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Water opportunity

Ed Davey has been a supporter of heat pump technology ever since a developer contacted him about using the River Thames to heat a new housing and hotel development at Kingston Heights, south-west London.

The Secretary of State for Energy and Climate Change understood the benefit of boosting low grade heat using heat exchangers and heat pumps. Since then his department has launched a water source heat map, which details 4,000 rivers, estuaries, canals and coastal sites that could produce 6GW of low carbon heat. One project looking at using the technology is Battersea Power Station, where SSE is doing a full feasibility study.

In anticipation of a large uptake of interest, CIBSE has joined the Heat Pump Association and Ground Source Heat Pump Association to produce a code of practice for the UK. Supported by the Department of Energy and Climate Change, the code will be out this summer and aims to raise standards in the design, implementation and operation of water source heat pumps (page 9).

Manufacturers are gearing up for a rise in demand for all types of heat pumps with more training on design installation, and operation. The roll-out has to be right first time or Davey's efforts on water divining will be seriously compromised. (page 4).

Alex Smith, editor
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Faith in tried-and-tested technology

'Out with the old and in with the new' is an increasingly apt description of our generation's disposable attitude towards technology. But innovation does not have to be restricted to shiny new products and equipment. Within the building services industry, condensing boilers are a perfect example of how a tried-and-tested, refined and adapted technology continues to prove invaluable in tackling the ultimate challenge of raising the energy performance of our existing buildings.

Medieval Hexham Abbey in Northumberland, pictured on the cover of this supplement, is a case in point. TGA Consulting Engineers were tasked with combining the requirement for a high efficiency, reliable thermal source with the tight

space constraints of the 13th century plant room, restricted access and a short time frame. The specification of three Remeha Quinta Pro 90 gas condensing boilers on a free-standing, in-line cascade system with low loss header proved a flexible, compact solution that offered numerous different options and resulted in a neat, effective, energy-saving heating system for the refurbished monastic complex.

The ongoing popularity of condensing technology owes much to the manufacturers who continue to invest in R&D, refining this already efficient technology to raise efficiencies still higher and offer still greater design flexibility. With some boilers now in their eighth generation, it is encouraging

to see how, rather than resting on their laurels, heating manufacturers continue to innovate, pushing boundaries by incorporating devices, such as heat recovery technology, to achieve new levels of efficiency. It is this pioneering approach to the design of practical, high-performance and, perhaps most crucially, affordable technology that will help us to improve the efficiency of our existing building stock and meet our environmental targets.

James Porter is national sales manager at Remeha Commercial

 remeha commercial

The government predicts a massive uptake in heat pump technology as the UK looks to accelerate growth in renewable energy.

Andrew Brister looks at the market drivers and how the industry is tackling skills shortages, installation issues and optimisation of the technology



PUMP UP THE VOLUME

One million homes could be tapping into renewable heat hidden in our waterways. The Conservative-Liberal Democrat coalition government launched The Water Source Heat Map, an interactive, online tool that reveals the 4,000 rivers, estuaries, canals and coastal sites across the UK that, together, could provide more than 6GW of low-carbon heat to communities. By installing a surface water source heat pump, people can help eliminate the need for gas-fired domestic heating and a typical household could slash its carbon footprint by up to 50%.

Launching the map at Battersea Power Station, in London, in March, the energy and climate change secretary, Ed Davey, said: 'We

need to make the most of the vast amount of clean, renewable heat that lies dormant and unused in our rivers, lakes and seas. Doing this will help contribute to an energy mix that maximises clean, reliable, home-grown resources rather than relying on foreign fossil fuels. It also provides a system that bolsters growth in our local economies, protects the natural environment and creates resilient communities capable of producing sustainable power systems.'

Battersea Power Station Development Company has announced that it is looking to install a surface water source heat pump at the site and that energy firm SSE will carry out a full feasibility study. The company will also investigate the re-use of the power station's

existing engineering infrastructure, built 80 years ago to connect it to the Thames when the station was generating power. If a heat pump is installed, it would be one of the energy sources used to provide heat to around 4,000 new homes, shops, offices and public amenities being planned at the site.

The Water Source Heat Map provides developers and homeowners with information to help them get surface water source heat pump projects up and running. It includes details of water conditions, such as temperature and flow rates, as well as the potential heat capacity of each waterway, and the heat demand across England – thus eliminating the cost and time it would take developers to do exploratory studies.



Daikin's new national training and technology centre in Surrey



London cooling

Are heat pumps with heat recovery a viable technology for energy cost reduction, and for improving the UK's environmental impact? A study at 350 Euston Road, Regent's Place, London – a seven-storey office block owned by British Land and managed by Broadgate Estates – suggests it is.

A comprehensive energy model was jointly developed by the Department of Industrial Engineering at the University of Padua and consultant Studio Planning, to both simulate how the building operates and test a range of options, including heat pump technology from Climaveneta. The key findings of the study were:

- Heat pumps with heat recovery are a viable solution for London office buildings
- London's climate conditions suit heat pump operating limits
- Heat pumps with heat recovery reduce the building's primary energy consumption by 38% and CO₂ emissions by 34.6%
- The carbon reduction achievable with this technology will improve over the lifetime of the system, achieving savings of between 75.4% and 88.4% in 2025
- In new developments, this technology allows

- simplification of the building services system
- In refurbishments, additional costs are necessary to adapt existing pipework to the new system. Given the achievable savings, the payback is less than two years
- Net present value of the total savings over the 15-year lifespan cover 60% of the initial investment
- Enhancing the system based on heat pumps with heat recovery with ancillary solutions – such as thermal storage and chiller plant optimisation systems – would further improve its energy performance



As well as the map, the government has published a flow chart to help people navigate the process of setting up a surface water source heat pump. It has also worked with the Environment Agency to make it easier and quicker for people to apply for permits, and a code of practice on surface water source heat pumps will be published this summer (see page 7).

The Renewable Heat Incentive (RHI) is one of the mechanisms government has used to encourage the take-up of heat pump technology, both water source and air source. In the commercial sector, the vast majority (94%) of applications under the RHI tend to be for biomass boilers, with heat pumps represented in only 2% of the 11,673 schemes from November 2011 to February 2015. The domestic RHI scheme has had a more enthusiastic take-up: of the 28,168 applications up to February 2015, 39% are for air source heat pumps and a further 16% for ground source ones.

The Conservative-Liberal Democrat government's Carbon Plan projects a massive growth in the market in the coming years. It shows demand for domestic air source heat pumps rising from 1 TWh/y in 2015 to 8 TWh/y in 2020 and a huge 85 TWh/y by 2030. 'The domestic RHI is now in

place to help facilitate the required market growth into the 2020s, where mass-market take-up will be required,' said John Kellett, general manager, heating systems, at Mitsubishi Electric. 'The growth opportunities remain very compelling for renewable domestic heating in the UK – as an industry, we must continue to prepare for mass-market adoption of the technology.'

Such a dramatic rise in demand prompts the question about whether there are sufficient installers with the necessary skills. The findings from early heat pump field trials – conducted by The Energy Saving Trust (EST) between 2008 and 2013 – have led to improvements in the Microgeneration Certification Scheme (MCS) installation standards, and the Department of Energy & Climate Change (DECC) and EST are continuing to work with industry and the MCS to further improve standards and training. DECC has also incorporated lessons learned from the trial into its design of the domestic RHI policy – for example, by providing an additional incentive for householders to install metering and monitoring packages, so they know how much energy their heat pump is consuming.

Daikin UK has opened a national training and technology centre in Woking, Surrey, in

‘The projected rise in demand for domestic heat pumps in the UK prompts the question about whether there are sufficient installers with the necessary skills



WATER SOURCE HEAT MAP

DECC's Water Source Heat Map produced by Buro Happold is available at <http://bit.ly/1z0pdPF>

response to the growth of the market. A recent report by the integrated climate-control firm found that 83% of HVAC companies are finding it very difficult to hire suitably qualified engineers. So the centre aims to train and promote a new generation with the specialist product and installation skills required to support and further encourage the growth of the UK renewables market.

'We want to help the HVAC industry to expand by training individuals to have the right product and service expertise,' says John Durbin, Daikin UK training manager. 'We have listened to the market and we are addressing the issues it faces by creating market-relevant courses.'



Climaveneta's Integra heat pump

'Those early findings from the EST trials still stand true and will do for some time yet,' said Max Halliwell, product marketing manager at Mitsubishi. 'Energy use and reporting has been high on the agenda, and high-performing and hybrid systems require metering for payments under the RHI.' The latest Mitsubishi Ecodan range of air source heat pumps includes remote energy monitoring and fault finding, with the capability to assist commissioning and log energy via the company's MELCloud.

Such tools are well established in the commercial sector. ClimaPRO is plantroom optimisation and control software developed by Climaveneta. 'In commercial buildings, HVAC accounts for 45% of total energy consumption, and 65% of that is used in the plantroom,' said Luca Micheletto, product manager, compact chillers and application, at Climaveneta. 'Chillers and heat pumps are complex machines, so it makes sense to optimise them, not just control them.'

Operating over the Niagara Framework, by Tridium, ClimaPRO can be stand-alone or interfaced with any BMS. Modules include control and optimisation, reporting and chart building, maintenance and diagnostics, measurement and verification, and management and monitoring. 'Depending on the complexity of the plantroom, energy savings can be as high as 35%,' claimed Micheletto. There are around 35 ClimaPRO installations worldwide, including at 350 Euston Road, London (see panel 'London cooling' on page 5).

Whether it's air source or water source, commercial or domestic, the future looks good for manufacturers of heat pump technology. With training and installation standards improving, and energy monitoring and optimisation getting the best out of the technology, the heat is on boiler suppliers. 

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A surface water source heat pump (SWSHP) system at the £70m Kingston Heights development in London was one of the first of its kind to be installed in the UK.

It harvests naturally stored energy from the River Thames and helps deliver underfloor heating and hot water for 56 affordable homes, 81 private apartments and a hotel.

This scheme was an exemplar for low-cost renewable energy in the UK, potentially offering a coefficient of performance approaching double figures. Secretary of State for Energy and Climate Change Ed Davey, whose constituency borders Kingston Heights, is a big fan, and has been promoting the technology since its completion. His department has produced a water source heat map of about 40 urban rivers with the greatest potential for SWSHP (see page 4).

There is now a significant impetus for SWSHP to become a big part of the UK's future energy strategy and this will be spurred on by a new code of practice.

Surface water source heat pumps: A Code of Practice for the UK – the draft of which is due to be issued for industry-wide consultation in June – is a joint project between the Heat Pump Association, Ground Source Heat Pump Association and CIBSE, supported by the Department of Energy and Climate Change (DECC).

The code of practice will identify and evaluate the options available to extract heat from – or reject heat into – an open body of water. It will not focus on ground water, such as aquifers, mines, or caverns.

Raising standards

The purpose of the code is to provide developers and designers with the information they need to consider whether SWSHPs can be used to provide heat on a large scale in densely populated urban areas.

The UK has an abundance of viable water resources – even in winter – and, with SWSHP systems capable of reaching temperatures of more than 80°C, there is value in this technique for designers – if the network is well designed and controlled.

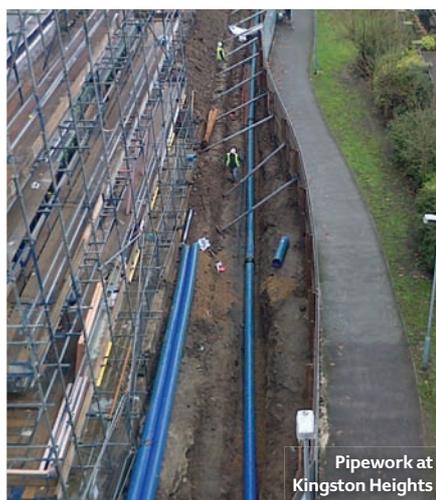
The code of practice aims to raise standards in the design, implementation and operation of water source heat pumps, and will cover the entire project life-cycle.

It is anticipated that the code would be used in tendering and specification to ensure contractors and their contracts meet a minimum standard.

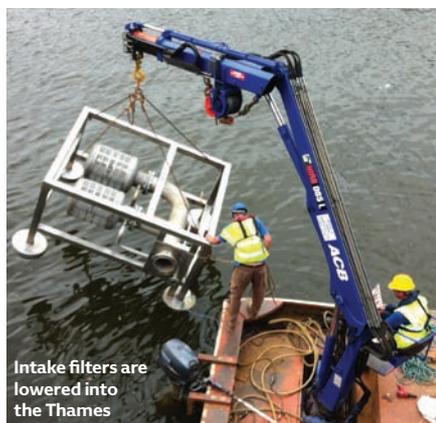
The adoption of a code by developers could give confidence to customers and

COMING ON STREAM

To boost the uptake of a technology with the potential to tap into plentiful energy stored in rivers, canals, and lakes, a set of new standards are being drawn up by CIBSE and two other industry associations. **Liza Young** looks at what the Surface Water Source Heat Pump Code of Practice hopes to achieve



Pipework at Kingston Heights



Intake filters are lowered into the Thames

property purchasers that the SWSHP has followed a set of design, installation and commissioning standards.

In the longer term, following the code could be a condition for receiving planning, private investment or public funding.

Once the code is complete, there is potential for developing training and certification to recognise suitably competent engineers in this area. This could lead to registration of SWSHP engineers in a similar

way to EPC and DEC assessors.

Developers and clients could then select trained specialists who understand how to meet the standards and implement them.

Code structure

The code of practice is structured around the typical sequence of a project's stages; for each stage a number of objectives are set and, for each objective, minimum requirements are defined to achieve it.

The project stages are outlined in the SWSHP plan of work, which shows the key responsibilities and how these relate to the major goals or themes.

The overarching goals will need to be considered in several stages of the project either by an individual or specialist sub-contractor. The goals include delivering:

- A safe, quality scheme where risks and environmental impacts are managed
- A cost-effective system with minimum life-cycle costs
- A reliable system with a long life and low maintenance requirements
- An energy efficient system
- A practical and compliant system, which effectively uses engineering solutions to overcome barriers.

Setting minimum – and perhaps best-practice – standards will provide greater confidence for specifiers and clients, while laying a foundation for CIBSE to explore provision of specialist training in the sector to improve knowledge and distinguish those with specialist skills.

It is hoped that the assurance provided by the standards and certification will significantly boost the SWSHP market. 

- More details will appear at www.cibse.org/knowledge

Portsmouth 2MW 2011

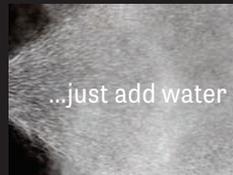


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As dwellings are highly insulated and sealed to improve energy performance, effective ventilation becomes essential to ensure good indoor air quality. Mechanical systems can address the issue, but they must be used as designed, and be properly maintained and installed.

Andrew Brister reports

Are you sitting comfortably? If you are at home, then perhaps not. According to the My Health, My Home campaign, by the British Electrotechnical and Allied Manufacturers' Association (Beama), indoor air can be 50 times more polluted than outdoor air and may contain more than 900 chemicals, particles and biological materials with potential health effects. A study by Prism and Waverton Analytics found a staggering 91% of homes tested for volatile organic compounds (VOCs) in the air were above the recommended level.

VOCs are not the only problem. A recent YouGov consumer survey, conducted on behalf of Beama, showed that 58% of respondents have experienced mould or condensation in their homes and 19% of these have suffered respiratory or dermatological conditions. Beama estimates that 15.3m homes are at risk from what is being called Toxic Home Syndrome.

Adequate ventilation is essential, yet – according to Beama – only 2% of UK homes have mechanical ventilation systems installed. Evidence shows that, if care is not taken to ensure adequate levels of ventilation – in line with Part F of the Building Regulations – high levels of humidity can lead to a growth in dust-mite populations, condensation and mould, resulting in health and comfort issues.

Britain is busy upgrading its ageing building stock, improving insulation standards to drive up energy performance. Beama's recommended approach to a balanced refurbishment involving internal or external insulation improvements is to specify continuous ventilation equipment.

'There is no doubt that indoor air quality has an impact on health, with mould and condensation being key factors of poor

UNWELCOME HOME



▶ indoor air quality and health risk,' says Lee Nurse, marketing director at Vent-Axia, and chair of Beama's ventilation committee. 'With many people spending the majority of their time indoors, improvements in indoor air quality must be seen as a priority. Continuous ventilation is a simple solution to air-quality problems.'

For new-build homes, more and more designers are turning to mechanical ventilation with heat recovery (MVHR) equipment. The National House Building Council (NHBC) says there has been a noticeable increase in the number of homes incorporating MVHR, with current estimates suggesting that this could be around a quarter of new homes.

A study conducted by the BRE for the NHBC sheds light on some of the issues surrounding MVHR systems, namely the way they are installed, used and maintained (see panel 'MVHR in use'). Certainly, an MVHR system is a step up from a simple bathroom extract fan, for installers and users alike, and it's no surprise that it takes time to get used to them.

'Beama is trying to establish a more integrated approach to competency when it comes to installation,' says Nurse. 'We are looking at whether there is a requirement for a Competent Persons Scheme – similar to what you have with gas installation – and we are looking at guidance on robust details around ventilation systems.'

'Perhaps there is a need for a handbook



Installation of Vent-Axia mechanical ventilation (above and over)

on how it should be done, with do's and don'ts – similar to what's available for walls and floors.'

Users need guidance, too. Carrie Behar is a PhD student at the UCL Energy Institute, and her research is examining occupant interaction with ventilation systems in low energy dwellings. 'Poor information provided to residents of new homes goes some way to explaining why they aren't interacting with systems in the way we might ▶

MVHR in use

The BRE's study for the NHBC monitored 10 zero-carbon Code for Sustainable Homes Level 6 properties at Scottish and Southern Energy's (SSE's) Greenwatt Way development at Chalvey, near Slough, Berkshire – both during construction and for almost two years post-occupancy. The research involved assessment and evaluation of MVHR systems, taking in design, procurement, installation, commissioning, performance, maintenance and occupant perceptions.

After approximately one year of occupation, nine of the MVHR units were recommissioned and changes made to room inlet air valves and air filters. In one home, the MVHR fan unit was replaced, and changes made to sections of ductwork and its insulation. The main findings are:

- It is critical that the overall ventilation strategy is taken into consideration during the design stage when using MVHR systems

- During the procurement process, it is important to seek technical input from the supplier and installer of MVHR systems
- MVHR systems should be installed by trained and experienced ventilation system installers
- Commissioning of MVHR systems must be fit for purpose
- Factors likely to affect the power consumption by MVHR fan units adversely during operation must be considered
- Factors likely to affect the thermal performance of MVHR systems adversely in operation must be considered
- Successful measures may be taken to increase the performance of MVHR systems and to reduce noise levels associated with their operation.

Occupant feedback has been mainly positive, with levels of satisfaction tending to increase over time as the homes and their MVHR systems became more familiar. Much of the

negative feedback associated with ventilation, thermal comfort and internal noise could be attributed to MVHR systems, including issues with perceived lack of control, temperature differences between storeys, experiences of draughts from cool air dumping and levels of mechanical noise. Levels of occupant satisfaction on these particular issues generally improved as a result of the remedial works carried out on MVHR systems after one year of occupancy.

However, the Greenwatt Way occupants will have been better informed than the average householder, and have benefited from the interventions carried out as part of this research project. In the wider world, there would be every possibility that, where MVHR systems are not designed, installed and operated correctly, occupants may take radical steps in response to problems – such as turning off the MVHR system.

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hope,' says Behar. The findings include a lack of awareness over the way the ventilation system is to be used, as well as no explanation of the need for maintenance, such as an annual filter cleaning.

A research team at the University of Exeter Medical School has found that failure of residents to heat and ventilate retrofitted properties could lead to more people developing asthma. Working with social housing provider Coastline Housing, the team assessed data from the residents of 700 properties in Cornwall.

'We have found that adults living in energy-efficient social housing may have an increased risk of asthma,' says researcher Richard Sharpe.

'Modern efficiency measures are vital to help curb energy use and prevent heat loss, through improved insulation and sealing. Yet some people, particularly those living in fuel poverty, are unlikely to heat a building enough – or ventilate it

People living in fuel poverty, are unlikely to heat a building enough – or ventilate it sufficiently – to prevent the presence of damp and mould

sufficiently – to prevent the presence of damp and mould, factors that we know can contribute to asthma.'

Head of technical services at Coastline Housing, Mark England, says: 'This research has given us an invaluable insight into how the behaviour of people living in fuel-efficient homes can affect their health. As a result, we're working to provide customers with better information on how to manage their indoor environment, including potential training of volunteer sustainability champions.'

Manufacturers are also addressing the installation and in-use issues. 'We offer installers free attendance on a BPEC-accredited training programme to make sure they are properly trained,' says Andy Mudie, marketing director at Nuaire.

'We also offer a design service, so that the industry can get the robust detail issues right, and we always provide information for the installer and the end user about how the products work. There has to be a handover pack.'

Clearly, the public has yet to understand fully the crucial role their ventilation system plays in indoor air quality and health. Beama's My Health, My Home campaign is a step in the right direction. Perhaps, one day, getting the ventilation system serviced will be as commonplace as the annual boiler check-up.

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Fire Design Solutions appointed to new residential development

Smoke ventilation contractor Fire Design Solutions (FDS) has been appointed to work on a new residential development in Deptford, London.

Engaged by mechanical engineer LKF, FDS will design, supply and install a number of systems for the Marine Wharf site at Surrey Quays, currently being delivered by developer Berkeley Homes (East Thames).

Initially, the FDS team carried out an appraisal of two of the development's three-core blocks, and will now begin installing the mechanical smoke ventilation and car park ventilation systems to meet the required fire safety standards.

FDS has also worked with Berkeley Homes' technical team to develop appropriate corridor environmental systems for the 532-home project, which will mitigate heat in the buildings' common areas. Installation works are due to be completed later this year.

Gerard Sheridan, FDS chair, said: 'We're delighted to work with LKF on Marine Wharf. By designing our corridor environmental systems alongside Berkeley Homes (East Thames) we've been able to gain approval for them to be used on selected Berkeley Homes (East Thames) sites.'

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DAIKIN

McQuay (UK) to become Daikin Applied (UK)

Manufacturer of energy efficient AHU and chiller products, heat pumps, cooling systems, ventilation and air conditioning systems, McQuay (UK) has announced that, as from 1 April 2015, the company will trade under the new name Daikin Applied (UK) and Daikin Applied Service.

Jim Henley, general manager, said:

'The decision to rename the company is part of a global rebranding strategy to define more clearly and communicate our HVAC offering to the UK and markets worldwide.

'While our name is changing, our legal status and our office address and contact details will remain the same. The firm's business remains fundamentally unaffected by this change. All contracts with existing customers, suppliers and stakeholders will remain unaltered, with corresponding obligations and rights assumed under the new names.'

As part of the rebrand, a new fully responsive, integrated website is being launched as an information hub for contractors, customers and suppliers.

Henley added: 'Customers can rest assured that we will maintain the same level of engineering service expertise and customer-orientated approach for which we are renowned.'

● Email mick.humphrey@daikinapplied.uk or visit www.daikinapplied.uk

Evinox Energy launches CIBSE-accredited CPD seminar

With the increasing focus on district heating, Evinox Energy has launched a CIBSE-accredited continuing professional development seminar (CPD), providing the opportunity to explore the topic in depth and identify new ways to add value, performance and efficiency. With more than 13 years of experience, Evinox Energy has been involved in the design and supply of equipment for both private and social housing schemes.

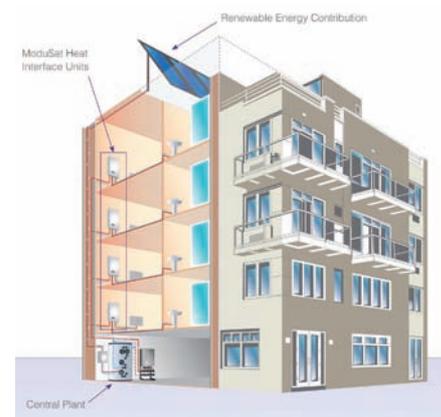
Our seminar entitled 'Modern communal heating installations – key considerations for an effective system' is accredited by the Chartered Institution of Building Services Engineers (CIBSE) and provides credits towards consulting engineers' CPD.

We offer a 60-minute seminar, ideal for M&E consultants, contractors, developers and housing associations, which covers topics including:

- Communal/district heating overview
- Central plant – the energy centre
- Heat interface units
- System design and regulations
- Metering, billing and revenue management.

The seminar can be held at either a client's premises or at the Evinox Energy offices in Epsom. Our speakers are highly experienced in communal heating with relevant professional qualifications. All attendees will receive a certificate for obtaining CIBSE CPD points.

● Call 01372 722277 or visit www.evinoxenergy.co.uk or www.evinoxresidential.co.uk



Lochinvar launches Optimus gas absorption heat pump

Boiler and water heater manufacturer Lochinvar has launched the Optimus range of gas absorption heat pumps, capable of delivering space heating and hot water to commercial buildings at extremely high efficiencies.

Optimus delivers outputs of up to 41.7kW and is capable of operating with ambient temperatures as low as -20°C. It can achieve efficiencies as high as 152% by capturing low-grade energy from surrounding air to supplement thermal output from the refrigeration cycle, which is driven by a natural gas or propane burner.

Low temperature hot water can be supplied at up to 65°C for heating applications and up to 70°C for domestic hot water. Outdoor installation provides a convenient space-saving solution, but an indoor option is also available. The indoor model requires only a 1m² louvred opening for air to be taken into the plantroom and is supplied with an easily removable duct section on top for the air outlet.

● Visit www.lochinvar.ltd.uk or follow @LochinvarLtd



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