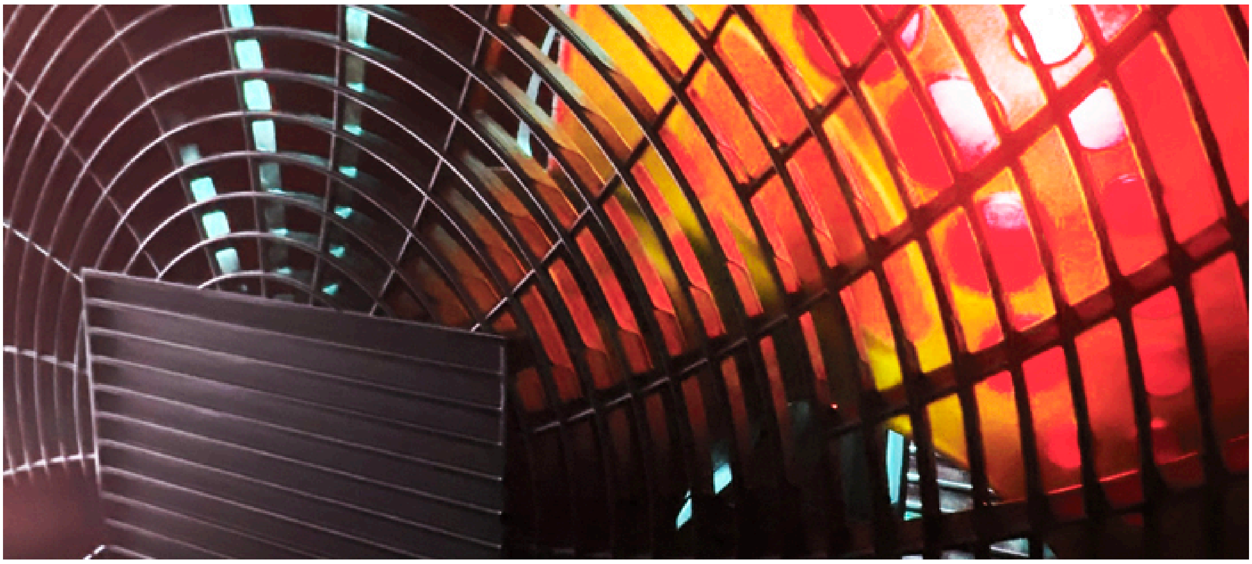
ADVECO NEWSLETTER

Welcome to Adveco's March 2026 newsletter,

This month, Adveco explores the fundamental differences in commercial heat pump DHW system design and key selection criteria. We cover the strategies for maximising performance and minimising the carbon footprint. We also consider the reasons for retaining commercial gas water heating in the face of pressure to become more sustainable. From regulatory tensions to cost considerations, gas remains a viable option for many commercial organisations retrofitting systems today and seeking greater sustainability in the future. Plus, we round this month off with a helpful run-through of frequently asked questions on low-carbon water heating for commercial projects...

Optimising Hot Water With Commercial Heat Pump Systems



Heat pump technology is rapidly emerging as a critical component in the global shift towards sustainable energy, offering a highly efficient method for heating and cooling in buildings. However, the application of commercial heat pumps to meet the rigorous and dynamic Domestic Hot Water (DHW) demands of buildings—such as hotels, hospitals, and large residential blocks—presents a complex design challenge. Simply installing a heat pump is insufficient; successful implementation requires optimising the system to strike a perfect balance between outlay costs, operational efficiency, and long-term environmental impact.

Commercial DHW systems are fundamentally categorised by their approach to heating and storage: Dynamic vs. Storage systems. Understanding this dichotomy is the foundation for effective heat pump integration.

Dynamic Water Heaters: These systems are characterised by high heat input and low storage volume. They are engineered for rapid, continuous heating, ensuring the supply never goes cold, making them ideal for high-demand applications where space for storage is severely limited.

Storage Water Heaters: Conversely, these systems utilise a large storage volume with a comparatively small heat input. Their design philosophy is to dump stored hot water to meet demand and then gradually reheat the large volume over an extended period. This approach is highly effective for low-energy systems that prioritise high storage capacity to buffer demand spikes. The choice between these two approaches significantly influences the size, cost, and complexity of the heat pump solution.

Key Design Considerations

When designing a commercial heat pump DHW system, the following factors must be meticulously evaluated: the initial capital investment for the heat pump units storage tanks, and associated electrical/plumbing infrastructure; the system's operational efficiency (COP) which directly determines the long-term utility bills; the carbon emissions associated with the electricity used, which is directly tied to the system's COP; noise and space requirements are also critical factors in urban environments, where heat pump siting must account for acoustic performance and physical footprint. The most important design decision is whether to utilise the heat pump for preheating only or for full water heating.

The heat pump preheat system is a strategy which employs a low-temperature air source heat pump (ASHP) to raise the water temperature to an intermediate level (e.g., 40°C). The secondary heat source (often a highly efficient electric after heater) provides the final temperature lift. The advantages of such systems are that although they require larger storage volumes, they allow for smaller, lower-cost heat pumps (e.g., 23kW ASHP). They boast a higher overall system efficiency (with a COP often around 2.6) because the heat pump operates in its most efficient temperature range. They are best suited for peaked demand patterns with minimal background use. The disadvantage is that these systems do require more physical space for storage tanks.

Commercial heat pump water heating systems utilising a high-temperature ASHP to directly heat the water to the required final temperature (e.g., 60°C) will, however, require a smaller storage volume (e.g., 1,000 litres). They are also suitable for buildings with continuous demand patterns, but will require larger, more powerful heat pumps (e.g., 90kW ASHP), leading to higher outlay costs. Operating at higher flow temperatures results in a slightly lower efficiency (COP often around 2.5). This comparison highlights a key trade-off between lower outlay costs and higher efficiency via preheat versus smaller space requirements via high-temperature direct heating.

Refrigerant choice is crucial, as it must balance performance, safety, and environmental impact. R32 is a common contemporary choice due to its medium Global Warming Potential (GWP) and low flammability.

However, emerging refrigerants, particularly R290 (Propane), are gaining traction for high-temperature heat pumps. R290 offers superior thermal properties, making it highly suitable for higher flow temperature systems. The challenge lies in its flammability and associated safety concerns, which necessitate enhanced installation protocols and a highly trained workforce. Future trends indicate a definitive transition to hydrocarbons like R290 by the late 2020s/early 2030s as regulations tighten on high-GWP fluids.

Designing for Maximum Efficiency

System efficiency (COP) is dynamically influenced by the flow temperature and the ambient air temperature, often resulting in capacity reduction in cold weather.

Strategies to maximise annual efficiency and reliability include minimising ASHP size. Correctly sizing the commercial heat pump reduces initial costs without compromising performance if paired with adequate storage. You can also design for the lowest possible flow temperature that still meets the system requirements, as lower temperatures equate to higher COP. Utilising the heat pump for preheating keeps it operating in its most efficient range, boosting the overall COP during the bulk heat-up cycle. Also critical is the inclusion of redundancy and simple controls to ensure system reliability and prevent operational errors.

Commercial heat pump systems are low-carbon but not zero-carbon, as their environmental impact is directly linked to the efficiency (COP) and the grid's carbon intensity. The Preheat System, with its higher overall COP, often proves to be the most cost-effective and environmentally friendly option, maximising the efficiency of the heat pump while utilising direct electric heating for a small, necessary temperature boost.

Heat pump systems represent a highly sustainable solution for commercial hot water needs. Success hinges on designers optimising the system by carefully balancing size, efficiency, and cost, recognising that preheat systems with low-energy, high-storage designs are frequently the superior choice. Future advancements in refrigerants, alongside necessary growth in workforce training, will continue to enhance the viability and performance of this critical technology.

Contact us today for expert advice on designing efficient, low-carbon hot water systems tailored to your specific commercial requirements. We offer comprehensive expertise in DHW system design, nationwide sales and support, and professional services including site surveys, metering, and full commissioning.

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Gas Water Heating And A Sustainable Future

While natural gas remains the dominant energy source for the existing commercial building stock in the United Kingdom, the application of gas-fired appliances for water heating in commercial properties must be able to navigate a complex period of transition. As of 2026, the regulatory landscape is defined by the pressures of maintaining operational costs, safety and achieving the UK's current legally binding Net Zero targets by 2050. Whilst the policy trajectory is decisively moving toward electrification and low-carbon alternatives, gas remains an important consideration for most commercial organisations with existing buildings.

Data from the Department for Energy Security and Net Zero (DESNZ) indicate that there are approximately 1.8 to 2 million non-domestic buildings in the UK. Of these, an estimated 65% to 70%

are connected to the gas grid, utilising natural gas for space heating, hot water, or both. Despite the growth in heat pump adoption, at a compound annual growth rate (CAGR) of over 11%, gas-fired appliances still commanded approximately 37% of the total heating equipment market share in 2025. This persistent reliance is due to the high 'peak' hot water demands of commercial facilities—such as hotels, hospitals, schools, restaurants and leisure centres—where traditional gas-fired storage and instantaneous water heaters offer a power density that early-generation electric alternatives struggled to match economically.

Today, the government's Heat and Buildings Strategy outline a transition that avoids the scrappage of functional equipment. Instead, policy is focused on 'natural trigger points', essentially the moment an old appliance reaches the end of its life. The government signalled its ambition to phase out the installation of all new natural gas boilers by 2035, but it is important to note that businesses will not be forced to remove existing, working boilers before their natural end-of-life. Modern appliances have an expected 15-plus years of efficient operation. This effectively extends gas water heating use through to the 2050 deadline for commercial buildings.

That said, policy evolution is likely to increase pressure on commercial organisations to consider transition before 2050. The Future Homes and Buildings Standard (FHBS), which is scheduled for full implementation by the end of 2027, by tightening carbon emission targets (Target Emission Rate or TER), makes it nearly impossible to specify a traditional gas boiler or water heater in a new commercial building without extensive carbon offsetting or hybridisation. The standard also requires all new buildings to be zero-carbon ready, meaning they must not require further retrofit work to become carbon neutral as the electricity grid continues to decarbonise. This effectively prevents any new commercial property from being gas-connected, with the rare exceptions for commercial/industrial properties with 'very high' demands for hot water.

For existing properties, the current primary regulation governing the installation of gas-fired water heaters is Approved Document L (Volume 2) of the Building Regulations, which focuses on the conservation of fuel and power in 'buildings other than dwellings.' Under the most recent updates, all new gas-fired water heaters must meet stringent minimum heat generator seasonal efficiencies. For direct-fired gas water heaters, the minimum efficiency is typically set at 91% (Gross Calorific Value). This effectively mandates the use of condensing technology, which captures latent heat from flue gases that would otherwise be wasted.

Policy trajectory for commercial decarbonisation remains focused on tightening energy efficiency standards (EPCs) of existing commercial buildings to accelerate the transition to low-carbon heating. Commercial landlords, for example, are already subject to MEES, which currently prohibits the leasing of buildings with an EPC rating below E. The government's stated target is to raise this requirement to EPC B by 2030. Since gas-fired water heating significantly impacts a building's carbon score, many landlords may be forced to move away from gas to meet these rental standards.

Why stay on gas water heating?

Despite the push for greater sustainability, there remains regulatory tension as operators of commercial buildings must address health, safety, technical and cost constraints. There are also questions over new and nascent water heating technologies.

By the end of 2026, the UK government is expected to make a strategic decision on the role of hydrogen in the gas grid, and most modern commercial gas water heaters are already capable of running on a 20% hydrogen blend. However, the prevailing policy trend suggests that while hydrogen may serve heavy industry, the vast majority of commercial office and retail space will be directed toward district heating networks - where they exist - or more likely heat pumps and the increasingly decarbonised electricity of the grid.

While the carbon data heavily favours electrification, commercial facilities face specific technical hurdles when transitioning away from gas-fired appliances. Many older commercial properties lack the electrical headroom to support large-scale heat pump arrays. Upgrading a local substation can be a multi-year, six-figure project that can quickly lead to sustainability goals being shelved. An ASHP setup with equivalent peak-load capacity also requires significant external space for fans and internal space for large thermal storage tanks, which can, again, stall projects if available space is lacking.

Critically, commercial hot water systems must comply with ACOP L8 (the Control of Legionella Bacteria). This requires that water must be stored at 60°C and distributed so it reaches outlets at 50°C (55°C in healthcare). Gas-fired appliances easily achieve these high temperatures. Heat pumps often require booster immersion heaters or specialised, and arguably highly flammable, poorly legislated refrigerants to reach 60°C efficiently. For this reason, many designs will now utilise a hybrid approach using heat pumps for the pre-heat (up to 50°C working flow) and gas or electric immersion for the final high temperature kill cycle. For small to medium sized business, pre-sized compact hybrid water heating systems, such as Adveco's award-winning FUSION concept, are the perfect solution. But for greater commercial demands, a bespoke approach is demanded that is likely to be complex and therefore demanding of capital investment.

If we take a 50-room hotel as an example, the primary barrier is often not the equipment itself, but the ancillary upgrades required. Because heat pumps deliver energy more slowly than gas, you need larger water cylinders. This requires not only larger, more expensive cylinders, but it may also require hidden costs, such as the reinforcing of floor structures, widening access or repurposing storage rooms. A gas system also requires minimal electricity. A heat pump array for 50 rooms may require a 100A – 150A 3-phase supply. If the building is already at its limit, due to the presence of a commercial kitchen or EV chargers for guest parking, a grid upgrade from the DNO (Distribution Network Operator) can add anything from £20,000 to 250,000+ to the project, with costs spiralling higher still in urbanised and built-up locations.

In our hotel scenario, the choice between gas and electric is as much about infrastructure as it is about energy. Hotels have a high, localised hot water demand (with morning shower peaks) that requires significant power. With an assumed daily hot water demand of approximately 3,000–4,000 litres, we can compare initial investment (capital expenditure) and running costs (opex) for a gas-fired condensing system compared to one based on ASHP.

Gas-fired water heaters are both lower cost to purchase and simpler to install. That installation phase, which is likely to be a couple of days for gas, will be extended by up to as much as two weeks for ASHP and plantroom work. So ASHP systems will typically cost in the region of three and a half times as much as a gas water heater to procure and install.

In terms of operational costs, fuel, maintenance and lifespan need to be considered. Both systems, leveraging the latest, efficient technologies, can expect to have similar lifespans. ASHP will be expected to operate for 15-20 years, and although gas water heaters may have a shorter lifespan, typically 12-15 years, regular maintenance can see operational lifespan well exceed these timeframes. The maintenance costs of both technologies are relatively similar by the time gas and F-gas safety checks are run, and parts and filters are replaced. The real question comes down to annual fuel/energy costs. Admittedly, there is a great variety of tariffs on the market, and these will change over time, but current commercial energy tariffs in the UK are characterised by relatively stable, lower wholesale gas prices alongside high electricity costs. As of early 2026, the average unit cost of energy per kWh is 7p for gas, compared to 27p for electricity. This factor of 4 has been relatively stable in recent years, and although ASHP can deliver 300% efficiency to close most of the gap, to drive greater heat from ambient temperature air to achieve necessary operational flow temperatures requires greater electrical energy input, reducing the cited overall efficiency.

Although the ASHP will run somewhat more expensive than a gas-fired water heater, the addition of a primary heat source to meet safe operational temperatures and peak demands can drive system operations costs to as much as three or four times that of gas for the same overall results. Many commercial buildings will therefore try to utilise smart tariffs to run heat pumps overnight at lower rates to 'charge' larger thermal stores, thereby bringing ASHP running costs below those of gas. Such storage for our hotel would need to be considerable, again demanding further capital investment in a system to meet ongoing daily demands and peaks.

As a result, gas-fired water heating is truly advantageous in terms of delivering cost-effective operations and lower capital investments when compared to heat pump-based systems. High-temperature water up to 85°C is achievable as standard, and easily maintainable above 60°C, meeting ACOP L8 compliance, thus guaranteeing operational safety. When owner/operators have multiple buildings requiring renovation, this becomes a key decision factor. If three buildings can be transitioned to low-carbon electrical systems, or for the same investment and operational outlay, 12 buildings can be refurbished to high-efficiency gas. It is easy to see why many continue to opt to retain gas, despite it being a fossil fuel.

What may change that decision ultimately is the value placed on sustainability gains. At 91% and above efficiency, gas-fired water heaters will typically generate, according to 2025/2026 DESNZ emission factors, in the region of 201g of CO_2 per kWh of heat compared to 43g to 60g by the heat pump operating at 250% – 350% (COP 2.5 – 3.5). Gas provides the baseline against which heat pump emission reductions of 70-80% will be measured. A heat pump system will also have zero carbon tax liability and may gain a bonus from low-carbon incentivisation. As we have seen already, government policy, such as MEES, is only likely to increase the carbon tax liability on gas, as the government seeks to curb the ongoing use of fossil fuels and steer the country toward net-zero commercial operations.

Given the relatively high CAPEX of heat pumps, many commercial operators are adopting a hybrid strategy. This involves keeping a smaller gas-fired unit for 'peak lopping' while a heat pump manages the base load throughout the day. This reduces the required electrical upgrade and lowers initial investment while still cutting carbon emissions by 60–70%. Further reduction in both operational costs and emissions is also attainable for both gas and heat pump systems if solar thermal is introduced as a truly renewable system pre-heat, or mid-heat source.

If you are managing a property with an ageing gas-fired system, switching to a high-efficiency gas appliance provides trusted, lower-to-operate options. Whilst not contributing as strongly to decarbonisation goals, gains can still be made, especially with hybrid solar/gas or even heat pump/gas systems. With current policy advocating a fabric-first approach, reducing the overall heat loss of the building and installing low-flow fixtures can help towards downsizing the eventual replacement system. This makes the transition to electric heat pumps, heat networks or green gas alternatives more financially viable between 2035 and 2050.

Low-Carbon Water Heating - FAQ

What is a low-carbon hot water system?

A low-carbon hot water system uses energy-efficient technologies, such as air source heat pumps (ASHP) or solar thermal systems, to reduce carbon emissions and energy consumption while providing hot water for residential or commercial use.

What are the benefits of using low-carbon hot water systems?

- Reduced carbon emissions: These systems use renewable or energy-efficient technologies, lowering environmental impact.
- Lower running costs: Improved efficiency reduces energy consumption, saving money on utility bills.
- Compliance with regulations: Helps meet sustainability goals and comply with environmental standards.
- Long-term cost savings: Lower energy usage results in reduced operational costs over time.

What are the key design considerations for low-carbon hot water systems?

- System type: Choose between dynamic (high energy input, low storage) or storage (low energy input, high storage) systems based on demand patterns.
- Heat pump size: Minimise the size of the ASHP to reduce upfront costs while ensuring sufficient capacity.
- Efficiency: Maximise the ASHP's efficiency (COP) by optimising flow and ambient temperatures.
- Storage volume: Determine the appropriate storage volume based on peak and background demand.

- Controls: Implement simple and effective control systems for efficient operation.
- Space requirements: Consider internal and external space availability for system components.
- Redundancy: Plan for backup systems to ensure reliability.

What is the difference between dynamic and storage hot water systems?

- Dynamic systems: Designed for high energy input and low storage, providing continuous heated water with minimal storage capacity.
- Storage systems: Designed for low energy input and high storage, heating water in large volumes for later use.

What is the role of heat pumps in low-carbon hot water systems?

Heat pumps are a key component of low-carbon hot water systems. They use renewable energy from air or water sources to preheat water, reducing reliance on traditional energy sources and lowering carbon emissions.

What are the advantages of using air source heat pumps (ASHP) for hot water systems?

- Energy efficiency: ASHPs have high coefficients of performance (COP), meaning they produce more heat energy than the electrical energy they consume.
- Low carbon emissions: ASHPs use renewable energy sources, reducing the carbon footprint.
- Versatility: ASHPs can be used for both preheating and direct water heating applications.

What are the challenges of using heat pumps for hot water systems?

- High upfront costs: Heat pumps can be expensive to install, especially high-capacity systems.
- Electrical infrastructure: Large heat pumps may require significant electrical upgrades.
-Capacity reduction: Heat pump efficiency and output can decrease in colder weather or at higher flow temperatures.
- Refrigerant concerns: Some refrigerants, such as R290 (propane), are flammable and require careful handling and installation.

What refrigerants are used in heat pumps for hot water systems?

- R32: Commonly used in low-temperature ASHPs, with medium global warming potential (GWP) and low flammability.
- R290 (propane): Used in high-temperature ASHPs, offering suitable flow temperatures for hot water systems but requiring careful handling due to its flammability.

How can I minimise the size of the ASHP in my hot water system?

To minimise the size of the ASHP:
- Use a storage system with a large preheat volume to reduce peak demand on the heat pump.
- Optimise the reheat time to allow the heat pump to operate efficiently at lower capacities.
- Use an after-heater to supplement the heat pump during peak demand.

What is the COP of a heat pump, and why is it important?

The coefficient of performance (COP) measures the efficiency of a heat pump, calculated as the ratio of heat output to energy input. A higher COP indicates better efficiency, leading to lower energy consumption and reduced carbon emissions.

What is the best application for a preheat system?

Preheat systems are ideal for hot water systems with peaked demand patterns and minimal background use. They are cost-effective and energy-efficient for applications where hot water is needed in large volumes during specific periods.

How does a heat pump preheat system compare to a high-temperature heat pump water heater?

- Preheat system: Uses a low-temperature ASHP and a large storage volume with an after-heater. It is more cost-effective and has slightly higher efficiency (COP ~2.6).
- High-temperature water heater: Uses a high-temperature ASHP with a smaller storage volume. It provides 100% of the hot water load but has higher upfront costs and slightly lower efficiency (COP ~2.5).

What are the environmental benefits of low-carbon hot water systems?

Low-carbon hot water systems reduce greenhouse gas emissions by using renewable energy sources and improving energy efficiency. They contribute to sustainability goals and help combat climate change.

How can I ensure the reliability of a low-carbon hot water system?

To ensure reliability:
- Include redundancy in the system design, such as an after-heater for backup heating.
- Use simple and effective control systems to manage the heat pump and after-heater operation.
- Regularly maintain the system to prevent issues like refrigerant leakage.

How can Adveco help with low-carbon hot water system design?

Adveco offers:
- Free CIBSE-approved training
- Expert design services for domestic hot water systems.
- Nationwide UK sales and support.
- Site surveys and DHW metering and analysis.
- Offsite construction services
- Professional commissioning and manufacturer-grade servicing.

Read The Complete UK Water Heating Report From Adveco

You can now read the complete Adveco report on water heating in the UK. We assess the impact from current to new technologies and regulations as the country seeks to transform how commercial buildings heat water in cost effective and more sustainable ways.

READ THE REPORT

Sustainable Hot Water

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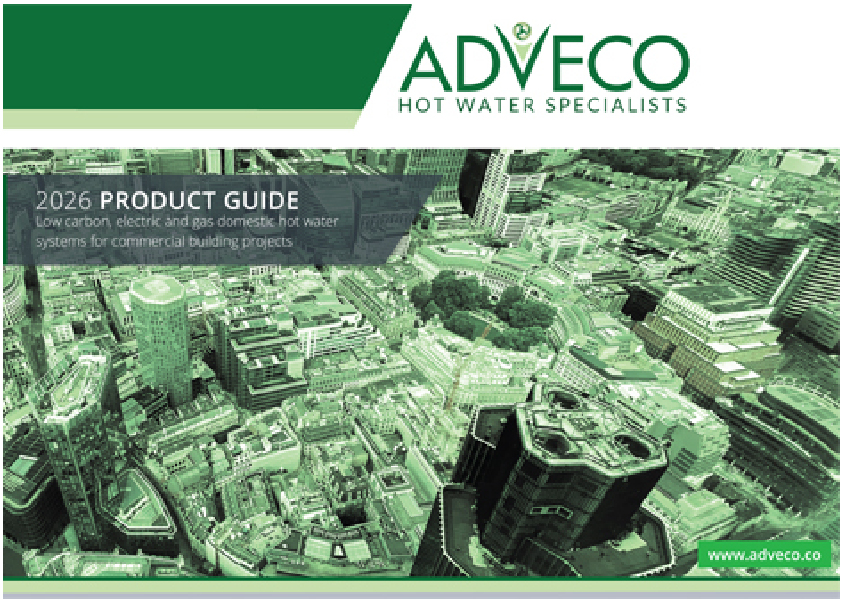

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