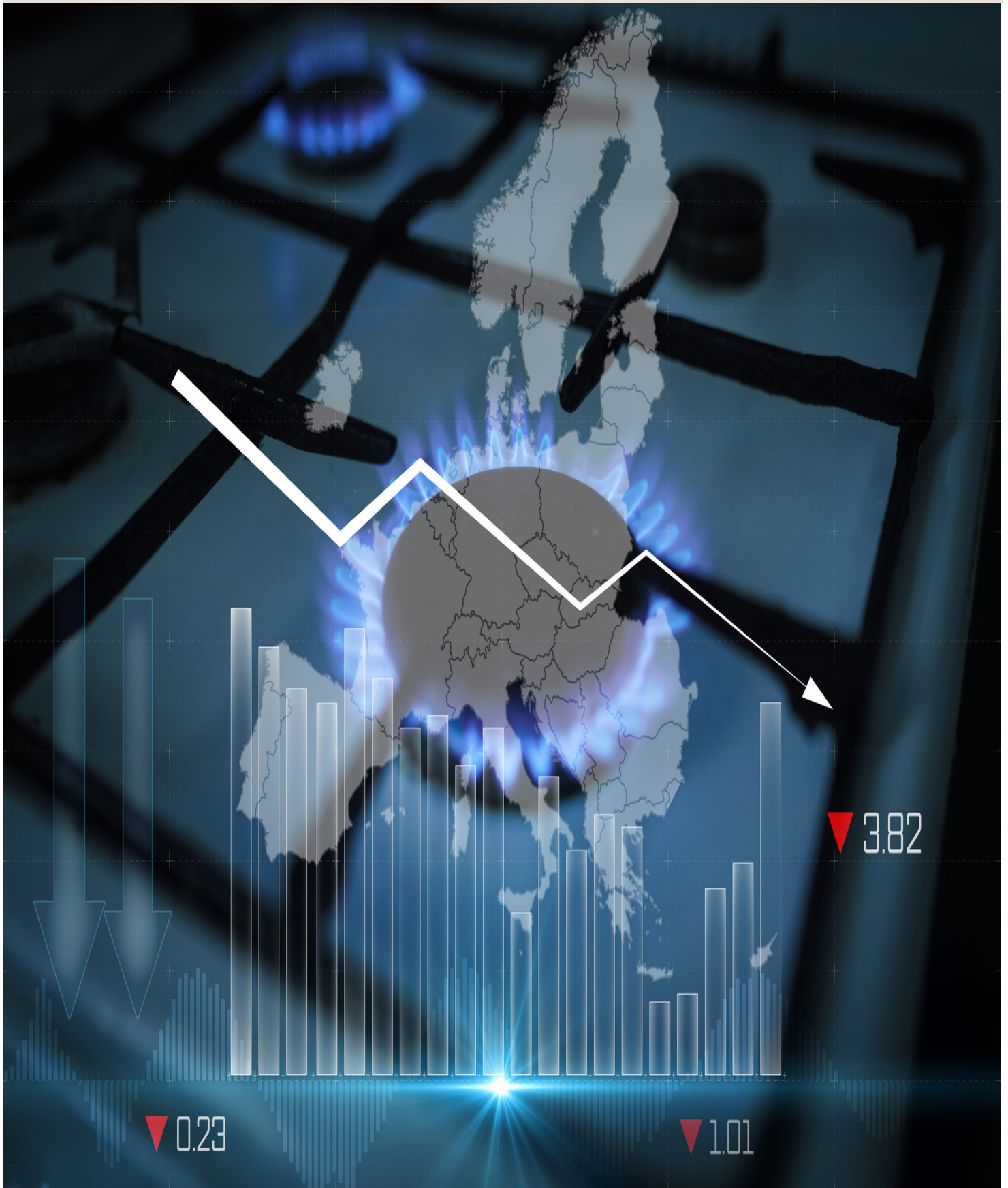


The impact of the energy crisis on commercial real estate in Europe



Key takeaways



Since the start of the energy crisis late 2021, at total of roughly €768bn has been spent on energy support schemes by European governments.



The built environment in the EU accounts for approximately 40% of total energy consumption and roughly 36% of the total greenhouse gas emissions.



Offices and industrial buildings and occupiers appear to be most shielded from the impact of the energy crisis since energy bills represent a small share of total occupier cost and most increases in energy bills can be passed on to customers.



Retailers to be impacted by higher energy bills in twofold; own operating expenses as well as lower retail sales since consumers having lower budgets due to higher household energy bills.



Data centres and life sciences most exposed to higher energy bills since they require large amounts of energy to operate and have fewer options for alternative energy sources.



It's all about energy

Energy has been on the agenda for some years as a result of a combination of factors, including geopolitical tensions, the closure of nuclear power plants, natural gas shortages, and the increasing interest and usage of renewable energy. The invasion of Ukraine by Russia caused energy to become a key topic to discuss as energy prices boomed, fuelling inflation to levels not witnessed since the 1970s.

Although this caused many challenges and concerns, the situation could be worse. Multiple EU and national policies, markets, consumer actions, non-Russian suppliers and mild weather conditions have all played a part in compensating for the missing Russian deliveries. Nevertheless, the energy crisis has a severe impact on economies and societies across the world and especially in Europe.

In a response to alleviate some of the impact of the booming energy prices on households and businesses, governments across Europe have taken measures, such

as the introduction of support schemes, the topping up of gas reserves, reducing energy consumption, and diversifying energy supply sources.

According to research by Bruegel, a total of €768 billion has been allocated across European countries to shield consumers from rising energy costs since the start of the energy crisis late 2021. Especially the German government supported consumers with a total of €265bn, reflecting 7.4% of the country's GDP.

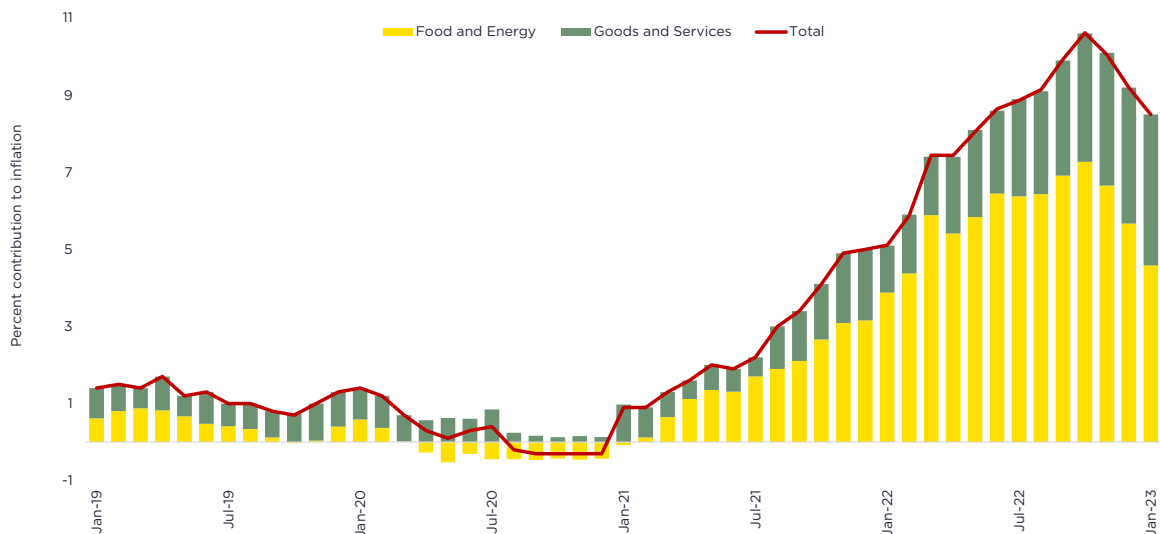
However, these support schemes are temporary and alleviate the immediate pressure of rising energy costs for households and businesses. Most of the support schemes are expiring at the end of the first quarter of 2023 when the warmer spring weather is expected to drive lower energy consumption and therefore prices. This is mainly in favour for households since businesses typically consume more energy, continuing the pressure of rising

energy prices for businesses.

A second measure that European countries had agreed on in June 2022, was to increase their gas reserves to secure sufficient and reliable supply. The agreement included that gas storage must be filled to at least 80% of their capacity before the winter of 2022-23 and to 90% before the subsequent winter periods. The relatively mild winter of 2022-23, has resulted in gas reserves sitting well above the 80% mark and above the levels held before the Ukraine/Russia war.

To mitigate any gas and energy supply challenges for the winter of 2023-24, the EU have agreed to extend the gas reduction measure in the current year and agreed to reduce the gas consumption in the current year by 15%.

Euro area inflation appears to have peaked



Source: Savills Research using Macrobond

“A total of €768 billion has been allocated across European countries to shield consumers from the rising energy costs since the start of the energy crisis late 2021”

Besides topping up gas reserves, reducing energy and gas consumption also limits the impact of the energy crisis. The EU agreed in August 2022 to the target to reduce natural gas demand by 15 percent between 1 August 2022 and 31 March 2023, compared to the average of the same period in the previous five years. As a result many economies have been reducing their energy and gas consumption in various ways such as reducing the lighting and illumination of landmarks, e.g. the Eiffel Tower switched off an hour earlier than usual or lowering the temperature in (public) buildings.

This has resulted in a drop of natural gas consumption across the EU by 19.3% in the period August 2022 to January 2023, compared with the average gas consumption for the same months between 2017 and 2022. The International Energy Agency (IEA) estimates that this drop in gas demand equals the amount of gas needed to supply over 40 million homes. Gas consumption fell the most in

the Nordic and Baltic states with Finland's gas consumption dropping most by 57.3% followed by Lithuania (-47.9%) and Sweden (-40.2%).

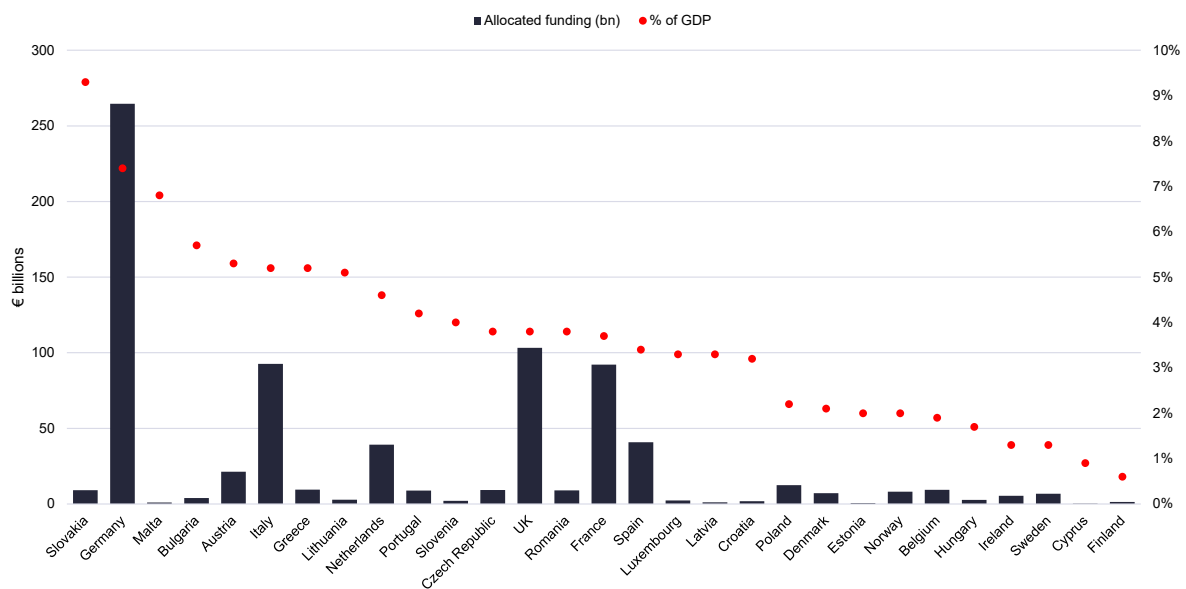
Another way to limit the impact of the energy crisis is to diversify the supply of energy sources both in terms of the energy sources such as renewable sources or Liquefied Natural Gas (LNG), as well as the suppliers such as USA, China and/or Middle East.

Although many countries have been making progress in their energy transition away from fossil fuels, most European countries are still dependent on them as their primary source of energy. According to the latest data, fossil fuels (gas and coal) made up 42% of the EU's electricity production in 2012 with renewable energy (wind and solar) sources only making up 9%.

However, a decade later the generation from renewable energy sources are coming closer to fossil fuels, with renewables making up 22% of the EU's electricity generation in 2022 compared to fossil fuels at 36%.

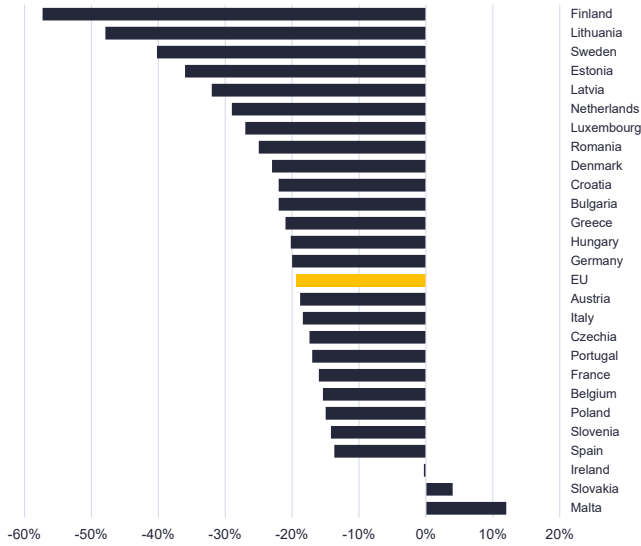
Besides the transition to renewable energy sources, a more immediate switch of energy supply is the increased usage of LNG. Many European countries have increased their LNG imports as an alternative to the gas supply from Russia. The EU's import of LNG has increased by 60% in 2022 compared to 2021 with the majority of this additional LNG is imported from the United States.

Government energy support schemes for households and businesses, Sep 2021 - Jan 2023



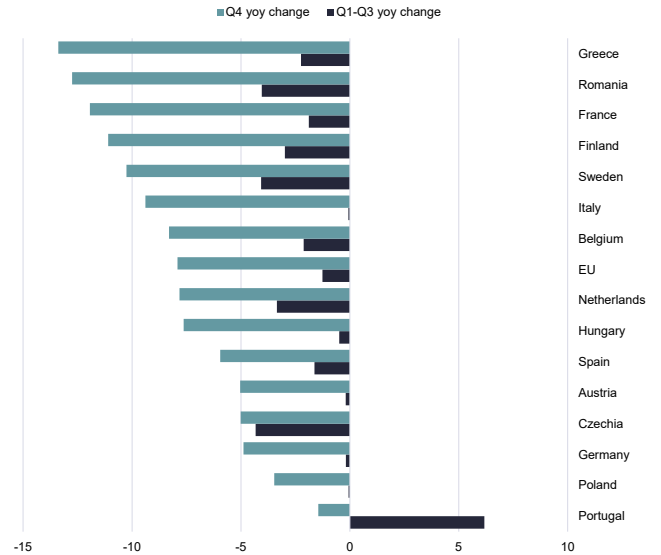
Source: Bruegel

Change in natural gas consumption across Europe, Aug 2022 - Jan 2023 vs. 2017-2022



Source: Eurostat

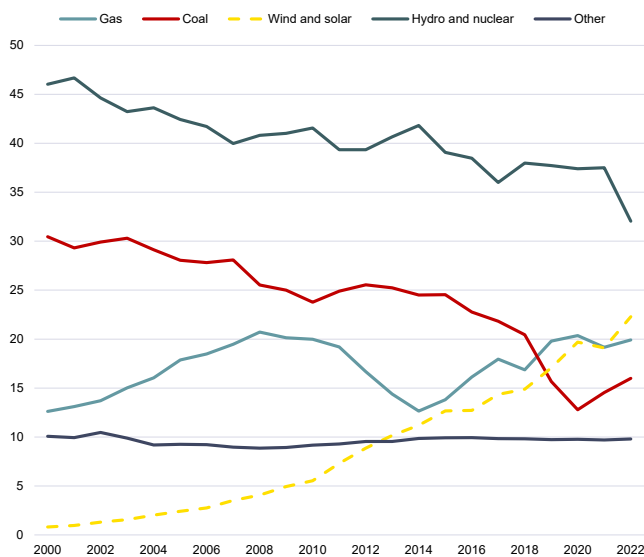
Change in electricity demand in winter 2022



Source: Eurostat

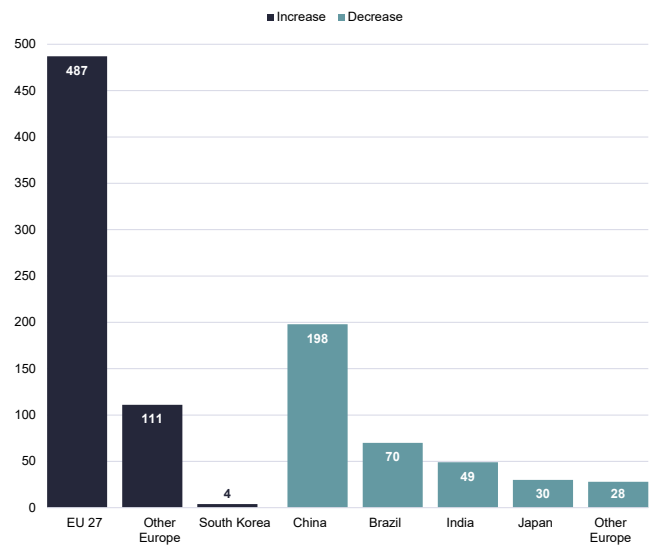
“ Gas consumption and electricity demand plunged in the winter of 2022-23, driven by a combination of a mild winter, awareness from individuals, and increased usage of alternative energy sources ”

EU electricity generation (% total)



Source: International Energy Agency

Change in LNG imports for selected regions and global export growth, 2022 vs 2021



Source: Bruegel based on Bloomberg

Commercial real estate exposed to higher energy costs

The European commercial real estate sector is not immune to the effects of the energy crisis. It faces various challenges due to the rising energy costs, energy security, and reducing carbon emissions. According to the European Commission, the built environment in the EU accounts for approximately 40% of total energy consumption and roughly 36% of the total greenhouse gas emissions.

The aforementioned drop in gas demand across Europe was partially the result of reduced gas demand from buildings, both from households as public and commercial buildings. According to the IEA, buildings in the EU used 20% less gas in 2022 compared to 2021, driven by a combination of a mild winter, i.e. less gas used to heat up buildings, and behavioural changes, such as lowering the thermostat and reducing hot water usage.

Nevertheless, the energy crisis has led to a significant increase in energy costs, making it more expensive to operate commercial real estate properties. As a result, occupiers are struggling to maintain profitability. The higher operating costs impacting their profit margins and therefore can impact their ability to pay rent.

Although the effects of the energy crisis affect all commercial real estate sectors, some sectors are more susceptible than others. Energy costs as share of the total costs differ per sector. For instance, the energy costs for an (older) industrial building with cold storage facilities are proportionally higher than for a modern grade A office building.

Analysing Savills service charge data for different commercial sectors in the UK shows that the share of the utility bills as

a percentage of the total service charges differs significantly per sector. On average in 2022-23 UK offices occupier's utility bills reflected 22.5% of the total service charge, whilst utility bills for industrial and retail sits around the 8% and 10% mark, respectively.

However, these numbers reflect the share of utility bills of the total service charge and not as share of the total (operational) costs. Total operational costs are harder to estimate and generalize since these differ per geography and per industry (e.g. professional services, manufacturing and F&B). The following paragraphs break down and analyse on a sector by sector basis their resilience to the energy crisis.

Share of utility bills of total service charge per sector type in the UK

Property Type	Avg. Utilities (Elec + gas) per sq ft % Total
Office Multi Let	21.7%
Office Single Let	23.7%
Average Offices	22.5%
Industrial Estate	5.2%
Industrial Unit	12.1%
Average Industrial	7.9%
Shopping Centre	13.0%
Retail High Street	10.0%
Single Let Retail	10.4%
Retail Park	8.4%
Average Retail	12.4%
Average	17.0%

Offices most shielded from energy shocks

In the office market, utilities costs reflect a relatively small share of the total business costs. A study by the British Council for Offices (BCO) found that energy and water reflect roughly 2% of the total costs for occupiers whilst employment reflect, unsurprisingly, more than 50% of the total costs.

The BCO research was conducted prior to the pandemic and the Ukraine/Russia war and, therefore, may not incorporate the new remote working trend and the effects of the energy crisis. Although energy prices soared since the invasion, the breakdown of the costs show that utility costs only account for a small share, and in extreme scenarios with doubling or tripling energy costs, the share of energy costs in total costs would still 'just' reflect 4 to 6%.

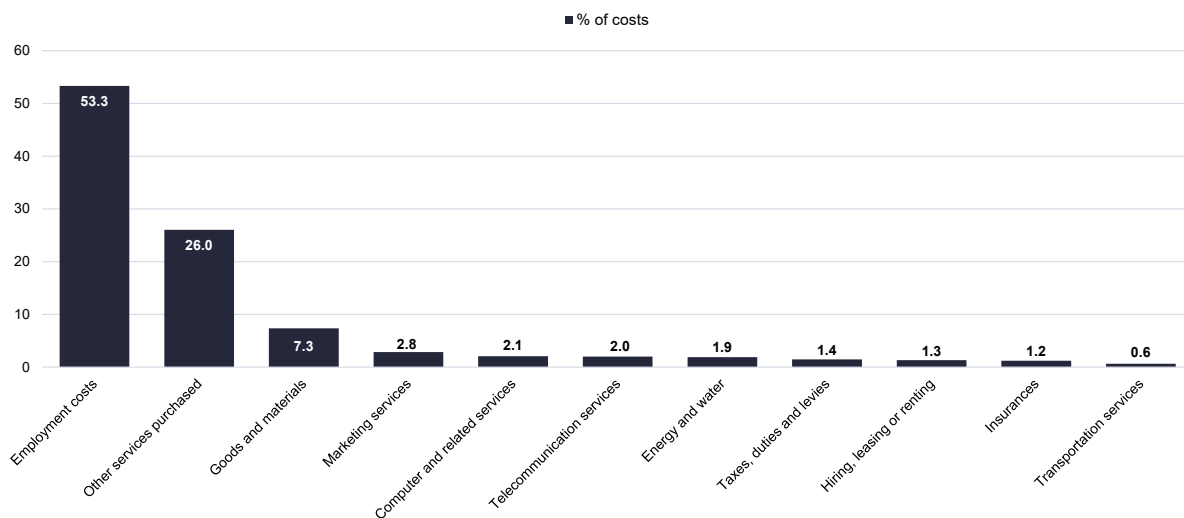
This assumption is only true if all other costs would have remained the same for office occupiers, which is not the case. All costs have increased mainly fuelled by the record inflation rates we witnessed in the last year(s). Especially the higher employment costs, to keep both the existing labour pool as attract new labour, impacts office occupiers as this is the biggest cost factor in the total costs. Taking this into account, it is reasonable to assume that on average, the utility costs for offices account for approximately 2 to 4% of the total costs, with the 4% reflecting an extreme scenario of doubling energy costs

The 2 to 4% share of energy costs of the total costs reflects an average across all types of office occupiers. However, the energy costs differ per office occupier type. As one can imagine, for large energy consuming occupiers with high(er) energy

requirements, such as high-tech, game developing, or TMT occupiers, their energy costs will reflect a large share of the total cost and are, therefore, more susceptible for higher energy prices than lower energy consuming occupiers.

Finally, occupiers from all commercial real estate sectors will look to pass higher energy costs on to their customers. Office occupiers are, compared to other sectors, less likely to do so as it is harder to legitimize higher prices due to rising energy bills since this is less visible in their end product (e.g. consultancy and other professional services). This does make the office sector relatively less resilient to energy price increases. Nevertheless, the energy costs only reflect a small share of the total costs for office occupiers and are therefore less exposed by the impact of the energy crisis.

Proportion of total business costs, by element, for UK offices



Source: British Council for Offices

Industrial & logistics able to cushion the blow

Savills research, with supply chain consultancy Hatmill, shows that for our sample of warehouse occupiers, costs related to utilities range between 2 to 4% of the total operational costs, whilst the combined costs of transportation and labour reflect more than 75% of the total costs. This implies that higher energy prices will impact the logistic operators to a minimum extent. For instance and in an extreme scenario of, utility bills doubling, the utility bills will still be less than 10% of the total costs.

Many commentators argue that 3PL (Thirds Party Logistics) companies operate on low profit margins, and therefore, any price increase such as energy prices, will affect their overall profit margins and balance sheet. However, many 3PL services are negotiated as an open book contract, meaning that any cost increases can be passed on to their end customer, which ultimately can then be passed to the consumer.

Other types of warehouse occupiers, such as manufactures and companies on the cold chain, are more directly impacted by higher energy bills as their operations often require more energy. Eurostat data highlights the heavy energy usage of industrial operations as industry

accounts for 26.1% of the total energy consumption in the EU in 2020. Where transportation costs are the main cost for retailer and parcel operators, the main costs for manufacturing and construction occupiers are more related to operational costs such as labour and energy.

The industrial sector is, however, more shielded from higher energy bills compared to other types of commercial real estate, as occupiers can pass higher energy costs easier on to their end consumer. These consumers are either individuals, who are more capable and willing to pay higher delivery costs to get their purchases faster delivered to their homes (relatable to occupiers in transportation and storage industries), or businesses doing businesses with other businesses (B2B), e.g. occupiers in manufacturing and construction.

Passing on higher energy costs by manufacturers is reflected in the industrial price index published by Eurostat. The index shows that as of May 2020 the industrial producer prices started to increase. The price increase accelerated during the last months of 2021 and the first months of 2022. Between May 2020 and March 2022 the index level of the total industrial producer price index increased by more than one third.

Where the breakdown of the producer prices shows that pricing developed relatively stable for most items, the producer prices for energy increased significantly. The producer price for energy soared by more than 150% since May 2020 and contributed to unprecedented increases in the overall producer prices since May 2020. For construction prices a similar trend is witnessed. Within just one and a half years (Q1 2021 to Q2 2022), construction costs increased by more than 16.5% and output prices for construction by 14%, particularly driven by increasing costs for input materials.

The industrial and logistics sector has, therefore, a relatively strong resilience to the energy crisis. Logistics operators are most resilient to higher energy prices due to the energy costs reflecting a small share of the total costs and their ability to pass rising energy costs to end consumers relatively easily. Occupiers in the manufacturing and construction industries that are more energy consumptive are more exposed to higher energy costs but can mitigate this by adjusting their producer prices to pass on higher energy costs customers.

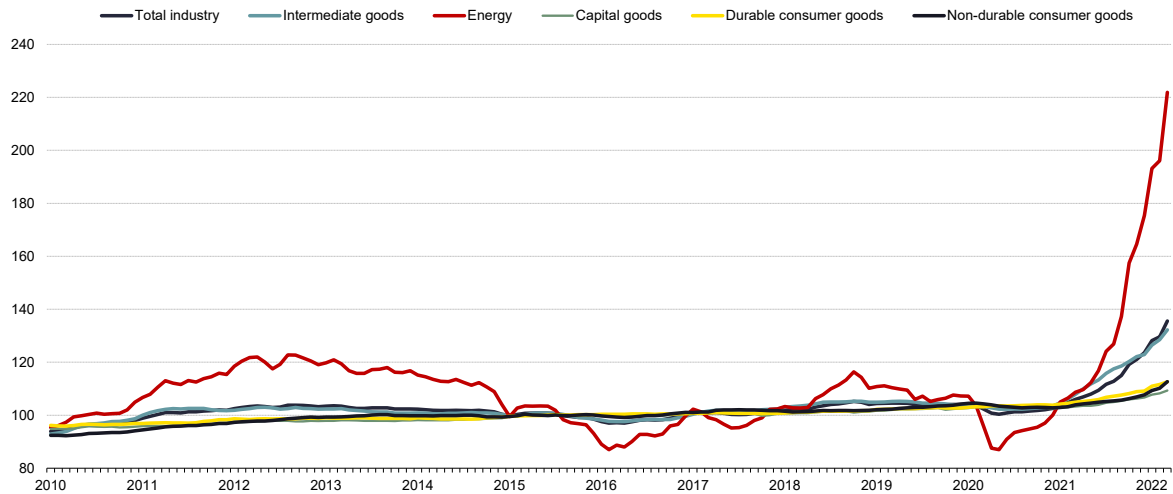
Typical split of costs for three types of logistics operations in the UK

Category	Sub-category	High street	Parcel	E-commerce
Property	Rent	16%	8%	13%
Property	Rates	7%	4%	6%
Property	Utilities	4%	2%	3%
Labour	Labour	27%	10%	27%
Other	Other costs	5%	1%	1%
Transport	Transport	41%	75%	50%
Total		100%	100%	100%

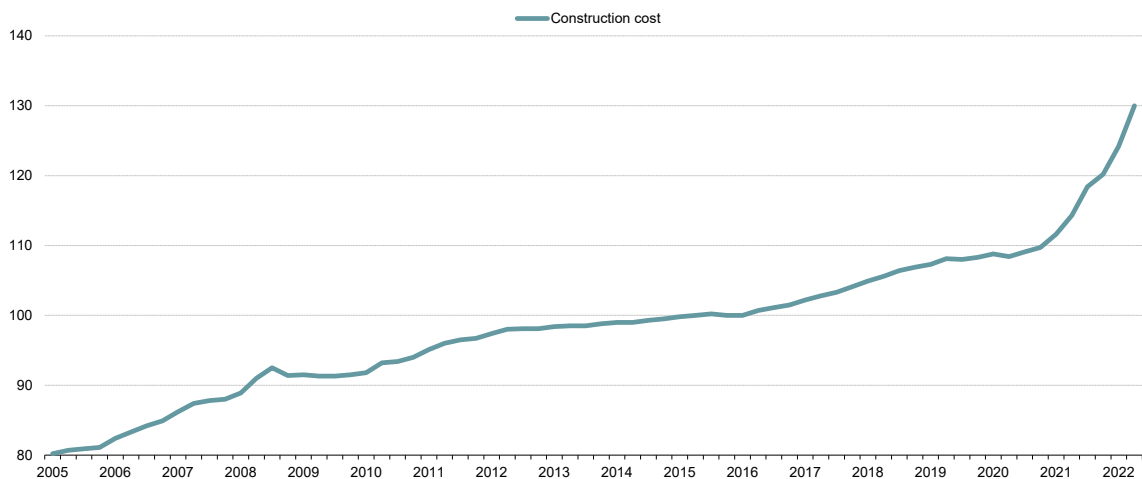
Source: Savills & Hatmill

“Higher energy prices will impact logistic operators to a minimum extent. For instance and in an extreme scenario of, utility bills doubling, the utility bills will still be less than 10% of the total costs”

Industrial producer prices - total and main industrial groups 2010 - 2022 in the EU (2015=100)



Construction prices and costs 2005 - 2022 in the EU (2015 = 100)



Stronger headwinds facing retailers

Retail can be seen as one of the more susceptible sectors to higher energy prices. In general, retailers generally consume larger amounts of energy and are not always able to pass this on to customers. Increasing the prices of retail goods is in the current, weaker economic outlook especially challenging. Record low consumer confidence levels and consistent high inflation fuelling the cost of living crisis, makes price hikes in (luxurious / non-essential) retail goods for customers undesirable as it will impact customers spending behaviour.

This is reflected by the UK retail sale data from the British Retail Consortium (BRC). Although the data shows that retail sales rose by 5.2% in February compared to same period last year and slightly up from January (+1%), it is driven by inflation price increases rather than volume growth. Similar results are recorded in the Netherlands where retail sales were up by double digits (11.3%) in January 2023 compared to January 2022, whilst retail sales volume growth increased just 0.4%.

The main driver behind this are higher energy costs cutting into consumer's spending budgets as consumers have to cope with their own household energy

bills. Furthermore, the BRC stated that: "High energy bills and the rising cost of a weekly shop were forcing shoppers to cut back in February this year". This causes further concerns and a gloomier outlook for the UK and European retail sector.

That energy and its rising costs is impacting the retail sector is reflect by a recent survey that Savills conducted amongst retail (warehouse) occupiers. The survey shows that higher energy costs is the highest concerns occupiers have.

However, different types of retailers are impacted to different extents. For instance, grocery operators tend to be more exposed due to refrigeration and having lower profit margins compared to the more luxurious high street retailers. The hospitality retailers are also impacted by higher energy bills. News articles and headlines report that some restaurants are shortening operation hours to reduce overheads when they are not busy. In addition, a group of independent brewers in the UK wrote a letter to the chancellor warning about the impact of the rising energy bills on their business. A survey by the Morning Advertiser showed that pub operators are faced with doubling or tripling utility bills. More than 35% of operators said they had seen their utility

costs double, while 30% said their costs had tripled, according. Anecdotally, one operator had been quoted with a six-fold increase on their current contract, increasing the price per unit to 83p up from 14p.

However, many and typically larger retailers have hedged their energy purchases which helped them to cope with the impact of the energy crisis. For the smaller, typically independent, retailers this is not always the situation and are therefore faced with more challenges.

Nevertheless, the retail sector as a whole is facing headwinds, mainly driven by the energy crisis. Retailers are confronted with a catalogue of costs issues, some mainly fuelled by higher energy bills some less so; higher costs of manufacturing, raw materials and products, transport and storage, and the cost and shortage of staff. Therefore, the retail sector is considered as the sector currently faced with most challenges with the impact of the energy crisis being one of them.

“Higher energy costs cut into consumer’s spending budgets as consumers have to cope with their own household energy bills”



Energy hungry data centres

Data centres are the world’s most energy intensive sector to operate. The International Energy Agency (IEA) estimates that the energy demand from data centres across the world accounted for roughly 1% of the worldwide electricity usage, excluding crypto mining, in 2021 and that it has increased since 2015 by 10 percentage points to 60%, depending on the region.

This high energy consumption of data centres is mainly due to the energy needed to cool their servers so they can stay operational. However, continuous innovations are resulting in improved energy efficiency in data centres. Savills research using TeleGeography data shows that the Power Usage Effectiveness* (PUE) in data centres has improved, with the average PUE in Europe in 2022 estimated to be around 1.25 in 2022, down from 1.74 in 2005.

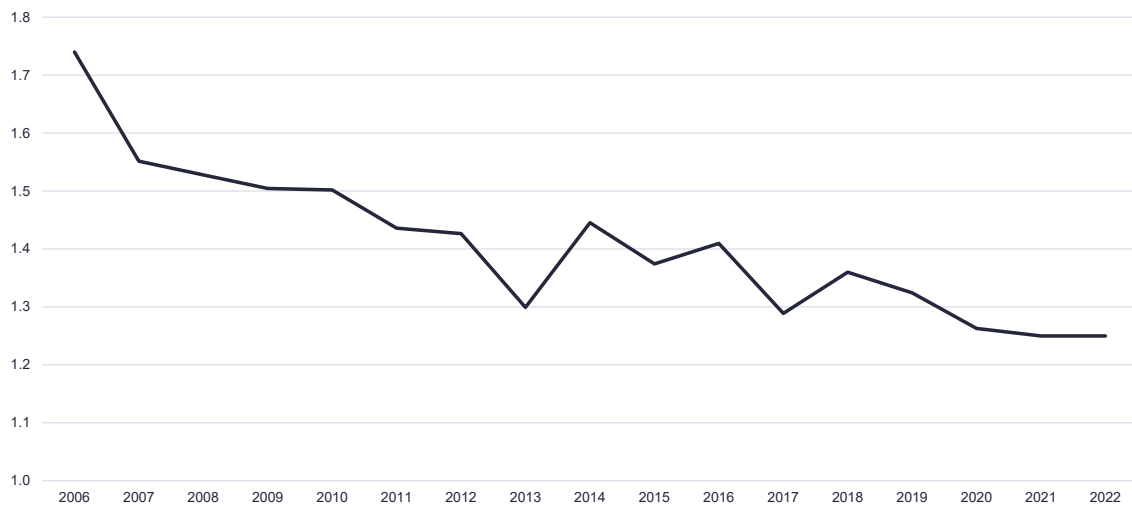
Besides energy costs, energy reliability is crucial for data centres as energy blackouts have severe impact on its operations. Data centre operators make, therefore, every effort to diversify and secure energy sources. Some data centre operators are looking into the options of having on-site power generation to guarantee energy supply.

Another challenge facing the sector are the limitations in the current energy grids and the increasing resistance to the development of new data centres. For example, new schemes in London and Frankfurt have been informed that there will be no power supply available until 2026-27. In the Netherlands, the government has restricted the development of new hyperscale data centres, because “The Netherlands is too small and the scarcity of space and energy is too great to deal with the data centre

development requirements”. The data centre sector is therefore one of, if not the most, susceptible to the energy crisis, facing challenges with increasing energy and data demand.

***Power Usage Effectiveness (PUE)** is the relation between the amount of power entering a data centre and the power used to run the computer infrastructure (including cooling, heating, ventilation, power conversion and distribution, lighting and utility plug systems). The hypothetical optimum PUE is 1.0, meaning that 100% energy is efficiently used.

Average PUE in data centres across Europe



Source: Savills Research & TeleGeography

Skyrocketing energy bills for life sciences

Life sciences are considered as the second largest energy intensive sector, data centres taking the first place. This is mainly caused by the large amounts of energy laboratories consume to power their laboratories, driven by the number of air changes per hours, cleanrooms, heating, and other air conditioning systems. The US Pacific Gas and Electric Company estimates that in the US laboratories can consume five to ten times the amounts of energy used in typical offices. Some specialty laboratories, can even consume as much as 100 times greater than a commercial building of the same size.

Many research and science institutions and companies are, therefore, worrying about sky-high electricity and natural gas bills to run large scientific experiments. For instance, a lab in Spain has seen a 60% increase in its energy bills in 2022 compared to 2021. Furthermore, estimations suggest that larger facilities in Europe can see energy bills go up sevenfold to tenfold compared to 2021.

To raise this concern with the EU, the industry group Medicines for Europe, representing major generics manufacturers, wrote an open letter to the European Union Ministers for Energy and Health warning that *“with electricity prices rising tenfold for some factories, the combination of cost inflation and price control policies threatens the availability of medicines and makes EU manufacturing unsustainable.”*

Sustainability and greening the life science sector was already a focus of research organisations prior the Ukraine/Russia war, but has been accelerated since then. For example, CERN has a sustainability strategy aiming to reduce its electricity consumption through reusing the heat generated by its facilities to warm up buildings on their campus and a nearby village. However, such mitigation plans are not enough to compensate the soaring energy costs.

Life sciences and data centres are, therefore, assessed as the sectors being most exposed to higher energy bills because they have high energy requirements and consumption which are hard to bring down. Furthermore, substituting their current energy sources with more renewable sources is challenging given energy security and reliability is essential for their operations.

“Larger life science facilities in Europe could see energy bills go up sevenfold to tenfold compared to 2021”



What's next for commercial real estate: the challenges & opportunities

Commercial real estate is exposed to the impact of the energy crisis and faces multiple challenges in the near future to secure reliable, affordable and 'clean and green' energy. Both landlords and occupiers can and must consider solutions to address these challenges. It must be noted that we cannot fully break down each sector in terms of its challenges and opportunities since most of them impact multiple sectors, if not all. For instance, an impact on data centres could impact big tech, and thus, likely office demand from that sector, and even into the wider economy. Likewise with other challenges and/or opportunities impacting other industries such as manufacturing or retailers. Therefore, the following paragraphs outline more generic and high level challenges and opportunities.

First of all, landlords and occupiers can invest in energy-efficient interventions to reduce energy consumption and lower costs over the long term. These interventions should initially focus on improvements to the building fabric to drive down energy demand in the first instance by reducing heat losses. The focus should then be on adopting more energy efficient building systems that are compatible with national net zero carbon policies, such as heat pumps, although this can also include smaller, easier and cheaper solutions, such as installing LED lighting. Furthermore, more and better collaboration between landlords and occupiers can help to reduce energy consumption and lower costs. Landlords can work with tenants to identify areas of energy waste and implement energy-

efficient practices.

The concept of digital twins, digital replicas of physical buildings and/or spaces, can also further improve energy-efficient and decrease energy usage, with digital twins providing improved tracking and monitoring of energy usage resulting in increased (energy) efficiency. Good communication between landlords and tenants is, therefore, key since landlords and tenants cannot improve the stock in isolation, they need to coordinate to ensure a whole building retrofit approach is followed, considering knock-on effects of interventions and ensuring no abortive upgrades take place and includes the question of who's paying for what.

Secondly, using more renewable energy sources, such as solar and wind energy, can reduce the reliance of traditional energy sources and can lower energy costs. The production and usage of renewable energy has been increasing in the last decades and has been accelerated since the Ukraine/Russia war and is set to increase only further.

Thirdly, policies and measures from governments and institutions can enforce sustainability, such as reducing energy consumption and the reliance on traditional energy sources. The EU aims to be climate-neutral by 2050, meaning an economy with net-zero greenhouse gas emissions. The EU has introduced the European Green Deal to achieve this which is in line with the Paris Agreement.

The introduction and monitoring of Energy Performance Certificate (EPC) for (commercial) real estate buildings can contribute to the energy efficiency awareness and therefore to the net-zero goals, as EPC ratings assesses a property's energy efficiency ranging from A (most efficient) to G (least efficient). By introducing laws and policies for commercial real estate buildings to have a minimum EPC rating by a certain year, governments can enforce landlords and occupiers to upgrade their buildings to meet the required EPC rating. Most countries have already set out their own net-zero ambitions and plans to enforce EPC minimums.

Energy efficiency with digital twins:

A research conducted by EY showed that digital twins, can help understand the energy use of an existing building and finetune its operation to reduce its greenhouse gas emissions up to 50% as well as cost savings of up to 35%. A case study on the Nanyang Technological University in Singapore tested the use of digital twins across its campus of 200 buildings over a five-year period. The programme resulted in a 31% saving in energy use and carbon emissions were reduced by 9.6 kilotons.



It must be noted that as the EPC system is based on energy costs rather than energy consumption a higher EPC rating does not necessarily translate to an actual lower energy consumption. The use of energy consumption metrics, as it is the case in France, is a more accurate and transparent ways of assessing energy efficiency.

The Netherlands is the first country where since the beginning of this year all office buildings are required to have a minimum EPC rating of C. In the UK a proposal is set to require all private rented property to have a minimum EPC rating of C by 2025. In France, it is no longer possible to rent any home with an energy consumption of over 450kWh/m² since the beginning of this year and from 2025, no G-rated properties will be allowed on the rental market. This is challenging as in France in 2022, nearly 2 million primary residences were classified as G, with roughly 800,000 belonging to the private or social rental sector.

Each commercial real estate sector faces consequences of higher energy bills but each sector has its own solutions and opportunities. Higher energy bills impact both landlords and occupiers as in general a higher energy bill implies less room for rental growth. This is reflected by the trend of green premiums, with 'green' and higher EPC rating properties being more sought after by investors and occupiers.

In the office sector, small and easy-to-implement solutions can be introduced such as lowering the heating setpoints,

increasing cooling setpoints, installing LED lighting and other smart, energy saving devices, improving energy efficient behaviours amongst employees. Furthermore, the WFH trend can reduce energy usage if smart solutions are implemented to reduce the energy usage on days with low(er) office attendance.

The industrial sector can benefit from installing more renewable energy sources, such as PVs, on their buildings to reduce their (fossil fuel) energy reliance and costs. Savills research shows that in the UK approximately 250 million sq ft of warehouse space is due to be delivered by 2030. By assuming that on average 40% of a warehouse roof may be suitable for PVs, implies that an additional 1,700 MW of energy could be delivered, enough to power more than 1 million homes in the UK.

Retailers are more challenged as they are less willing to pay a premium for renewable energy source, shown by the results of our survey. Instead they could consider other (smaller) solutions such as lowering temperatures in their shops, turning off the lights outside opening hours and/or to closing their doors. Research from Cambridge shows that closing shop doors in winter reduces energy usage and carbon emissions by up to 50%.

Furthermore, retail is just like the other sectors impacted by different EPC policies. Savills Re-Imagining Retail study shows that a staggering 83% of the

UK retail stock will need to be improved by 2030, to prevent any obsolescence. Landlords will have to invest in energy efficiency upgrades of the buildings and will then look to pass the costs on to tenants with the big discussion arising who is going, willing and capable of paying for it.

Data centres and life sciences rely more on efficient building fabric and upgrade to newer, more efficient heating, ventilation and cooling systems and technologies to improve energy efficiency. As stated, the PUE in data centres are continuously improving and current operators are exploring more alternative and greener sources of energy supply such as on-site hydrogen fuel cells which could also be introduced to the life science sector.

To summarize, Europe is currently strongly positioned to counter the impact of the energy crisis as a result of the mild 2022-23 winter, the reduction in gas consumption, and stocking up on gas levels. However and although we entered the meteorological spring with warmer temperatures ahead of us, the resilience to the energy crisis will be truly tested in the next winter when governments are perhaps less capable and/or willing to spend as much capital to support households and businesses, especially if next winter turns out to be colder for a longer period.

Most sustainable office building in the world; Currently, the most sustainable office building in the world is *The Edge in Amsterdam*. The office covers an area of 40,000 square meters across 15 floors. The energy consumption of *The Edge* is 70% lower than other office buildings of similar size, and the roof and facade on the south side incorporate the largest range of photovoltaic panels seen on an office building in Europe. In addition, the building is equipped with an aquifer thermal energy storage system, fully providing the energy needed for heating and cooling, and lighting, humidity, and temperature,

among others, and are controlled with the help of artificial intelligence.

Energy efficient data centres; The data centre provider *EcoDataCenter* provides its Arctic data centres with constant access to 100% renewable hydropower electricity since their Arctic sites are located within Sweden's northern forests where they're in close proximity to a number of hydropower plants.

A different data centre provider, *VIRTUS*, has successfully achieved 100% renewable electricity usage across its entire site network,

committed to reaching net zero by 2030. Remarkably, VIRTUS has reached the top 10% of UK commercial buildings in terms of energy efficiency. This is largely a result of sourcing energy for all ten of its data centres from a zero-carbon electricity supplier. By doing so, VIRTUS is able to save 45,000,000 tonnes of CO₂ annually.



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