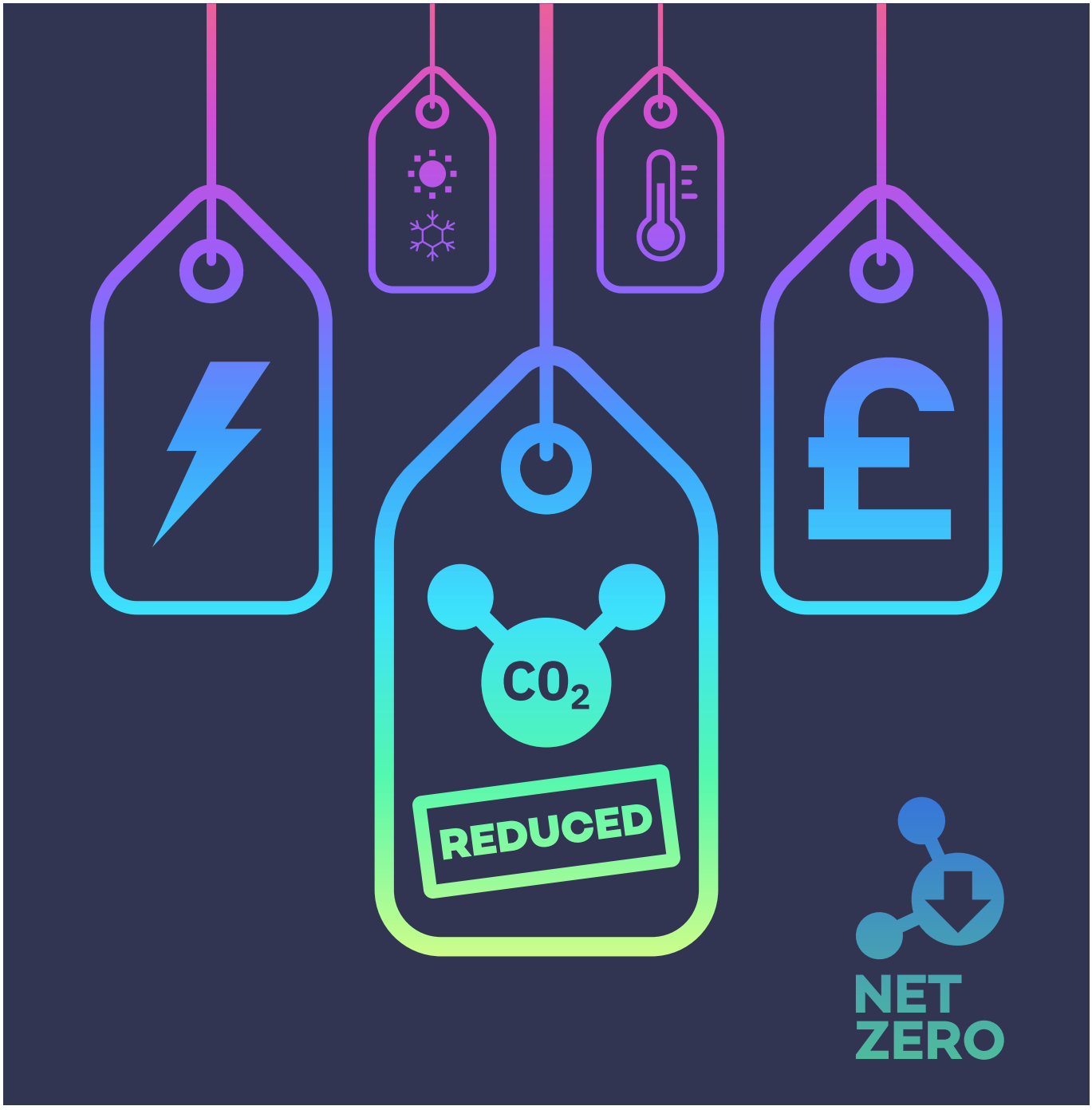
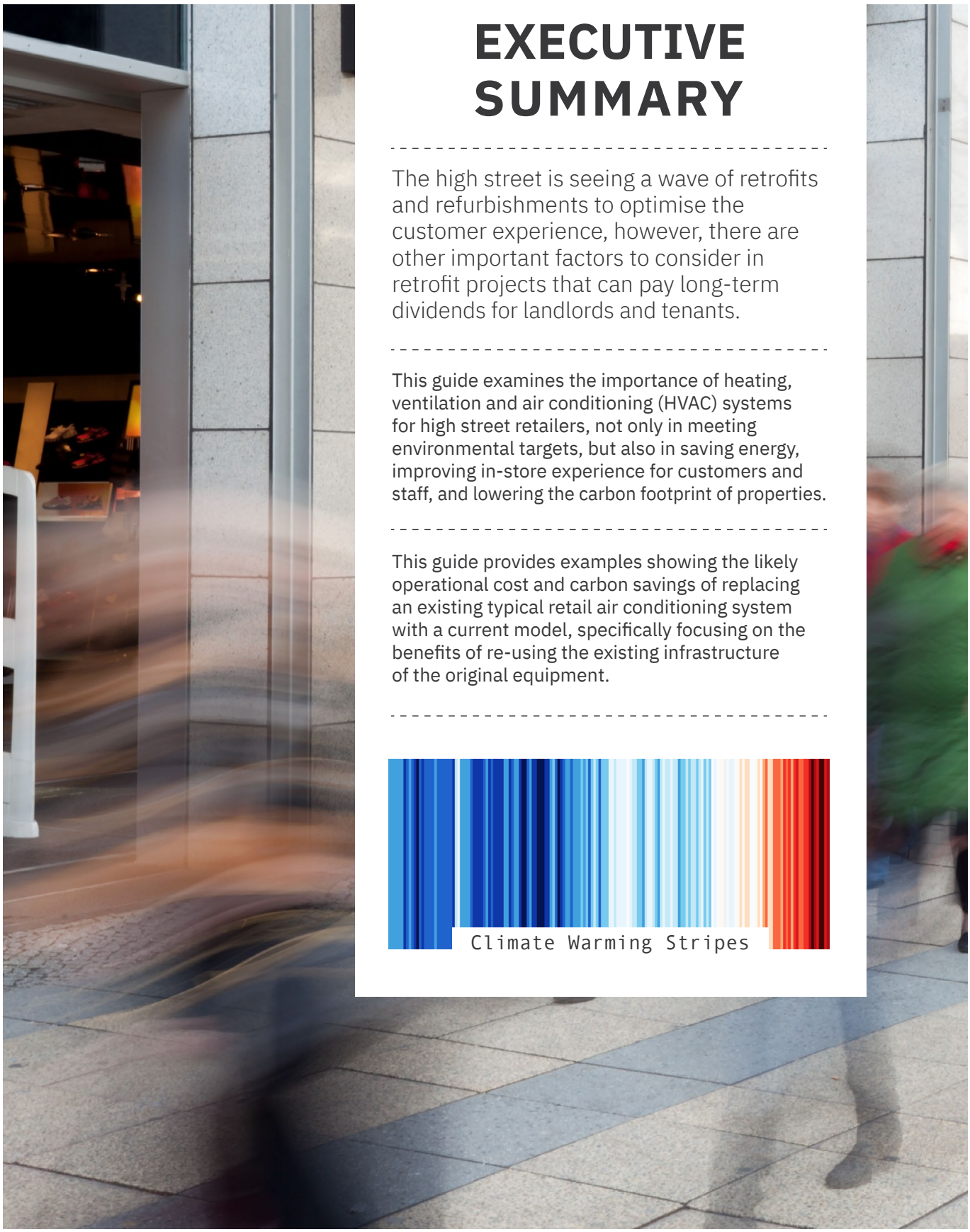
MITSUBISHI ELECTRIC

HVAC Retrofit for high street retail:

A practical guide to energy efficiency and carbon reduction





EXECUTIVE SUMMARY

The high street is seeing a wave of retrofits and refurbishments to optimise the customer experience, however, there are other important factors to consider in retrofit projects that can pay long-term dividends for landlords and tenants.

This guide examines the importance of heating, ventilation and air conditioning (HVAC) systems for high street retailers, not only in meeting environmental targets, but also in saving energy, improving in-store experience for customers and staff, and lowering the carbon footprint of properties.

This guide provides examples showing the likely operational cost and carbon savings of replacing an existing typical retail air conditioning system with a current model, specifically focusing on the benefits of re-using the existing infrastructure of the original equipment.

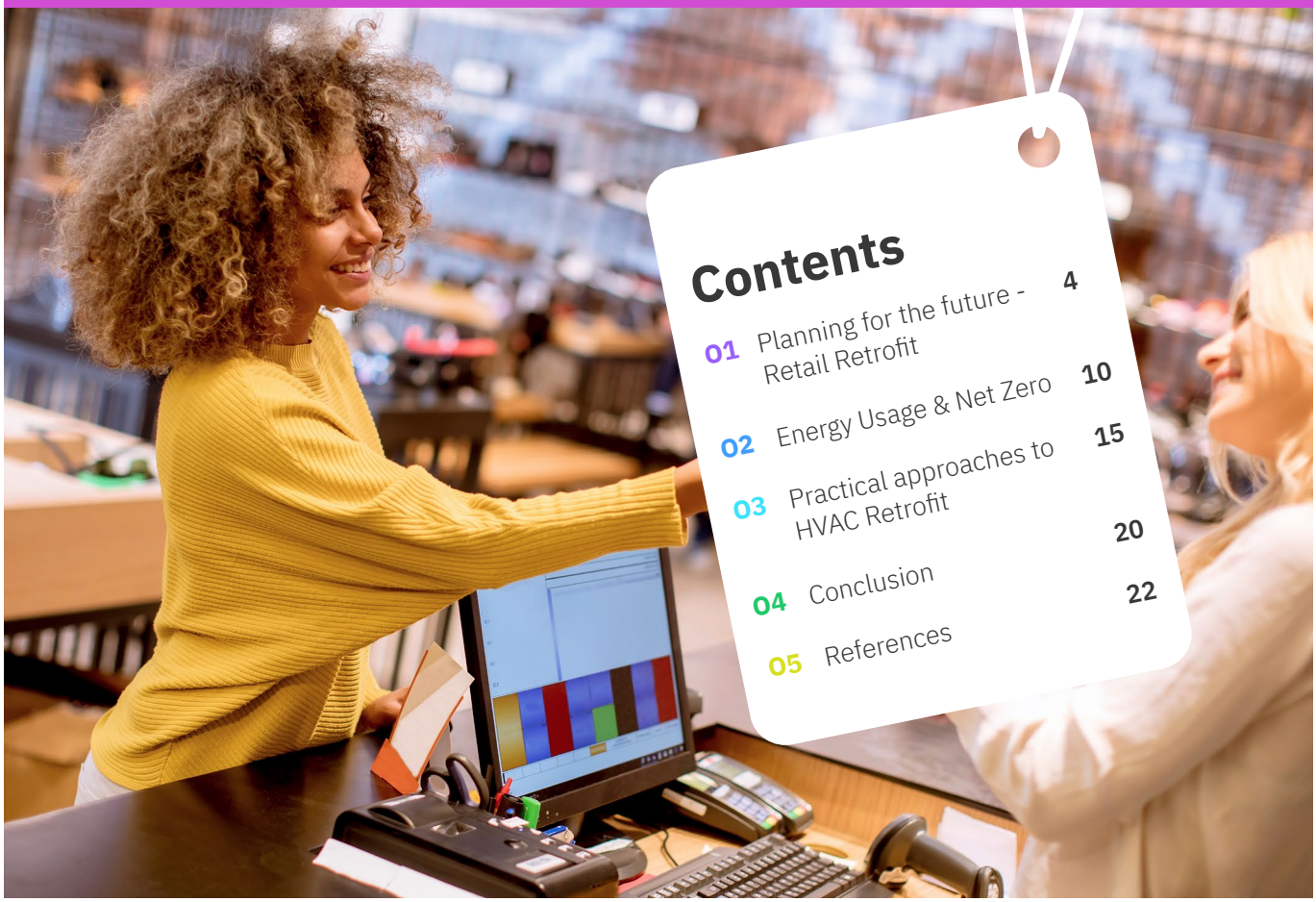
What do we mean by ‘high street retail’?

Definitions of ‘retail’ vary, depending on the source. For example, the UK government refers to the retail sector in narrow terms:

“Any business or individual involved with selling products directly to consumers.”

This definition includes not only shops and department stores but also market stalls and internet retailers. By contrast, the UK Net Zero Carbon Building Standard (Pilot) takes a much broader view, including shops, salons, restaurants and takeaways pubs and bars. The UK NZCBS also encompasses showrooms and warehouses.

The term ‘high street retail’ used in this g uide combines parts of both definitions to reflect the wide range of businesses we find on a typical UK high street and which are likely to include HVAC systems, often of the split type. So, this document covers any typical high street business that provides goods or services to customers - **shops selling products from vegetables to books; hairdressers; beauticians; restaurants; bars and pubs, gyms and small offices.**



01 Planning for the future - Retail Retrofit

UK retail's impact on national emissions reflects the size and influence of the sector. As the British Retail Consortium (BRC) notes[1]:

> **"The products we buy account for nearly a third of all household emissions, placing the retail industry among the highest contributors to emissions in the UK."**

However, the UK's retail sector is also taking a leading role in helping to deliver national Net Zero emissions targets. In addition to regulatory requirements, most of the UK's best-known retailers have developed their own carbon reduction plans that influence their business decisions - from choice of products and suppliers to logistics and in-store equipment specification.

An important part of this evolution is adapting retail premises to meet the low-carbon future. As in all property sectors, retrofitting for energy efficiency and reduced carbon is high on the agenda for retailers.

This can often present a challenge because of the age of the properties. If we examine the state of high street buildings, we can see figures from the government[2] show that **more than 60%** of non-domestic properties in England and Wales were built pre-1939 .

PERIOD OF CONSTRUCTION	NUMBER OF 'SHOPS'	PERCENTAGE OF TOTAL
Pre-1900	204,000	41%
1900 - 1939	109,000	22%
1940 - 1970	78,000	16%
1971 - 1995	55,000	11%
1996 - 2019	43,000	9%
2020 - 2024	4,000	1%
TOTAL	**493,000**	

The Non-domestic National Energy Efficiency Data Framework England & Wales 2024

In addition to being older buildings, they also often have ageing heating and cooling systems. Equipment installed in the early 2000s to 2010 is now at least fifteen years old, putting it at the end of its reasonable life-span

It's clear that retrofitting will be a critical step in bringing these properties up to date to meet new standards on energy use and carbon emissions. In addition, a refurbishment programme for stores must also consider options for HVAC updates.

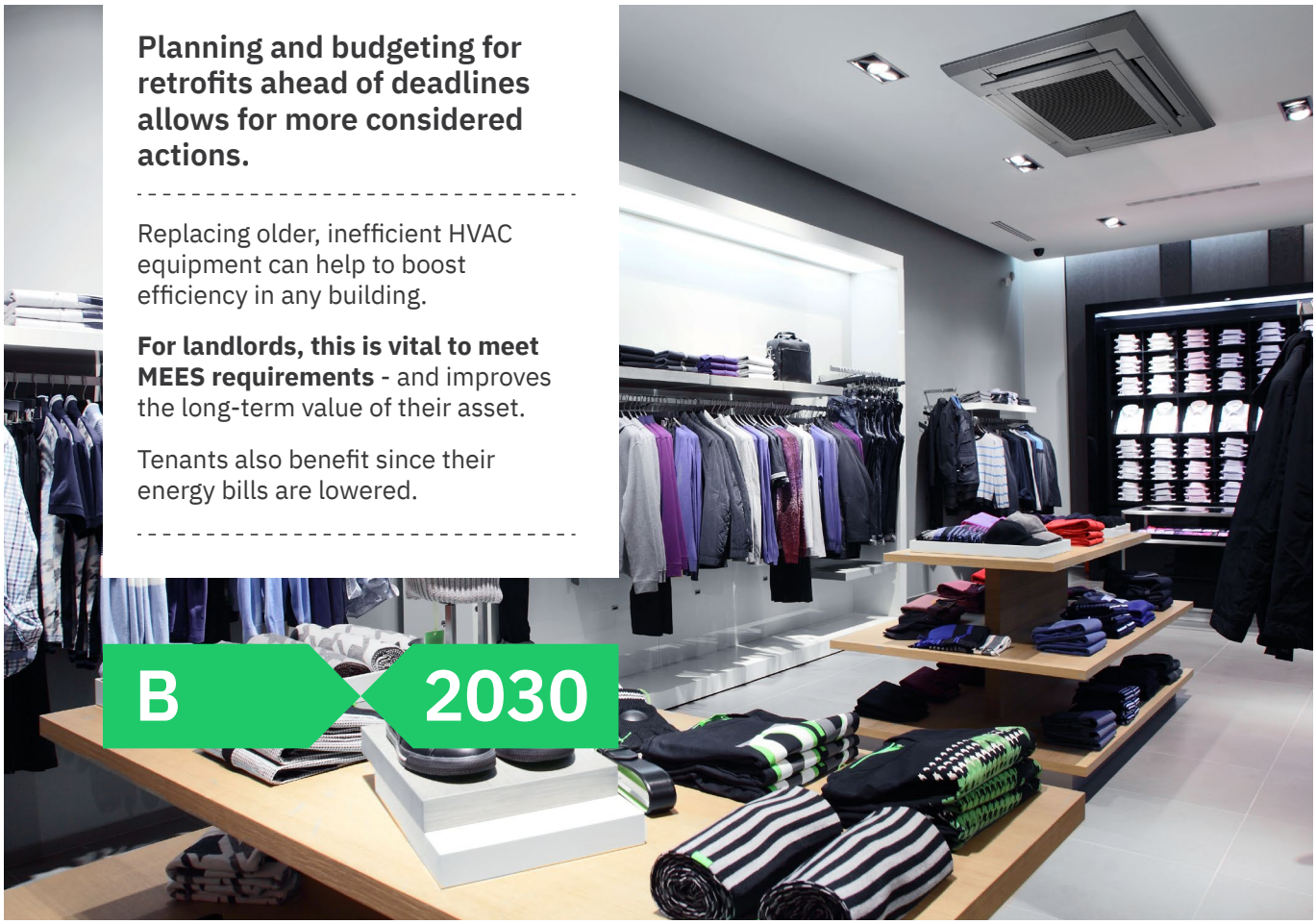
There are several reasons why retrofitting HVAC can benefit high street retailers - and their landlords where they are tenants of a property:

1. Meeting new energy efficiency standards

The Minimum Energy Efficiency Standards (MEES) currently require all commercial properties to achieve a minimum Energy Performance Certificate rating of E before they can be leased (including a lease renewal to an existing tenant) or sold. The government proposed that it will raise this minimum to drive energy efficiency in non-domestic buildings.

Although the proposals are yet to be confirmed, one suggested pathway is for a **minimum EPC rating of C by 2027 and B by 2030**. Many older properties (encompassing a significant proportion of retail outlets) would not meet this standard. This would leave them at risk of becoming stranded assets.

The government is currently undertaking consultation[3] on the energy performance of buildings with a view to clarifying future requirements, however, the overarching aim is to drive efficiency across the built environment.



Planning and budgeting for retrofits ahead of deadlines allows for more considered actions.

Replacing older, inefficient HVAC equipment can help to boost efficiency in any building.

For landlords, this is vital to meet MEES requirements - and improves the long-term value of their asset.

Tenants also benefit since their energy bills are lowered.

2. Protecting asset value

The UK government[4] increasingly regards the local high street as a centre of potential growth for the economy, suggesting that other public services such as libraries, GP surgeries and diagnostic centres could also find a home there.

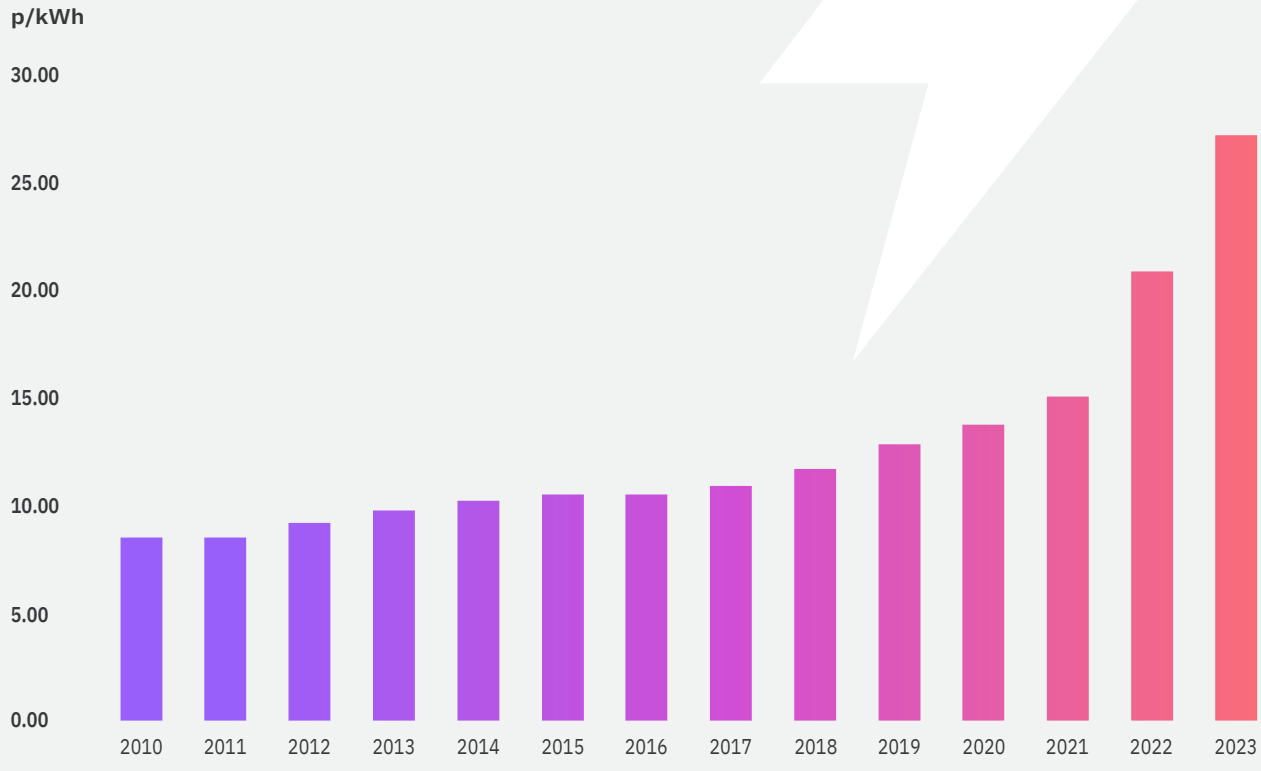
This potential is attracting interest in high street properties from investors. The Savills Q3: 2024 Shopping Centre and High Street Report[5] notes: **"We continue to see a positive uptick in rents on new deals across high streets and shopping centres."**

This positive news means that it is increasingly important for owners of high street buildings to consider issues such as the long-term value of their properties, attractiveness to tenants and operating costs as well as environmental impacts. Updating HVAC systems can play a key role in achieving this, providing a better indoor environment for customers, reducing the likelihood of breakdowns while also reducing overall energy use in the building.

3. Reducing energy costs

In the past decade, retailers of all sizes have been paying more for their electricity year-on-year, as shown in the table below.

ELECTRICITY: AVERAGE (Pence per kWh)



(Data from Department for Energy Security and Net Zero, Prices of fuels purchased by non-domestic consumers in the UK)

4. Getting ahead of changing refrigerant and equipment regulations

Regulatory phase down of certain refrigerants used in heating, cooling and air conditioning systems is in place across Europe. The F Gas Regulations, as they are known, are designed to phase out refrigerants with a high global warming potential (GWP). Although the UK is not directly impacted by EU legislation, the effects of this regulation will be felt here.

For example, from 2029 the EU has placed a prohibition on sales of new <12kW capacity systems, unless they use refrigerant with a GWP below 150. This does not affect the use of today's higher GWP refrigerants for service and maintenance, ensuring that existing equipment can be confidently operated and repaired if needed until its end of life.

However, manufacturers are introducing a range of new products that use the **ultra-low GWP refrigerant R290** (propane) to comply with the upcoming prohibitions on new equipment sales.

High street properties are likely to feel the impact of this change, since the equipment used in these buildings is often within this capacity range.

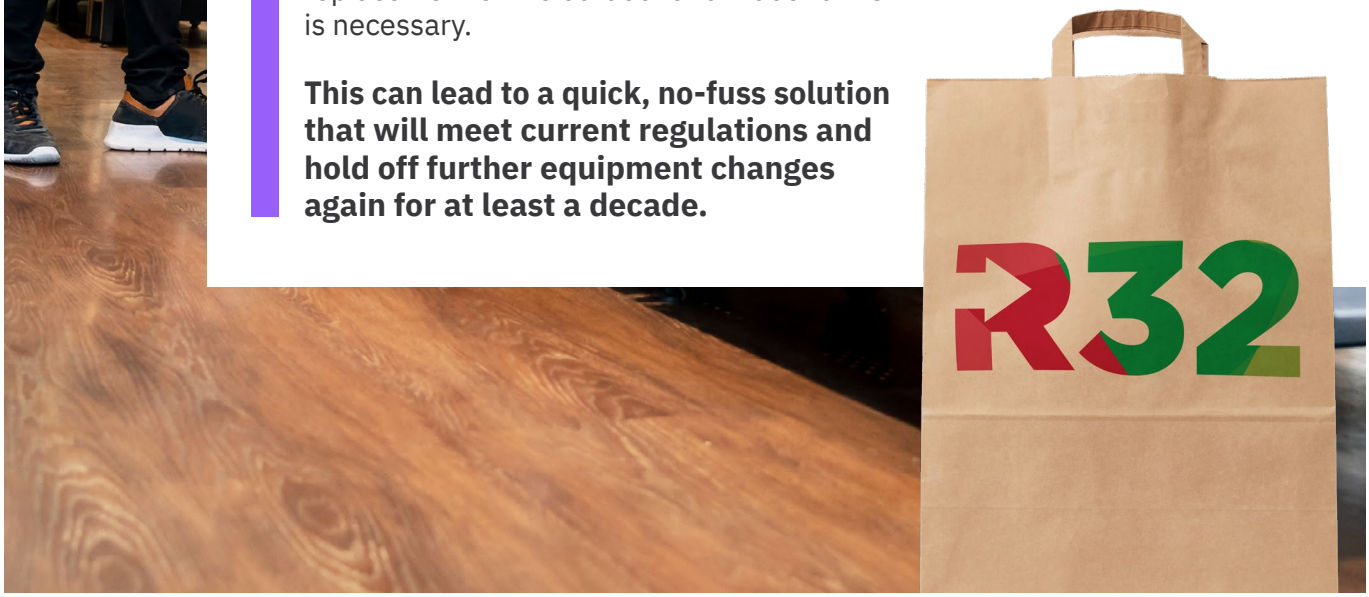
While it is possible to replace an R410A system with one that uses R290, it may cause disruption.

R290 is highly flammable, meaning there are additional constraints on system design and installation, including exclusion zones around outdoor units and maximum refrigerant charge amounts. This can reduce the amount of allowable distance between outdoor and indoor units and could make positioning of outdoor units more difficult.

These requirements could make a like-for-like system replacement challenging, requiring new pipework inside the property, creating mess and disruption in-store.

Property owners can get ahead of these incoming changes by replacing their old R410A systems with today's R32 systems - a much more straightforward process than moving straight to R290. In addition, Mitsubishi Electric's R32 split air conditioning systems can re-use the existing pipework and cable, therefore only replacement of the outdoor and indoor units is necessary.

This can lead to a quick, no-fuss solution that will meet current regulations and hold off further equipment changes again for at least a decade.



02 Energy Usage & Net Zero

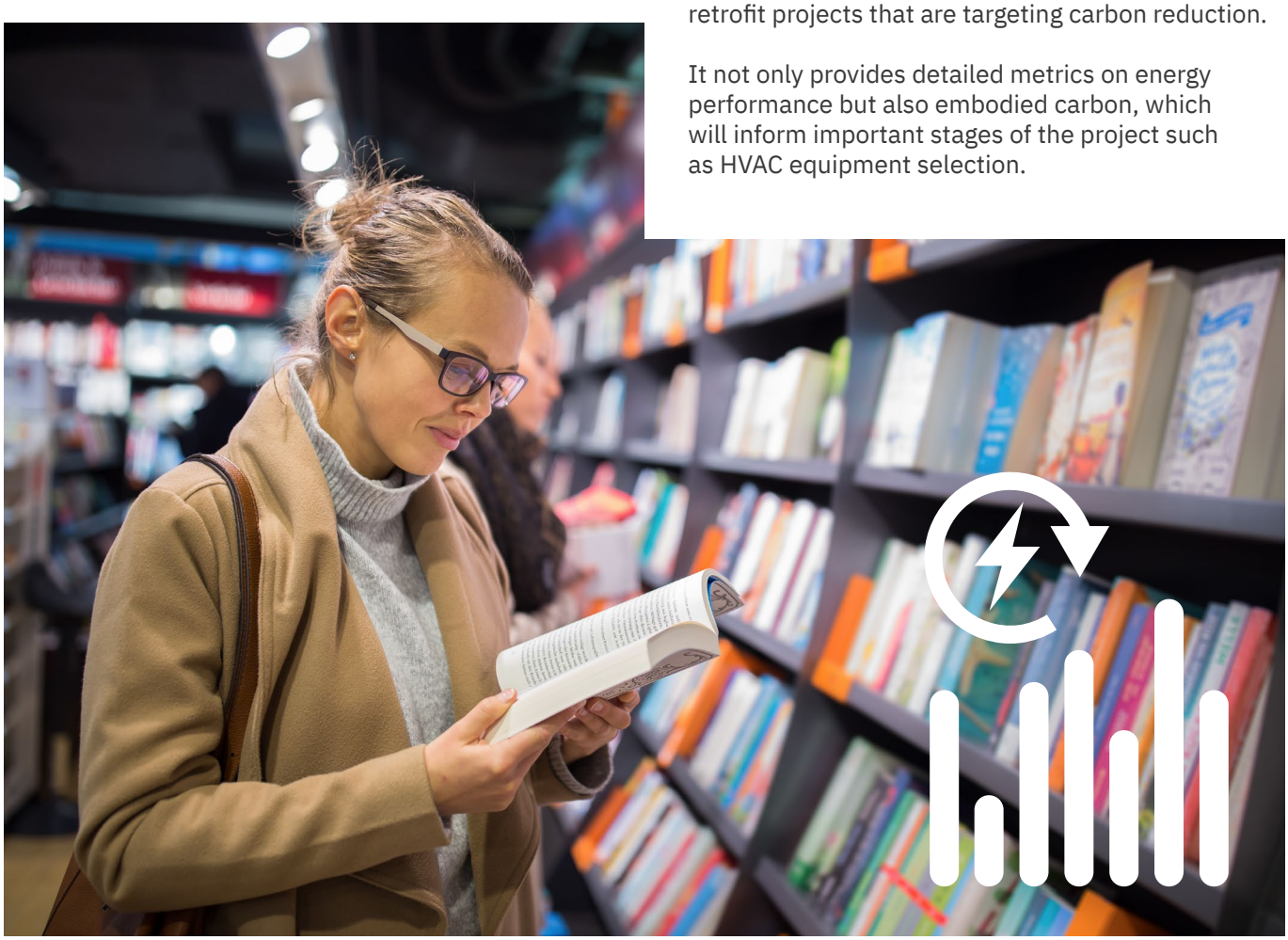
Planning is a critical stage in retrofitting any building.

Clarifying the goals and intended outcomes of the project can keep the team on track and ensure everyone understands the objectives.

These goals could be set by internal measures, such as current average store energy use against a percentage decrease. However, it may also be useful to consider working to an external standard to ensure that all the potential benefits of retrofitting are captured. This is particularly true for retail brands that are setting corporate carbon targets and that want to demonstrate alignment with recognised standards.

For example, the **UK Net Zero Carbon Buildings Standard** (UK NZCBS)[8] was launched in 2024, and it points the way to what 'good' looks like for retrofit projects that are targeting carbon reduction.

It not only provides detailed metrics on energy performance but also embodied carbon, which will inform important stages of the project such as HVAC equipment selection.



The UK Green Building Council (UKGBC) has launched a new Retail Retrofit guide to help building owners decide their best course of action.

The UKGBC notes that HVAC optimisation offers **"significant opportunities for energy reduction in a cost-effective way." It also points to the replacement or upgrading of existing electrical heating and cooling systems as "offering significant opportunities for energy reduction."**

Both the UK NZCBS and the UKGBC Retail Retrofit Guide reference Energy Use Intensity (EUI) as a key metric for whole building energy use.

The UK Green Building Council notes that the limits it recommends as targets for the retail sector are the same as those used by the Net Zero Carbon Building Standard.

This diagram below illustrates how retrofit projects can be treated as one-go or stepped.

A retrofit project aiming for reduced carbon emissions and energy use can set targets and achieve these in a single project; alternatively, improvements can be made in a series of steps over time. The choice of approach will rest with the client, and is generally influenced by time, budget and urgency of the need for building upgrades.

This diagram shows how the UK Net Zero Carbon Buildings Standard treats operational energy limits, measured as EUI, for One-Go and Stepped retrofit projects. The green line shows the limits for new-build projects. The aim is for Stepped retrofit approaches to set 2040 as an end goal for achieving the required operational energy limit for their building type.

Retrofit 'step by step'

Not achieving the end point limit on 1st verification, but with a Retrofit Plan and improvements over time to meet the intermediate limits and the end point limit by 2040.

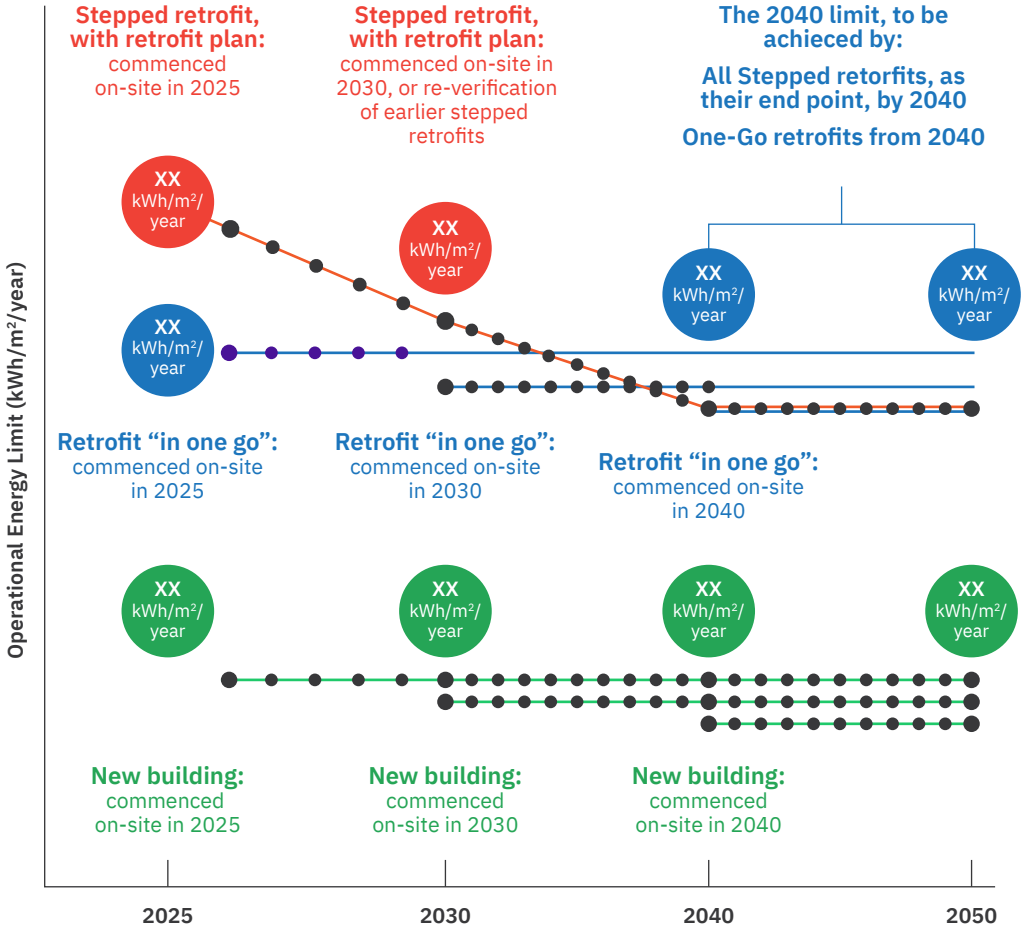
Retrofit 'in one go'

Achieving the end point limit from its 1st verification.

Limits are fixed based on the time the retrofit commenced on-site i.e. once verified as a retrofit using the 'in one go' limit, a building will retain the same operational energy limit in future verifications.

New Build

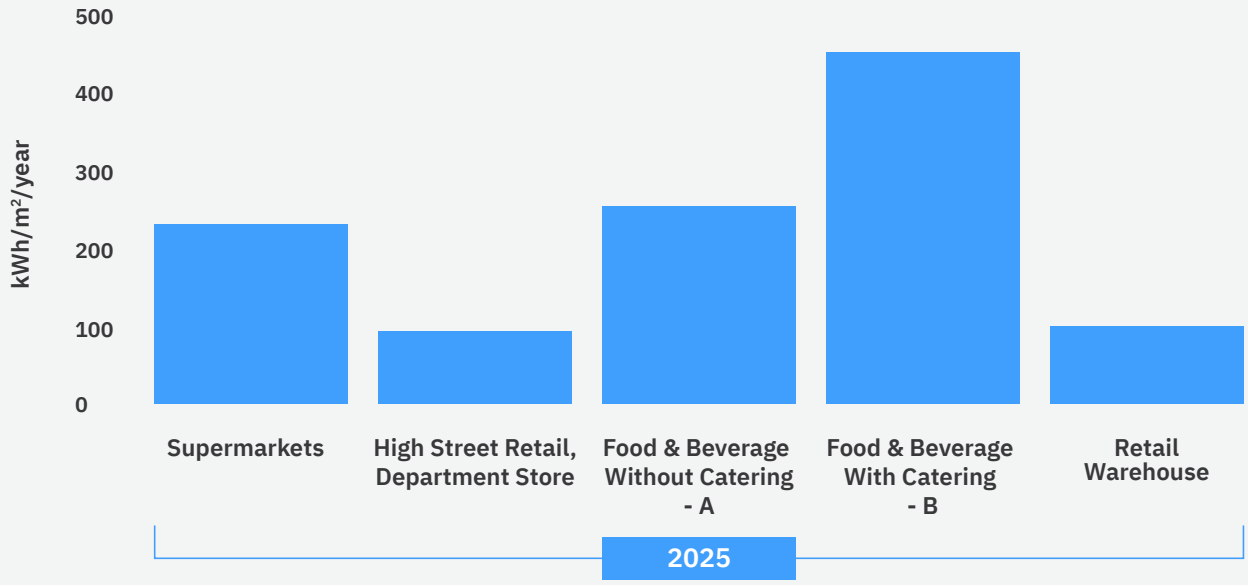
Limits are fixed based on the time the development commenced on-site i.e. once verified as a New Build, a building will retain the same operational limit in future verifications.



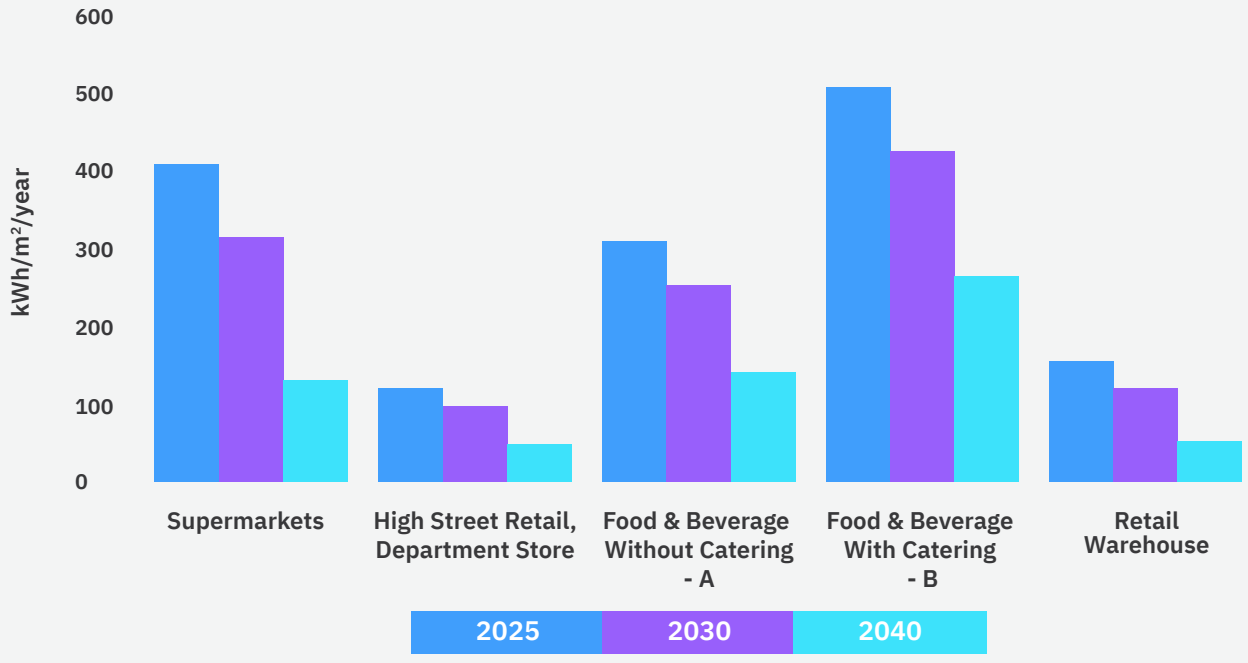
(From UK NZCBS Pilot; Annex A page 93)

The graphs below shows the UKNZCBS limits for EUI in retail buildings when carrying out retrofit projects.

ENERGY USE INTENSITY LIMITS (ONE-GO RETROFIT) - RETAIL



ENERGY USAGE INTENSITY LIMITS FOR (STEPPED RETROFIT)



Since the UK NZCBS will tighten its targets over time, there is a benefit for those who complete whole building upgrades sooner as the energy usage targets will, in theory, be easier to achieve and maintain over time. A phased approach to building upgrades will require the project to meet ever-lower energy reduction targets, creating more of a challenge.

The UK Green Building Council reflects this 'sooner rather than later' approach, stating:

> **"Investors, owners and occupiers of retail and logistics buildings must urgently plan and implement retrofit strategies that close the gap towards net zero. Significant opportunities may be missed by those who do not have clear retrofit strategies in place."**

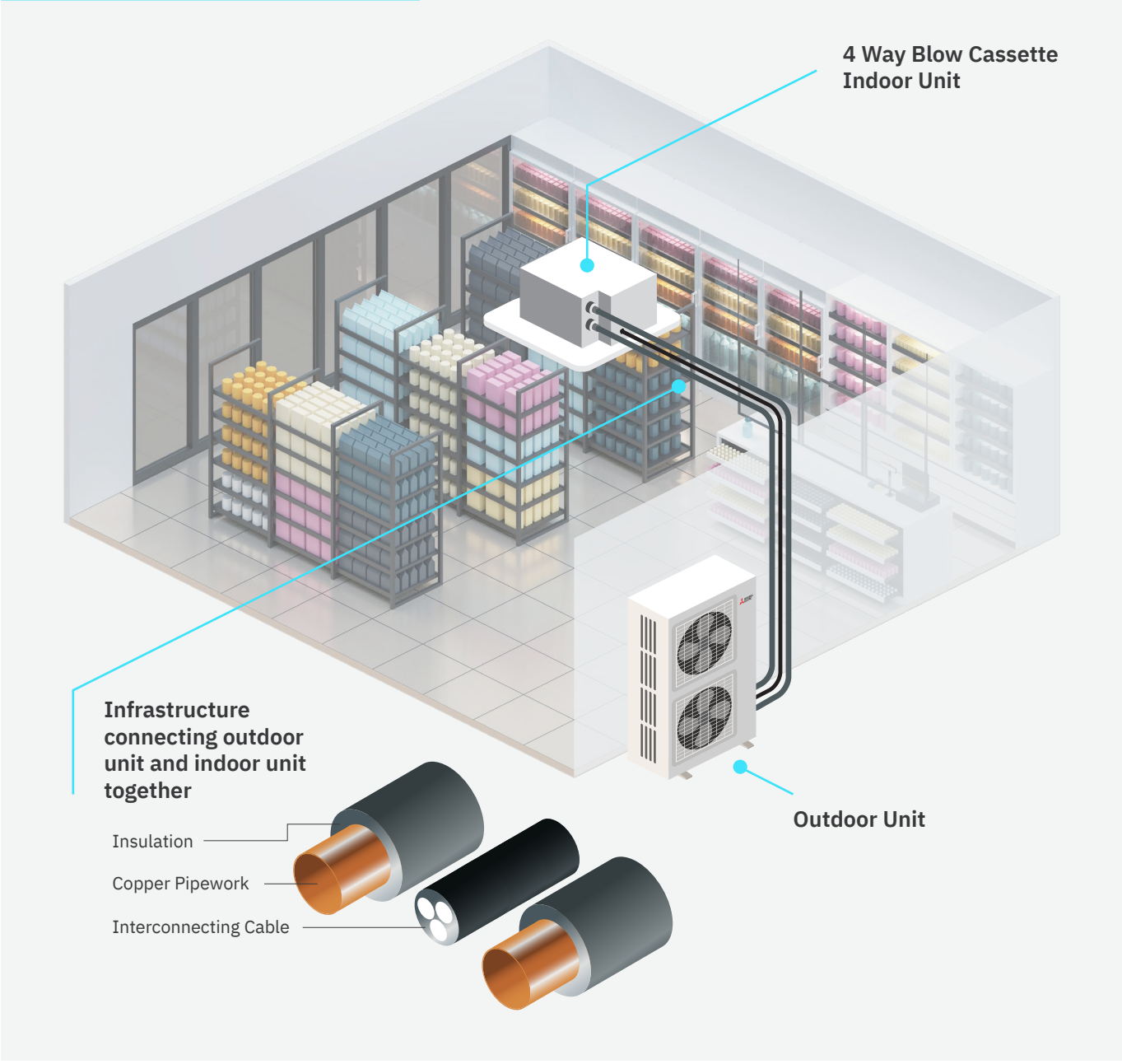
03 | Practical approaches to HVAC Retrofit

A typical installation of an air conditioning system found in a high street property today is likely to consist of the components shown in **Diagram 1**.

If a like-for-like (or very similar) replacement of an air conditioning system such as this is being considered, several factors affect the cost, performance, sustainability and ease of replacement.

Retaining as much of the existing infrastructure as possible (such as pipework, insulation and cabling) will allow capital costs to be reduced, installation time to be shortened, disruption to be minimised and a significant proportion of the embodied carbon emissions can also be avoided.

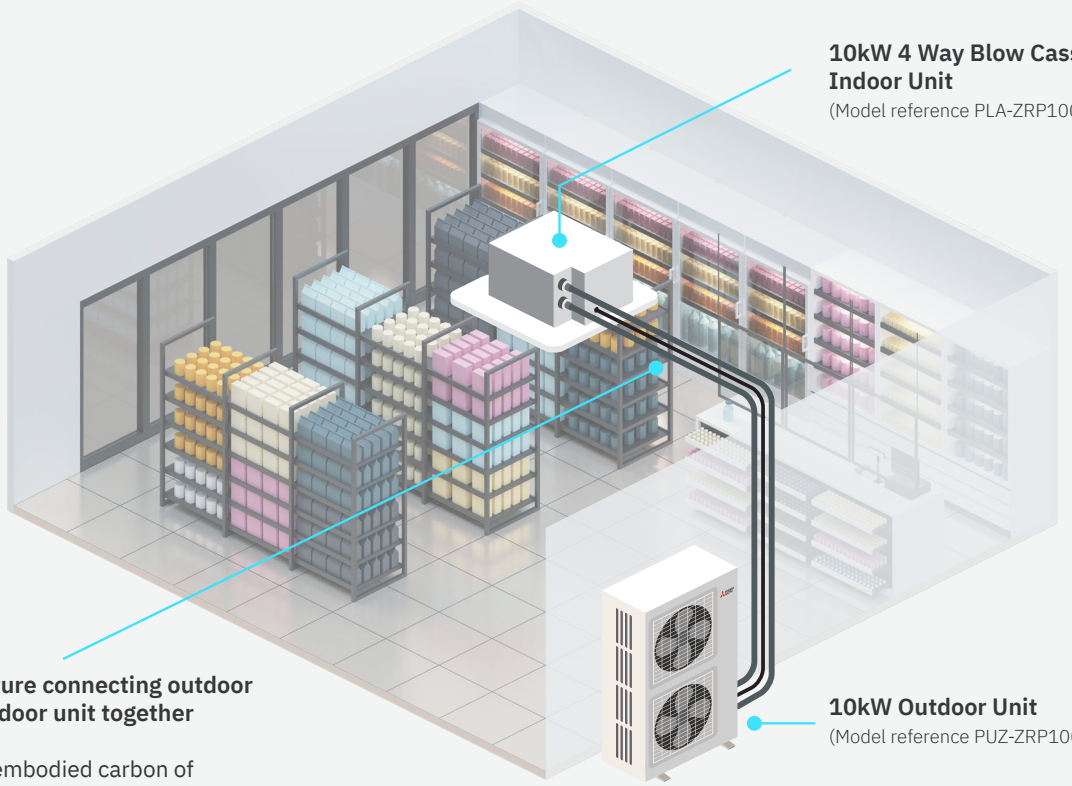
DIAGRAM 1



We have taken an example of a typical installation of a 10kW capacity 4 way blow cassette system from between 2010-2015 which would now be approaching end of life and due for replacement as the basis of our estimations in **Diagram 2**.

A system such as this would usually serve a retail area of up to 100m^2 and is likely to be consuming around 3,000 kWh of energy per annum providing heating or cooling when required. In larger retail environments, multiple systems may be used to provide coverage across the whole shopfloor area. The energy usage from a system such as this could represent around 30% of the total energy usage intensity of the retail store and where heating or cooling loads are higher than average or building fabric performance is poorer, the energy usage intensity will only increase.

DIAGRAM 2



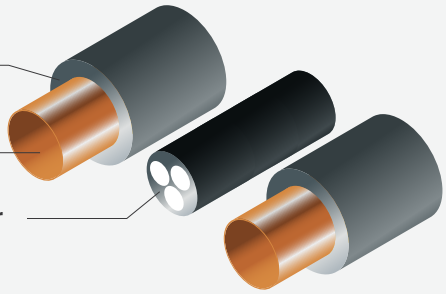
Estimated embodied carbon of interconnecting infrastructure:

Insulation = **0.54Kg / meter** (total for both pipes combined)

Copper Pipework = **2.2Kg / meter** (total for both pipes combined)

Interconnecting Cable = **0.91Kg / meter**

Overall total = **3.65Kg / meter**



The existing pipework, insulation and cable originally installed to connect the existing outdoor and indoor units together is estimated to contain over **100Kg of embodied Carbon**[*1].

Footnote: *1 assumption based upon 30m separation with pipework sizes of 9.52mm x 15.88mm with 13mm insulation and 1.5mm 3 core SWA cable 9.52mm refrigeration copper weighing 0.19Kg/linear meter and 15.88mm weighing 0.40Kg/m using ICE database V4 figure of 3.81KgCO_2e/Kg of embodied Carbon for virgin copper 10mm x 13mm insulation weighing 0.067Kg/linear meter and 15mm x 13mm weighing 0.079Kg/m with embodied Carbon of 3.686KgCO_2e/Kg (lifecycle stages A1-A3) taken from published Armalex EPD. 1.5mm 3 core SWA cable with embodied Carbon of 0.91Kg/linear meter taken from Pyrsmian cables published figures (https:/datasheet.prysmian.com/pdf/datasheet/en-GB/312418/GB00_BS54671KV).

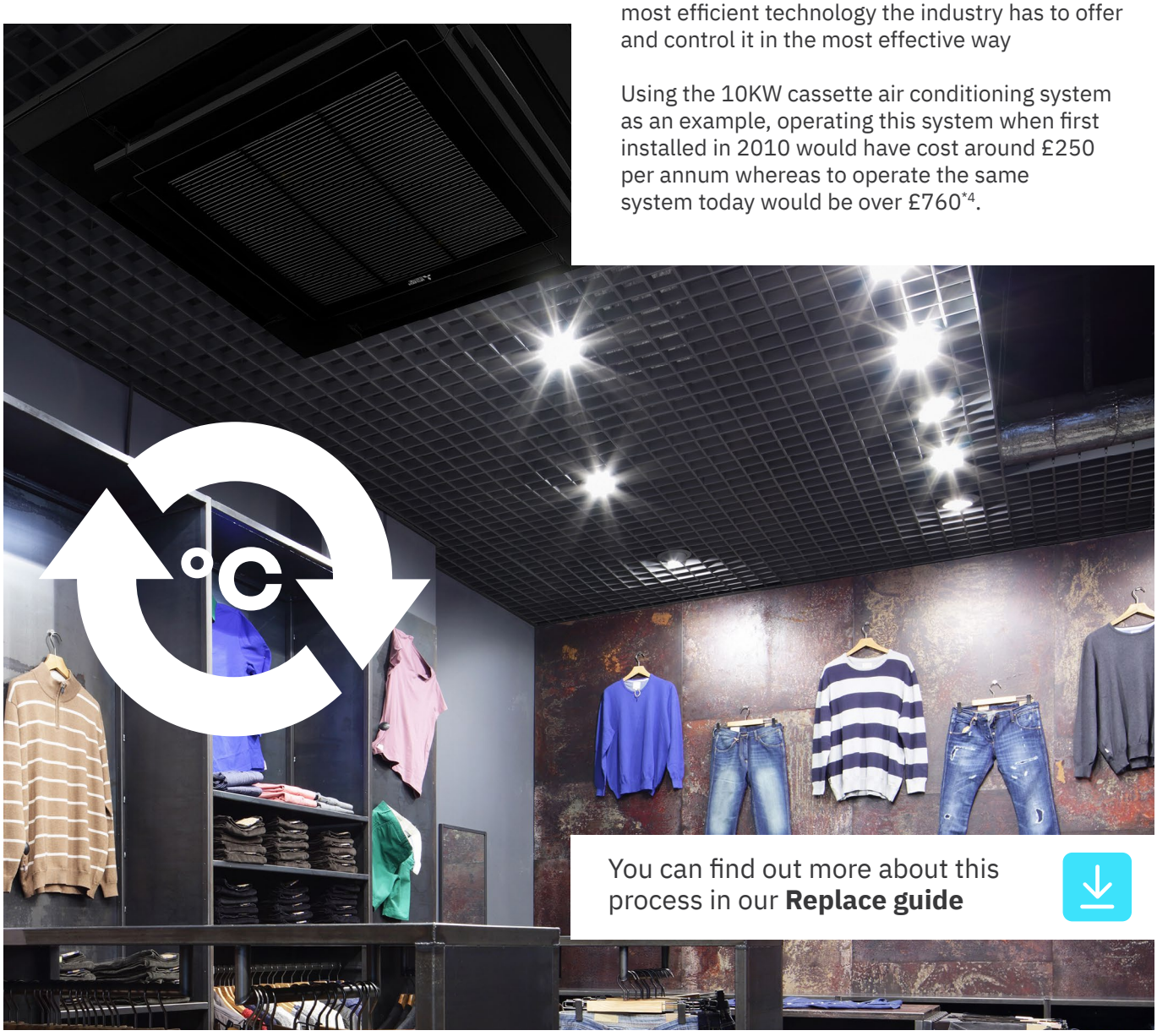
Mitsubishi Electric's **Replace technology** allows a new indoor and outdoor unit to be connected to the existing pipework, insulation and interconnecting cable*2.

This delivers the benefits of a new system while avoiding many of the costs, disruption and carbon emissions associated with carrying out that replacement installation.

The operational efficiency of a modern like-for-like system offers a significant improvement in heating and cooling efficiency (over 20% improvement in cooling mode) therefore reducing the future operational energy consumption of the HVAC system*3.

Continuous innovations in air conditioning system technology and efficiency have resulted in these improvements, but the increasing cost of electricity significantly outpaces these equipment efficiency improvements so the only way to stay in touch with increasing operational costs is to utilise the latest, most efficient technology the industry has to offer and control it in the most effective way

Using the 10KW cassette air conditioning system as an example, operating this system when first installed in 2010 would have cost around £250 per annum whereas to operate the same system today would be over £760*4.



You can find out more about this process in our **Replace guide**

*2 See detailed technical guide for full supporting information https://library.mitsubishielectric.co.uk/pdf/book/AGuidetosupportProductReplacement#page-1. *3 Based upon published catalogue data of Mitsubishi Electric PLA-ZRP100BA/PUHZ-ZRP100VKA 2013 vs PLA-ZM100EA2/PUZ-ZM100VDA2 2025 and assuming annual heating and cooling delivered in accordance with EN14825 Ecodesign directive. *4 Assuming operational efficiency and heating/cooling energy consumed in accordance with Ecodesign Directive and electricity costs from the table on page 7.

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Operating the new R32 replacement system with its increased efficiency and reduced energy consumption offers operational Carbon savings of around 400Kg over a 15 year lifecycle[*3] When added to the embodied Carbon saving of not having to replace the existing pipework, insulation and cable, the result is an estimated total saving of around **0.5 tonne of CO_2 (495Kg)**.

In addition to carbon reduction, there are several additional benefits to be gained from replacing an old air conditioning system.

For example, new equipment will include a warranty, providing peace of mind for landlords and tenants. New equipment is less prone to breakdowns and disruptive maintenance visits.

Mitsubishi Electric also offers to recycle the old air conditioning system via its material recovery and recycling expert partner, Enva, to ensure that as many of the raw materials as possible from the old system are captured and recycled (typically 98%).

Furthermore, modern controls technology provides increased controllability alongside functionality such as cloud connectivity, built-in energy monitoring and remote fault diagnoses.

These innovations, introduced over the past decade, put today's air conditioning equipment far ahead of older systems in terms of performance and efficiency.

Today's air conditioning controls help to create a more comfortable indoor environment for customers, while making the system much more cost-effective to operate.

04 Conclusion

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There has never been a better time to consider retrofitting and updating HVAC equipment in high street properties.

There are critical business benefits to undertaking these changes sooner rather than later.

Changing legislation such as Minimum Energy Efficiency Standards should be a key incentive to take steps today to ensure an easy and effective replacement can be carried out with minimal disruption.

The shifting market for refrigerants is also an important driver since it will affect the availability and price of this critical element of cooling and heating systems in the retail environment. Getting ahead of those changes makes retrofitting easier and will help to make long-term maintenance costs more predictable.

The UK high street can have a significant impact on the UK's Net Zero emissions targets, as well as its energy efficiency goals.

In addition, it can also help to engage and influence the customers who shop there every day by demonstrating its commitment to sustainability goals.

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Note: The fuse rating is for guidance only and please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R515B (GWP:292), R454C (GWP:148), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a hydrocarbon, R290 (GWP:0.02). *These GWP values are based on IPCC 6th edition.

Effective as of June 2025

Green Gateway greengateway.mitsubishielectric.co.uk