February 2023

Watt a Save!

The financial benefits and carbon efficiency of new homes

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HOME BUILDERS FEDERATION

Introduction

New build home buyers are saving over £500 million a year in energy bills, as well as collectively reducing carbon emissions by over 500,000 tonnes.

On average, buyers of new homes save over £2,000 on household bills per property each year, equivalent to £174 a month. For buyers of houses, as opposed to flats the savings are even greater at £216 per month, an annual saving of £2,600.

With energy prices set to rise again the Spring, the savings that new builds can offer consumers will increase even further, rising to an average of £2,510.73 a year, and £3,117.85 for houses.

On top of this, new build properties are significantly more environmentally friendly than older equivalent properties, emitting just 1.4 tonnes of carbon a year, compared to the 3.6 tonnes that existing properties emit.

As home builders work towards the Future Homes Standard, which is due to come into force in 2025, the energy efficiency of new homes will become even greater in the years ahead. Amid an increasingly eco-conscious consumer base, the role of new build properties in meeting this demand will only become even more important.

Methodology

The Department for Levelling Up, Housing and Communities (DLUHC) regularly publishes updated statistics on Energy Performance Certificates (EPCs) in the UK, which breaks down the rating of EPCs allocated to different property types, and the carbon emission, energy use and estimated bills for new build and existing properties.

By using data from British Gas on average gas and electricity use, and average annual bills for homes of different sizes, this report uses an average combined price for gas and electricity per kWh. Applying this price to the energy use figures from DLUHC, the report estimates average bills for different dwelling types, and the average annual savings for new build homeowners.

The data sample is made up of nearly 1.7 million properties, including over 1.4 million existing dwellings and over 250,000 new builds, all of which were registered with an EPC in the year to end of December 2022.

It is important to note that of the base of existing dwellings, these will encompass a broad range of properties by age, with some being a few years old but many being decades or even centuries old.

Context

As energy prices and household utility bills continue to rise exponentially, the importance of having an energy efficiency home has never been greater. England has one of the oldest and least energy efficient housing stocks in Europe, with over 70% of our homes built before 1980.

Since 2007, all homes in the UK have been required to have an EPC before they are sold or let. The system was introduced in the hope that energy labelling will raise awareness of energy efficiency and encourage upgrading to make properties more marketable. In recent years in particular, homes across the UK have been worth more when scored more highly in an EPC.

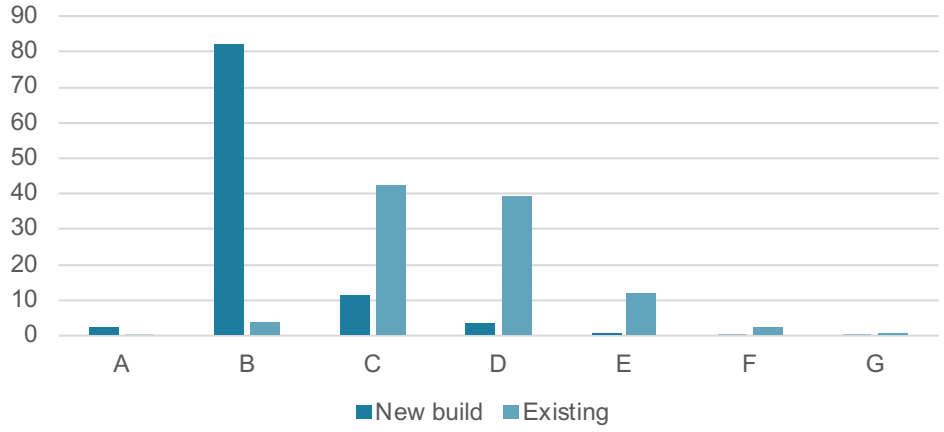
On numerous occasions, the Government has attempted to introduce schemes to retrofit homes and improve energy efficiency, but older properties fail to reach the same standards as new build homes. While new build homes are constructed using new technologies and materials, and are built to ever evolving regulations, older homes face extensive and costly retrofit works to get to the same standard.

These newer homes need drastically less energy to power and heat, and therefore are significantly cheaper and more environmentally friendly to run. Although older homes can be retrofitted, research finds it will cost owners between £6,000 and £8,000 to bring a home up to an EPC rating of C, so the financial payback from utility bills would take years to realise.

Energy performance certificates

New build homes are consistently rated with much higher EPCs than existing dwellings. For homes logged in the year to December 2022, 85% of new builds were rated A or B for energy efficiency, while under 4% of existing dwellings reached the same standards. In contrast, 51% of existing dwellings were rated D or lower, as compared to less than 4% of new builds.

EPCs of new build vs existing existing properties

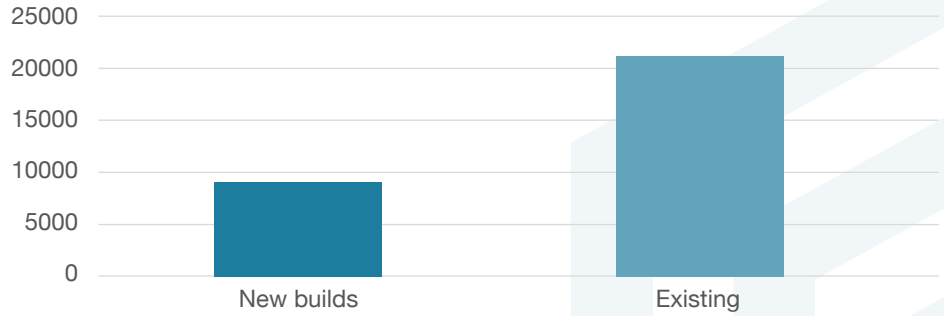


Energy use

While DLUHC's data attempts to quantify how much the different dwelling types will spend, on average, on household bills (i.e, heating, lighting, and hot water) each year, it put these figures at £453 for new builds and £840 for existing dwellings. With rampant inflation in energy markets and household bills increasing at unprecedented rates, it is clear that these figures are no longer accurate, but a much clearer picture can be painted by looking at the difference in energy use.

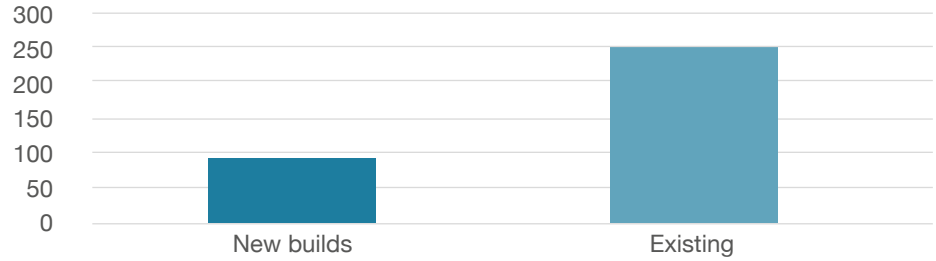
The improved energy efficiency of new build homes has a significant impact on their energy use. The average new build property uses approximately 8,618 kWh a year, as compared to older properties which use an annual average of 21,293 kWh.

Total energy use per annum (kWh)



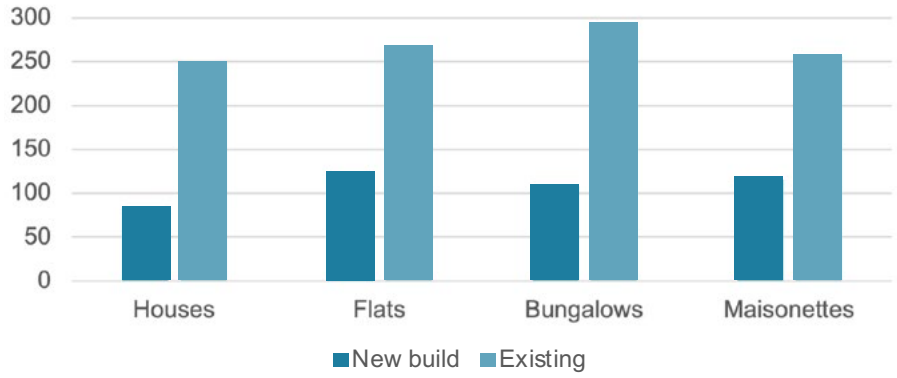
Although some critics of new build homes may claim this is due to new builds being smaller than existing properties, the data shows this clearly is not true. The new build homes in the data set are not only larger, with an average floorspace of 90.7m2 as compared to existing dwellings at 84.4m2, but also use significantly less energy per m2 over the year. The average new build home used approximately 95 kWh per m2 in the year to December 2022, whilst older homes used 252 kWh per m2 in the same period.

Average energy use - kWh/m2 per annum



Across all property types and sizes, new build home usage was substantially below existing dwelling usage.

Energy use per m^2/PA (kWh)



Bills

Due to decreased energy use, average new build home buyers will see significant savings on their household bills.

	New build homes costs per year	Existing homes costs per year	Average savings
Houses	£1,518.80	£4,117.27	£2,598.47
Flats	£1,214.11	£2,354.84	£1,140.74
Bungalows	£1,709.60	£3,464.70	£1,755.10
Maisonettes	£1,511.10	£3,034.00	£1,522.90

The average new build property cost £1,422.99 to run in the year ending December 2022, just 40% of the cost of an average older property, which was £3,515.48.

This means that buyers of new build properties in the year to December 2022 are collectively saving over £500 million a year in running costs compared to if they had bought an equivalent older property.

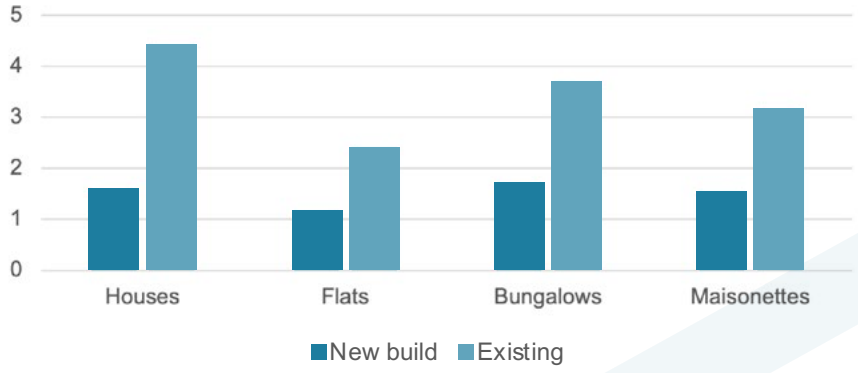
With the Government's Energy Price Guarantee increasing in April 2023 to £3,000, average household bills will increase again, as will the savings that new build homes can offer. Under the new prices, the average new build will cost £1,707.42, saving £2,510.73 as compared to buyers of older properties who will be facing bills of an average of £4,218.15.

Buyers of houses, rather than flats or bungalows, will see the greatest savings, at £3,117.85 a year.

Carbon emissions

While the financial benefits are reason enough to buy a new home, the appeal becomes stronger still when the environmental aspects are also taken into account. Due to the decreased energy usage as outlined earlier in this report as well as new technologies, improved industry knowledge and low carbon heating, new builds are constructed to emit significantly less carbon dioxide each year. For homes registered with an EPC in the year to December 2022, the average new build emitted 1.4 tonnes of carbon over the year, whilst the average existing dwelling emitted 3.6 tonnes. The breakdown of carbon emissions by type of home can be seen in the graph below, with new builds emitting significantly less across all property types.

Average annual carbon emissions of new build and existing properties in the year to December 2022 (tonnes PA)



Last year's new build home purchasers are reducing carbon emissions by an average of 2.2 tonnes a year per home, with a total saving of over 570,000 tonnes compared to if they had bought an equivalent older property.

There are 19.58 million homes registered in England with an EPC of D or below. If all of these properties were brought up to the standard of the average new home built in the year to December 2022, carbon emissions could be reduced by up to 44 million tonnes a year.

Case studies

To deliver the vast environmental and financial benefits enjoyed by owners of new build homes, developers are required to adopt a range of innovative technologies and measures during the planning, design, and construction of their developments.

In the remainder of this report, we seek to bring these benefits to life through a selection of case studies, which highlight just some of the most ambitious and forward-thinking examples of new homes in the industry.

Case study 1

Autograph Homes: ViewPoint@Totterdown, Bristol

The construction methods and materials used during the building of a property have a significant role to play in determining the dwelling's energy efficiency. These factors have been a key focus of Autograph Homes' ViewPoint@Totterdown development in Bristol.

The development features 13 low carbon townhouses which have been built using timber frame construction. This method has the lowest CO2 cost of any commercial building material: it takes less energy to produce and build with, and it's easily recycled. As such, every timber frame home saves a potential four tonnes of CO2.

Attentions have also been focused on how to minimise heat loss, through a combination of insulation, airtightness and a precision built timber frame. The properties include oversize, thermally insulated windows to let more natural daylight in and reducing the reliance on artificial lights. They also help to warm the house through solar gain, as well as cutting heat loss during the winter.

Furthermore, every home is fitted with high output, 320W photovoltaic panels to provide free solar energy. Altogether, the PV panels at ViewPoint produce up to 25,150 kWh/year – that's enough to power four electric cars. In the larger properties, solar energy is also paired with air source heat pumps which extract the warmth from outside air to help heat water for zoned underfloor heating, radiators and hot water. Heat pumps are carbon neutral, when powered by PV or similar alternative energy sources, delivering up to three times as much thermal energy as the electrical energy used to drive them.

As a result of these technologies, household energy requirements will be less than 10% of a similar-sized Victorian property, and as little as a third of a typical new build home. The houses have consequently been awarded an 'A' EPC rating.

Case study 2

Barratt Developments: The Zed House and Energy House 2.0, University of Salford

While the Future Homes Standard is one of the first key milestones in the home building industry's journey to net zero, many developers are already looking beyond this. One such builder is Barratt Developments, who have developed the Zed House: a zero-carbon concept home that showcases the future of the sustainable living in the UK.

Built on the University of Salford's main campus, its purpose is to test and monitor the most modern sustainable housing technology such as air source heat pumps, infrared panels, plaster that eliminates pollutants, a fridge that keeps food fresh for longer, heated skirting boards, air-powered showers, electric vehicle charging points, PV solar panels and battery storage.

In recognition of the importance of taking consumers with industry on its journey to net zero, the home will also be lived in by a university academic to better understand the customer's experience of zero carbon living.

Built using modern methods of construction, the Zed House is part-funded by Government and has been developed in partnership with over 40 leading organisations from across the housebuilding, sustainability, and technology sectors, helping to broaden knowledge with lessons learnt shared across the industry.

In addition to the Zed House, Barratt has also launched the Energy House 2.0, an innovative research centre tasked with helping to accelerate progress towards low carbon and net zero design at scale.

Also based at the University of Salford, the £16m research lab, part-funded by the European Regional Development Fund (ERDF), is the largest facility of its type, containing two environmental chambers each able to accommodate two detached houses.

Harnessing the University of Salford's expertise and knowledge of the built environment, the chambers can recreate a wide variety of weather conditions, with temperatures ranging between -20˚C to +40˚C, as well as simulating wind, rain, snow and solar radiation.

Inside Energy House 2.0, Barratt and manufacturer, Saint-Gobain UK and Ireland, are working together to build a home - known as eHome2 - to test products at a range of temperatures and weather conditions to replicate predicted changes in the climate.

The eHome2 is being built with an advanced timber frame solution that uses engineered timber studs. This will enable them to create a building that will be future proof and hit the 2025 Future Homes Standard fabric targets. The walls will be pre-insulated and lightweight render-based bricks by Weber are also being used to enable them to build the house in 12-14 weeks - half the time it takes to build a standard home.

In time, Barratt will be looking to take the lessons learnt from the Zed House to integrate new and improved technologies to the eHome2. Barratt is committed to building sustainably and has pledged that all of its new homes will be zero carbon by 2030 - the Zed House and eHome2 are the first steps to achieving that ambition.

Case study 3

Aequus Group: St Joseph's Court, Bath

With 86% of new homes achieving either an A or B EPC rating in comparison with just 46% of existing homes, new builds are the obvious choice for environmentally conscious consumers looking to make savings on both their energy bills and carbon emissions.

St Joseph's Court, Bath, developed by Aequus Group (Bath & North East Somerset Council's wholly-owned housing company) is a prime example. Featuring nine 'A' EPC rated new homes, the development uses a range of features to support its sustainability credentials including the reuse of crushed concrete arisings from the demolition of the site's former Church as pipe bedding and under patios and a Sustainable Urban Drainage System (SUDS).

The houses were constructed from a timber frame to enable a fabric first approach of high levels of insulation, and they have subsequently achieved a very good standard of airtightness. Furthermore, they all incorporate energy efficiency measures such as air source heat pumps, solar panels, LED lighting, remote Nest temperature controls, PV panels on the roofs and Electric Vehicle (EV) charging points which will save residents more than 50% on energy bills. The homes emit no net carbon in use, helping Bath & North East Somerset Council to reach its target of net carbon zero by 2030.

Thought has also been given to environmental measures outside of the home. Rainwater butts were connected to rainwater downpipes to enable gardens to be watered from rainwater, reducing reliance on mains water. In addition, holes for badgers and other wildlife were cut through fences, badger and vole mounds were formed to encourage local wildlife, and bird/bat boxes were fixed to most homes.

Commenting on the development, Cllr Tom Davies, Bath & North East Somerset Council Cabinet Member for Adult Services and Council House Building said:"The development at Sladebrook Road presented an opportunity for Bath & North East Somerset to combine its ambitions to address the climate emergency and directly deliver affordable housing, by purchasing two highly energy efficient homes for shared ownership tenure. The homes are of outstanding quality, spacious and well designed. Importantly for the resident, the sustainability features are integrated in a way which feel intuitive to use and we have every confidence that the energy use and carbon production targets will be realised".

Case study 4

The Hill Group: The Villas, Knights Park, Cambridge

With the UK having experienced record-breaking temperatures during the summer of 2022, discussions around housing are increasingly focusing on how we can keep our homes cool. The Hill Group provides an excellent example of how new technologies can be used to achieve this.

The Villas, a collection of homes in the Knights Park development, Cambridge, have used a special glazing on the windows to eradicate solar gain preventing the rooms from getting too hot in the summer. In addition, a mechanical ventilation heat recovery system has been implemented which ensures a constant flow of fresh filtered air.

However, the Hill Group's focus on sustainability stretches far beyond measures to keep the houses cool. For example, aerated showerheads and taps and energy efficient kitchen appliances have been used in the homes to help keep electricity and water consumption low. These features, along with Solar PV panels, triple glazing, air tightness and many more, mean the homes have achieved both a Code for Sustainable Homes Level 5 rating and an 'A' EPC rating.

Sustainability has also been factored into the materials used to build the homes, with The Villas constructed from locally sourced and recycled materials wherever possible and the use of signature buff brick keeps their appearance in line with historic Cambridge.

The broader Knights Park development, which will deliver 3,000 new homes when complete, contains further environmentally friendly initiatives including:

- The energy centre uses gas to generate heating and hot water for the homes, distributed via a district heating network. This is a more efficient use of resources, providing greener, more environmentally friendly heating, hot water and energy.

- Eddington is home to the UK's largest site-wide water recycling system. Rainwater is gathered and stored in underground tanks. It is then filtered and used as a renewable source of clean water for flushing toilets, washing machines and garden watering.

- Around 2,000 trees, plants and brambles will be planted in the first phase of development.

Case study 5

Vistry Group: Europa Way Triangle, Leamington

In 2021, Vistry delivered 54 homes that form its Europa Way Triangle development and surpass the Future Homes Standard. In fact, the regulated energy of these homes has been reduced to net zero. This has been achieved through a high performing fabric, timber frame construction, solar PV panels and an air source heat pump.

The homes at Europa Way Triangle, in Leamington, were delivered for Warwick District Council in support of its commitment to be a zero-carbon authority by 2025. Vistry is capturing real practical experience from people living in these homes, helping them ensure customers have a smooth transition to net zero carbon over the coming years.

The project included ambitious carbon reductions in all possible areas, including embodied carbon, which drove a change from brick and block masonry construction to timber frame.

A significant proportion of Vistry's total carbon emissions are associated with occupant energy use. Lessons from its experience at Europa Way have helped Vistry to develop its carbon reduction roadmap and allow it to confidently develop a carbon reduction plan.

This has led to Vistry signing up to Business Ambition for 1.5°C, submitting Science Based Targets and also linking carbon reduction to remuneration (5% of executive and manager bonus scheme and equal weightings for the staff discretionary bonus scheme), as well as a sustainability linked credit facility with carbon reduction targets.

Councillor Jan Matecki, Warwick District Council's portfolio holder for Homes, Health and Wellbeing said: "This is really welcome news for the district. Our overall vision is to create healthy and sustainable developments that will stand the test of time and neighbourhoods that are both inclusive and accessible.

"The formation of Milverton Homes and our partnership with Vistry has allowed the council to take a stewardship role in the allocation of affordable and energy efficient homes, such as these to those who are struggling to get on the housing ladder."

Case study 6

McCarthy Stone:
The role of retirement housing in the journey to net zero

In order to tackle the housing crisis most effectively, its vital that we build more homes that deliver for a variety of different needs, circumstances and lifestyles. One such area where attentions need to focus is the expansion of retirement housing. This is important not just because of the UK's ageing population, but because of the environmental benefits such properties can deliver.

These benefits have been highlighted in research produced by public policy consultancy WPI Strategy, which after examining properties built in 2021 by McCarthy Stone, found that each of their apartments could save up to two tonnes of CO2 per year compared to a standard new-build house, creating a 'downsizing dividend'.

In addition, the report found a 'home improvement dividend' of between 0.3 and 0.5 tonnes less CO2 a year caused by younger homeowners who move into the vacated

properties and make energy efficient improvements to that home. Due to the central location of retirement properties, the report also identified a significant carbon saving of around 0.35 tonnes per year as a result of reduced driving, with retirement developments typically well-located on central, town centre sites.

Taken together, retirement housing could remove up to 60,000 tonnes of carbon from the atmosphere per year if 30,000 new retirement properties were built, meeting the level of demand for retirement living (at present around just 7,500 units are built each year). It could also save downsizers considerable money on their energy bills; research shows that the typical net saving of running a McCarthy Stone retirement apartment when compared to a three-bedroom house is up to £1,200 per year.

In terms of construction methods, the developer announced a commitment in February 2022 to build 40 new retirement developments in full using modern methods of construction (MMC), with an ambition for 50% of its future retirement communities to be built in this way.

The MMC solution will be provided in partnership with Leeds-based Sigmat using its Light Gauge Steel Framing (LGSF) off-site structural solution. As such, McCarthy Stone's MMC plan supports the Government's Heat and Building Strategy to reduce carbon emissions, with each new retirement community built using MMC seeing an improvement in building performance, (fuel usage and thermal transmittance), in comparison to those built using traditional methods.

Case study 7

Cala Homes: Maidenhill, Newton Mearns, Glasgow

Innovative new technology which could enable new communities across the nation to become significantly more sustainable is being used for the first time in the UK thanks to a partnership between Cala Homes, E.ON, Energy Assets and SP Energy Networks. Together, they are piloting a bespoke solution which helps harness green energy to work towards decarbonising the grid. The solution is designed to allow energy generated in a home – for example through PV panels – which is not consumed right away, to be exported and used elsewhere, either in other homes in the area or into the grid. It also ensures the energy being transferred to the grid does not exceed its maximum load.

Through gateways installed in each home, the smart solution manages the energy flows, enabling the connection of technologies like PV panels, air source heat pumps and electric vehicle charging points to work in harmony. By allowing the load of green energy within a large development to be managed without overwhelming the grid, Cala believes it will have more opportunity to roll out sustainable technology, contributing to the net zero operation of homes.

Without a solution like this, certain sites would require significant investment in additional substations, which could make them unviable, but Cala believes that with this smart load management system, the possibilities for creating, harnessing and using green energy are greatly enhanced, offering wider implications for housebuilding across the UK and beyond.

The dynamic technology is being piloted in an initial 77 homes at Cala's flagship development within the new 800-home Maidenhill community in Newton Mearns, near Glasgow, with plans to roll it out further thereafter.

Stephen Kelso, Group Product Design Manager for Cala Homes, said: "Building more sustainable communities is a huge task for the housebuilding sector and a major focus for Cala. New, innovative technology is vital to this, and we've been researching and trialling tech that can help us make net zero carbon a reality – but it's not a case of just switching this on. The right infrastructure needs to be in place to support it.

"Communities like Maidenhill – with 800 homes overall, a new primary school and community amenities – have huge implications for the availability and use of energy. Making a site of this size as sustainable as possible brings additional considerations and puts more pressure on the grid. So, we asked the question: how do we meet this challenge and allow a development like this to fulfil its green energy potential?

"The result is what we believe to be a unique collaboration between a housebuilder, energy company and network operator to find a solution. The technology developed by E.ON is the first of its kind in the UK and there are plans to roll it out in other territories."

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