

THE SMART

E-HOME OF THE FUTURE



Picture yourself in 10 years' time. Are you still in the same house, watching the same TV and facing the same weekend chores of vacuuming, cutting the grass and sending in your energy readings? Well, you may want to think again. Thanks to the pace of change and technological advances, in just over a decade we could all be living in a very different domestic environment filled with the kind of innovations we have only seen before in Star Trek or The Jetsons.

As a great man once said, the best way to predict the future is to create it, and some of the small steps we are taking right now are the foundations of some of the biggest and most exciting home innovations. For example, requesting a smart meter from your energy supplier, fitted at no extra cost, is key to providing access to cheaper and greener energy for ourselves and for our children in the near future.

From electric vehicles to how we do our washing, innovations in housing and technology could transform the way we live. We at Smart Energy GB, the campaign for a smarter Britain, asked a panel of experts including a representative from Go Ultra Low to consider the

innovations we might find in our Smart E-Home – homes that are energy efficient and good for the environment – using technology either already in production or possible within 10 years. From kettles in kitchens to wind powering entire streets, here's how they think our homes will be better for the planet in 2030 – and what steps we can take now, such as requesting a smart meter, to pave the way.

BATTERIES INCLUDED

Currently our energy is transmitted to us on a nationwide network, carrying electricity from its source, for example, a power station, to where it's needed, perhaps your kettle or washing machine. With fossil fuels, it's relatively easy to change how much electricity is made to match demand – when we need more, we can burn more coal.



“Fridges could have batteries that charge when electricity is cheap. They could run on the battery when electricity is expensive. It’ll be simple and invisible for people.”

Robert Llewellyn
Actor, Comedian, Writer

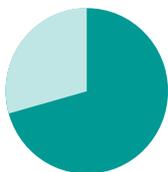


Renewable energy sources like solar and wind can’t be managed like this – you can’t switch off the sun or the wind to suit. Britain’s energy system as we know it will have a complete transformation, where smart meters will provide two-way communication between our homes and the energy supply. Smart meters will give the grid information about how we’re using electricity so it can store the excess for us to fall back on when there’s high demand. Likewise, smart meters in our homes will make it easier for us to draw on electricity when it’s less in demand, to store within in-house batteries, helping to take pressure off the grid too.

Batteries will be vital to this. The University of Edinburgh has already invented the Karma Kettle which can store excess electricity from the grid when it’s being produced in abundance. This energy can then be used to boil water when electricity is scarce or more expensive later in the day. This is just the beginning – many appliances in our homes could use electricity in a way that’s smart for us. Renewable energy is clean and abundant, storing it reduces waste, and this could make electricity cheaper or even free.

“If we’re all using electricity in a way that’s smart, that’s an amazing service to our country when it comes to preventing climate change,” says Robert Cheeswright, Director of Corporate Affairs, Smart Energy GB. “Smart meters are the hubs that will find out the price of energy and enable appliances to use energy when it’s cheapest.”

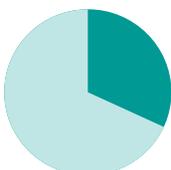
In 2030



70%

of all our energy will come from low carbon sources, and green, offshore wind power will supply us with a third of all our energy needs.¹

In 2018



33%

of all the UK’s energy came from renewable sources like wind, hydro, solar and bioenergy.²

¹ [gov.uk/government/news/offshore-wind-energy-revolution-to-provide-a-third-of-all-uk-electricity-by-2030](https://www.gov.uk/government/news/offshore-wind-energy-revolution-to-provide-a-third-of-all-uk-electricity-by-2030)
² [smarterbusiness.co.uk/uk-renewable-energy-percentage-2018/#1](https://www.smarterbusiness.co.uk/uk-renewable-energy-percentage-2018/#1)

“Over the next 10 years, batteries will become much smaller and modular. Therefore, as households change in size over time, batteries can be added or removed as needed, without taking up lots of space. Batteries enable energy to be generated from technologies integrated into the home or cheaper energy from a cleaner grid.”

Dr. Jo Patterson

Welsh School of Architecture, Cardiff University

SUPERCHARGING OUR RESOURCES

More and more people are switching to electric vehicles – they’re great for the environment, reduce air pollution, and can save us money. Fully electric cars can cost as little as three pence a mile to run, compared with up to 11 pence a mile for petrol and diesel cars. Smart meters make charging even simpler, because you can plug in at home and let your smart meter decide when it’s best to charge up – another way of taking care of the planet.

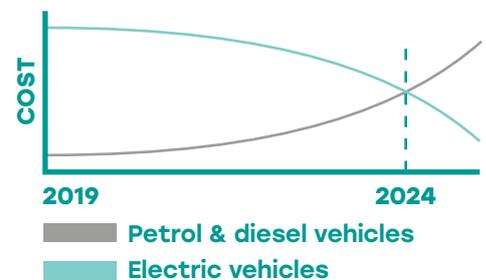
“If you own a car right now, for 80 or 90 per cent of the time, you’re not using it,” says Fully Charged presenter and electric car enthusiast Robert Lewellyn. “By 2030, people’s attitudes towards car sharing will have changed and that will be the norm. There’ll be 80 per cent fewer vehicles on the road; we’ll have the same access to a car, without needing to own one.” For those who enjoy having their own car, the in-home charging element will be crucial. “Electric vehicles will become part of a smart household,” says Cheesewright. “Cued up by your smart meter, your car will take pressure off the grid



by acting as a giant battery for when energy is in short supply.”

“Last year almost 60,000 electric cars were sold in the UK, and in 2019 we’ve seen sales of pure electric cars rise by over 60%”, says Poppy Welch, Head of the Go Ultra Low campaign. “With more electric cars on the roads, our streets will be quieter and significantly less polluted, without any loss of convenience.”

Dr. Pearson imagines autonomous electric vehicles will provide an upgrade to public transport systems for those who don’t live near bus routes. “Lots of people don’t live next to a bus stop even if they live on the edge of town. If I can get an electric car to pick me up at my front door, that means I can go into town, get involved in local clubs, societies and politics. There’s a big social inclusivity benefit.”



The Committee on Climate Change believe electric cars will cost the same as petrol or diesel vehicles by 2024.³

“Considering the current rate of uptake, we fully expect electric cars will become the new normal.”

Poppy Welch,

Head of Go Ultra Low

³ [bbc.co.uk/news/science-environment-48097150](https://www.bbc.co.uk/news/science-environment-48097150)

“ Everything changes – your household budget will change because you’re not spending on a car, cars will become more integrated with electricity generation, and autonomous, electric vehicles will allow people greater access to their local communities.”

Dr. Ian Pearson
Futurologist

Fleets of autonomous cars, closely connected to energy suppliers, will be available so we can call one to our homes for us to drive for small errands as and when we need them. We won't have to park it – you'll get out, do your shopping, and call another vehicle to take you home. Once you get out of that car you have no responsibility for it, it drives off and charges up, ready for the next person.

SMART SAVINGS

No matter how small, every appliance in every Smart E-Home of the future could play an important role in enabling us to use renewable energy and contribute to a more sustainable environment. Smart meters are already helping us to make better decisions about how we use appliances. We think by 2030, it won't just be one or two appliances – it could be the whole house, and maybe whole communities.

There will be appliances that can talk directly to your smart meter, helping you to use electricity at the optimum time for you. That could be when it's cheapest or it could be when it's most convenient, depending on your own preference. For example, the washing machine could be turned on

remotely, so the load is ready to be taken out when you get home and the dishwasher could run automatically when the cost of electricity is cheapest.

A Cardiff University project has fitted seven social housing homes with batteries. These batteries are about the height of a standard fridge and 15cm deep and can store electricity from a photovoltaic (PV) panel integrated into the roof of the house or from the grid. Throughout the day the PV panels generate electricity which is used by the householders or, if not used, recharges the battery. Throughout the evening, electrical appliances such as the tv and shower are powered entirely by the electricity stored in the battery. Dr. Jo Patterson is the project lead: “Between March to October when the days are longer and the PV panels

can generate lots of energy, the occupants of these homes are paying around one pound a month for their electricity.”

4M OUT OF 66M

FOUR MILLION HOUSEHOLDS IN THE UK ARE FUEL POOR.⁴

“In the future, it will be possible to lend your neighbours your excess electricity, to donate it to vulnerable people like the elderly, or to support local businesses.”

Dr. Ian Pearson



⁴ endfuelpoverty.org.uk/about-fuel-poverty

“The time of peer-to-peer renewables is coming; we could be making, buying and selling our own electricity to one another.”

Robert Cheesewright

Director of Corporate Affairs at Smart Energy GB

Mersey Care NHS Foundation Trust and Liverpool John Moore’s University have been collaborating on a research project using smart meters with machine-learning to help monitor people with dementia. Because smart meters can collect and send around-the-clock data, it’s possible for researchers to spot important changes in behaviour. Often as people progress with dementia their body clock switches so they become more active in the evening, which is the sort of change that smart meter data could indicate, which in turn would be of help to health professionals. Most significantly, an unusual lack of energy activity could alert carers quickly to the fact that someone might need assistance.



“Smart products and services in our homes aren’t just the foundation for a greener, cleaner Britain; they’re also a way of keeping us living at home, and being part of our communities, for longer.”

Robert Cheesewright

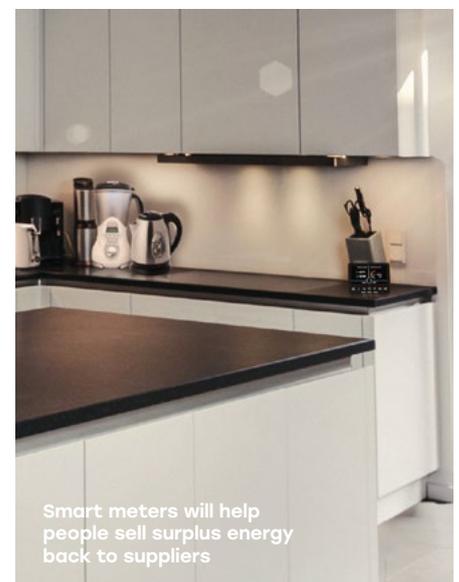
As our homes become more efficient at storing, using and sharing energy, it could be possible for us to send the surplus in our homes to those who live near us. Smart meters in our homes won’t just measure what we use, but also what we produce, and we could be able to share or sell the electricity we make to any supplier at a time of our choice.

The possibilities of power-sharing are vast. “In 10 years’ time, it will be possible to label and price every kWh of electricity according to different priorities,” says Pearson. “Some electricity could be labelled for use only by the elderly, for example, and surplus could be marked to be used to charge your kettle or your fridge.”

Currently researchers are also exploring how the data from smart meters could be used to support vulnerable people, by tracking their energy using routines and alerting carers if there are notable changes that could indicate a fall or a problem. This will mean in the future, people should be able to stay in their own homes for longer if they want to, rather than having to move to care homes.

FLEX TO FIT

New homes could be built with energy efficient materials, with sensors built in that will be able to alert you when something needs repairing or isn’t as energy efficient as it could be, like the insulation in your loft or draughty windows.



“As we build new houses, I would hope we’ll have progressed from bricks and mortar, to buildings that are modular, eco-friendly, cheaper and faster to build. They’ll use less energy as they’re built and with solar panels built in as the norm, not as extras, they’ll be energy efficient to live in. The game changer, though, is for us to be able to store our electrical energy in our own houses with some form of battery, with smart meters at the heart of this. That changes everything.”

Carol Vorderman

Mathematician, TV host, Author

in place of roof tiles and retrofitted with painted on solar panel coatings, and local communities and housing estates will generate a local electricity supply through a community wind turbine, and whole streets will be heated from carbon-zero community boreholes.

Even waste shower water and toilet waste could be transformed into a valuable source of energy for our homes. Wastewater could be captured, stored and repurposed for heating or re-filtered to make our homes water self-sufficient. Smart toilets could use the energy from our waste, and accurately calculate exactly how much water is needed to dispose of it.



Technology will be able to flex around the needs of the people who live in each house. In homes where there’s only one person, whether all the time or just some of the time, technology could exist that will be able to heat specific areas of your home around where you are. For example, a bed could include different temperatures on each side to account for people’s varying body temperatures. This will save the energy needed to heat a whole house, and will be much more economical for those who live alone and for the elderly.

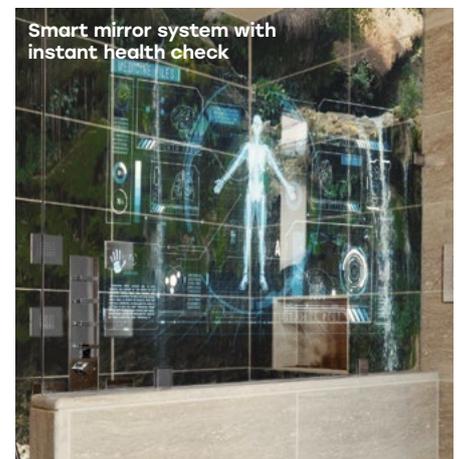
Modular housing will mean people can literally build their

own homes: empty nesters can get rid of rooms they no longer need to make their homes more efficient, new homeowners can start small and expand out as their families grow. These Smart E-Homes will use resources in sensible ways by reusing water for example, reducing waste, improving insulation and making the most of the technology we have to hand. Inside, sensors will detect where we are in our homes to switch appliances, heating and lighting on and off as we need them.

As the construction industry catches up with modern technology and the price of eco-friendly building materials comes down, houses will be equipped with solar panels

“In 2030 our homes will be mini power stations.”

Robert Cheesewright



“In the near future, you’ll be able to ask your house how efficiently it’s working and get a direct answer.”

Dr. Jo Patterson

“ Building to help people to reduce demand for energy, but also to generate energy people can use in their own homes as part of their daily living.”

Dr. Jo Patterson



Wall hanging screens already exist, as do reconfigurable materials. So, if you get bored of your brown leather sofa, by 2030 you could talk to your in-home AI and change it to a plush red velvet one, with no waste. Furniture will be more sustainable and last a lot longer, because no one will need to get rid of their old sofas to replace them with new ones. Instead we'll simply reconfigure what we have to meet our needs as they change.

Some things won't change too much – kitchens will still have all the appliances we recognise, though the way energy is used by the oven, toaster and microwave will be more efficient.

And it won't all be gadgetry. In 2030, we'll have living kitchens to fuel us with fresh food. Featuring a hydroponic garden, with efficient use of light, we'll have fresh vegetables to harvest in our

own kitchens – and they'd only take the space of a family-size fridge.

BUILDING THE FOUNDATIONS OF A SMART E-HOME

At the heart of the Smart E-Home are smart meters. In fact they're already bringing the future into our homes today – they're the first step to being in control of our homes, of saving money by using energy more efficiently, and they're a really easy way we can all work to combat climate change to make our current and future world a cleaner and greener place for our families and their children to live.



“Soon, it'll be possible for us to entirely redecorate our homes, without buying in new fixtures or fittings, using augmented reality and smart furniture made from reconfigurable materials.”

“Smart has to mean smart to the environment, smart in using new technology, and smart in how we control it.”

Dr. Ian Pearson

TOP 10:

WHAT ADULTS THINK

THE HOME OF THE FUTURE

WILL LOOK LIKE

- 1 Everything will be powered by renewable energy such as solar power or wind power
- 2 Solar panel paint and solar panel windows which can capture the sun's natural energy to be used within the house
- 3 Windows that change shade in reaction to external light so you can keep your house warm or cool without having to use radiators or air conditioning
- 4 Smart meters that help us manage our electricity use so that we can cut down on energy waste and use greener, cheaper energy
- 5 All cars will be battery operated
- 6 Each house will have a giant battery to store energy from the sun and use it when you need it
- 7 Living entirely on recycled rainwater that is filtered, cleaned and reused within the house
- 8 Toilets which turn waste into fuel which is then used to heat and provide energy to the house
- 9 No more switches - sensors will entirely control lights and appliances as you move around the house
- 10 Recycling bins built into kitchen appliances for easier recycling (e.g. in fridges etc.)

WHAT CHILDREN THINK

THE HOME OF THE FUTURE

WILL LOOK LIKE

- 1 Everything will be powered by renewable energy such as solar power or wind power
- 2 All cars will be battery operated
- 3 Each house will have a giant battery to store energy from the sun and use it when you need it
- 4 A system to recycle water in the home such as being able to easily clean a car with old bath water
- 5 Smart meters that give us control over every aspect of our electricity use so that we can cut down on energy waste and use greener, cheaper energy
- 6 Recycling bins built into kitchen appliances for easier recycling (e.g. in fridges etc.)
- 7 Windows that change shade in reaction to external light so you can keep your house warm or cool without having to use radiators or air conditioning
- 8 No more light switches - sensors will entirely control lights
- 9 People will grow all their own food inside the house
- 10 Toilets which turn waste into fuel

The features discussed in this report are based on technology or solutions that are already available, are in design, or could be available as soon as 2030.