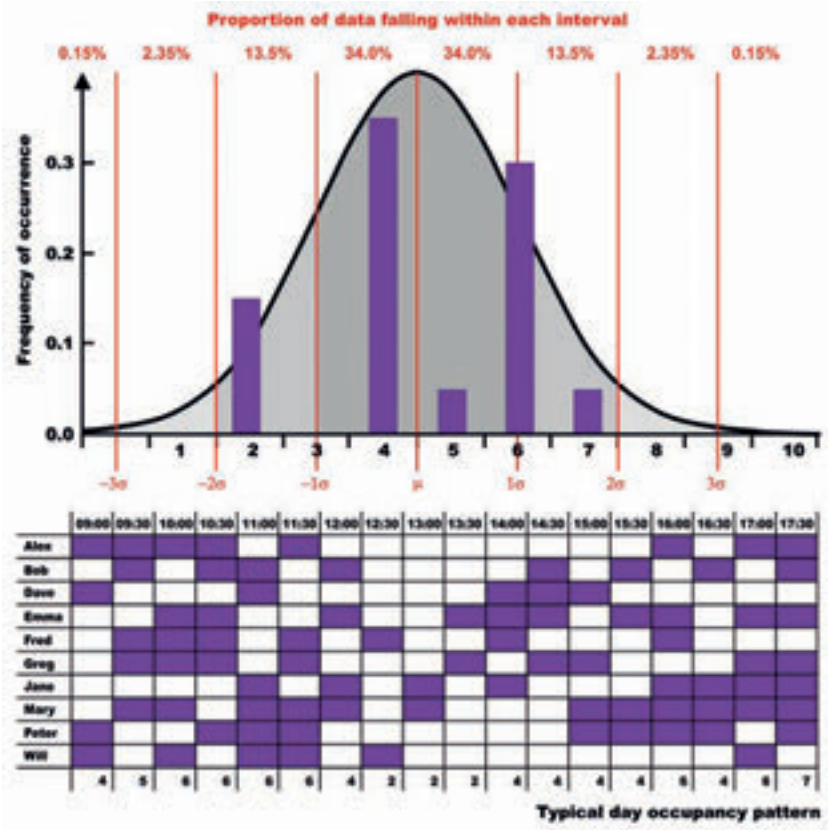

Figure 1: Generating a random pattern of occupancies for a notional office of 10 estate agents reveals that 100% occupancy is an unlikely occurrence. In order to determine suitable design occupancy we need to delve further into the statistics. The Gaussian (or Normal) Distribution curve represents the frequency of occurrence of events randomly distributed about a mean (_). The standard deviation (_) is a measure of the spread of the data. Knowing the rule of thumb, that 95% of the data fall within 2_ of the mean and that 99.7% fall within 3_, allows us to quickly establish suitable design parameters and understand the significance of events occurring outside those parameters.

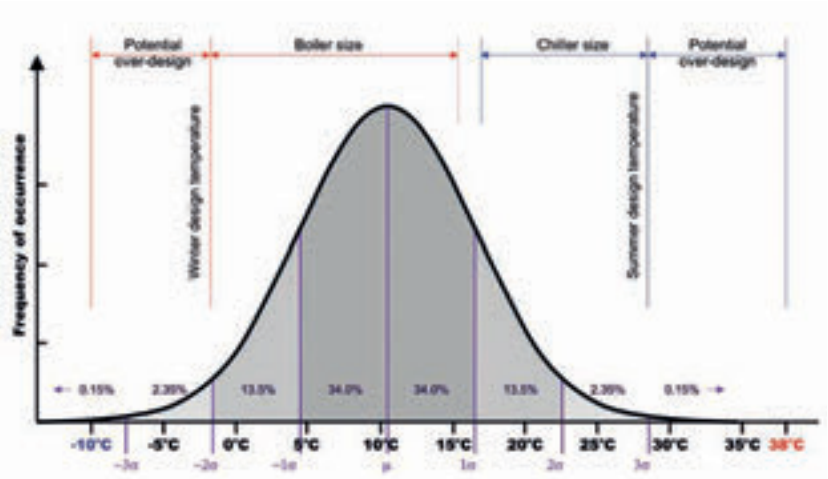

Figure 2: When we apply statistical analysis to weather data, such as the widely available monthly averages and extremes, like this for London, we can begin to appreciate the significance or otherwise of occasional extreme events. To design for these events would result in severe over-sizing of plant and equipment compared to that designed for a more rational balance of cost and risk.

> as simple as designing for either 100% occupancy or 50% occupancy.

Simply generating a random pattern of occupancy (see Figure 1) shows us that it is unlikely that the office will be fully occupied at any time. However, this simple approach does not give us a suitable basis for determining a design level of occupancy, as it is still easy to argue that random chance can give rise to maximum occupancy. So it can, but with what probability?

If we plot the occupancy data as a histogram, we can fit a Gaussian Distribution curve to it by calculating the mean and standard deviation. It is then helpful to know that, to a close approximation, events more than three standard deviations from the mean occur with a probability of less than 0.15%.

So we can now examine the data again and determine that the occupancy is unlikely to exceed eight people for more than about 0.5% of the time, or eight working hours per year. Conversely, this means that designing the air conditioning for the very few occasions on which the occupancy will exceed eight people will increase the plant size and cost by 25% (assuming the plant size is directly proportional to the occupancy).

Understanding these sorts of diversity factors is critical in determining the appropriate conditions to which we should be designing. Consider, for example, that this simple diversity applies not only to the fresh air volume and therefore external air gain, but also to the occupancy gain and the casual gains and electrical consumption from computers and task lights. If we don't get our diversity factors right then the consequences can quickly snowball.

These days, of course, we would probably design the plant for 100% occupancy and then justify the decision by adding variable volume control with some form of occupancy sensor. This will reduce some of the operating inefficiency but we are still stuck with a system which is essentially over-sized for the use to which it is typically put.

Now let's apply a similar statistical method to gain an understanding of external design temperatures: The Met Office weather record for London shows extremes of –10C and 38C with a mean of 10.5C and a standard deviation of about 6C. If we assume a Gaussian distribution for the temperatures (which is a good approximation), and fit these parameters we can immediately identify some of the key points that have historically been used to define London design temperatures (Figure 2).

Temperatures more than three standard deviations from the mean are likely to be exceeded less than 0.15% of the time, or just 13 hours in an average year. In the summer the majority of these extremes will occur during the working day and so 28C became adopted as the temperature for cooling design. In the winter the majority of the cold extremes will occur at night and so a lower deviation is accepted for commercial buildings leading to the –2C rule of thumb for heating design.

If we were to select our cooling plant based on the extremes of temperature that we sometimes

experience, we will be significantly over-sizing the plant based on a very small risk of occurrence. Designing for 38C would result in a cooling system nearly twice the capacity of one sized for the design temperature. This situation of over-design is often exacerbated by the value engineering that inevitably results from the selection of over-sized plant in the first place. During value engineering the third chiller that the engineer selected to provide better part-load efficiency will be eliminated in favour of two machines and a cost saving. This now means that each machine will effectively be sized to 100% of the normal design condition and therefore the operation will be at part-load for the vast majority of the time, with the other machine largely redundant.

Although the *CIBSE Guides* now recommend a more sophisticated analysis to determine suitable heating and cooling design conditions, it is still vital that we understand the significance of the statistical probabilities revealed by this first approximation. As climate change is beginning to impact on our weather it becomes increasingly difficult to resist adopting design temperatures closer to the extreme events. Even with these increasing extremes, the probability of such events is still small.

> **"Operational flexibility beyond a provision that can be reasonably expected leads to over-design"**

CIBSE, the Met Office and a consortium of universities are presently working on the UKCIP probabilistic future weather data to develop sample weather years that can be used in analysis software and to determine new design temperatures. However, until then, we can still determine useful design information from the historic weather records, provided they are up to the present date, but we should not allow our judgment to be driven by the occasional bad weather experience.

The purpose of defining diversity factors and design temperatures is to avoid expensive over-design of the systems while balancing this with an acceptable risk of exceedance. It is essential to apply these kinds of analyses at the briefing stage in order to discuss risk and cost with the client. This allows informed decisions about system design criteria, which will result in a more robust and cost effective design.

This approach can also often avoid the round of value engineering that occurs when the cost of over-designed systems exceeds the client's expectations, as you can demonstrate that the design is the most cost effective for the actual anticipated need with an acceptable level of non-conformity. ●

Doug King is principal of King Shaw Associates and visiting professor of Building Physics at Bath University

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Applying micro-hydro power generation

Sunlight and wind are seen as key providers of renewable energy, but what potential does naturally flowing water have to provide green power?

The introduction of feed-in tariffs (FITs) in the UK has given a boost to the installation of solar panels and wind turbines to generate electricity. But what about harnessing the power of rivers and streams? In appropriate locations, hydro-electricity can provide a highly cost-effective solution with low maintenance requirements. This article offers an introduction to the use of hydro and an overview of the mechanical side of micro-hydro power generation.

Hydro-electricity

Hydro-electric power generation may be broken down into four general categories according to power output:

- 10MW: full-scale hydro
- 300kW to 10 MW: mini-hydro
- 50W to 300 kW: micro-hydro
- Under 50W: pico-hydro

Of the 170 hydro schemes currently receiving payments under the FIT scheme, all but three are micro-hydro schemes. One of the key attributes of micro-hydro schemes is that only a portion of the waterway's flow is used to generate power, so allowing the normal ecological activities to continue with relatively little impact. The planning rules guided by the '*Good practice guidelines to the Environment Agency hydropower handbook*'[1] strive to ensure that the environment is largely unaffected; and unlike solar and wind power, the resulting electricity will be produced 24 hours a day (although the amount may vary with season).

The systems can supply DC (for battery charging) or AC (powering appliances) for 'off-grid' use, or they can feed back into the grid (just as with photovotaic panels and wind turbines). A micro-hydro system may be as simple as a 'zero-head' propeller-type device close-coupled to an encapsulated generator submerged in a free-running stream providing power for riverside lighting. This would require no particular civil engineering infrastructure and only very basic, low-cost electrical conditioning equipment to provide power for charging batteries. However, most micro-hydro systems divert part of the flow from the waterway (stream or river) to pass through a turbine and then return the water (still using no reservoir of water). These are known as 'run-of-river' schemes and require some civil and/or mechanical engineering works. Water flow rates of less than 0.5 litres per second (l/s) with a 'head' of water as low as 1,000mm can usefully produce power.

Hydro power generation

The total amount of electricity generation capacity in the UK from hydro power (reservoir and run-of-river schemes) is nearly 1.5GW.[2] This is just under 1.5% of the UK electrical power requirement, and it is estimated that there is potential to increase this to 2.5%. As an indicator of potential, the recently published Hydropower Resource Assessment Report identified (Figure 1) far more suitable sites than were previously thought feasible in England and Wales.

In October 2010 the UK government announced that 'remanufactured equipment' would also be eligible for FITs, so long as this equipment had not been generating energy after 31 March 1990. This opens up the potential use of disused installations that were previously associated with mills and industrial sites that, before the introduction of FITs, had not provided an economically feasible proposition. The generation tariff for hydro installations (that have been installed under the auspices of the Microgeneration Certification Scheme) is shown in Figure 2. To put this in some context: the total cost of installing a system producing, say, 5kW might be around £25,000. There is an economy of scale here, as much of the basic >

English Region	Number of Sites	Potential (kW)
Anglian	126	4, 920 – 13,370
North West	284	32,000 – 37,700
Midlands	157	18,000 – 32,400
Southern	36	1,100 – 2,600
South West	322	20,000 – 29,400
Thames	125	16,200 – 30,120
North East	318	27,330 – 39,810
England Total	**1368**	**119,550 – 185,400**

Wales	Number of Sites	Potential (kW)
Wales Total	324	26,730 – 63,000

Figure 1: Potential sites for hydro power generation in England and Wales
(Source: Hydropower Resource Assessment Report, DECC October 2010)

infrastructure is not wholly dependent upon output capacity: a 5kW system may only cost 50% more than a 2kW system.[3]

Power generated	FITs tariff
Hydro <=15kW	19.9p/kWh
Hydro >15-100kW	17.8p/kWh
Hydro >100kW-2MW	11.0p/kWh
Hydro >2-5MW	4.5p/kWh

Figure 2: Generation FIT for hydro installations

Micro-hydro system components

Smaller systems will not visibly have all the individual components, however their function will be present albeit in a consolidated form.

Intake/weir

Ideally, the intake is sited at a point in the waterway where both the flow and streambed are stable – solid bedrock, constant flow and a low gradient on a straight section where there is reduced chance of erosion and sediment deposition. Depending on the size of the installation this could be a simple sink, a diverted inlet using a weir or a bifurcated waterway. The intake would have some coarse 'filter' with some sort of grating to reduce the intake of flotsam, flora and fauna, this is often referred to as a 'trash rack'.

Canal/pipeline and forebay tank

This section provides a diverted track for the water that will be used to generate the power. As the water passes through the canal (known as a 'headrace' or 'water race') any drop in height will not contribute to the available power and so is a loss of potential generation. The forebay tank will allow the water to settle, sediment to drop out and provide a location for a finer trash rack. Excess water (not used for generation) flows freely from the forebay directly back through channels down to the waterway and helps to purge silt so that it does not accumulate and enter the generation equipment. Many micro-hydro systems do not utilise the canal/forebay section as they pass water directly from the intake into the 'Penstock pipe'.

Penstock pipe

The penstock pipe is one of the most important elements of the system to optimise the availability of the water's power. Typically made of HDPE, steel or UPVC, this provides a closed pathway from high level (providing the 'head') for the water to enter the powerhouse and generation equipment. As with any pipe carrying liquid the frictional losses will be related to the pipe diameter and the roughness of the internal surfaces. When the penstock pipe is sized it is a balance of pipe cost and pipe diameter, with a rough rule of thumb that the pipe is sized so that the frictional losses amount to no more than 10% - 20% of the available head – the lower the head loss, the more power will be generated.

Powerhouse

The 'powerhouse' may be nothing more than a mounting frame for weatherproof generation equipment, or it could be a substantial building housing larger scale generation and electrical conditioning and control equipment. The functioning parts of the powerhouse can even be totally submerged to reduce noise breakout. However, it would typically be sited above the point where flooding might be expected, also taking into account foreseeable changes in the path of the river that may take place due to erosion. There should be good access for construction and maintenance – the powerhouse may be some distance from the main waterway to satisfy all of the required criteria.

Tailrace

Leading from the powerhouse, this channel calms the flow and reintroduces the water back into the main waterway.

The turbine

Normally housed in the powerhouse, the turbine converts the flow of water into shaft rotation that (directly or indirectly) drives the electrical generator or alternator. The choice of turbine will depend on the net head and the available water flow rate, together with the required running speed for the electrical equipment. The range of seasonal flow rates may also affect the selection.

Turbines are split into two principal groups – impulse and reaction. Pelton, Turgo and Banki Michell turbines are commonly-used impulse-type turbines in micro-hydro installations with nozzles directing the water flow onto the turbine. A small Pelton turbine is simple to manufacture, relatively cheap and has good efficiency and reliability. Individual Pelton or Turgo 'cups' may be simply cast (or cheaply mass produced in plastic).

Pelton turbines are generally more suited to high-head, low-flow rate applications and Turgo turbines more suited to lower-head, higher-flow rate applications. To adjust for variations in available water flow, these turbines are adapted by changing nozzle sizes or by using adjustable nozzles. The efficiency of both the Turgo and Pelton wheel depends on size and manufacture but is likely to be between 70%+ and 90%+.

The Banki Michell cross-flow turbine will not reach the efficiencies of the Pelton or Turgo turbines (although may well reach 80%) but it is cheap to produce, simple to maintain and has a reasonably constant efficiency (down to 50% design flow) and is ideally suited to low-head applications. A chart comparing the performance of common impulse turbines is shown in Figure 3.

Reaction turbines sit in the full flow of the water delivered by the penstock pipe and are either propeller machines (such as the 'Kaplan') that are suited to low-heads and high-flow rates; or they are similar to a centrifugal pump acting as a turbine (such as the 'Francis') that are most suitable for mid-range flows and heads (flow properties between those ideal for the Kaplan and the Pelton).

Available power and energy

The static-head (or gross-head) is calculated from the vertical distance in metres between the water intake of the system (normally the entry for the Penstock) and the point where the water enters the generator. For reaction turbines the static head includes the vertical

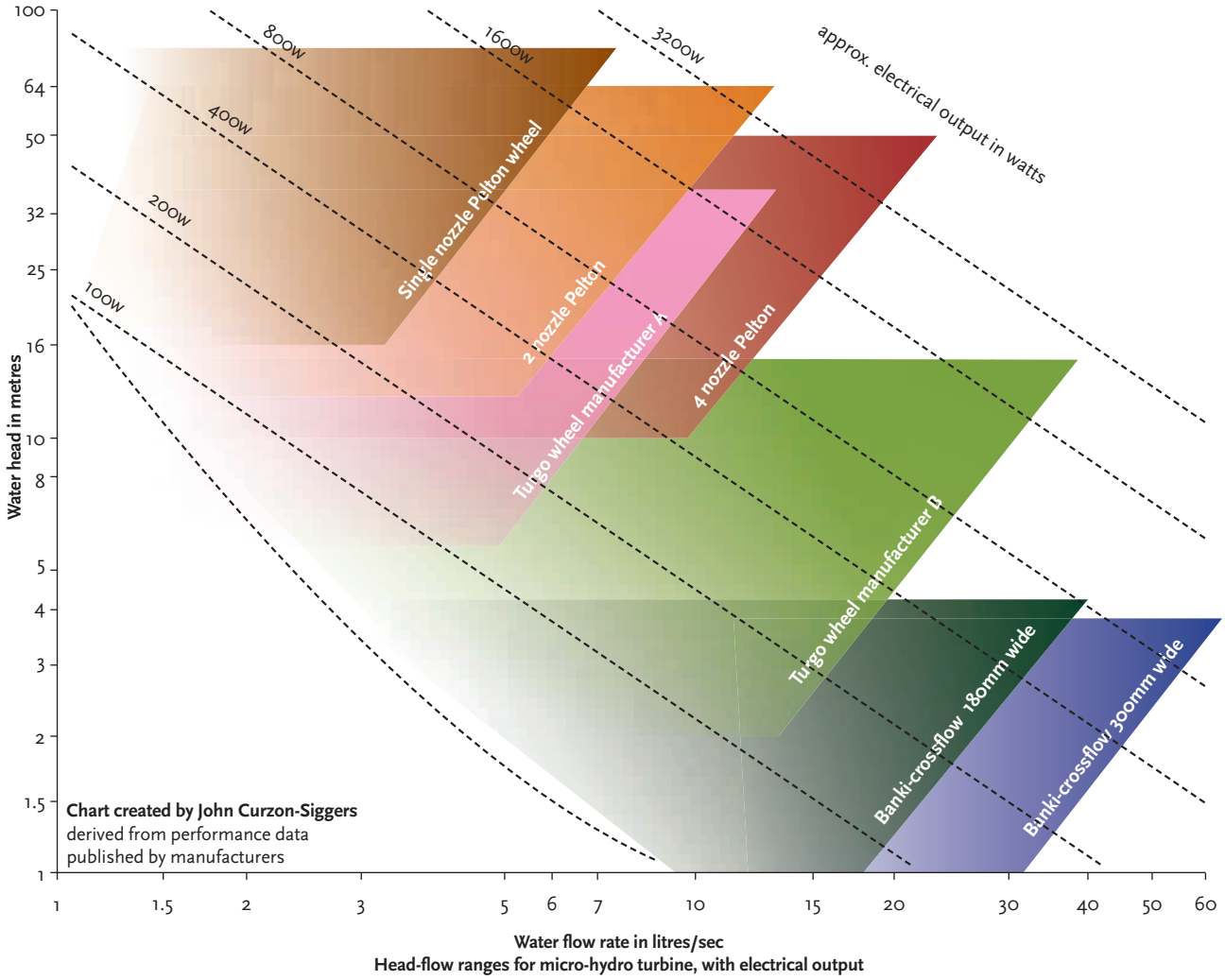

Figure 3: Turbine performance for micro-hydro installations

distance from the turbine to the bottom of the draft pipe where the water is released back into the stream through the tailrace. The static head can be determined by using topographical maps or preferably, for design purposes, by practical onsite measurements.

The potential generating power from a hydro generation plant is established by calculating the energy released by the falling body of water of mass, m (kg), over a height, h (m static head)

Energy = m·g·h = ρ·V·g·h (Joules)

Where ρ = density of water (kg/m^3), V = volume water (m^3), and g = acceleration due to gravity, and so the power (watts) associated with flowing body of water will be determined by the volume flowrate of water, Q (m3/s) and so Power = ρ·g·h·Q (watts).

This is the potential power available from the flowing water dropping over a head, h, but real installed systems will have losses due to friction in the trash rack, Penstock, etc., turbine efficiency and generator efficiency. The overall efficiency of a system would normally range between 40 percent and 70 percent. A well-designed system will achieve an average efficiency of 55%.

$P_{net} = \eta \cdot P = \eta \cdot \rho \cdot g \cdot h \cdot Q$ (watts), where η is the 'efficiency' of the overall water, turbine and electrical generator system

And substituting in standard approximate values for ρ and g

$P_{net} = \eta \cdot 10 \cdot h \cdot Q$ (kW)

So, for example, taking 50 litre/s flow from a stream with a head of 3m @ 50% overall efficiency would provide the power = 0.50 x 10 x 3m x 0.050m3/s = 0.75 kW and assuming that this flow is constant throughout the year, the potential yearly energy in kWh would be 0.75kW x 24 hrs/day x 365 days/yr = 6570kWh/yr. This could meet the electrical power requirements for a small family house.

Further reading

This article has outlined the principle sections that make up the mechanical side of a micro-hydro installation. There are some excellent free resources available to provide a thorough grounding in the complete application of micro-hydro technology. Examples are:

A Guide To UK Mini-Hydro Developments, British Hydro Association, www.british-hydro.org; *Micro-Hydropower Systems – A Buyers Guide*, Natural Resources Canada; and *Guide on How to Develop a Small Hydropower Plant*, ESHA 2004, **www.esha.be/**

To see a practical implementation of a micro-hydro installation employing a Kaplan turbine, visit **www.youtube.com/watch?v=4teOpoYYmwY**

References

1. *Good practice guidelines to the environment agency hydropower handbook*, Environment Agency, 2009
2. *England and Wales Hydropower Resource Assessment*, DECC October 2010
3. *Micro-Hydro Systems*, Centre for Alternative Technologies, 2010 **www.cat.org.uk/information/pdf/MicroHydroSystems.pdf**

Module 25

February 2011

1. How many certified FIT eligible installations are currently hydro schemes

- ☐ A 0 to 50
- ☐ B 51 to 100
- ☐ C 101 to 150
- ☐ D 151 to 200
- ☐ E more than 200

2. What is thought to be the potential percentage of UK power that could be supplied by hydro

- ☐ A Less than 1%
- ☐ B 1.5%
- ☐ C 1.7%
- ☐ D 2.5%
- ☐ E 6%

3. What is the name of the pipe delivering water directly to the powerhouse/input of the turbine?

- ☐ A Forebay
- ☐ B Penstock
- ☐ C Tailrace
- ☐ D Trash rack
- ☐ E Weir

4. Which impulse turbine is more suitable for mid-range head, higher flowrates while maintaining higher efficiencies

- ☐ A Banki
- ☐ B Francis
- ☐ C Kaplan
- ☐ D Pelton
- ☐ E Turgo

5. The turbine in the calculation is positioned where the flow is now 25 litres/s and the head is just 2m. Assuming the efficiency remains constant, calculate what electrical power will be generated?

- ☐ A 0.05kW
- ☐ B 0.15kW
- ☐ C 0.25kW
- ☐ D 0.35kW
- ☐ E 0.45kW

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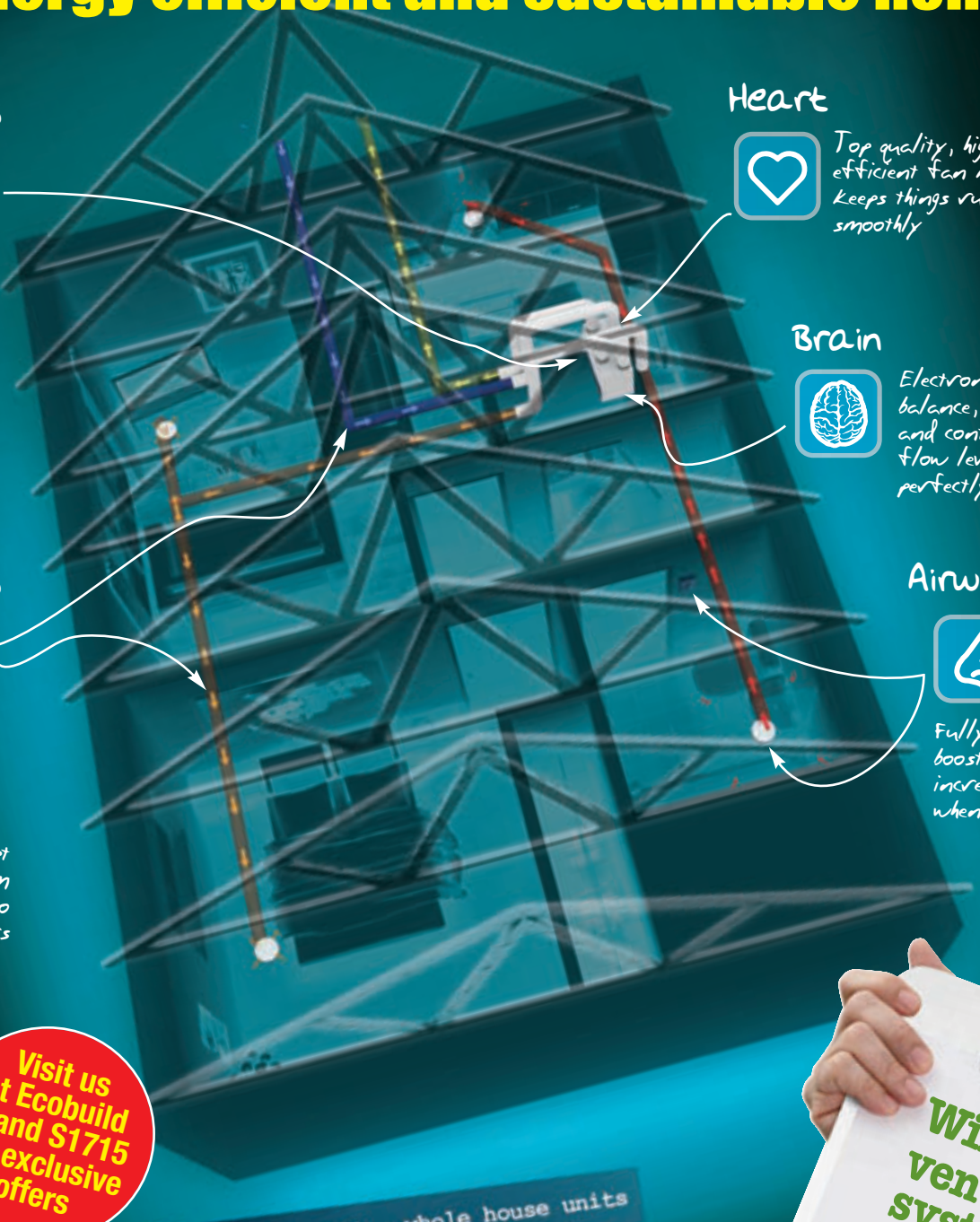

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● **For more info visit www.aircraftairhandling.com**

Keraflo water control for Cornwall's cricket centre

The new Gannel Building in Truro gives Cornwall a truly magnificent cricket centre, offering a first-class practice and coaching area for sportsmen throughout the county. The centre includes five indoor nets, changing and showering facilities, meeting rooms and a state-of-the-art video analysis suite. It is the result of an initiative shared between the English Cricket Board [ECB] and Truro and Penwith College, which has run a cricket academy for several years.

● **For more information call 0118 921 9920 or visit www.keraflo.co.uk**

Dominion selects Cooper LEDs

Cooper Lighting and Safety has supplied 65 of its pioneering RXD1 LED downlights to the Dominion Centre in Wood Green, London, a former theatre now used as a place of worship. In addition to minimising the building's energy consumption, the LED fittings provide a long service life. Originally constructed in the 1930s for use as a cinema and theatre, the Gaumont Palace was subsequently converted into a bingo hall and eventually renamed as the Dominion Centre when it became a place of worship. The building retains its original high ceiling and has 12 large 400W metal-halide house lights recessed into the ornate plasterwork.

● **For more information call 01302 303200 or visit www.cooper-ls.com**

Architects delighted with Autron radiators

British manufacturers Autron have extended their Sovereign range of low surface temperature radiators, with practical and aesthetic qualities to meet every application. Architects have been delighted with the continuous casings and corners which provide clean lines and neat appearance around difficult corners. Also in the range are vertical LST radiators, ideal for specification where wall space is at a premium.

● **For more information download a Sovereign Special Options brochure at www.autron.co.uk**

Wiring up new demonstration suite

Modular Wiring Systems, a subsidiary of electrical cable manufacturer Tratos, has opened a new demonstration and training facility at its Slough offices. The Modular Academy is a showcase for Modular Wiring Systems' product ranges and services. The large ground-floor room has been divided into three key sections – power, lighting and bespoke equipment – each with working plant that will allow customers to see and interact with its modular wiring products while they are in action.

● **For more information call 01753 566700 or visit www.modularwiring.com**

Hanging on the telephone

BPT Security Systems (UK) – a specialist in door entry, access control and gate automation – has launched a new range of door entry panels that utilise GSM and landline telephone technology. The new GSM range of door entry panels has been designed by BPT as a cost-effective solution for applications where a hard-wired door entry system cannot be installed, such as where there is an excessive distance between a gated entrance and the main building.

● **For more information call 01442 230800 or visit www.bpt.co.uk**

Best things come in small packages, says Frese

Innovative product development from Frese has resulted in the launch of the new Optima Compact Pressure Independent Balancing and Control Valve for fan coil and chilled beam applications. The Optima Compact PIBCV provides accurate flow limitation and differential pressure and temperature control within a single compact housing. Optima Compact is available in sizes DN10 to DN20 with both motoric and thermic actuators providing either linear or equal percentage control characteristics.

● **For more information call Andrew Pender on 01704 896012 or visit www.frese.co.uk**

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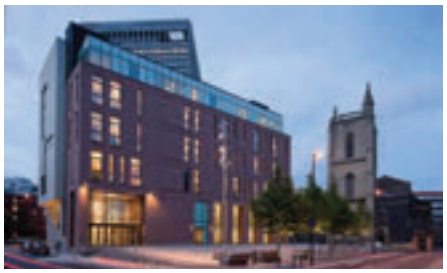

Oventrop valves take the honest path

An extensive range of Oventrop valves have been installed at Bristol's new Civil Justice Centre for HM Courts Service to meet the stringent demands of the Courts Standard and Design Guide. The new development comprises 9,600 square metres over seven floor levels, with a plant room on floor five, and constitutes the largest civil courts centre in the south west. The building also houses Bristol Probate Registry, enabling all civil business to be dealt with under one roof.

● **For more information call 01256 330441 or email sales@oventrop.com**

Business booming for Medem

Leading British gas safety panel manufacturer, Medem UK, is off to a flying start in 2011 with its move to larger premises to accommodate the company's continuing success. Despite the tough economic environment, Medem has continued to grow its business year on year, reporting an increased turnover of 11% on the previous 12 months, and an equally healthy sales forecast for the year to come. The company has moved its headquarters to more spacious surroundings at Manchester's iconic 1897 Linotype Works Factory.

● **For more information visit www.medem.co.uk**

Weatherite's ventilation solution for John Lewis

A new cooling fan coil unit (FCU) system from Weatherite Building Services has helped to enhance the working environment at the London head office of the John Lewis Partnership. The project is part of a continuing programme to upgrade the building services, improving the building's energy efficiency and performance, while also permitting regular access for future maintenance. The work to date has involved replacing difficult-to-access ducted FCUs systems in a variety of locations.

● **For more information call 0121 665 2266 or email rboswell@weatherite-holdings.com**

'SE Controls TV' launched on new website

Communication is all about getting a message across quickly and efficiently. Education is providing information that is clear and concise, which uses as many of our senses as possible in order for the information to be retained. Video provides both the moving image and sound, which is as close as one can get to the real thing.

SE Controls have recently launched 'SE Controls TV' on their new website. The new service allows visitors to view video programmes of the company's solutions, products and projects.

● **For more information call 01543 443060 or visit www.secontrols.com**

Titon 'lets it flow' with its whole-house ventilation units in London

Titon's HRV1 Q Plus ultra efficient whole-house ventilation units have been installed in a Kitewood Estates development of 123 affordable homes in Southbury Road, Enfield. Now the product of choice for a number of major UK housebuilders, the Titon units are helping all the apartments in this development comply with Level 3 of the Code for Sustainable Homes. The installers were London-based SJD Mechanical Services. Titon's HRV1 Q Plus is one of the most efficient whole-house ventilation (with heat recovery) units of its size in the UK.

● **For more information call 01206 713800 or visit www.titon.co.uk**

Pump up the energy efficiency

One successful BSF project was the new Bexhill High School, which caters for 1,650 pupils, including some with special needs. The £40m building, which opened late last year, incorporates a range of specialist learning zones – each of which can accommodate up to 90 pupils. The school has incorporated a wide range of energy efficient features – and, making sure the pump solutions met or exceeded these ambitions, Grundfos Pumps worked closely with consultants White Young Green to ensure the optimal pump solution was achieved.

● **For more information call 01525 850000 or email uk-sales@grundfos.com**

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Zip Hydrotaps specified for Ministry of Defence

When the Ministry of Defence moved into Walker House in Liverpool recently, it elected to install Zip's innovative HydroTaps. These provide instant boiling and chilled filtered water for the MoD's 530 staff on three floors of the newly refurbished landmark building, situated next door to Liverpool's iconic town hall. Lynn McCaldon, information manager at Walker House, said: 'People have readily adapted to using the HydroTaps and really like them for their ease of use and versatility.'

● **For more information call 0845 602 4533 or visit www.zipheaters.co.uk**

Direct-drive for cooling tower fans

Baldor has extended its novel direct-drive technology for controlling cooling tower fans from power ratings for commercial buildings, to ones suitable for power generating and processing industries. Baldor's direct drive eliminates the gearbox and right-angled coupling of conventional drives to save energy, improve reliability, and run more quietly. A novel permanent magnet motor increases energy efficiency dramatically. The latest products extend the power rating of the motors to torques up to 13,500 Nm.

● **For more information call 01454 850000 or email sales.uk@baldor.com**

Vaillant celebrates millionth ecoTEC boiler

Vaillant, one of the largest heating technology manufacturers in Europe, is celebrating the production of its one-millionth ecoTEC high-efficiency condensing boiler for the UK market, at its award winning state-of-the-art factory at Belper in Derbyshire. The one-millionth boiler produced was an ecoTEC plus 831 high-efficiency combination boiler, which was also recently awarded 'Best Buy' by the leading Which? consumer publication. To celebrate, Vaillant is awarding £1,000 of holiday vouchers, shared between the householder and the installer of the boiler.

● **For more information visit www.vaillant.co.uk**

Kentec watches over National Maritime Museum

Kentec addressable fire alarm panels are protecting the National Museum at Chatham – a new centre for world-class collections at the heart of the historic Dockyard, which include the priceless exhibits and collection of more than 4,000 ships' models. The fire alarm system, installed by CTA Fire Detection, comprises a Kentec Syncro 4 loop analogue addressable fire alarm panel, supported by Hochiki's open protocol fire data communications and more than 100 Hochiki devices.

● **For more information call 01322 222121 or visit www.kentec.co.uk**

BACnet Control from Titan Products

Titan Products has developed a range of application specific controllers. Designed for every control requirement, the controllers offer total flexibility. The BACnet range includes fan coil, VAV, room, natural ventilation and plant room controllers as well as BACnet to Modbus gateways. The controllers can be used as stand alone or as part of an integrated building management system and have an option for a built-in display. Each controller can be used in conjunction with Titan's RDU (room display unit).

● **For more information visit www.titanproducts.com or call 0161 406 6480**

Dimplex heat pump system warms riverside apartments

A stunning development of 85 high-specification riverside apartments on the southern bank of the River Tyne, Gateshead, is getting energy efficient heating from a communal system of nine Dimplex 28kW air source heat pumps. Each home at the Friars Wharf apartments has underfloor heating with individual time and temperature control, designed to run at low temperatures to maximise the efficiency of the heat pump system. Heat meters log the energy usage in each flat and can be remotely read and billed.

● **For more information call 0845 601 5111 or visit www.dimplex.co.uk**

Danlers energy-saving PIR thermostat control will help cut heating loads – and bills

Danlers has designed and manufactured a passive infra-red thermostat for heating loads. The product combines an adjustable room thermostat with a passive infra-red person detector. If somebody is present in the room, the heating unit is switched on to achieve the selected thermostat temperature. When nobody is present, the temperature is allowed to fall to a set-back temperature, reducing energy consumption by restricting the time when the heating unit is working.

● **For more information call 01249 443377 or visit www.danlers.co.uk**

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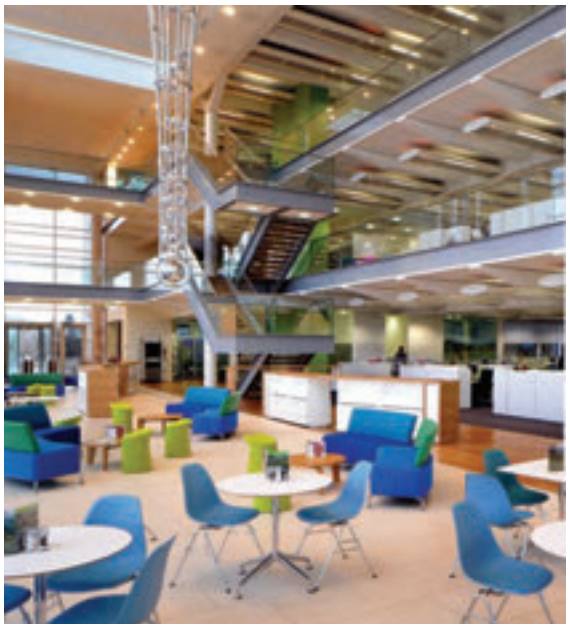
Waterworks fitted with passive chilled beams

SAS International Integrated Service Modules, fitted with Passive Chilled Beams, have been installed at the newly built operations centre for Essex & Suffolk Water. Situated at the existing Hanningfield Water Treatment Works near Chelmsford, architects FaulknerBrowns was selected after a national competition was staged to design the purpose-built premises. The three-storey building incorporates a range of innovative sustainable features, including a water-source heat pump, which utilises water from the nearby Hanningfield reservoir.

● **For more information call 0118 929 0900 or visit www.sasint.co.uk**



Windowmaster helps TfL hit sustainability targets

WindowMaster has helped to make Transport for London's West Ham bus garage the most sustainable building of its kind in the UK. The 12,000 sq m, £30m garage was designed by architects Pringle, Richards, Sharratt to meet the Mayor of London's target of 20% on-site renewables. Half the roof is a sedum green roof which, along with a rainwater harvesting system, forms part of the building's sustainable drainage scheme (SUDS). It forms the base for 350 buses.

● **For more information call 01536 510990 or visit www.windowmaster.com**

Oventrop valves for Rose Bowl building at Leeds Metropolitan Uni

An array of Oventrop valves was used in the Rose Bowl building, at Leeds Business School. The building provides a state-of-the-art learning environment inside a five-storey signature glass building consisting of lecture theatres, teaching areas, offices, conference and catering facilities. The £50m development is in Leeds city centre. At its heart is the reflective glass Rose Bowl lecture theatre. Leeds Metropolitan University is one of the largest and most popular universities in the UK, with around 30,000 students.

● **For more information call 01256 330441 or email sales@oventrop.co.uk**

Web controller punches above its own weight

Mitsubishi Electric has launched a new air conditioning web-based controller to replace the 'Baby' GB-50, and offer users high-level control and energy monitoring functionality. The controller is aimed at the more cost- and environmentally-conscious end-users in these times of austerity and energy conservation. The new GB50ADA is the latest web-based group controller from Mitsubishi Electric, and offers much of the functionality previously only available in the more advanced touch screen AG150A controller, but at a significantly lower price.

● **For more information visit www.mitsubishielectric.co.uk/aircon**

University's Star quality

Students using the library at the University of Strathclyde in Glasgow are keeping their cool, thanks to an air conditioning system from Star Refrigeration. The university was looking to replace an ageing refrigeration plant in the Curran Building. The six-storey facility is home to the Andersonian Library, which houses university archives and main collections, including books, journals and electronic resources. Star had previously supplied an Indigochiller refrigeration plant for cooling in another building on the Glasgow campus.

● **For more information call 0141 638 7916 or visit www.star-ref.co.uk**

Wood: a more cost-effective heating solution for off-mains customers

The cold snap made us all more aware of the cost of fuel bills, not least because some of the largest utility providers have announced price rises of as much as 10%. For home owners relying on oil and LP Gas, often in rural, off-mains locations, winter can be an extremely expensive time. The answer for many could be wood. Euroheat, leading wood-biomass solutions provider, urges Britain's off-mains customers to consider switching to nature's sustainable fuel.

● **For more information visit www.euroheat.co.uk**

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Pioneering programme from Remeha helps make 'Places for People' carbon neutral

European domestic and commercial heating company, Remeha, has helped Places for People, the UK property management and development group, reduce its carbon footprint. Places for People is delighted to announce that an initial offset contribution of £7,267.50 is already helping finance a number of important carbon reducing projects in the third world. As part of its commitment to create a more sustainable future, Remeha has offered all of its domestic customers the opportunity to offset the carbon emissions from its boilers.

● **For more information visit www.avantarange.com**

Clivet gets smart with SMARTpack

Clivet is setting out a challenge to traditional split/multisplit and hydronic air-conditioning systems for smaller retail premises, showrooms, restaurants and production plants where optimum temperature, humidity, ventilation and air quality freshness is essential. SMARTpack is a new high-efficiency, air-to-air heat pump air-conditioning package designed to provide make-up air, and to recover energy. Unlike split and multisplit direct expansion systems, the Clivet SMARTpack does not require a separate system for treating primary air, nor are there any refrigerant pipes.

● **For more information call Andy Mayes on 01489 550626 or email a.mayes@clivet-uk.co.uk**

Bespoke air curtain at banqueting hall

JS Air Curtains has supplied a two-metre bespoke Zen air curtain to the Manzil Banqueting Hall in Manchester. On the inner-facing side, the air curtain incorporates an exit sign plus four clocks, showing the time in Manchester, Mecca, Medina and Islamabad, and on the outward fascia the air curtain has an illuminated welcome sign. Manzil Banqueting Hall is one of Manchester's most prestigious restaurant and conference venues and can seat up to 1,000 diners in two lavish halls.

● **For more information call Mike Verney on 01903 858656 or email sales@jsaircurtains.com**

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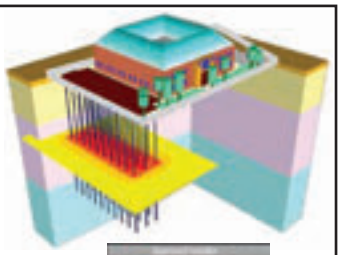

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Best-performers in the built environment. www.cibseawards.org
- **17 Feb 2011 Planning for solar farms: making money by cultivating a greener world** Watford
Planning and benefits of large-scale PV. events@bre.co.uk
- **01 Mar 2011 Modern communal heating, domestic hot water and thermal storage installations – key considerations for an effective system** London
Benefits of modern heating systems. www.cibse.org/sophe
- **01-03 Mar 2011 Ecobuild 2011** London
Sustainable design and construction. www.ecobuild.co.uk

SOCIETY OF LIGHT AND LIGHTING

- **24 Feb 2011 SLL Lighting Masterclass** Norwich
The Low Carbon Challenge. www.sll.org.uk
- **24 Feb 2011 LED Lighting** High Wycombe
Lighting control, lumen values, watt energy. www.sll.org.uk
- **15 Mar 2011 Is Light a Hazard?** London
Evening talk. www.sll.org.uk

CIBSE REGIONS

- **08 Mar 2011 BREEAM** Cardiff
Current requirements and future changes. jno@neiloliver.plus.com
- **04 Apr 2011 UV Filtration** Cardiff
Presentation by Peter Hudson of UVGI. jno@neiloliver.plus.com
- **12 Apr 2011 NEC3 form of contract** Cardiff
Overview and review of the NEC3 field of contract documentation. jno@neiloliver.plus.com
- **12 Apr 2011 East Midlands region CIBSE AGM** Nottinghamshire
Further details to be advised. densel.davy@ntlworld.com
- **14 Apr 2011 Southern region AGM and hospital lighting annual general meeting** Chichester
Presentation by Iain Macrae. laurie.socker@gifford.uk.com

CIBSE/OTHER TRAINING

- **07-08 Feb 2011 Low Carbon Energy Assessor EPC Training** London
www.cibsetraining.co.uk
- **15-16 Feb 2011 Training to produce Display Energy Certificates** London
www.cibsetraining.co.uk
- **18 Feb 2011 Opportunities to generate income from the Renewable Heat Incentive** Watford
An overview of the RHI. events@bre.co.uk
- **21 Feb 2011 Part L update for LCEAs -– Changes to Part L for energy assessors** Manchester
www.cibsetraining.co.uk
- **24 Feb 2011 Part L update for LCEAs – Changes to Part L for energy assessors** London
www.cibsetraining.co.uk

CPD TRAINING

Visit www.cibsetraining.co.uk, call 020 7675 5211 or email eventbookings@cibse.org.

GENERAL INTEREST

- **17 Feb 2011 Introduction to Building Services** London
- **23 Feb 2011 Mechanical Services Explained** Bristol
- **08 Mar 2011 Electrical Services Explained** Bristol
- **11 Mar 2011 Introduction to Electrical Services in Buildings** London
- **28 Mar 2011 Mechanical Services Explained** Bristol
- **10 May 2011 Electrical Services Explained** Birmingham
- **16 May 2011 Mechanical Services Explained** Birmingham
- **15 Jun 2011 Mechanical Services Explained** London
- **21 Jun 2011 Electrical Services Explained** London
- **06 Jul 2011 Electrical Services Explained** Manchester

ELECTRICAL SERVICES

- **09 Feb 2011 Earthing and Bonding Systems** London
- **17 Feb 2011 Power system harmonics: causes, effects, reduction** London
- **02 Mar 2011 Electrical distribution design** London

BUILDING SERVICES AND ENERGY EFFICIENCY

- **05 Feb 2011 2010 Part L Building Regulations** Birmingham
- **10 Feb 2011 How to specify a ground source energy system** London
- **17 Feb 2011 The Carbon Reduction Commitment (CRC)** London
- **18 Feb 2011 Building Regulations Section 6 (Energy)** Glasgow
- **22 Feb 2011 Low carbon buildings and energy infrastructure for local authorities** London
- **02 Mar 2011 Building Regulations Part G (2010) explained** London
- **02 Mar 2011 2010 Part L Building regulations** London
- **03 Mar 2011 2010 Part L Building Regulations** Newcastle
- **04 Mar 2011 Building Regulations Section 6 (Energy)** Edinburgh
- **07 Jul 2011 2010 Part L Building Regulations** London

FACILITIES MANAGEMENT

- **24 Feb 2011 Preparing FM and Maintenance Contracts** London

FIRE SAFETY

- **01 March 2011 Fire detection and alarm systems for dwellings BS 5839 PART 6:2004** London

MECHANICAL SERVICES

- **09 Feb 2011 Understanding and application of psychrometric charts** London
- **10 Feb 2011 How to specify a ground source energy system** London

CIBSE training course programme for Jan-July 2011 now available online **www.cibsetraining.co.uk**

Send your event details to **cbailey@cibsejournal.com**

Ecobuild gets settled into new home

Ecobuild, the event for sustainable design, construction and the built environment, is back from 1 to 3 March 2011 at London's ExCel centre.

Showcasing sustainable construction products, it will feature more than 1,300 exhibitors, and is expected to attract 50,000 visitors.

The renowned Ecobuild conference will expand to three concurrent streams: Making sustainable construction happen; Beyond construction: Achieving a sustainable future; and Design, Architecture and Sustainability. The seminar programme now offers 130 seminars, plus many interactive attractions and demonstrations on the exhibition floor.

CIBSE will once again have a seminar stream at the event, with a focus on Energy in Buildings. Speakers include Doug King, the author of the RAE report *Engineering a Low Carbon Built Environment*, and Bill Gething, principal of Bill Gething: Sustainability & Architecture.

Entry to the event, including conferences, seminars and all the attractions, is free. For your ticket visit **www.ecobuild.co.uk**

Mechanical Engineer
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We are recruiting a mechanical design engineer for a consultancy that has won awards within the building services industry for their work and approach to projects. The projects worked on range from retail, hotel and leisure, education, healthcare and commercial schemes with a focus on sustainability and low carbon technologies. The successful candidate will have previously used hevacomp and IES calculation software for the design of mechanical building services with an exposure to BREEAM assessments.

BAR 557/JA

Electrical Engineer
Hertfordshire £35-£40k

A vacancy has become available for an Intermediate / Senior Design Engineer to work within a multidiscipline environment. Candidates will be required to carry out all necessary design functions covering lighting layouts and calculations, cable sizing, containment routing, data and fire alarm systems. Calculations will be done using both manual methods and the Cymap suite of software. Applicants must be Degree qualified and preferably a member of a recognised Institute such as IEE or CIBSE.

BAR 547/PA

Mission Critical Design Engineers
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BAR 406/CB

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Application forms and further details are available on our website: http://www.aston.ac.uk/jobs, by email: recruitment@aston.ac.uk or by telephoning: 0121 359 0870 (24 hour answerphone). CVs will only be considered if accompanied by a completed application form. Reference no: R110003.

Closing date: Thursday 17 February 2011.

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If you don't have internet access call Donna Gibbons on 01452 396729

Closing Date: 12 noon on Monday 28th February 2011.
Interview Date: Friday 11th March 2011.

Gloucester City Council is committed to increasing the diversity of employees at all levels, particularly the representation of people with disabilities, women and ethnic minorities in key positions

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Global multi-tasking

Flexibility and collaboration help architects produce successful projects, says **Graham Goymour**, principal in urban design for the design + planning business at AECOM

Goymour's typical working week demands handling a variety of project types, scales, and locations. At any one time he might be working on three or four schemes, ranging in scale from a single building to a masterplan for regenerating a city centre.

Among his key skills is being able to switch between understanding how projects work at micro and macro levels, local and global perspectives, and moving seamlessly between detailed design and business-level oversight.

'Working locally and globally is one of the great strengths of a company like AECOM,' he explains. 'We're currently working as far afield as Brazil, Istanbul, and China, as well as in the UK. In every case we need to understand and respond to the local context and work with local teams, but we also bring to bear our extensive global experience and expertise – this ability is helping us on projects in many countries.'

Canada-born Goymour, 49, has worked at AECOM for three years, and continues to find freshness in the evolving nature of his work. As well as contributing to the finer points of design, he helps expand the business by liaising with clients and seeking opportunities for his studio to collaborate with colleagues in many other parts of the AECOM business – from transportation and water experts to project managers, economists and building engineers.

Trained as an architect in Canada before coming to the UK, Goymour is familiar with the benefits of having an international perspective. 'I spend a lot of my time working at our London office among our team,' he says. 'But I also spend time visiting sites, meeting with clients – and, increasingly, at other AECOM offices overseas.'

> "Being able to travel widely and work alongside others in any number of places really makes work interesting"

'Recently I've spent time participating in projects in China and Singapore. Being able to travel widely and work alongside others in any number of places really makes work interesting. You meet new people and experience innovative approaches to design, and not just inside our firm – we have great success collaborating with designers outside AECOM as well.'

This cross-pollination of ideas and disciplines ensures Goymour and his studio are exposed to as many design perspectives as possible. He cites two recent projects that demonstrate the benefits of collaboration with experts in transportation, building engineering and sustainability – both of them competitions: the Youth Olympics City in Nanjing, China, and Greenwich Millennium Village in the UK. Looking to the future, he hopes to develop this collaborative spirit in new projects.

Movers & Shakers

Val Evans, an architect at engineering consultant, Atkins, has been chosen as a 'Modern Muse' by the women's business community, everywoman. The Modern Muse campaign features 100 inspirational women in an initiative designed to inspire and engage the next generation of female UK business leaders and entrepreneurs.

The chief executive of the Heating and Ventilation Contractors' Association (HVCA) **Robert Higgs** has announced he will retire from the association in July after 38 years' service. Higgs has been a member of the HVCA executive staff since 1973, and was appointed its chief executive in July 1989. In recent years he has helped to shape UK policy on sustainability and climate change.

Martin Lewis has been appointed as associate director within building services company, GDM Partnership. Lewis has been with GDM for 15 years and his promotion follows five years as an associate. His key role will be fulfilling the duties of senior electrical designer and he will report to the board on all electrical matters.

The Energy Institute (EI) has announced the election of its first chartered energy manager, **Owen Everall** CEng MEI, who is the site engineering and facilities manager for Syngenta. The EI launched this new grade of registration earlier in the year to support and recognise professional practitioners who are responsible for managing energy to reduce use, increase efficiency and reduce carbon emissions.

Multi-disciplinary consultancy Mott MacDonald has appointed **Alan Tulla** as an architectural lighting designer. Tulla is currently the president of the Society of Light and Lighting. He has worked in the lighting industry for 30 years, focusing specifically on lighting design.

John Armitt has been reappointed as the chairman of the Engineering and Physical Sciences Research Council (EPSRC). The body plays a key role in ensuring that the UK develops leading edge technology. Armitt will now remain as chairman of the EPSRC until 31 March 2012.

After nearly 50 years in the industry and 20 years with the British Electrotechnical and Allied Manufacturers Association (BEAMA), electrotechnical sector figure **Dave Dossett** has retired. His roles have included director of the Electrical Installation Equipment Manufacturers Association (EIEMA), director general and chief executive of BEAMA, and director of the installation sector.

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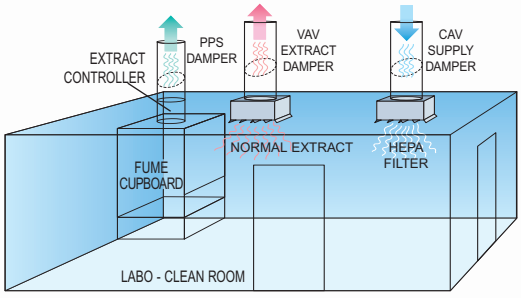

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