What would you do with surplus energy from your solar panels? Switch off more lights to maximise that warm green feeling, or splash out on a bigger TV to soak up the free power? Kathryn Janda argues that energy-efficient buildings will reduce carbon emissions faster if we can become energy conscious citizens.

Domestic energy use is one of the biggest sources of fossil-fuel emissions worldwide. The UK is committed to reducing its carbon emissions by 80 per cent by 2050, and part of this target will be met by making all new homes ‘zero-carbon’ by 2016.

Renewable energy and green-fuel technologies are developing rapidly. But our whole energy system – the amount we use, the type of fuel and the sorts of things that consume power in our homes – is driven by demand; demand created by you and me. So the way we use buildings is at least as important as their design when it comes to energy use.

My research looks at how we live in our homes and how our behaviour changes – or doesn’t – when we have energy-efficiency tools at our disposal. Our social expectations – keeping up with the Joneses’ new Wii for example – and energy-consumption patterns can defeat the most careful design; old habits die hard, even in a state-of-the-art eco-home. It’s an area that’s been largely ignored by existing efforts to improve energy efficiency, which instead focus on architectural and technological developments. In the face of climate change these solutions are important, but...
they can’t do everything. Understanding how socio-economic and technical change affect energy demand in the UK is crucial if we’re going to find an approach to climate change and energy security that works.

Does more mean better?

Take solar power. Grid-connected solar is the fastest-growing power generation technology in the world. Meanwhile, reducing energy demand in homes is a critical part of meeting carbon-reduction targets. But if people install a new PV panel on their roof without making their house more efficient first, we might just be following a path that leads us to consume more solar panels rather than one that helps us become wiser energy users.

Many people living in PV-powered houses designed to be ‘zero energy’ in fact don’t change their energy use at all. This doesn’t mean that PV arrays and energy-efficiency measures aren’t effective: they are. Case studies show there is an across-the-board decrease in energy bills in zero-energy-home (ZEH) developments compared to neighbouring conventional ones. But people in ZEH developments often don’t produce enough solar power to meet their needs. Moreover, energy-use patterns in ZEH developments exactly mimic those of their neighbours, rather than reflecting the near ‘zero energy’ intention of their designers. What does this mean? People are paying less for their energy, sure, but they aren’t using less – it’s business as usual, with a small renewable twist. There are two problems with relying exclusively on renewables to solve carbon-emissions problems. Renewable energy is abundant, but our ability to capture it is limited. Although the fuel itself is free, the devices to capture and transform renewable energy are expensive. Renewables currently provide a tiny fraction of the energy used in the world, which means we have neither the production capacity nor the cash to rapidly replace our fossilised system for a renewable one. (Think of replacing every rhinestone in the world with a real diamond.) The smaller our energy needs are, the quicker our renewable capacity will match our needs.

Citizens vs consumers

Does this matter? I think it does. If we categorise people as consumers, then all they can do is buy more, or buy differently. Will a PV system on every roof and a hybrid car for every family solve our environmental problems? Or might ‘more’ of these different technologies have unintended consequences? The answer depends, of course, on how they are used. If the car is driven more often because it’s more efficient and someone adds an air-conditioner to their home because the electricity is ‘free’, buying more PVs or hybrid cars may actually increase our energy consumption.

What is the answer?

We could start by addressing the fact that households and bill-payers often don’t have the knowledge they need to change their energy-use habits.

This dilemma has been compared with shopping in a supermarket where the shopper doesn’t know the price of individual items, but instead is presented with a total bill at the end of each month. In the absence of specific information, residents asked to reduce their consumption by 10-20 per cent, energy monitors, can help people reduce their energy use 10-20 per cent, by showing them how changing their behaviour directly affects their energy use. In the case of PV, a real-time feedback device, like smart meters and energy monitors, can help people reduce their consumption by 10-20 per cent, by showing them how changing their behaviour directly affects their energy use. In the case of PV, a real-time feedback meter invites people to see themselves as producers as well as consumers of energy.

This approach paves the way for an important change in the assumed identity of the occupant: from blind consumer to educated citizen. But it’s not the end of the story. Surveys in the US reveal that most people appear not to understand energy issues; many of us are uninterested, incapable or simply ill-equipped to handle the challenges presented by the need to reduce energy consumption. So relying on energy feedback to change people’s behaviour is unlikely to be enough.

So education of a different kind is needed, delivered at the right time and in the right way to address the habits and ‘social norms’ which are the strongest influence on people’s behaviour – behaviour that can be idiosyncratic and unpredictable (while I’m throwing on an extra jumper you might be turning up the thermostat).

This could come through a number of channels. In schools, integrating the built environment into the curriculum could benefit physics, maths and art students – as well as tackling sustainability more thoroughly for architecture students. Perhaps the architectural profession itself could take on more responsibility for teaching building users to see their homes as dynamic systems rather than static objects.

It could even be an issue for public health education; public health addresses the relationship between sanitation and housing so this wouldn’t be an illogical step. Or perhaps a new profession should step up to the mark, one at the intersection of the built environment, public health and climate change.

Whatever approach we take, for green technologies to reach their full potential, people’s behaviour in their homes needs to be considered more thoroughly. Designers need to work with homeowners to enable and encourage more sustainable behaviour in buildings, rather than designing around people’s existing habits. And developing technologies like PV need to be part of an integrated solution to our energy needs, which includes educating individuals to be solar citizens.

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MORE INFORMATION

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