Welcome to Adveco's March newsletter,

This month we are again celebrating the FUSION system as we head to the 2025 National Heat Pump Awards with the T and Tplus variants that maximise input from the ASHP to decarbonise electric water heating for slam and mid-sized organisations.

As Spring approaches and the days are starting to get longer, it's a good time to consider the advantages of Solar Thermal. This month we look at the opportunity to take advantage of this true renewable as part of the transition to electric DHW applications.

Understanding the challenges and advantages of transitioning to net zero has become increasingly complex, so to wrap up this month we look at three key topics: retrofit, renewables, and refrigerants. These are the three 'Rs' of net zero that need to be learned if we are to successfully decarbonise the built environment in the UK...

FUSION Heads To The National Heat Pumps Awards 2025

Adveco's FUSION Packaged Electric Water Heating has been named a finalist in the Commercial Heat Pump of the Year category of the National ACR And Heat Pumps Awards 2025. The renowned NACRHP Awards celebrate the best in the HVACR industry and promote the year's successes.

The award nomination focuses on the T & Tplus variant models which integrate an R32 air source heat pump (ASHP) and controls with FUSION's base arrangement of a hot water cylinder and mounted electric boiler.

FUSION is conceived first and foremost as a response to the need to provide greater sustainability to commercial organisations. These pre-sized, packaged, low-carbon water heating systems offer small to mid-sized commercial businesses an easy-to-adopt hybrid water heating offering that can address the most complicated projects, whether new build or retrofit.

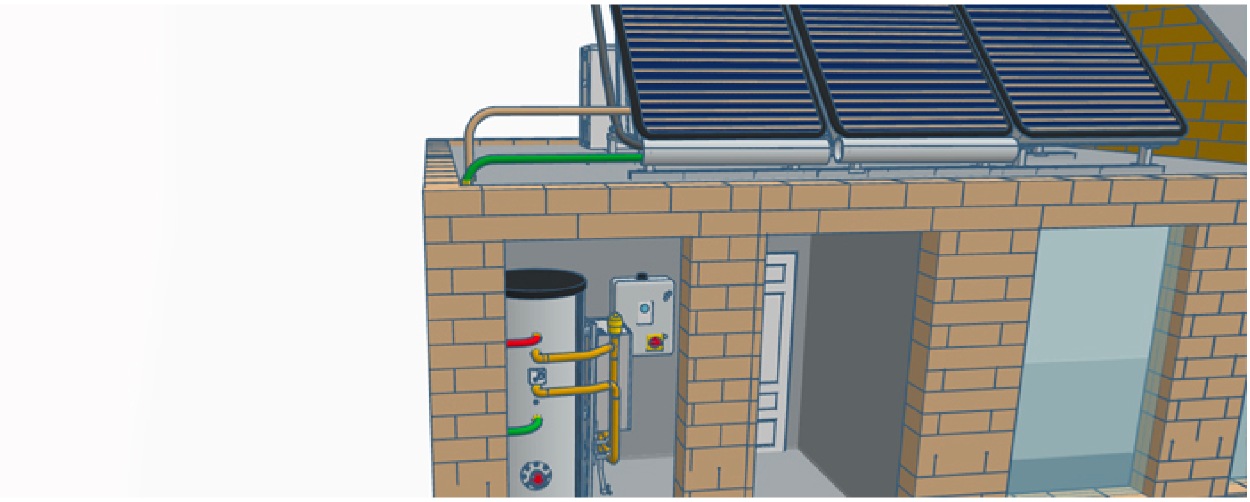
The nominated variants employ a dual-coil version of the cylinder, enabling the heat pumps to maximise efficiency by providing consistent pre-heat. The electric boiler supplies necessary top-up heating to meet the more stringent higher operating temperature required of commercial applications, as well as addressing peak and unexpected demands on the system. The Tplus also incorporates an electric immersion, meaning there is no single point of failure for assured operation since water heating is typically a business-critical service. Bespoke controls ensure the system remains perfectly balanced to enhance efficiency, reducing energy demands and carbon emissions, as well as helping to manage operating costs.

Industry judges continue to recognise the need and the immediate opportunity for reducing carbon emissions from buildings previously reliant on gas-fired water heating. FUSION represents a simple, cost-effective means of addressing the decarbonisation of buildings for commercial businesses that wish to demonstrate active investment in sustainability strategies today.

FUSION has previously been named Commercial Heating Product of the Year in the 2024 Heating and Ventilation News(HV&N) Awards and won a Highly Commended award in the 2023 Heating & Ventilation Review (HVR) Awards for Best Commercial Heating Product.

FUSION ELECTRIC WATER HEATING

Embracing The Power Of Solar FUSION



Whether new build or retrofit, the application of solar thermal pre-heat is a well-established means of reducing the energy demands of domestic hot water (DHW) applications, offsetting operational costs and actively cutting carbon each year by 148 kg of CO_2 per m^2 of collector installed on a building. Traditionally such a system would have employed gas-fired water heating to top up for peak and unexpected demands, especially outside of the summer months. Today, as buildings transition to all-electric water heating to address decarbonisation, the integration of solar thermal with more costly to operate electric DHW applications is even more advantageous.

Adding extra elements to DHW systems increases the complexity, especially in commercial buildings, leading to the need for bespoke system design, which inherently adds capital costs that can exclude those organisations with low- to mid-capacity DHW demands. That is changing with the application of Adveco's award-winning FUSION electric water heating system, which incorporates cylinder, electric boiler and controls.

Designed as a simple, cost-effective means for transitioning to fully electric low-carbon water heating. FUSION T offers a twin-coil stainless steel tank variant which, although designed for heat pump integration, allows for the introduction of solar thermal energy into the lower coil as the system preheat. This option is enabled with a small amendment to the controls to optimise top-up heating from the boiler as the pre-heat fluctuates across the year.

Well-designed commercial solar thermal systems are capable of offsetting on average a minimum of 30% of the energy demands for water heating, making it potentially ideal for organisations that require regular DHW. For some UK regions, especially in the South and West, this percentage is much higher. In the summer months, solar can potentially meet all a DHW system's energy demands, especially in the case of smaller commercial businesses and offices.

A south-facing and unobstructed roof with an inclination of 30° from the horizontal is optimal, but Adveco recognises that small- to mid-sized organisations are likely to also struggle with space for the installation of solar collectors. In response, its modular, high-performance flat plate collectors can be situated on or integrated into flat or sloped roofs, as well as mounted on a building's façade. By far the most efficient way to heat water with solar energy, flat plate collectors also offer a smaller footprint compared to equivalent solar photovoltaics (PV) for DHW. A typical office may require, as a rule of thumb, one solar thermal collector per 100 litres of thermal storage capacity.

Most commercial applications average six to 20 collectors, and with a single FUSION capable of supporting capacities up to 750 litres with 24 kW heat output, this places it firmly in the lower spectrum demand for collectors. While solar thermal systems will typically be designed to evenly split capacity between the preheater and after heater, this single-cylinder FUSION scenario uses Adveco's smart controls to 'cheat' the system in favour of the solar thermal input. Adveco can deliver a 600-litre solar capacity application in a 750-litre tank for an extremely compact all-electric, low-carbon emission, solar water heating system with a minimal rooftop or façade footprint.

Adveco will also specify Drain Back modules with the collectors to preserve the operational qualities of the solar fluid, adding further resilience to the solar function in line with the robust, protective operation of the FUSION system. FUSION is resilient to limescale formation in hard water areas, common in the South and South-East where solar is also optimal and incorporates multiple, balanced heating elements built-in and the option of an immersion back-up for no single point of failure.

Integrating FUSION packaged electric water heating with solar thermal is one of the most cost-effective and simple ways of introducing hybrid DHW into smaller commercial buildings. For larger applications, FUSION can still be integrated into more bespoke alternatives that not only harness solar thermal but optimise the use of air source heat pumps to provide the initial pre-heat for the system.

Operating at lower temperatures with the cold feed maximises the efficiency of the heat pump, reducing electrical operating costs and raising working flow temperatures from 10°C to 40°C. This is not hot enough for commercial applications, so the pre-heated water is passed to a mid-solar thermal system. Essentially free to operate, the solar thermal system boosts the working flow temperatures from 40°C to at least 50°C. Although not operating at maximum potential, there is enough advantage gained from solar thermal to warrant the additional system complexity and capital investment. During summer months the solar thermal system can deliver the necessary 60°C working flow for safe provision of commercial hot water. But to ensure safe, consistent, and necessary high operational temperatures, the water is passed to the FUSION unit where the electric boiler ensures consistent water temperatures of up to 65°C are available year-round.

SOLAR THERMAL SYSTEMS

Learning The Three Rs Of Net Zero

The transition to net zero and a renewable future necessitates a multi-pronged approach across various sectors. In the commercial built environment, understanding the challenges and advantages of tackling three key areas stand out: retrofit, renewables, and sustainable refrigerants. These are the three Rs of net zero that need to be learned if we are to successfully decarbonise the built environment in the UK...

Number 1 - Retrofit

The built environment accounts for a significant portion of global greenhouse gas emissions. Existing buildings, with their inherent energy inefficiencies, pose a substantial challenge. Retrofit, the process of upgrading existing buildings to improve energy performance, is therefore crucial and so our first of the Three Rs of net zero.

In terms of attaining net zero this represents, and needs to be recognised as, one of the largest challenges. According to Statistics released by the Department for Business, Energy, & Industry Strategy (BEIS) there were 1,755,000, recognised non-domestic buildings in England and Wales at the end of March 2024, accountable for 23% of the UK built environment's operational emissions.

Much emphasis has been placed on improving building regulations so that new-build support more sustainable construction and operation, but the reality is that new non-domestic construction, having peaked at 22,000 new properties in 1985 has gradually declined to less than 2,000 annually by the end of 2023. Non-domestic building stock between 2012 and 2023 did average 7,000 buildings per year, but this annual rate has been impacted by economic and other events, with a substantial fall in construction seen around the 1990 and 2008 recessions and during the COVID-19 pandemic in 2020 and 2021 (with successive annual falls of in the number of non-domestic buildings of 14% and 28%). This has consequently driven up the percentage of pre-existing properties in the UK which include shops, offices, factories and warehouses, hospitality, arts and leisure, health, education and emergency services which account for 1.6 million recorded non-domestic buildings. Of these, just 14.6% were constructed after 1996, and considering the rates of new construction it is easy to see why the UK Green Building Council (UKGBC) estimates that 80% of buildings that exist today will still be here in 2050. Many of these buildings will have been constructed to lower energy efficiency standards meaning the large majority require some or considerable retrofit over the next 25 years if improved performance for sustainable operation is to be achieved.

The positives of retrofit should also help to outweigh the capital investment. Under retrofit, buildings should consume less energy, leading to lower operating costs and reduced carbon emissions. Such work can also deliver enhanced insulation and ventilation, improving indoor air quality, benefiting occupant health and well-being. And, energy-efficient buildings are generally more attractive to tenants and buyers, increasing property values.

Retrofit will typically incorporate enhancements to insulation to minimise heat loss in winter and heat gain in summer, and replacement of glazing to significantly heat transfer, reducing energy demand for heating and cooling. This will go hand-in-hand with the installation of new high-efficiency HVAC Systems. Retrofit of space heating can be a complex and expensive function of retrofit as it can demand replacement of pipework and heat emitters alongside new plant. Domestic Hot Water (DHW) Systems are far quicker and easier to replace, despite the inherent complexity of the system, because basic alterations will occur within the plant room. More advanced retrofit which could include heat pumps or solar thermal will require external work to the building, but this again is less invasive than other options. Building automation systems deploying smart thermostats and controls enhance these new appliances allowing for optimised energy use and reduced waste.

Chief amongst the goals of retrofit moving forward is, and will increasingly be, the integration of renewable energy. This sees a shift to greater consumption of grid electricity as fossil fuel dependence is reduced. But truly sustainable retrofit will require the incorporation of on-site renewable energy sources like Solar and to some extent Heat Pumps (as these still require electrical energy to operate) to further reduce reliance on the grid.

Number 2 – Renewables

According to Data released in December 2024 by the Department for Energy Security & Net Zero dependency on fossil fuels was 71.8%, the lowest quarterly share this century due to reduced gas demand and displacement by renewables for a low carbon share of 24.6% in the third quarter of the year. This marked the highest percentage share for low-carbon energy so far this century.

But we are still a distance from achieving a truly renewable grid supply. The UK was still consuming 94 thousand tonnes of coal for electricity generation, 40% of which was sourced from Columbia in September of 2024, but this month also saw the closure of the only operational coal-fired power plant. With coal being phased out, the grid remains reliant on gas, nuclear and renewables. As we move into 2025 approximately 68% of electricity is being generated from low carbon sources of which 50% is deemed renewable.

This is why it remains important for commercial and public service organisations to not just consider a transition to electricity but seek to integrate renewable energy sources into buildings for active decarbonisation. Key technologies for generating clean renewable future electricity include small-scale wind turbines, solar photovoltaic (PV) panels that convert sunlight directly into electricity, plus ground-source heat pumps which utilise the stable temperature of the earth for heating and cooling.

For DHW applications, in terms of simplicity and efficiency, the recommendation is to deploy Solar

Thermal, which collects solar energy as heat which is then transferred to stored water for distribution. Solar thermal is considerably more efficient for water heating than solar PV, so greater heating can be obtained from a smaller area of collectors meaning it is easier to fit to older buildings, especially when applicable roof or wall space is at a premium. Supplying system pre-heat solar thermal will typically offset at least 30% of a UK organisation's annual water heating energy demands. Further South and West, the solar gains can be considerably more, especially from April through September. Solar can also be used after heat pumps providing mid-heat top-up for larger, more demanding systems for further carbon and operational cost reductions. In terms of water heating, solar thermal is the best understood and proven renewable energy source, which, if deployed as part of an all-electric system can achieve rapid return on investment (ROI). solar thermal is thus a real opportunity to deliver a renewable future.

Though typically grouped with renewables, Air Source Heat Pumps (ASHPs) are not a true renewable. When installed correctly in a well-designed system ASHPs will maintain efficiency to deliver heat to a system more effectively than direct electric heating. This is defined by the coefficient of performance (COP), best averaged across the year for a more realistic annual rating (Seasonal COP). The higher the SCOP, the better able the heat pump can generate low-carbon heat. ASHPs are designed to work best in lower temperature systems, with efficiency impacted by low ambient temperatures of air which heat is being drawn from by the ASHP and the temperature of the water that needs to be input into the DHW system. To ensure consistent output temperatures the heat pump will be required to work harder as the ambient temperature drops and to meet safe higher temperatures (60°C) required by commercial DHW systems. This additional work demands electrical input to the pumps, hence they are not a 'true' renewable but rather should be classed as low-carbon appliances. Maximising the efficiency of heat pumps in commercial-scale building projects is one of the core aims of the HVAC sector. For DHW this currently means deploying heat pumps as part of a wider application as opposed to a single technological response to the building's demands. Such 'hybrid' approaches make optimal use of the heat pump to deliver lower, sub 55°c hot water as pre-heat to the system, then topping temperatures up to +65°c using electric boilers or a combination of solar thermal and electric water heating to assure low carbon, cost-effective to operate water heating systems capable meeting consistent and peak daily demands.

The alternative is to maximise the efficiency of the heat pump through the application of improved refrigerants to create higher-temperature heat pumps.

Number 3 - Refrigerants

Heat pumps leverage the well-understood refrigerant cycle used for more than a century in devices such as fridges and freezers, only reversing the process to generate heat rather than cold. This four-part cycle within the heat pump is dependent on a chemical refrigerant. In the evaporator, the refrigerant absorbs heat from the surrounding air (in heating mode) or from the indoor air (in cooling mode). This heat causes the refrigerant to evaporate into a low-pressure gas. The gaseous refrigerant is then compressed by the compressor, significantly increasing its pressure and temperature. In the condenser, the high-pressure, high-temperature refrigerant releases heat to the surrounding environment (in heating mode) or to the outdoor air (in cooling mode). This heat rejection causes the refrigerant to condense back into a liquid state. Finally, the liquid refrigerant passes through an expansion valve, where its pressure and temperature drop dramatically. This low-pressure, low-temperature liquid is then ready to re-enter the evaporator and start the cycle again.

The more efficient the refrigerant, the greater potential to deliver consistent higher temperatures from the heat pump for less effort, so less electrical input required to the heat pump. Higher efficiency refrigerants also mean less is potentially required in the unit to achieve desired heating output, so the heat pump can be more compact and less costly to purchase, install and operate.

So, choosing a heat pump with the right refrigerant is an important facet of any sustainability planning. The choice of refrigerant is going to depend typically on which best maximises the heat pump's efficiency to minimise energy consumption. In addition, and increasingly important is the prioritisation of refrigerants with low global warming potential (GWP) and zero ozone depletion potential.

This need has seen a shift in refrigerant preferences, with a gradual phasing out of high-GWP refrigerants with hydrofluorocarbons (HFCs) in favour of low-GWP alternatives. This mostly recently led to the move away from refrigerant R410A, to R32 which offered extremely safe, high-efficiency operation with a much lower GWP. R32 is the current recommended refrigerant of choice for DHW due to its consistent ability to maintain temperatures suitable for system preheat. Initially developed a century ago, R32 was conceived as a safe, non-flammable refrigerant, however, it and its more recent derivatives are still considered to be potentially harmful to the environment should they be leaked. As a result, the EU is considering stricter regulations on refrigerants such as R32, with the intent to phase out their use in the near term. However, it's important to note that this is still under discussion, and a complete ban on R32 may not be implemented. If it does proceed the expectation is that the UK would likely follow this lead.

This does leave a question regarding which refrigerant will be the future choice. The process of developing and testing new refrigerants has taken considerable time, with variants of known refrigerants taking years to be refined before they can safely be used in products. The heat pump industry has invested heavily in the shift to R32, and early curtailment of its use is certainly problematic. Focus is therefore turning to the utilisation of natural refrigerants such as carbon dioxide (CO_2), hydrocarbons (propane) and water, which have negligible or zero GWP.

Heat pumps using CO_2 or propane are available and claim high output temperatures, in excess of 70°C. To achieve this CO_2 based systems will operate at extremely high pressures, requiring specialised and robust components, which can increase the size, costs and complexity of the heat pump. They also best work within narrower windows of ambient temperature compared to refrigerants like R32 which can maintain consistent heat output when external temperatures drop lower than -20°C. Commercial CO_2 heat pumps also notably struggle when trying to keep the return temperature below 30 degrees. That is fine if you have continuous high demand, but most commercial systems need to meet peak period demands but also adapt to little to no demand outside those peaks. It's these periods where the efficiency of CO_2 heat pumps falls away and if the return temperature gets too high the coefficient of performance (COP) drops exponentially, and the unit eventually shuts off because it cannot work anymore.

Propane offers greater efficiency than CO_2, so long as the heat pump is correctly charged with enough propane. Manufacturers have recorded high COPs, notably at lower flow temperatures, so it is important to review the SCOP at intended higher working temperatures to gain a true idea of a heat pump's efficacy. Ambient temperature, flow temperature, and other operating conditions can all significantly impact efficiency. Propane heat pumps will address concerns over the GWP of refrigerants deployed in sustainable applications. However, the Building Engineering Services

Association (BESA) recently voiced concerns which stem from the growing adoption of propane as a replacement for high-GWP refrigerants, particularly in smaller systems. It issued a warning about the increasing safety risks associated with the use of flammable refrigerant gases like propane (R290) in air conditioning and heat pump systems. BESA emphasised the need for specialised training for all engineers working on R290 systems to ensure safe handling and installation practices.

Others have also raised concerns over the lack of regulations relating to the storage and transportation of propane heat pumps which are pre-charged at the factory. The amount of propane used in a heat pump was also a concern. It is important to note that heat pumps will incorporate considerably more propane than traditional fridges and freezers that have used the refrigerant for many years, often cited as an argument that the refrigerant has a long and proven safety record. Should a heat pump unit leak, there is a potential for an explosion of more than $15m^3$ based on refrigerant charge in currently available models. This means locating propane heat pumps at a safe distance from each other and other electrical devices which would drastically limit project design, especially if the intent was to place the units on a rooftop. The other concern should a unit leak is that propane, which is denser than air, will 'pool' and flow downwards. For rooftop installations this could result in propane travelling down drainage channels, potentially bringing it into proximity to working areas, further endangering a building's occupants. Considering the tightening of building regulations, especially relating to fire in higher-risk buildings following the completion of the Grenville Enquiry, there must remain question marks over an unregulated application of propane as the refrigerant of choice in heat pumps for commercial buildings.

The goal is to deliver a single, sustainable technology which can meet the future demands of the commercial built estate, and finding a refrigerant which is environmentally friendly, efficient enough to deliver consistent high temperatures and safe to deploy, could, in the face of new legislation become a real challenge. The EU's response to the proposed ban on future R32-based heat pumps is telling, it has initiated widespread plans to roll out solar thermal and solarPV systems across public buildings and is actively pursuing the same from commercial organisations. This potentially leaves the heat pump industry in a quandary and facing a huge challenge of rapidly bringing new alternatives to market. As we have indicated, for the time being, hybrid systems that successfully blend a mix of low-carbon and renewable technologies remain the most trusted and typically lower-cost option to achieve necessary operation within sustainability guidelines and building regulations.

Conclusion

Continued innovation, policy support, and widespread recognition of the need to support retrofit, renewables, and refrigerants are going to be increasingly essential to achieve a net zero built environment across the UK. Commercial and public services building owners and developers can significantly reduce their environmental impact, improve energy efficiency, and create more sustainable and resilient buildings for the future if they pay greater attention to the new three 'R's. Projects that address retrofit, renewables and carefully choose technology with the optimal refrigerant will be better positioned to reap the rewards of sustainability: gaining more comfortable and safer interior spaces, lower operational costs, energy independence for more robust operations which are less impacted by fluctuations in energy prices, able to avoid potential sanctions or fines under legal corporate reporting and gaining improved brand value. All whilst maintaining typically business-critical hot water supply for building operations and service offerings.

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Sustainable Hot Water

FUSION

Adveco's FUSION packaged electric water heaters offer a range of low-carbon, all-electric applications for commercial projects with a wide choice of pre-sized variants combining ARDENT electric boiler, cylinder, ASHP, controls and immersions.

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ADV16-30W ASHPs

The ADV-W air-to-water heat pump range includes 16, 22 & 30kW (3 phase) and 10, 12, & 16kW (single phase) models that bring quality and efficiency to commercial domestic hot water systems. The ASHP can provide hot water output up to 60°C throughout the year for 55°C working flow.

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ARDENT is designed to serve as an indirect water heater or heating system. Wall-hung and oorstanding variants for those seeking to avoid a reliance on gas energy supplies. In hard water areas the ARDENT electric boiler can be used to dramatically reduce the costly build up of damaging limescale.

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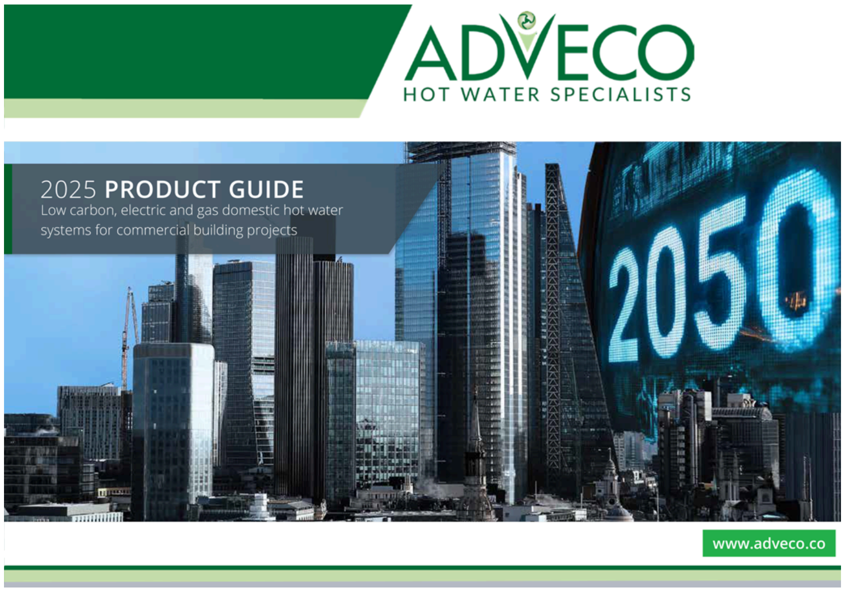
Get the handy guide to Adveco's current product range for 2025



2025 PRODUCT GUIDE

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ADV65-110W ASHP
ADVS10-16W single phase ASHP
FPi R32 monobloc Air Source Heat Pump
FUSION packaged electric water heaters
Electric Boilers
Hot Water Cylinders, Indirect Water Heaters, Calorifiers & Buffers
Commercial Gas-Fired Water Heaters
Standalone Heat Recovery from Chillers
Offsite Constructed Packaged Plant Rooms
Premium Chilled Water Systems

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