**Episode 1 - What is energy demand? And why does it matter?**

People in government departments, in universities and in businesses are talking about energy demand and how to reduce it.

This is because national and international policies require radical reductions in carbon emissions to limit future climate change. And at present, it's not clear how this can be achieved without a really significant reduction in the amount of energy that is used.

But what is energy demand? There are different ways of answering this question.

For many who think about these sorts of things, energy demand is simply the volume of energy supplied to consumers, homes and businesses.

Understood like this, energy demand can be reduced by improving the energy efficiency of the appliances and vehicles.

Others think about energy as a kind of commodity: as something that is bought and sold, and that can be saved or wasted. In this case, the demand for energy is seen to depend on how much it costs, meaning that demand can be turned up or down via economic incentives and penalties.

[However] these standard interpretations of energy demand are only part of the story. They miss out on what energy is actually for.

Because energy is used to provide services. Heating provides comfort during the winter. Mobility by car, bus or train enables people to get to work. And lighting makes it possible to read, work, or move about at night. In other words, it is not energy that matters. What really matters are the services that energy makes possible.

As physicists say, energy is the means to do ‘useful work’.

The meaning of useful work depends [up]on what people ‘normally’ do, and so it changes over time and varies from culture to culture. Entirely new ‘uses’ of energy – such as wireless internet access – emerge as practices change. Others decline, such as daily or weekly doorstep deliveries of milk or coal.

Since the meanings of ‘useful work’ change, energy demand isn’t fixed or universal: it depends on the services and practices that exist in society at any point in time.

If we take this view of energy demand, radical reductions in demand depend on how energy-intensive practices change and how they might be steered and shaped.

Current policies and strategies usually take the practices on which energy and travel demand depends for granted. In taking this approach they run the risk of encouraging and even locking in levels of energy consumption that are simply unsustainable.

**Episode 2 - Changing energy demand: why social practices matter**

Meeting the UK’s 2050 carbon reduction targets depends on radical reductions in energy demand.

Trends in everyday life – in what people do at home, at work or in moving around - matter directly for the extent and timing of the demand for energy and travel.

For example, doing office work at home and in cafes is becoming more normal. And as people buy more of their clothes and groceries online, the meaning of shopping and the role of supermarkets and town centres is changing.

Such trends are not simply expressions of personal choice – they are outcomes of changing social practices.

[It is important to understand that] social practices are shared. They exist beyond the individuals who do them: meaning that they have histories and futures of their own. They involve objects as well as people. And they change over time.

For example, it used to be rare for people to take holidays abroad. But this is no longer the case: long-haul leisure travel is increasingly common. And when flying becomes part of the experience, taking a holiday demands more energy.

Some shifts in practice have to do with the development of new energy-consuming technologies. Over their relatively short history, freezers – which now exist in most modern kitchens - have transformed methods of shopping and cooking.

They have also helped change ideas about diet; and enabled new systems of food production and supply; including ready-meals, out of season foods and foods from distant countries.

This is not simply a story of technological innovation. Appliances like fridges and freezers have become woven into practices of provision and consumption.

As in other areas of daily life, the way that appliances are used is a consequence of how practices are *socially* organised. This depends on interconnected histories of the many activities that make up everyday life, and of how technologies, practices, and infrastructures develop together over time.

This means that reducing energy demand is not a matter of persuading individuals to cut back on their consumption. Nor is it a question of making cars, freezers, and heating systems more efficient. Instead, radical demand reduction is about shaping the ways in which energy-demanding practices develop over time.

**Episode 3 – How do infrastructures make energy demand?**

Infrastructures like electricity and gas grids, or mobile phone networks, exist in the background. They allow us to go about our daily lives and it is only when they break down that we notice them at all.

Despite this invisiblity, infrastructures have a critical role in making and shaping current and future patterns of energy demand.

People often think that infrastructures are built to meetexisting or anticipated demand. And there *is* a long tradition of predicting future needs and providing systems capable of meeting them. For example, systems that supply electrical power are designed to meet *maximum* demand, even though that only occurs for a few hours each year.

But infrastructures do not simply meet demand, they are also involved in creating it. For instance, in the early days of the electricity network, new appliances like hoovers and electric heating were deliberately introduced to create new needs for power.

Contemporary infrastructures also enable patterns of consumption: this is because they are linked to changes in social practice. The provision of high-speed broadband, for example, makes it possible to stream high-definition box-sets and watch them [on-demand] at home [on-demand].

This possibility is only realised as and when practices change. And as box-set binge-watching becomes normal for many people, high-speed broadband becomes increasingly necessary.

As well as enabling people to do new things, infrastructures also limit what people can do, and when and where different practices take place. This is obvious in rural areas and in places that are not well served by rail, main road networks or high-speed broadband.

[So] the relationship between infrastructures and practices works in both directions. Networks and grids of different kinds shape how practices develop, but they are also maintained, modified and extended in response.

As habits of heating, shopping and WATCHING TV change, and as new patterns of demand emerge, infrastructures adapt.

Exactly how infrastructures and practices shape each other depends on networks and systems laid down in the past.

In some respects, the future of cities and homes is limited by infrastructures built in the Victorian era. Meanwhile existing road systems and electricity grids help keep certain practices in place; again making some futures more likely than others.

In other words, past and present combinations of infrastructure have a crucial role in structuring what people do now and in shaping future ways of living and consuming.

This means that serious reductions in energy demand require new or modified infrastructures. It also means that rather than meeting present needs, future infrastructures should be designed to enable *less*-demanding practices, and *less*-resource-intensive ways of living, to take hold.

**Episode 4 - Unpacking Peak Demand: Societal Rhythms of Electricity Consumption [/of Energy and Travel]**

For the carbon emissions associated with electricity and transport, peaks are a problem.

When electricity demand peaks more carbon intensive sources of power are switched on to top up the normal supply.

Although more renewable sources of energy are now included in the mix, the timing of their supply - does not often match the timing of peak demand. Quite simply, if the peak was lower fewer power stations would be needed.

There *are* ways of reducing the peak, [especially for electricity demand], like automatically switching off appliances or introducing tariffs that are much higher during peak hours. But what is it that makes this peakyness in the first place?

Some peaks in electricity demand happen when lots of people are doing the same thing at the sametime - like having a cup of tea after Eastenders.

The main peak in electricity demand occurs between 5pm and 8pm on winter evenings, when it is dark and cold and when some people get home and start cooking dinner and others are still at work, all with the lights on.

Peaks in travel are also strongly associated with the rhythm of the working day. They are concentrated in the morning because many people start work at 9am, and in the evening, when those same people head home.

This makes public transport more viable but it also produces congestion. Road and rail networks are often expanded in response but this extra capacity may help encourage further travel, such as for off-peak leisure.

In both cases, peaks in electricity demand and travel come about because practices are socially scheduled and organised around working hours, meal times, and shared leisure activities.

Practices also link together to form sequences – so commuting takes place before getting home and cooking happens before eating dinner. And this is why peaks and troughs in demand are not random.

Some practices, like having lunch, matter for the timing and sequencing of others, like shopping and working. Meanwhile, traditions like a dedicated week-end, structure the temporal rhythm of the week as a whole [the whole week].

There are variations in these temporal patterns. For example, cooking and eating, working and watching TV do not happen in exactly the same way each day, or over the seasons.

On Friday evenings people in the UK tend to watch less TV and also cook less compared to Mondays and Tuesdays. They also watch more TV in the winter than in the summer.

Sequences and patterns also change over time. In the UK in 1950s and 1960s it was still common to return home from work at lunchtime. But lunchtime peaks, both in travel and in the energy used for cooking at home, have largely disappeared.

Since peaks in electricity and travel demand are consequences of how social life is organised they can’t be shifted or reduced by act of will.

Measures like peak-time pricing, or load management [may] help reduce consumption, but they do not fundamentally change the social and temporal organisation of daily life.

Managing peak demand, on a *societal* scale, depends on understanding and intervening in how practices are sequenced and synchronised over the day, the week and the year.

This might involve all sorts of adjustments, such as the timing of school days and holidays, moving from ‘standard’ working hours to a number of socially shared working patterns, or adjusting the order or location of work and leisure activities.

The point is that depending on the peak in question many new possibilities come to light if we think about sequences and synchronisation of practices.

**Episode 5 - Using non-energy policies to reduce demand**

Significant reductions in energy demand are required if the UK is to meet the 2050 carbon reduction targets set out in the Climate Change Act.

To date, most energy policy focuses on decarbonising energy supply or promoting more efficient technologies. What’s missing is a more fundamental plan for reducing energy *demand* at a societal scale.

It might seem like the policies that matter for energy demand are those that focus on energy – such as improving the efficiency of appliances or buildings or regulating supply networks. But many kinds of policies affect the things that people do - at home, in work, and in moving around - that all make-up energy demand.

This is well understood by transport researchers who recognise that the demand for travel is a *‘derived’* demand.

By this, they mean that the ‘need’ to travel depends on what people do – activities like getting to work or school, or going for a day trip to the seaside. The same applies to all other forms of energy demand. It is derived from what people do.

So the policies that matter for travel and energy demand are those that affect the organisation of daily life. This includes policies on economics, trade, health, education, welfare and employment, to name just a few.

There are many routes through which *non-energy* policies influence energy demand.

For example, although most universities are committed to energy demand reduction, they also have to compete for students. And if universities believe that students want libraries to be open 24/7, that is what they will provide, despite the energy costs involved. In this way, higher education policy directly affects energy demand.

The impacts of non-energy policy on energy demand are often unintended and unseen, but they are real enough. These *‘invisible’* energy policies exist and have effects at every level: in national and local government and in how organisations are designed and structured.

Since energy demand is shaped by non-energy policies, there is scope for taking advantage of this. There are opportunities for non-energy policymakers to influence the extent and the timing of demand.

For example, many non-energy policies matter for opening hours, school times, leisure time and patterns of work. They help create these social rhythms. But they are not immovable: they can be changed.

A critical step in this direction is to recognise that peoples’ ‘needs’ are not already there, waiting to be met. In fact, governments and businesses have a hand in making and sustaining such ‘needs’ by supporting, investing in and regulating infrastructures, technologies, and practices that, together, shape future demand.

Conventional energy policies – that focus on increasing the energy efficiency of appliances and buildings - also shape demand. Whilst they may help reduce some consumption; in the longer run such strategies perpetuate ideas about ‘normal standards of living’. And that could make the problem even worse.

Rather than reproducing current expectations and needs, infrastructures and appliances can be designed to enable lower-carbon practices, new meanings of comfort, new diets and new ways of organising education, health care and employment.

This isn’t about being interventionist but it is about understanding that the future is not the present: it is not fixed and current policies are already shaping how it unfolds. Nor is the future made by individuals choosing to reduce consumption, one by one.

Energy demand and energy demand reduction is nothing more and also nothing less than a consequence of how societies are organised and how they change.