UK Government

LCPDelta

UK Space Cooling Market Landscape Update

Report by LCP Delta

Department for Energy Security and Net Zero (2025)

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Contents

Introduction

This report provides a high-level viewpoint on the market as part of the multi-stage research project on the UK cooling market. Cooling is a significant and growing part of UK energy demand and there has been a lack of data, intelligence and insight on this market. This makes it challenging for DESNZ to develop a clear and detailed understanding of the market to inform policy decisions. The UK Government have now also committed to the Global Cooling Pledge which includes a commitment to publish a cooling outlook document by 2026.[1] This 'UK Space Cooling Market Landscape Update' report will support that commitment by taking a first step in the development of a coherent source of data, intelligence and insight and provides the basis for future research on the active cooling market. The report provides information on:

- Commercial and residential market sizes
- Trends by technology type
- Key market players
- Routes to market
- Drivers and barriers

This information provides a summary of the size and shape of the market and a basis for next stages of research on the wider landscape, including forecasts, supply chains and customer segmentation.

Disclaimer: The below report is limited to available evidence and provides a narrative summary for an update to the current landscape of the UK Space Cooling Market. The report considers active cooling in the UK and does not consider passive cooling. Passive cooling can be appropriate and cost-effective options to mitigate overheating.

Project scope

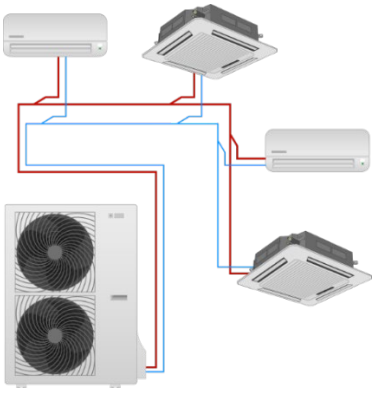
This report focuses on the UK fixed active space cooling market (air conditioning - AC) for both domestic and non-domestic buildings. The focus is on providing data and insights into technologies listed in Table 1.

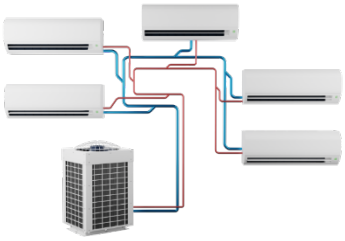
Other technologies used for cooling, including portable systems and hydronic heat pumps, have been considered as part of the market analysis but are not included in the scope of the

[1] Environmental Audit Committee (2024) Heat resilience and sustainable cooling: Government Response to the Committee's Fifth Report

research and market sizing. Whilst portable AC systems are an important segment of the market, the manufacturers and sales channel is very different to the fixed space cooling market (predominantly imported and commercialised by the retail channel). Therefore, the process for obtaining data was outside the scope of this project. Future research is needed to better understand the portable air conditioning market, including stakeholder engagement with manufacturers and distributors. Passive cooling measures were also outside of the scope of this report, whilst recognised as potentially an appropriate and cost-effective option to reduce indoor temperatures, the focus of this report was to provide an update on the fixed active cooling market.

Table 1: Cooling products included in the report.

Product		Description
Single-split		Single split systems have an outdoor unit (often wall mounted, containing the compressor and condenser) and an indoor unit. Refrigerant is circulated between the two units, and a fan system passes air over the internal coil for air distribution in the room. Units can operate in cooling or heating mode by reversing the cycle.
Multi-split		Multi-split systems are similar to single split systems, but with multiple (up to ~10) indoor units connected to one external unit. These are suited to buildings where multiple rooms or zones need cooling (or heating); all indoor units operate in the same mode at the same time (cooling or heating).

VRF (Variable Refrigerant Flow)		VRF systems distribute refrigerant from the outdoor unit to multiple indoor units similar to a multi-split. In addition, the flow rate (volume of refrigerant) distributed to each indoor unit can be controlled, and by typically using a two or three-pipe system,[2] different indoor units can simultaneously operate in heating or cooling mode, allowing internal heat recovery between zones. These systems are generally more efficient than multi-split systems.
Chillers		Chillers use a refrigeration cycle, transferring heat from the liquid to the ambient air or to a cooling medium (e.g. water). They are either air cooled (using fans) or water cooled (using cooling towers and are generally mounted on the roof of non-domestic buildings). Chillers are used from cooling commercial buildings to facilitating industrial processes and in refrigeration. This report only focuses on vapour compression chillers up to 250 kW used for space cooling applications.
Technologies not included in the scope of the project:		
Portable air-conditioning system	Portable air conditioners are self-contained, movable cooling devices designed to cool individual rooms or specific areas rather than an entire building. It typically includes a compressor, condenser, and evaporator in a single unit and uses a ventilation hose to expel warm air outside (often through a window or a ventilation hole). Portable air conditioners require minimal installation, are often equipped with wheels for easy mobility, and usually feature adjustable settings for temperature, fan speed, and sometimes dehumidification. They are mainly used for temporary or supplementary cooling.	

[2] A Complete Guide to VRF Air Conditioning | MFM

Hydronic heat pump	An appliance for providing space heating and/or water heating to buildings, using a vapour compression cycle, where the driving energy is electricity. The main types are air/water and ground/water-water solutions. These systems are primarily used to provide heating but some can work in reverse cycle and lower the temperature in the building, using fan coils or under-floor heating as emitters (although are not able to decrease the indoor temperature to the levels that air conditioning systems are able to).

Methodology

This report has used a combination of desk-based research and a series of stakeholder interviews to obtain supporting evidence particularly where there is an absence of existing sector specific data and evidence. The interviews used LCP Delta's and DESNZ's network of contacts in the UK to set up 13 interviews with manufacturers, distributors, trade bodies and wider stakeholders. Each interview lasted between 30-60 minutes and was held via Microsoft Teams. The interviews were conducted following a semi-structured interview guide (See Appendix 1: Discussion Guide), which provided consistency across the interviews but allowed the process to be guided by the interviewee and what they considered to be the key points. To ensure robustness and mitigate bias, we engaged a range of stakeholders, cross-checked insights with desk-based research, and critically assessed responses for potential influence, such as commercial, policy-driven or personal agendas.

The research and interviews were held between November 2024 and February 2025.

LCP Delta has in-house expertise, research and data on the energy transition, covering topics such as decarbonisation of heat, home energy management, power markets and electricity networks. The AC market will be closely linked to wider trends in the energy transition and the research incorporates these wider insights. The report provides a high-level summary of the market.

Future research

This research provides an overview of the UK cooling market and provides a foundation for future research. The next stages of research will build on the current report to provide more insights on the market, including:

- Market forecasts
- Insights into key refrigerants used in cooling solutions
- Customer experience
- More detailed insights into the breakdown of the domestic and non-domestic market
- Key insights from other European markets.

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Current UK space cooling market

Market Background

Cooling is a significant and growing part of UK energy demand. It is currently not well understood what proportion of energy demand is attributed to cooling but there have been some studies to estimate the figure. A 2016 study estimated air conditioning accounted for 3% of total energy demand and 10% of UK electricity demand and the market size is understood to have grown over the last decade.[3,4] While current cooling demand is dominated by non-domestic buildings, cooling in the domestic stock is increasing. BSRIA[5] estimates that penetration of residential air conditioning will increase to 8% by 2028 and the English Housing Survey report a baseline use of 3% in 2021.[6]

This is closely linked to increasing temperatures. In the UK the number of 'warm' days (over 25°C) has increased by 63% in the most recent decade compared to 1961-1990 (mean average). In the same period, 'hot days' of over 28°C have more than doubled, and 'very hot' days (over 30 °C) have more than trebled.[7]

As summer temperatures have increased, demand for air conditioning systems and cooling in general in the UK has been rising and the trend is forecast to accelerate; according to BSRIA this is particularly in the south east. Households and businesses are often focused on first cost and are choosing the cheapest options normally resulting in the least efficient solutions.

A Cooling Degree Day (CDD) refers to a day in which the average base temperature is above 22°C. The number of degrees above this threshold for a set time period determines the number of Cooling Degree Days, for example, 1 day at 24°C is 2 CDDs, and 2 days at 23°C is also 2 CDDs.[8] The Met Office Climate Data Portal provides detailed projections of annual CDDs at a 12km resolution in the UK, based on the UK Climate Projections UKCP18 (but excluding local urban heat island effects). In the period 2025-2035 it shows increasing projected CDD for the various regions of the UK: e.g. for London it is projected to rise from ~80 CDD in 2025 to ~125 in 2035 (although this does not account for the local urban heat island effect). In relative terms CDD demonstrates an increase by ~56%, whereas in comparison to a Heating Degree Day (HDD) the projections estimate that there could be a decrease in the number of HDD days by ~5 to 10%.

UK buildings have been traditionally designed to keep warm in the winter rather than for keeping cool in the summer season, but overheating is already a problem in some buildings

[3] Abela, A. et al. (2016). Study on Energy Use by Air Conditioning: Final Report. 39. BRE on behalf of Department of Energy and Climate Change
[4] UK Parliament POST (2021) Sustainable Cooling
[5] BSRIA, 2024, Worldwide Air Conditioning Splits Systems 2024, Report 105340/20, March 2024
[6] English Housing Survey 2021 -2022 https://www.gov.uk/government/statistics/english-housing-survey-2021-to-2022-energy/english-housing-survey-2021-to-2022-energy
[7] Royal Meteorological Society (2024) Temperature extremes and records most affected by UK's changing climate
[8] Met Office (2025) Annual Cooling degree days

during summer, and this is expected to get worse as temperatures heighten. It is estimated that 4.6 million English homes are susceptible to overheating in the summer.[9] A study in Greater Manchester identified that the type of home significantly impacts the sensitivity to overheating, with mid-terrace, and purpose-build low-rise and high-rise flats, being most vulnerable to overheating.[10]

In recent years there has been an increased occurrence of heat waves in the UK, such as in 2022, when heat waves between June-August are estimated to have caused 4,507 excess deaths.[11] In its World Energy Outlook 2024 report, the IEA assumed that more frequent and higher intensity heatwaves should be expected globally, which almost certainly will impact the UK as well.[12]

Analysis by Arup for the Climate Change Committee explored the risk of overheating in different warming scenarios. This found that in a scenario with temperature rises of 2°C by 2080 none of the buildings outside Scotland passed the overheating risk assessment.[13] In their '+4°C by 2080' scenario they found that 90% of all UK dwellings will need some type of active cooling solution to mitigate against overheating.

There are a range of solutions that can be used, from modifying window opening behaviour to installing air conditioning. Research has identified that while adaptive, non-structural solutions, such as modifying window opening behaviour can reduce overheating to some degree in the short term, structural actions yield much greater reductions.[9] There are a number of structural solution options to avoid overheating in homes, including[14]:

- Wall and loft insulation
- External and internal shading
- Window replacements
- Ventilation mechanisms.

Multiple reports have recommended these are used as a primary response to hot temperatures and warned against over reliance on air conditioning.[13,14,16] Some of these measures can be expensive and difficult to install into existing homes, such as solid wall insulation. There will also be limits to the effectiveness of passive solutions in sustained high temperatures. Therefore, active cooling is still expected to increase in response to rising temperatures.[15]. To date, the data on the use of space cooling in the UK has been limited, making it difficult to identify how many homes and businesses have been responding to rising temperatures by using a type of air conditioning unit. The English Housing Survey includes a subjective measure to gauge whether residents feel their homes get uncomfortably hot, and have found that in 2022 11% of residents reported that at least one part of their home got uncomfortably

[9] Lomas, K. et al. (2021) Dwelling and household characteristics' influence on reported and measured summertime overheating: a glimpse of a mild climate in the 2050's. Building and Environment
[10] CS-NOW (2025) Adapting Homes to Heat in Greater Manchester
[11] Office for National Statistics (2022) Climate-related mortality, England and Wales: 1988 to 2022.
[12] IEA (2018) The Future of Cooling
[13] Arup (2022) Addressing overheating risk in existing UK homes
[14] University of Exeter (2024) Decarbonising Cooling in UK homes
[15] CS NOW (2023) Assessing the future heating and cooling needs of the UK housing stock

hot, compared with 9% in 2021. This report provides data and insights to build on existing data and reduce the knowledge gap on the market.

Policy background

Air-air heat pumps are listed as eligible technology under the Warm Homes: Local Grant and Warm Homes: Social Housing Fund. There are ecodesign regulations in place for ACs which introduce a minimum energy performance standard (MEPS) to ensure the lowest energy performing products are removed from the UK market.[16] The UK has also committed to the Global Cooling Pledge which requires the establishment of revised challenging MEPS by 2030 with regular reviews to progress towards net-zero emissions by 2050. The Global Cooling Pledge also includes a commitment to publish a Cooling Outlook Document, which provides an action plan for cooling.

As outlined above there have been multiple recommendations to avoid an over reliance on air conditioning and to instead focus on passive measures to increase resilience against overheating. Building regulations support a preference for passive cooling and updates in July 2022 include requirements to limit overheating.[17]

Building regulations are an important driver for the new build market but there is currently limited policy in place to shape the cooling market in existing properties. There will be many factors to consider in future policy decisions, potentially increased attention regarding air-air heat pumps and the suitability of these systems to provide space heating (with the additional benefit of lowering the indoor temperatures as a solution against overheating) in more efficient homes. Additionally, a significantly decarbonised electricity system reduces the carbon impact of running these systems, particularly if they are used flexibly.

The Town and Country Planning (General Permitted Development) (England) Order 2015 sets out which air source heat pump installations fall under permitted development. This includes some air-air heat pumps that deliver both heating and cooling. Installations not permitted (e.g. in non-domestic premises) will require the submission of a planning application to the local planning authority[18]. For commercial air conditioning systems, planning permission may be required depending on the type of building and the policies of the relevant local authority. The Boiler Upgrade Scheme (BUS) has recently consulted on the inclusion of air-air heat pumps[19]. The Microgeneration Certification Scheme (MCS) is updating its standards to ensure they provide for air-air heat pumps and [has recently] launched a consultation on updates to MIS 3005-D: Heat Pump Design Standard and MCS 007: Heat Pump Product Standard[20].

[16] Environmental Audit Committee (2024) Heat resilience and sustainable cooling: Government Response to the Committee's Fifth Report
[17] MHCLG (2021) Overheating: Approved Document O
[18] The Town and Country Planning (General Permitted Development) (England) Order 2015
[19] Boiler Upgrade Scheme and certification requirements consultation (accessible webpage) - GOV.UK
[20] MCS launches six-week consultation on updates to MIS 3005-D: Heat Pump Design Standard and MCS 007: Heat Pump Product Standard - MCS

In England and Wales[21], air conditioning systems with an effective rated output exceeding 12kW are subject to mandatory inspections every five years by a qualified energy assessor to ensure energy efficiency.[17] These inspections provide recommendations to improve the energy efficiency of the system but there is no requirement to act on these recommendations. Ministry for Housing, Communities and local Government (MHCLG) consulted on proposed changes to these requirements as part of the consultation on Reforms to the Energy Performance of Buildings regime in December 2024.[22]The F-gas Regulation in GB and NI sets requirements to reduce use and emissions of fluorinated greenhouse gases (F gases).[23],[24]. For example, 'single split' systems that contain less than 3kg of refrigerant (a system with one cooling coil connected to a remote condensing unit) need to have a global warming potential of <750 from 2025[25]. Air conditioning units which are fixed and are not portable or moveable will not be subject to VAT due to the VAT relief on energy-saving materials and heating equipment.[26]

[21] Buildings in Northern Ireland and Scotland are subject to separate regulatory requirements.
[22] Reforms to the Energy Performance of Buildings regime - GOV.UK
[23] Fluorinated gas (F gas): guidance for users, producers and traders - GOV.UK
[24] Many active cooling systems contain fluorinated gases (F-gases) which can be very potent greenhouse gases if they leak. There are natural refrigerants available but there are flammability risks associated with these options.
[25] https://www.gov.uk/guidance/bans-on-f-gas-in-new-products-and-equipment-current-and-future#air-conditioning-and-heat-pump-systems-f-gases-banned-in-new-products
[26] Energy-saving materials and heating equipment (VAT Notice 708/6) - GOV.UK

Space cooling market size

This section provides an overview of the market size and existing number of cooling systems in the UK residential and non-residential sectors. The qualitative and quantitative findings are based on a mixture of published data (assembled via desk-based research) and interviews carried out by LCP Delta with industry stakeholders.

Residential market

Market size

This section insights and data on the annual sales and installed base of the residential cooling market, developed through literature review and stakeholder engagement. Appendix 2 has a breakdown of the methodology used.

Traditionally homes in the UK have not required cooling solutions, although increasing airtightness, greater use of glass facades, and more frequent and extreme heat waves have led the residential space cooling market to grow. Nevertheless, these solutions are still not common in the majority of domestic properties. It is estimated that in 2024 around 2-3% of homes had some form of cooling[27] with the bulk of these solutions being portable air conditioning units, followed by dedicated space cooling solutions (see Table 2).

Table 2: Residential fixed space cooling market size in 2024

	Total sales to residential in units in 2024[28]	Installed base in residential segment in units in 2024
Single-split	~ 9,000	~ 64,000
Multi-split	~ 1,000	~ 7,000
VRF	~ 2,000	~15,000
Chillers	negligible	negligible

Table 2 provides data on the fixed space cooling market. As set out in the project scope, the portable market is different to the fixed cooling market in terms of manufacturers and sales channels and is not the focus of this report. It was acknowledged by stakeholders interviewed

[27] Department for Business, Energy and Industrial Strategy (now DESNZ) ((2021) Energy Follow Up Survey (EFUS) 2017 reports

[28] Number of units show number of condensing units, calculated based on secondary and primary research. See Appendix 2 for further information on the methodology.

that portable air-conditioning is the most wide-spread residential space cooling type in the UK. There is no reliable sales data and statistics available on this segment, but stakeholders estimated that around 50,000 portable air conditioning units are sold to residential customers each year. Stakeholders suggested this annual figure remains relatively stable but further research is required to understand the trends in this market.

Annual sales of single and multi-split as well as VRF systems were in the region of hundreds of units 10-15 years ago, gradually increasing in the past decade to several thousand units per year. Installation of single and multi-splits and VRF systems in the UK residential buildings are relatively recent and their replacement rate is still at a minimal level.

To provide an idea of the number of homes the installed base equates to we have estimated the number of units installed per home based on stakeholder interviews and research on manufacturer websites. Based on this estimated one split system installed per home which equates to around 64,000 homes have single-split and 7,000 homes have a multi-split system installed (overall ~0.24% UK homes). This is probably an oversimplification as a small share of homes potentially could have more than one single split system installed.

Typically, a single VRF system is used in very large homes, but in some cases a VRF system can provide sufficient capacity for 3 homes on average; the number of homes with VRF systems is estimated to be less than 15,000.

A small share of hydronic heat pumps, with fan coils, are also used in reverse mode to ease higher indoor temperatures and enhance comfort.

Typical capacity sizes of individual space cooling systems in residential applications in the UK[29]:

- Single-split system: 2-3.5 kW
- Multi-split system: 4-9 kW
- VRF: 10-14 kW.

Data gaps at this stage: There is no reliable available data on the installation of residential and non-residential units before 2013. The lifetime of split units and VRFs is between 10-20 years and chillers is 20-30 years. Therefore, the installed base figures would be improved with further insights into sales data prior to 2013 and on replacement rates.

There is limited data on the portable cooling and further research is needed to better understand this market.

Key cooling trends in the residential segment

As a result of high temperature days in the UK over the last few years, portable AC solutions have seen a rapid uptake. These are typically sourced from DIY stores or other retail channels,

[29] Ranges derived from interviews with AC manufacturers and online research on key manufacturer offerings (e.g. Daikin, Mitsubishi Electric, Samsung and Panasonic websites)

as well as online (e.g. Amazon). Portable air conditioners are still the most wide-spread form of space cooling sold in the UK residential sector, although there are no reliable data sources of the annual sales and installed base of these products due to the wide range of retail-based sales channels. Through interviews with AC manufacturers we have estimated that 50,000-80,000 portable AC units are sold annually.

Manufacturers interviewed stated that split air conditioning types (single and multi-splits, as well as VRF) have been mainly installed in high-end residential homes, predominantly in London and surrounding areas, which are either purchased or rented by individuals with high disposable income.

In households with average income level, sales of split air-air heat pump units (with cooling function) have initially been driven by house extensions and installations in bungalows, as these units have been cheaper and more straightforward to install than extending the legacy hydronic heating system (often running on fossil fuel) and also have the added benefit of operation in cooling mode. Demand for split units able to provide space cooling has also been helped by the increasingly frequent high-temperature days, as homeowners acknowledged that portable air conditioners are not effective and powerful enough to provide the required comfort level on a longer term. This is partly because cheaper units are purchased with higher breakdown rates, and often because they require the window to be opened for the duct, letting warm air into the building. Previous research carried out in 2021 identified that portable solutions can be a ‘stepping stone’ for customers as they get used to having cooling in their homes and look for a better quality, more permanent system.[30]

All interviewees reported that COVID-19 lockdown period in 2020 and 2021 had a significant impact on the market, with a surge in remote working prompting increased investment in home extensions and garden office buildings. This trend has boosted the popularity of reversible single split air conditioners, which are valued for their primary heating capabilities, but also for their additional cooling functionality. This trend then accelerated in 2022-2023 driven by the hot summer in the UK in 2022, when temperatures above 40°C were recorded for the first time.

Interviewees also reported that the residential cooling market in 2024 experienced a decrease, with c. 9,000 single splits, 1,000 multi-splits and 2,000 VRF systems installed. This downward trend is largely due to the coldest summer experienced in the UK since 2015 but is also impacted by workforce returning to offices. It is interesting to compare this level with the Dutch market, a country with similar type (although significantly smaller) building stock (c. 8 million dwellings) and similar weather but with a much warmer summer in 2024 compared to the UK. During a year with high summer temperatures in 2024, sales in the Netherlands reached 350,000 fixed units (up from 300,000 units each year between 2020-2023).[31] This supports the correlation between cooling system sales and the summer temperatures, with hotter summers driving increased demand.

There are an increasing number of installations involving hydronic heat pumps (with fan coils and underfloor heating), primarily designed to provide heating, but also able to cool down the

[30] AECOM, Delta-EE & University of Exeter (2021) Cooling in the UK
[31] Warmte 365

living space. These solutions are not referred to as air conditioning, but rather 'comfort cooling' by the manufacturers involved. Such technologies are not part of the scope of the current study, but their role in providing indoor comfort and their market potential should be investigated further in future studies.

Non-residential market

Market size

In the UK, space cooling has traditionally been used in non-residential applications much earlier than its adoption in the residential sector. Historically, cooling in non-residential buildings was provided by chillers, typically located on rooftops, while heating relied on fossil fuel boilers. Increasingly, there has been a shift away from these solutions, with an increasing preference of VRF (Variable Refrigerant Flow) systems and chiller heat pumps – both able to provide heating and cooling.

Table 3: Non-residential fixed space cooling market size in 2024

	Total sales to non-residential in units in 2024[32]	Installed base in non-residential segment in units in 2024
Single-split	~ 175,000	~ 2.6 million
Multi-split	~ 19,000	~ 143,000
VRF	~ 18,000	~ 306,000
Chillers	~ 2,500	~ 48,000

The number of non-domestic buildings with air-conditioning was not calculated as part of this research. Nevertheless, previous research has estimated that about two-thirds of offices and a third of retail spaces have air conditioning in England and Wales but further research is needed to better understand the penetration of space cooling in this segment.[33]

Whilst in residential properties the cooling will often be limited to one room the use in non-residential properties will often be for a much larger area. Typical capacity sizes of individual space cooling systems in non-residential applications in the UK[34]:

[32] Number of units show number of condensing units, calculated based on secondary and primary research. Initial figures were developed based on desk-based research and early interviews and were then tested in subsequent interviews with key players in the market and industry experts. See Appendix 2 for further information on the methodology.
[33] BRE (2016) Electricity use by air conditioning
[34] Ranges derived from interviews with AC manufacturers and desk-based research on key manufacturer offerings

- Single-split system: 7-14 kW (capacities installed in non-domestic applications are larger than in residential, driven by higher cooling demand)
- Multi-split system: 5-20 kW in small offices and retail, 20-50 kW in medium offices, retail and restaurants and above 50 kW in large offices and hotels
- VRF: 10-30 kW in small commercial applications (e.g. small offices, retail, restaurants), 30-150 kW in medium size buildings (e.g. medium size offices, hotels, leisure centres) and above 150 kW for larger commercial buildings (e.g. hospitals, data centres, airport buildings)
- Chillers: 50-500 kW in small commercial buildings (e.g. small retail and small offices), 500 kW – 2 MW in medium size commercial buildings (e.g. hotels, medium offices) and over 2 MW for large commercial buildings (e.g. hospitals, data centres airport buildings).

Key cooling trends in the non-residential segment

Research in 2021 identified that over half of cooling-related energy demand in the non-domestic sector originates from offices, retail spaces (mainly small shops), and leisure centres.[35] Manufacturers interviewed reported that the COVID-19 pandemic (particularly during 2020 and 2021) significantly impacted the non-residential cooling market as a large portion of the workforce shifted to remote/hybrid working patterns. This led to subdued sales of air conditioning solutions until 2022.

After 2022, sales of non-residential cooling solutions began to recover as workforce started to return to workplaces, driving new investments in office buildings. Additionally, there also have been increased investments in health-related facilities and hospitality (such as hotels and leisure centres) in recent years. This trend has notably benefited sales of VRF systems and chillers.

As shown in Table 3, in terms of volumes, single-split units accounted for the largest segment for several years, as these have been the de-facto choice in light commercial applications (i.e. in small businesses, hotels, offices etc.).

The majority of VRF systems sold in the UK are installed in non-residential applications, similarly to chillers. There is a significant trend towards reversible types, which are also able to provide space heating.

[35] AECOM, Delta-EE & University of Exeter (2021) Cooling in the UK

Data gaps at this stage: This analysis uses insights from stakeholder engagement and existing literature. There has been limited previous research on the size and trends in this market so future research should focus on gathering data from AC customers. This can provide insights into the current customer experience of AC, drivers and barriers to installation and key customer groups. In addition, the number of non-domestic buildings by type (e.g. offices, retail) is currently unknown and would require further research to calculate.

Market landscape

Key players

This section provides a summary of the leading companies in the UK cooling market. These have been identified through desk-based research and interviews with key industry stakeholders.

Split units

Consumers have a wide choice when it comes to cooling appliances, particularly regarding split air conditioners at the smaller end of the scale. Daikin is commonly acknowledged as the market leader in this category. Other Japan headquartered brands Mitsubishi Electric and Panasonic are also among the market leaders, as is South Korea's Samsung.

Outside of the leading split brands, other cooling specialists like Hitachi, Fujitsu, Midea, Hisense, Haier and LG are also present. Worcester-Bosch is the only player from the leading boiler brands which currently offers splits in the UK market.

VRF

The top four brands in the VRF segment are the same as in the splits segment, with Daikin once again being considered the market leader, followed by Mitsubishi Electric, Samsung and Panasonic.

Outside of the leading group, Toshiba and Fujitsu also have established VRF offerings. US-headquartered Carrier is among the other brands offering VRF products in the UK.

Chillers

The competitive landscape in the chiller market is quite different than it is for splits and VRF. CIAT (now owned by Carrier) is the market leader, with Aermec (also under the Carrier umbrella) and York (recently acquired by Bosch Group from Johnson Controls) also among the most successful brands. Established international players such as Lennox and Airedale (owned by Modine of the US) also supply into the UK.

Product offering of key providers

All the top providers, outlined in Table 4 below, provide both residential and non-residential solutions. Residential solutions include wall-mounted, floor-standing and concealed ceiling options.

Table 4 : Main space cooling providers

	Headquarters	Product offering
Daikin	Osaka (Japan)	Single-splits, Multi-splits, VRF, Chillers (Daikin Applied[36] – part of the Daikin Group)
Mitsubishi Electric	Chiyoda City, Tokyo (Japan)	Single-splits, Multi-splits, VRF, Chillers
Samsung	Suwon (South Korea)	Single-splits, Multi-splits, VRF
Panasonic	Kadoma, Osaka (Japan)	Single-splits, Multi-splits, VRF, Chillers

Data gaps at this stage: There is high confidentiality in the industry around the sales numbers by company. Accurate data on the market shares for the AC market are not available at the time of writing the report.

This research has not included a detailed review of the pricing of air conditioning systems. Stakeholders interviewed suggested the residential units typical fully installed costs (without VAT) are:

- Single-split system: £2,000-£3,000
- Multi-split (2 indoor units): £2,800-£5,000
- Multi-split (3 indoor units): £4,100-£6,500
- VRF (25 kW unit with 6 indoor units with heat recovery): £30,000-40,000.

Installation fees are reported to be high for AC systems. Labour fees are around £350 a day with installations generally taking 1-2 days for split systems.

Portable units can be much cheaper, ranging from £100-£400, with no installation fee.

[36] https://www.daikinapplied.uk/

Routes to market

Split units

Split air conditioning units are sold via both a three-step (manufacturer - wholesaler – installer - end-user) and two-step distribution channel (manufacturer – installer – end-user).

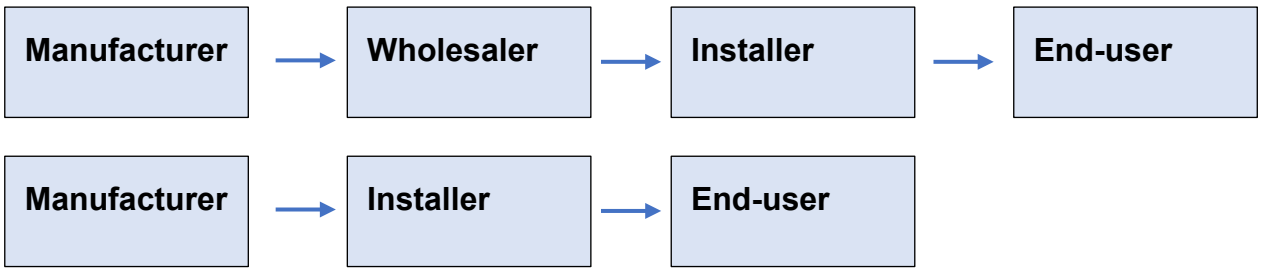

Figure 1: Split air conditioning distribution channels

Currently the number of split air conditioning systems sold via the three-step distribution channel is slightly higher than via the two-step channel. Single split air conditioners are predominantly sold via a three-step, while multi-split air conditioning units are mainly sold via a two-step distribution route (therefore allowing manufacturers to have a better control and relationship with installers who specify/design the installation and ensure that they have adequate knowledge of refrigerant handling).

VRF

Due to the higher complexity of VRF systems and the fact that each installation configuration is unique, such systems are typically installed by specialised installers with good knowledge of refrigerant handling. The majority of VRF systems are sold directly to installers by the manufacturers (in a two-step distribution channel). Installers typically use software to assess cooling demand and make recommendations on system design.

Chillers

Installing chillers require specialist skills, as each installation and system configuration is unique and needs to be specified and planned.

The system configuration is typically designed by mechanical design consultants or mechanical and electrical (M&E) contractors, which specify the type of cooling solutions / chillers. Most chillers are then sold directly to the installers by manufacturers (in a two-step distribution channel), who are subcontracted by M&E contractors to carry out the installation work.

Drivers and barriers for the space cooling market

This section provides an overview of the drivers and barriers for the fixed space cooling market. These have been identified through stakeholder interviews and the literature review.

Drivers

The uptake of space cooling in the UK depends on the following key drivers:

- Periods of high temperature.
- Buildings which were primarily designed to meet building regulations which were traditionally aimed at retaining heat and therefore can have overheating issues.
- House extensions increasingly lead to installations of air-air heat pumps, as the primary driver is to provide a space heating solution. These are easier to install than extending the existing heating system and also have the added benefit of cooling which is increasingly important in decision making.
- Changing working patterns since the outbreak of the COVID-19 pandemic led to growing installation of air-air heat pumps in the residential sector in home offices, with added benefit of cooling.
- Attractive price of air-air single split heat pumps (air conditioning split units) compared to hydronic types for space heating.[37]
- Retrofit investment in offices increased in the past few years as workforce has been returning after lockdown. Investment in other commercial applications (healthcare, leisure centres etc.) also helped uptake of space cooling solutions.
- Growing consumer expectations for better indoor comfort: As people experience air conditioning in workplaces, supermarkets, and cars, they increasingly appreciate its benefits and develop higher expectations for thermal comfort in other environments, including their homes.

As the extreme hot weather intervals of recent years (especially in 2022) demonstrated, this acts as the largest driver for adopting cooling.

The research suggests that homeowners often purchase a portable air-conditioning unit in the first instance, however these often suffer reliability issues and can be inefficient and noisy. For example, the systems have to discard the heat via a duct (in most cases through an open window) which has a negative impact on its efficiency and the draining of the generated condensation can also add complications. These factors then shape homeowners' decision making to install a split air conditioning unit at a later stage (single or multi or VRF, depending

[37] BEIS (2021) Cost-Optimal Domestic Electrification (CODE)

on the budget available and the type of property) after they have experienced the improved comfort levels achievable.

Home extensions and the rise of home / hybrid working in the past few years have also been a very strong driver for adopting cooling solutions, although interestingly this has been a secondary benefit, as the primary driver has been to find a space heating solution which can be installed at an affordable price and with minimum disruption.

In the existing non-residential building stock, there has been a trend towards buildings having a high surface area covered with glazing, which can accelerate overheating in warm weather.[38] Cooling the indoor area in such buildings has also been a major driver.

Improving indoor air quality in the commercial building stock (mainly in offices) has been a major trend in the past few years, especially in the aftermath of the COVID-19 pandemic. This includes improvements to ventilation and to space cooling as well, adopting more modern and energy efficient solutions. Occupiers are increasingly requiring higher quality internal conditions when purchasing or leasing office space.

Barriers

Key barriers which hinder the uptake of space cooling in the UK:

- Air-air heat pumps not currently fully recognised by all standards and policies (e.g. MCS standards and tools are in the process of being updated and BUS currently doesn't include air-air heat pumps).
- Regulatory uncertainty (e.g. F-Gas update, PFAS)[39],[40]
- Enhancing occupant comfort via cooling not reflected fully in building standards (e.g. in Building Regulations)
- Insufficient number of trained and F-Gas accredited installers who can ensure safe installations and comply with the relevant safety standards (e.g. BS EN 378). There is transferability of skills between non-domestic and domestic installations, although interviewees reported that most installers prefer non-domestic projects (due to the clarity of contract terms and the timelines involved).
- Unfamiliarity of UK homeowners with air-air heat pumps / reversible air-conditioning split units.
- Installation and running costs.

[38] Imperial College London (2023) London has the fastest increase in cooling demand in the world, shows new model
[39] Poly- and perfluoroalkyl substances (PFAS) are a large group of synthetic organofluoride chemicals that have been widely used since the 1940s. There is concern about the adverse impact from PFAS on the environment and human health.
[40] Lowes (2023) Blowing hot and cold: Reflecting the potential value of air-to-air heat pumps in UK energy policy

The BUS had a positive impact on the recent uptake of hydronic heat pumps (mainly air-water solutions) in the UK. However, the absence of air-air heat pumps from the list of MCS accredited technologies and the current lack of installation standards has supressed the uptake of a technology which can also provide the added benefit of cooling and could help tackle the overheating issues in the UK building stock. At the time of drafting, MCS have launched a consultation on updates to their heat pump standards (including MCS 007 and MIS 3005-D) to provide for air-air heat pumps[41]. A consultation, which has now closed, explored including air-air heat pumps in BUS.

Interviewees cited Building Regulations as a barrier to AC, with current regulations preferencing passive cooling solutions.[42]

The cost of obtaining F-Gas certification and disposal of refrigerants have been deterring installers, resulting in a shortage of F-Gas certified installer workforce who could carry out installation and service work, especially in the residential sector. Additionally, interviewees reported that most installers prefer non-domestic projects over residential installations, mainly due to the clarity of contract terms and the related timelines. Availability of more well-trained and accredited F-Gas installers would be crucial to support the adoption of air-based heating/cooling solutions across all segments.

In addition, the majority of UK homeowners have very limited familiarity with air-based heating solutions (compared to countries like Italy, Spain and France) and most have been using fossil fuel boilers for heating. This can further hinder uptake of air-air heat pumps as a primary heating solution in the UK, even though the cooling function would provide additional comfort during future heat waves.

[41] MCS launches six-week consultation on updates to MIS 3005-D: Heat Pump Design Standard and MCS 007: Heat Pump Product Standard - MCS
[42] EIRO: Air-to-Air Heat Pumps – Literature Review

Conclusion

The UK space cooling market is evolving due to a number of factors including rising temperatures, building design and ventilation issues and changing working habits. While cooling has historically been much more prevalent in the non-residential sector, the residential market is seeing increased adoption, particularly among high-income, owner-occupied households in the south of England. The demand for cooling solutions is expected to rise further as climate change leads to more frequent and intense heat waves, with projections indicating a significant increase in Cooling Degree Days across the UK in the coming decades.

The correlation between installation of AC systems and summer temperatures is clear, with hotter summers driving higher demand. The extreme hot weather spells in recent years (especially in 2022) demonstrated the link between summer temperatures and adoption of cooling. In the domestic setting the initial step has often been to purchase a portable air-condition unit to respond to the hot temperatures. Issues with reliability and user experience (e.g. noise) of the portable systems can then be a driver for some customers to then install a fixed solution.

There have been multiple recommendations to first use passive measures, such as shading solutions, as a first response to increase resilience to rising temperatures. However, the AC market is still increasing and it is important to understand how this technology will fit alongside other solutions. The AC market has been under researched, and this report provides a summary of the market. This provides a foundation for future research into areas such as retail routes, controls and smart operation, customer segmentation, which will support the understanding of the role air conditioning will play in future energy systems.

Disclaimer: The below report is limited to available evidence and provides a narrative summary for an update to the current landscape of the UK Active Space Cooling Market.

Appendix 1: Discussion Guide

In the interviews slides were presented with current views on the market and a semi-structured discussion guide was used to gather insights and data from interviewees. A summary of the questions asked is provided below.

[LCP Delta presented a slide showing a breakdown of cooling projects]

1. Are these the main space cooling categories?

[LCP Delta presented current view of the UK space cooling market]

2. Do we segment the overall UK space cooling market correctly?

3. Do you have a view on how the overall sales of these cooling products developed in 2023/2024? Or point us to relevant contacts / sources to find out?

[LCP Delta presented current view of the UK residential space cooling market]

4. What are the key uses for these cooling technologies in the residential sector?

5. What is the proportion of the installed base in the UK for the following cooling solutions in residential applications? Single-split, multi-split, VRF, chillers, portable AC

7. How does the market split between new build and retrofit? And private and rented?

8. How much seasonal link is there for residential cooling sales?

9. Do you have any view on the average capacities sold / installed?

10. Can you provide price ranges for: Single-splits, multi-splits, VRF and chillers?

11. Which are the main suppliers for each of the key residential cooling technologies?

12. What are the main routes to market for the following residential cooling products (Single-split, multi-split, VRF, chillers)?

[LCP Delta presented current view of the UK non-residential cooling market]

13. What are the key uses for these cooling technologies in the non-residential sector?

14. What is the installed base in the UK for the following cooling solutions in non-residential applications (Single-split, multi-split, VRF, chillers, portable AC, other)?

15. How did the non-domestic cooling segment perform in 2023/2024?

16. How does the market split between new build and retrofit?

17. How much seasonal link is there for non-residential cooling?

18. Do you have any insights on the average capacities sold/installed?

19. Can you provide an indication on the prices for: single-split, multi-split, VRF, chillers?

20. Which are the main suppliers in each of the non-residential cooling segments?

21. What are the main trends in the non-residential cooling market?

22. What are the routes to market for the following non-residential cooling products(Single-split, multi-split, VRF, chillers)?23. What are the main market drivers for AC uptake in the residential and non-residential sectors?

24. What are the main barriers to AC uptake in the residential and non-residential sectors?

25. What kind of questions do you have for the Government / DESNZ regarding the cooling sector?

26. Any suggestions for policies related to space cooling?

Appendix 2: Market sizing methodology

Below is a summary of the methodology used to estimate the market size of the UK space cooling market:

1. Historical annual AC sales for 2013-2019 gathered from secondary research. Key research sources were:
   Cooling in UK Report
   Study on Energy Use by Air- Conditioning: Final Report
   English Housing Survey
2. Total AC annual sales for the 2020 – 2024 period by type of AC technology gathered from interviews and validated via further interviews and literature review (sources referenced throughout document used to inform understanding of the market)
3. Interviewees provided views on the annual sales split between residential and non-residential segments by type of AC technology
4. Using the historical sales trend and making an assumption on replacement rates for each technology, the estimated installed base was calculated
5. Assumed replacement rates:
   a. Residential
      i. Single splits: given that this segment started relatively recently, a 2% annual replacement ratio was assumed. This figure is informed by wider LCP Delta research of the heating and cooling landscape, including regular engagement with industry stakeholders.
      ii. All other fixed cooling technologies: relatively new residential market, no replacement ratio was assumed.
   b. Non-residential:
      i. Single splits: 10% annual replacement ratio was assumed.
      ii. Multi-splits: 5% annual replacement ratio was assumed.
      iii. VRF: 5% annual replacement ratio was assumed.
      iv. Chillers: 5% annual replacement ratio was assumed.

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