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RECC
RENEWABLE ENERGY CONSUMER CODE

Can you be flexible?

How consumers can play a part in a smart flexible energy system

Our energy supply is in a period of change or 'transition'. In April 2021, the UK government announced a climate change target to reduce emissions by 78 per cent by 2035 compared to 1990 levels, on a pathway to Net Zero greenhouse emissions by 2050. To achieve this, we will all have to move away from using fossil fuels to heat our homes, light our spaces and run our vehicles.

We will need to adapt our energy use so as to avoid the need to invest in new fossil fuel plants or to shore up existing less efficient, often older more polluting power stations that have to be brought on stream at times of peak demand.

Instead, our energy supply needs to be low-carbon, from sources such as the sun, the wind, the air and the ground. And we need to adapt to the fact that some of those low-carbon renewable sources of energy are 'intermittent' or only generating when there is daylight or when the wind is blowing.

At the same time as this shift to low carbon energy supply needs to happen, the demand for electricity is on the rise to power the increasing number of electric vehicles on our roads and rising numbers of low-carbon heat pumps in our homes.

All these factors mean we need to be smarter about what kind of energy we use and when we use it. We need a smart, flexible energy system. We need tariffs and deals that incentivise us to take part, because flexibility on a wide scale can help keep costs down for all consumers.

With developments such as rooftop solar PV, home storage batteries, electric vehicles and smart meters, consumers at home can now play their part – and potentially save some money too. By shifting your demand you could take advantage of lower tariffs at off-peak times, for instance, or you could receive a financial reward for consuming less in peak times.

While you might not generate or demand sufficient electricity on your own account to provide meaningful flexibility to the grid, your generation/demand can be pooled or 'aggregated' by a third party (such as an energy supplier) with hundreds or thousands of other individual domestic consumers to form 'virtual power plants' that can dynamically increase supply to, or significantly reduce demand loads on, the grid. The third party can then deliver the resulting flexibility to the grid. Or you, along with many others, might be asked to increase demand to 'mop up' surplus generation e.g. on particularly windy days.[i]

The Renewable Energy Consumer Code (RECC) has put together this guide for domestic consumers on energy flexibility to help you decide if taking part in flexibility initiatives is for you.

1. Why do we need to be flexible? The background

"Peaky" demand

It's half-time in the England v Iran match on 21 November at the 2022 football World Cup in Qatar. Millions of households watching at home simultaneously switch on hundreds of thousands of kettles. The demand for electricity spikes, reaching a peak up some 800 MW in the space of a few minutes (see Figure 1 below).

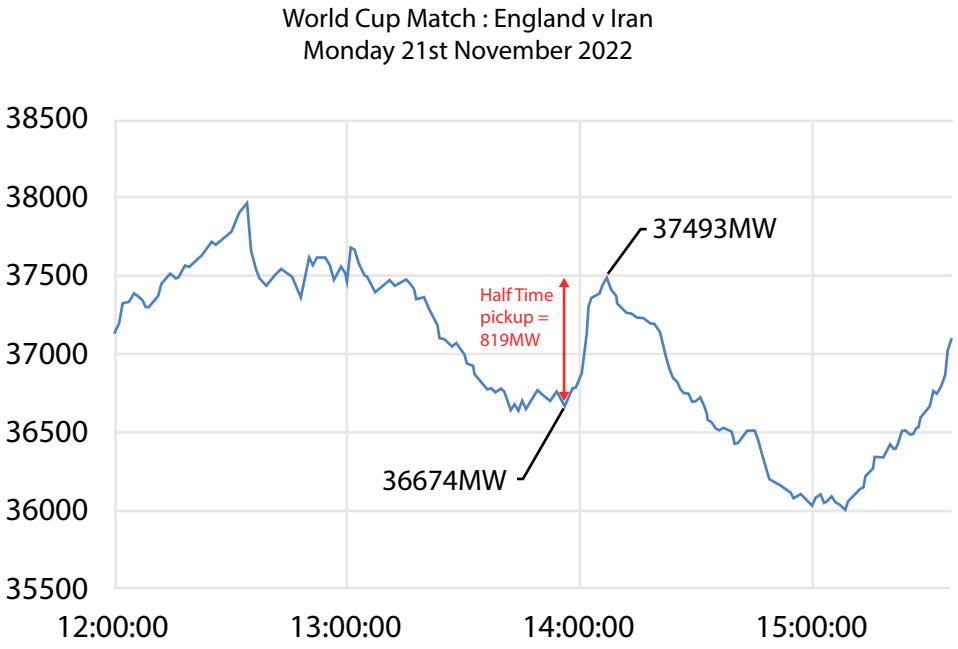

Image: LCP Enact

Figure 1: Half-time peak

In the UK the demand for energy is peaky throughout the day and across the year, as well as in response to particular events. Homes, for instance, typically have two 'peaks', one in the morning and another in the evening, as can be seen in Figure 2.[ii]

To make sure the supply of electricity always matches demand, electricity power stations change how much they generate in response to these varying levels of demand. So, when demand peaks, as it did at half-time on 21 November, we typically have to bring more expensive, less efficient, often older more polluting power stations on stream in order to make sure consumers have enough, making it more expensive and less green to generate electricity at times of high demand.

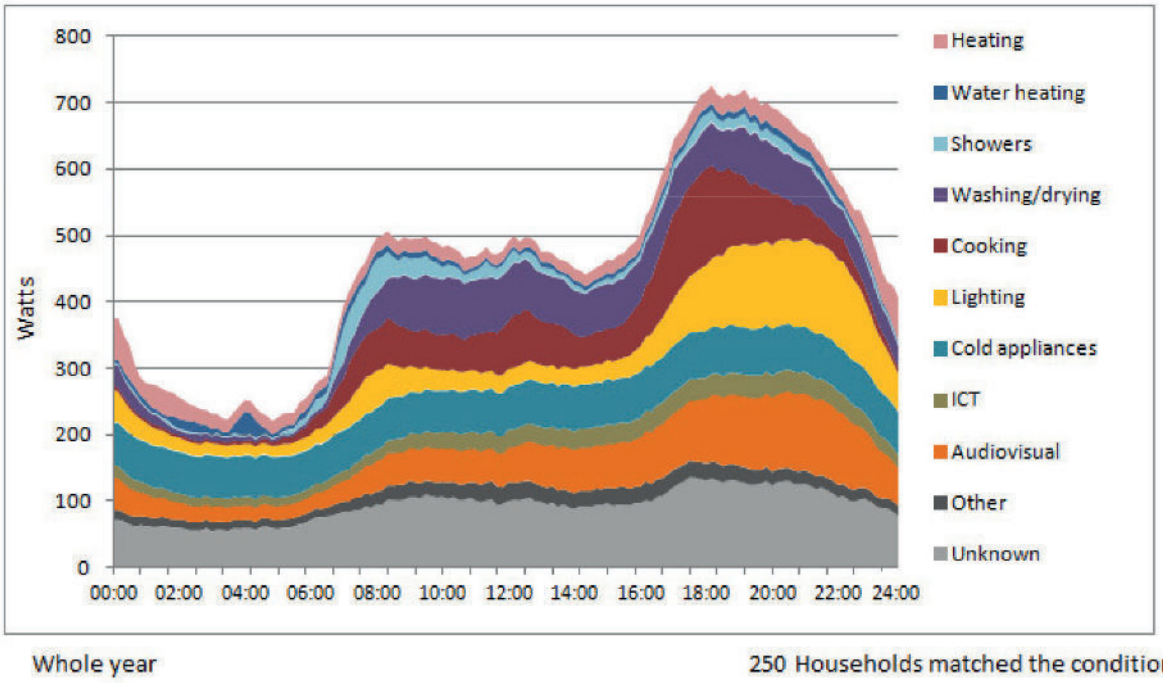

Figure 2: Household demand for electricity

Flexibility arrangements are designed to incentivise consumers (and businesses and industry) to alter their demand for electricity to 'flatten the peaks' by shifting it to times when it is cheaper and/or greener to supply. They can also be about reducing pressure on the grid at times of expected high demand where it might otherwise struggle to meet the demand (as the National Grid's Demand Flexibility Service sought to trial in Winter '22/23 – see Annex).

Increased demand without increasing carbon emissions

At the same time as we want to reduce demand, there are also developments that are increasing it.

The UK Government has committed to ending sales of new petrol and diesel cars by 2030 so the numbers of electric vehicles (EVs) on our roads can be expected to continue to increase. That means an increase in the demand for electricity to power them.

The Government also plans for 600,000 heat pump installations annually by 2028 to replace fossil-fuelled heating systems. Heat pumps run on electricity too, further driving up electricity demand.

These sources of increased demand may also be peaky, with households simultaneously switching on their heating systems when it gets cold and charging their electric vehicles when they get home from work.

This extra demand needs to be met as far as possible from low carbon sources to keep us on the path to Net Zero, rather than shoring up existing older fossil fuel plants or building new ones.

Intermittent supply

Low carbon energy sources such as the sun and wind are by nature variable, dependent on the time of day, season, and prevalent weather conditions. They can't be ramped up and down as power stations can, they are 'intermittent'.

These sources may be generating most when demand is low (e.g. the wind may be blowing during the night) or not generating much or at all when demand is at its highest (solar PV will not be generating on a winter's

evening). To make the most of them, then, requires a combination of shifting demand to times when they are most productive and capturing any electricity they produce that isn't used at the time it is produced, storing it (e.g. in batteries) and then drawing on that stored energy when it is needed.

As one senior executive in the energy industry has said:

> *'..... The issue for the 2020s is what happens when everyone has a heat-pump, and we often hear that the grid can't cope with this increased demand, and intermittent supply from renewables. A smart grid can control demand to manage this. Actually, a smart grid can even bring demand forward, increasing consumption when renewables are plentiful on the national grid, and wholesale prices at their lowest.'* [iii]

So, what is a smart grid? And how can it help us have a flexible energy system?

2. A smart flexible energy system

A smart and *flexible* system is one which uses smart technologies to provide flexibility to the system, to balance supply and demand and manage constraints on the network.

Smart means the ability of a device to respond in real time to communication signals, using digital technologies, to deliver a service.

Flexibility is the ability to shift the consumption or generation of energy in time or location.

Low- carbon flexibility can be provided by:

- **Flexible demand:** Shifting demand away from peak periods to times of lower demand or when energy is more abundant, cheaper and cleaner. For example, charging an EV at night when there is lower demand on the local network; using an appliance or charging a home battery during the day when there is lots of solar on the system; incentivising customers to use more energy on windy days.
- **Flexible generation:** Low-carbon, intermittent generation such as solar and wind can also provide flexibility.
- **Electricity storage:** Electricity generated by low carbon sources can be stored for when it is needed, for example in batteries on the wall of a home or business. EV batteries also store electricity (some can also feed to the grid, known as Vehicle to Grid, though these are not yet widely available in the UK).
- **Heat storage:** energy generated from a variety of sources can effectively be stored by using it to heat special material (in heat batteries), ceramic or clay bricks (in electric storage heaters) or water (in hot water tanks).

How do consumers fit in?

Industrial and commercial customers with high demand and sometimes on-site generation and storage already offer flexibility to the grid. Consumers at home can now play their part in a smart flexible system – and potentially save some money too.

The rollout of smart meters, more homes with renewable energy generators, domestic batteries and smart EV chargers all potentially contribute to making the energy system smarter and more flexible. Individual consumers are enabled to shift their demand, to store their domestically-generated electricity and even to supply electricity to the grid, while a host of 'aggregator' organisations can pool these individual contributions to create significant amounts of flexibility for the grid.

Smart meters

Smart meters automatically deliver meter readings to your energy company through mobile networks, so no-one has to come and read the meter and you don't have to send readings. Usually, you will also have an In-Home Display to let you easily see how much you're using.

A smart meter and an In-Home Display

Currently most of us pay the same for each unit of electricity regardless of the time we use it and how much it costs to supply it. Smart meters can record usage in half-hour chunks, making it possible to see roughly at what time of day a unit of electricity was used and in theory to charge accordingly, known as 'Time of Use' (ToU) tariffs. The lower cost of supplying electricity at off-peak times can then be reflected in lower tariffs at those times, which in turn incentivises users to shift their demand to those times.

The Government-backed roll-out of smart meters should see every household and small business offered a smart meter by mid-2025.

Domestic renewable energy ("microgeneration")

The last decade or so has seen significant growth in homes generating renewable energy, largely thanks to government or local level incentives to promote it. Increasing numbers of rooftop solar panels, heat pumps and biomass boilers mean consumers are increasingly also producers of energy.

Storing energy

Renewable energy is growing in importance in our overall energy mix. But sources such as wind and solar are harder to control and don't necessarily produce most at times when demand is highest. Domesic batteries and other forms of energy storage can charge up with renewables (or from imported grid electricity when it's cheap), then discharge that stored energy for use in the home at peak times when grid electricity is expensive. Charging and discharging at the 'best' times can be automated, via a smart charger.

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As battery prices fall, more households are installing them, usually to store 'surplus' energy generated by solar PV panels in the day to use in the evening. Every stored kilowatt hour (kWh) is one less you need to import from the grid and, at current tariffs, saving kWhs is worth more than any incentive payments (Smart Export Guarantee tariffs) from an electricity supplier for you selling any 'surplus' that you don't use back to the grid.

As Time-of-Use tariffs are increasingly offered, and battery prices fall, it could begin to make economic sense even for people without solar PV panels to install batteries.

Storing heat

Domestic electric storage heaters have been in use for many years. Electricity is used to heat ceramic or clay bricks inside the heaters at night, they retain the heat and release it gradually during the day. Similarly, electricity can be used to heat water in highly-insulated hot water tanks. And, in recent years, heat batteries have been developed: energy is used to turn a solid material into a liquid ('phase change material'). When the material is converted back from liquid to solid, heat is released and can be used to heat water.[iv]

Where these appliances are smart, they can be set to heat up when energy is cheaper or greener. Mixergy smart hot-water tanks, for instance, can be programmed to take advantage of low-cost time-of-use electricity tariffs to give you cheaper hot water in off-peak periods.

Electric Vehicles (EVs) and EV chargepoints

The private market for EVs in the UK is growing rapidly and can be expected to really take off ahead of the Government's planned ban on sales of new petrol and diesel cars from 2030.

The batteries that power EVs can be charged at home or at one of the ever-growing network of public EV chargers around the UK. Their charging does represent a heavy draw on the electricity grid. By the same token, however, they also represent a source of flexibility, if they can be charged at times of high supply or low demand - from solar panels in the middle of a sunny day when no-one's home, for instance, or overnight when demand is low and energy cheaper.

EV owners typically get a smart charger for their home when they first get an EV (in the UK, chargers now have to be smart). The chargepoint is installed at the user's home and connected to their domestic electrical wiring installation via a dedicated circuit.[vvi] Some chargers can also charge from solar panels.

The smart chargepoint can communicate and receive information over a mobile network or internet connection. It can be programmed to charge the EV's battery at a time or rate best suited to the network but within the car owner's tolerances eg so as to be 'ready by' the time the user is likely to want to use the car, with the customer able to override the charging schedule in time of need.

The customer can control the charging pattern, typically via a smartphone app or a web portal, or can give control to a third party (eg a chargepoint operator) to provide demand management. A number of energy suppliers, for example, have linked up with EV manufacturers and/or a EV chargepoint providers that together can enable EV charging at times when electricity prices are at their lowest and, with customer agreement, control demand to offer flexibility to the grid.

Some of these chargers are 'bi-directional' ie capable of both sending electricity from the grid to the EV to charge it and also sending electricity from the battery to the grid (i.e. discharging) when the grid needs it (knows as 'vehicle to grid' or V2G). Domestic V2G is still in its infancy here, however.[vii]

Other energy smart appliances

An "energy smart appliance" or ESA is defined as a communications-enabled device able to respond automatically to price and/or other signals by modulating or shifting its electricity consumption and thus of contributing to flexibility. As well as smart EV chargepoints, this would include, for example, washing machines that turn on at off-peak times when electricity is cheaper and fridge freezers that turn off for a short period when there's a nationwide spike in electricity use.

Energy smart appliances can be connected to a smart meter (with a built-in Auxiliary Load Control Switch that can switch them on and off remotely) or via a wifi-enabled 'gateway device'. The consumer can control them via a timer or an app and can be prompted to take action by requests from the supplier. Or the ESA can be controlled on the consumer's behalf by a supplier or network, for example, without the consumer needing to do anything.

Aggregators

While you might not generate or demand sufficient electricity on your own account to provide meaningful flexibility to the grid, your generation/demand can be pooled or aggregated with hundreds or thousands of individual domestic consumers (to form 'virtual power plants' that can dynamically increase supply to, or significantly reduce demand from, the grid.

'Aggregator' is a general term for those who perform this pooling. An aggregator organisation, or those acting on one's behalf, contracts with various individual demand sites (i.e. homes, for domestic flexibility) and consolidates (or aggregates) their response to create in effect a single, larger flexibility asset. The aggregator then sells the net effect on to another party in the energy market and gets a percentage of the return from that party for reducing peak demand (or for providing other flexibility services).

The Licensed Electricity Suppliers – British Gas, EoN, Ovo, Octopus and others – can act as aggregators but aggregation could in theory be performed by any organisation with control over a number of energy resources that the flexibility procurers can work with, including EV manufacturers or chargepoint operators.[viii]

Possible models include:

- customers are paid a certain amount in return for allowing an aggregator to use their asset to deliver flexibility. If you have an EV, for example, you might allow a third party to control your EV's charging pattern with that of lots of other EV owners so as to charge them when renewable energy is plentiful and/or off-peak. Payment may be a fixed amount or the consumer can be rewarded based on the actual usage/revenue made by the aggregator.
- a load controller owns the asset (ie it's installed for free or very low cost or is leased by the householder) in return for being able to control the appliance's demand for electricity – setting an EV chargepoint's schedule, for example.

Battery manufacturer Moixa's 'Gridshare' scheme provides owners of smart batteries (including those in an EV) with a yearly payment or a profit share in return for allowing Moixa access to excess power in those batteries. With thousands of batteries under its management, Moixa in effect has a 'virtual power plant' whose output it can trade with National Grid at a profit.

3. Being flexible

In general flexibility is either prompted by consumers responding to price signals to shift demand or by controlling their loads (load control) in return for a reward. In either case, the consumer may control the response or have it managed by an outside party.

Price signals

'Consumers...can sign up to special tariffs and schemes which reward them for changing how and when they use electricity...Smart meters and other technologies...make this easier than ever for domestic consumers.' [ix]

Price signals typically take the form of tariffs that offer lower rates at certain times to encourage shifting demand for electricity to those hours. The tariff you pay depends on the time that you use the electricity, known as 'Time-of-Use' or ToU tariffs.

Some ToU tariffs are '*static*' where the times you'll pay less (or more) for your electricity stay the same, with cheaper tariffs in the early hours of the morning for instance e.g. Octopus Go customers, at the time of writing, get much cheaper electricity between 00:30 - 04:30 every night, paying 12p per kWh compared with 44.17p per kWh at all other times (in a London postcode).[x]

To date these ToU tariffs have been particularly aimed at EV drivers, with very cheap rates for late-night charging, incentivising owners to shift the charging of their EV away from peak periods when older fossil-fuel power stations may be called into service.

Dynamic ToU tariffs fluctuate in line with movements in wholesale electricity prices up and down. Octopus was the first electricity supplier to offer these in the UK domestic market (see Agile Octopus, below).

Price changes can be signalled to the consumer (eg by SMS or via an app) leaving them to manually alter their demand in response. However, automation can make this easier: timers can be set to take advantage of cheaper periods; smart appliances, batteries and thermostats can be set up to respond automatically to price signals carried by the smart meter or over the internet. In practice the more complex dynamic tariffs are unlikely to become widespread in the domestic market without household automation.

With rising and volatile wholesale prices, dynamic tariffs are unlikely to be attractive to consumers currently.

Agile Octopus

Agile Octopus was described as *'the 100% green electricity tariff with Plunge Pricing'* that was *'perfect for electric vehicles, storage heaters or anyone who can shift their electricity use outside of the 4pm-7pm peak."*

With Agile, the price consumers paid for electricity varied as wholesale electricity prices went up and down with changes in the market. Consumers were provided a day ahead with half-hourly pricing and could then set an appropriate schedule for charging an EV.

In periods of high generation, wholesale prices fell and so did the price the consumer paid (aka 'Plunge Pricing'). At the extreme, consumers could even be paid to use electricity (ie a tariff less than zero). In one weekend in December 2019, for instance, more than 2000 households were actually paid to use extra renewable electricity. Octopus told its customers ahead of time that it would pay up to 5.6p for every kilowatt-hour of electricity used in certain overnight periods as windfarms generated more energy than the UK needed in the early hours of the morning.

As recent events have clearly demonstrated, wholesale prices can go up as well as down. At times of high demand, when prices are likely to surge, Octopus would alert customers so they could delay using electricity if they would like to avoid higher bills. And the Agile Octopus included a 'Price Cap Protect', such that consumers were guaranteed never to pay more than 35p per kWh. (at the time – now 100p per kWh).

Octopus states that consumers can switch to another of their standard tariffs at any time, so they are not locked into a tariff that becomes inappropriate for them.

As wholesale prices rocketed in 2022, Octopus stated on its website: *'Agile prices vary a lot based on trends in the wholesale energy market.... Currently, soaring global gas prices have pushed wholesale prices to record highs: they've increased over 400% since the start of 2021. This means Agile's prices are consistently high right now, and it's likely you'll save more money by sticking to a standard variable or fixed tariff throughout the Winter.'*

Controlling loads

Another approach to incentivising consumers to be flexible in their use of energy is to reward them for altering their behaviour in line with the needs of the grid eg reducing their peak-time energy use. This was the model tested in Winter '22/23 by National Grid with its Demand Flexibility Service events (see below).

Alternatively, consumers could be incentivised to use *more* electricity at a time when there's excess supply on the grid (e.g. much cheaper rates for electricity on very windy days).

Again, this response could be automated to respond to a signal that loads need to be limited or increased.

Load *reduction* can involve:

- simply shifting demand to off-peak hours by doing some of the energy intensive things you normally do in peak time (cooking, heating, washing clothes or dishes) to later or earlier in the day.
- managing the energy load used or generated by various smart devices to increase or decrease consumption eg an EV or standalone domestic battery can be set to charge or discharge in line with the needs of the grid.
- in a more extreme form, restricting the flow or amount of electricity allowed to a consumer. Smart meter technology can enforce this by temporarily disconnecting the supply if the limit is exceeded.

National Grid's Demand Flexibility Service

In Winter 2022, amid concerns about supply, the National Grid (NG) set up tests of its Demand Flexibility Service (DFS). This involved NG scheduling a series of 'flexibility events', certain times (usually between 4pm and 7pm) on certain days in which it would pay approved providers (energy suppliers and aggregators) around £3000 per MW hour their flexibility arrangements saved by cutting demand below normal levels.

The providers signed up domestic consumers who were asked to reduce their normal energy consumption by around 30 per cent in the specified hours (only those with a smart meter could take part). If they achieved this, they received a financial reward (somewhere around £3 for every kWh they saved).

The Association for Decentralised Energy's factsheet about the service is reproduced in the Annex, along with details of one flexibility provider, the app HUGO.

By mid-December 2022, five planned demonstration test events of the Demand

Flexibility Service had been run, successfully delivering consumer demand flexibility at scale for the first time in British history. In fact, the confirmed results from the first and second tests revealed that consumers reduced demand even more than expected. National Grid commented:

'These test events have successfully demonstrated that the Demand Flexibility Service can deliver flexibility at scale, enabling consumers and businesses across the country to benefit from shifting their electricity use away from a specific time period.'

Direct control

In the Demand Flexibility Service tests, consumers were in control of whether they shifted any demand out of the test period. But if you are willing to allow 'direct control' of your energy use, flexibility arrangements can be automated and managed by an external party such as your energy supplier or an aggregator.

An example could be the offer of a 'free' or subsidised new fridge, washing machine and dishwasher in return for it being controlled remotely by a supplier or an aggregator who can then turn it off and on, up and down.

Nb If you have critical equipment that must be able to run at all times, such as medical equipment, it is NOT advisable to opt for any kind of demand-shift deal unless you are able to exclude this equipment from it.

FRED

The Flexibly-Responsive Energy Delivery (FRED) project is led by Evergreen Smart Power, working with Energy Systems Catapult, myenergi, Tonik Energy and Swansea University. The trial uses Evergreen Smart Power 's software platform to increase and reduce electricity demand in real-time. EV charging and electric heating (immersion heaters and heat pumps) loads are managed using MyEnergi's Zappi, a smart EV charger that can also use power from people's solar panels o charge the car, and Eddi hardware. These devices control energy loads and are capable of both autonomous action on detection of signals from the grid and receiving commands sent remotely. The devices are registered within Evergreen Smart Power's Virtual Power Plant software which optimises power usage to enable participation in grid services.

4. Things to be aware of

If your main motivation for considering a flexibility deal is to make savings on, or income from, your energy, it's worth considering whether you would do better to first invest in energy efficiency measures – such as insulation and energy efficient lighting - to reduce your demand overall. Beyond that, there are aspects of a smart flexible energy system that you should bear in mind before opting for flexibility deals of one sort or another, including:

What consumer protection you have

In participating in any element of a smart flexible system, you are of course protected by general consumer protection laws and regulations that prohibit various sorts of unfair practices. And there are a lot of additional provisions to protect you as a domestic energy buyer: among other things, licensed electricity suppliers (LESs) are required to treat customers fairly, to have tariffs and terms and conditions that are easily identifiable, clear and easily comparable, to provide important information, to be easily contactable and to have robust customer service arrangements.[xi]

Where licensed electricity suppliers (or those acting on their behalf) sign you up to flexibility-related services or products (ie when they engage in aggregation), those additional protections may also apply to the aggregation service. But these do not necessarily apply when you sign up to a flexibility deal with others involved in aggregation on their own account.

The government has recently set out possible changes to regulating load controllers and aggregators and stated that it will *'ensure that regulatory approaches for smart appliances, chargepoints, home energy management systems, flexibility service providers and load control systems are aligned.'*[xii]

Until that happens, be sure to ask if the contractor is either an LES or working on behalf of one.

Standards

There are standards or codes specific to certain elements of a smart flexible energy system aimed at ensuring equipment is installed so as to work efficiently and safely and that sellers of services act appropriately. Its's worth asking whether any of the relevant standards apply to your installer, provider or equipment:

- The Government has sponsored the development of two new 'specifications' (a form of standard) around Energy Smart Appliances. 'Publicly Available Specification' or PAS 1878 relates to the equipment, PAS 1879 is a Code of Practice aimed at those responsible for providing and delivering the kind of energy services described in this guide. These PASs are voluntary at present but worth asking about.
- The Office for Zero Emission Vehicles placed requirements on EVs, EV chargepoints and EV chargepoint installers tied to various government grants (for domestic consumers, these are now only available to flat owners and renters).
- The Microgeneration Certification Scheme (MC) and the associated approved Consumer Codes set

standards for small-scale renewables (solar PV, heat pumps, biomass boilers, solar thermal, wind turbines). These are compulsory to qualify for certain government incentives such as the Boiler Upgrade Scheme, but not otherwise.

- MCS also has a standard for Battery Storage installation, but this is not tied to any incentive scheme currently and is not yet widely adopted.
- FlexAssure is a voluntary code for aggregators offering services to business customers, established by the Association for Decentralised Energy (ADE). The ADE is currently working on HomeFlex, a similar scheme for domestic customers.

Comparing prices

Some of the smart ToU tariffs on the market are quite complex eg EdF has three different tariffs for EV drivers, with different rates and different off-peak times. This can make it pretty complicated to work out what's the best or most suitable deal for you.

With standard energy tariffs, you can usually turn to Price Comparison Websites like energwhich or uswitch to have an idea of what's on offer that might suit you, but these sites don't currently include smart ToU tariffs.

A Government- commissioned smart tariffs comparison tool is in the works but is not yet available at the time of writing (see the latest news on it at: www.smarttariffsmartcomparison.org/home)

Data protection

Connected devices like smart meters and smart appliances generate new data about you that can be accessed remotely. Collection of large amounts of that data is likely to increase in future to enable aggregators to deliver their service. So data security becomes even more important.

Smart meter data is protected both by the general law on data protection and also by a specific regime, the Data Access and Privacy Framework (the DAPF). The DAPF covers levels of access to energy consumption data collected by your smart meter, the purposes for which it can be collected and the consumer's choices about it.

However, the DAPF doesn't cover all data eg where aggregators use Consumer Access Devices (CADs) or clip-on monitors to collect consumption data from a smart meter, this sits outside the DAPF. And none of the existing smart controlled home EV charging solutions in the UK use any part of the Smart Metering system, instead delivering control using their own or other separate communications channels and IT solutions, according to a report for Energy UK.[xiii]

The Government-commissioned PAS for Energy Smart Appliances mentioned above includes data security provisions.

Financial risk

With certain deals, if your demand proves not to be as flexible as you think[xiv] you could either end up paying more or losing out on rewards.

Time of Use tariffs usually offer cheaper tariffs at certain times but significantly higher tariffs at peak times. If you don't manage to shift your demand away from peak times you could end up paying more than you currently do for electricity.[xv] And, as noted above, it's not currently easy for consumers to 'trawl' the market for ToU tariffs on offer to find the best option for them.

Prices in energy supply contracts are subject to a price cap but this only covers a supplier's 'standard variable' energy tariff or a 'default' tariff (such as a customer may be transferred onto when a fixed-price term ends). ToU tariffs are not subject to a cap.

And dynamic tariffs that vary with wholesale costs expose consumers to considerable financial risk at times of fast-rising wholesale costs. A provider might voluntarily set a cap on how high these tariffs can go but this can be set at a high level (eg Octopus initially set a cap of 35p per kWh on its dynamic Agile tariff which at the time it was more than double the typical average electricity tariff. The cap is now 100p per kWh.)

So it's important to ask how easy it is to switch away from a ToU or other smart tariff without penalty.

If you sign up to flexibility deals, you might lose out on a reward or even face a financial penalty if you do not provide the contracted flexibility (eg if you're signed up to charge only within certain hours and you override this). At present, though, the amounts that you might make from providing flexibility via load control are limited. To that extent, the risk that you don't end up getting as much as you were hoping for is not a major concern. But make sure you understand the implications.

Interoperability

There are potentially various pieces of kit involved in providing flexibility– the automation system for smart appliances, the smart meter, the battery storage controller etc – and they may not all be readily operable with each other or with the kit of competitors. There have been examples of EV chargepoint providers, for instance, using different, bespoke equipment that is suitable only for their own solution, so the customer who wants to change the company that controls their chargepoint may face changing the chargepoint itself.

The PASs, the voluntary standards referred to under 'Standards' above, include requirements on the interfaces of energy smart appliances to help ensure they are interoperable. The government has committed to encouraging the take-up of the PASs and indeed said it will take powers to regulate energy smart appliances, setting requirements that underpin the principles of interoperability, data privacy, grid stability and cyber security.

Check if any ESA you're considering is compliant with PAS 1878. And whether there are adequate arrangements for tech updates.[xvi]

Complaints/redress

Licensed energy suppliers – such as EdF, EoN and others - are required to maintain and operate an effective complaints-handling procedure, and to inform customers about its existence. They must also be members of a qualifying alternative dispute resolution (ADR) scheme that provides consumers with an alternative to going to court: in retail energy, this is the Energy Ombudsman.

Retail energy aggregators who are not LESs are not subject to these requirements. So they may or may not have an effective complaint handling procedure, or voluntarily offer a route to alternative dispute resolution. You need to ask about this.

Contract terms

Some flexibility models will require long-term contracts that may be difficult for consumers to get out of, such as those where the provider owns the asset and needs a long-term commitment to be sure of making sufficient profit to justify their investment. But such contracts 'lock in' the consumer who may find at some point that the product is no longer suitable or their needs have changed such that they need to withdraw from the contract.

If the bundle includes electricity supply, the protection around existing electricity deals may provide the consumer with more protection than where it is not in the bundle. An electricity supplier can load-limit, for example, but this is tantamount to disconnection which for electricity supply is subject to a range of measures designed to protect the consumer.

5. Questions to ask

If you are tempted to become part of a smart flexible energy system, there's no substitute for doing your homework to be as sure as you can be that it's right for you. Here we've listed some of the questions to ask.

Equipment

What equipment, if any, is necessary?
Who provides it?
What does it cost to you?
Who is responsible for its repair and maintenance?

Does equipment comply with relevant standards?

Renewable energy systems and battery storage – MCS?
EV chargepoint – OZEV-approved?
Energy smart appliances – PAS 1878?

Can all the equipment work with other equipment?
For example, are smart appliances interoperable with different suppliers' smart meters?

Will any equipment interfere with anything in your home?

What if you want to switch electricity supplier and/or aggregator?
Your electricity supplier cannot oblige you to accept them as your aggregator but you should check if there are any issues if you subsequently want to switch eg are there any issues around compatibility of controls?

Who will the installer be notifying that these assets are in place?

Do you need to get any permission/notify anyone before signing up?

Contracts

Who are you contracting with?

Is it your energy supplier? Or an aggregator? Or another organisation?

Are they a regulated energy supplier?

Are they signed up to a Code of Conduct? Or PAS 1879-compliant? Or an MCS or OZEV installer?

Can they show you any independent reviews or testimonials about them in relation to this type of deal?

Are they asking you lots of questions – about your lifestyle, needs etc. - to make sure whatever they're offering is suitable for you?

Can they tell you how they make money on the deal? Is it commission-based? Or a cut of the reward for providing flexibility? Is it a reasonable cut?

What are the terms of any contract?

Are you tied into the contract for a minimum period? If so, for how long?

Are there penalties for quitting early?

Is there a 'cooling-off' or a trial period during which you can cancel without penalty?

Are there any costs to signing up or ongoing charges?

Who has control of elements of your electrical load?

If it's you, how do you get a signal to reduce or shift usage?

If it's a third party (you're allowing direct control of your appliances), can you override this control? How do you override? Is any override function easy to identify and use?

What happens if you do override (eg are there any penalties?)

Could your electricity be limited at certain times?

Are there time bands that tell you when you'll be liable to have supply reduced?

What are the rewards?

For example, do you get cheaper electricity at certain times?

Do you get direct payments or rebates for allowing access to your stored energy?

What is the estimated value of those rewards to you over a year?

Can they show you how they've calculated that estimate?

What are the terms of any Time of Use tariffs?

Are they dynamic or static? If dynamic, how are you notified of a change in price? And with how much notice?

If static, what are the time bands and prices?

How easy is it to switch away from a tariff?

How will your data be protected?

If things go wrong

Who is liable if things go wrong (particularly if more than one party is involved in the contract)?

Who is liable if an error somewhere along the line causes you to lose out financially?

Is there a complaints-handling system in place at any entity you are dealing with?

Is there someone you can turn to if you can't resolve an issue with a provider/installer etc., E.g., an Ombudsman or other non-court dispute resolution process?

Further information

On a smart, flexible energy system, from HM Government and Ofgem:
'Transitioning to a net zero energy system: Smart Systems and Flexibility Plan 2021'
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003778/smart-systems-and-flexibility-plan-2021.pdf

On smart meters, from Smart Energy GB:
https://www.smartenergygb.org/en/about-smart-meters/what-is-a-smart-meter

On 'smart' everything, including energy-smart appliances, from the Energy Saving Trust:
https://www.energysavingtrust.org.uk/what-smart/

On microgeneration renewable energy technologies, from the Microgeneration Certification Scheme:
https://mcscertified.com

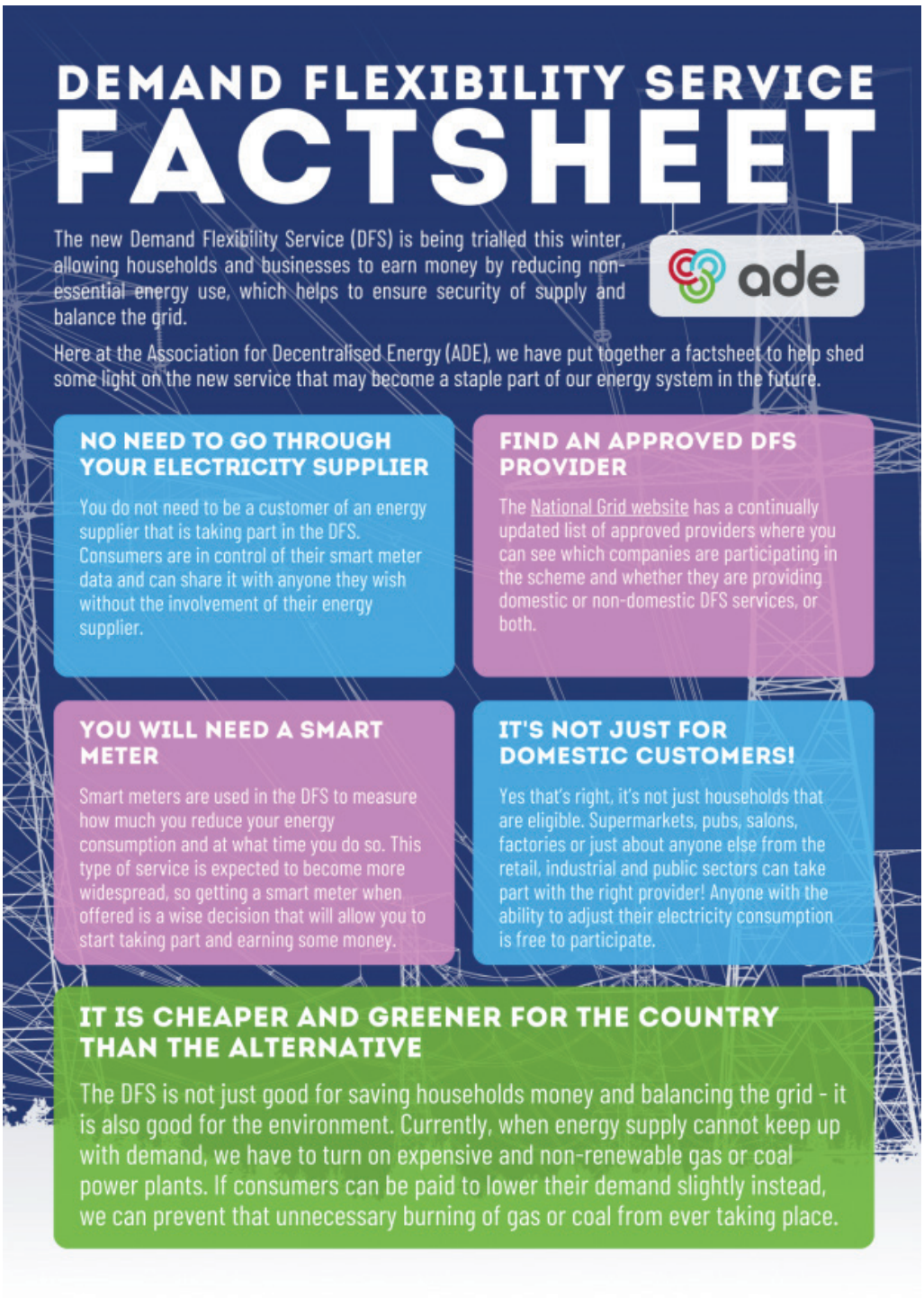
On domestic EV chargepoints, from EVCC (the Consumer Code for home chargepoints):
https://www.electric-vehicle.org.uk/pdf/ev_chargepoint_guidance.pdf

On EV tariffs, from Citizens Advice:
https://www.citizensadvice.org.uk/Global/CitizensAdvice/Energy/Take%20Charge%20-%20EV%20tariff%20report.pdf

On storage, from RECC/BRE National Solar Centre:
http://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/88166- BRE_Solar-Consumer-Guide-A4-12pp-JAN16.pdf

ANNEX: Demand Flexibility Service

The ADE's factsheet



HUGO, an app that invited users to participate in the DFS, explained their offer:

> *'Starting from November 2022, we'll notify you through an app alert the day before National Grid require the service, advising you of the time when you should reduce electricity demand the next day ("Demand Event"). We will also send another alert and/or SMS 1 hour before the Demand Event is to take place. We'll read your smart meter data to measure your normal historic consumption, and track how much you reduce demand during times when National Grid call on the service. Once we know how much Winter Cashback you have accumulated under The Service this credit will be added to the HUGO app for you to review. If you reduce your electricity demand during a Demand Event you'll earn money and will have helped keep the lights on across the UK.'*

Notes

i Or you, along with many others, might be asked to increase demand to 'mop up' surplus generation e.g. on particularly windy days. Octopus Energy customers in Scotland's Dumfries and Galloway, for instance, could sign up to the 'Windy Day Fund' to take part in 6 'Turn Up' events over March to May 2022, where they would increase their electricity use in a specified two-hour period above their normal usage at those times. If they achieved the target increase, all the electricity used in those two hours was free.

ii Source: Further Analysis of the Household Electricity Use Survey, Electrical appliances at home: tuning in to energy saving, Cambridge Architectural Research Limited, Element Energy and Loughborough University, November 2013

iii Dan Nicholls, MD of SNRG, quoted in Current+, 28.11.22

iv See Sunamp for more on heat batteries.

v Home charging is quicker and safer through a dedicated EV charging point than by simply plugging the EV into a domestic 13 Amp socket outlet.

vi On occasion, a new electricity supply will be required where the existing supply lacks sufficient capacity, or where the required vehicle charging position is remote from the house.

vii V2G chargers are not yet readily available to purchase in the UK and Nissan is currently the only EV manufacturer that offers V2G-compatible models that use CHAdeMO charging protocols. Domestic V2G is still in its infancy here, much of it the subject of trials. Recently, though, several energy suppliers have teamed up with car manufacturers to offer combined car leasing and energy plans that include bi-directional charging.

viii At present, DNOs generally prefer to procure flexibility services through third party aggregators and other intermediaries rather than seeking direct control. All the DNOs run local flexibility markets eg Western Power Distribution's 'Flexible Power Portal' that enables procurement of flexibility services for its networks

ix From Ofgem's website.

x Rates as specified on Octopus's website at the time of writing (January 2023).

xi For example, domestic customers are not required to give any form of notice when terminating a fixed term supply contract with a licensed supplier. Any termination fee payable must be proportionate and not exceed the direct economic loss to the supplier resulting from the termination of the contract. Termination fees are unable to be applied in certain circumstances, including where the contract is of an indefinite length or the customer has received notice of an increase in their charges for supply.

xii BEIS, Third-party intermediaries in the retail energy market, Call for evidence, 2021

xiii The Future of Electric Vehicle Smart Charging, Energy UK

xiv Research suggests people are actually pretty inflexible in terms of when they do certain activities such as cooking meals, putting the lights on and watching TV, but more flexible about when they put the washing- machine and dishwasher on.

xv A project to study ToU tariffs conducted by British Gas and Northern Powergrid found that while 60 per cent of participants benefited, the other 40 per cent paid more than they would have done otherwise. More automation might have reduced this effect but brings its own concerns. See: Customer-Led Network Revolution (2014), Progress Report 7.

xvi Which? recently reported that several brands of smart appliances did not offer long-lasting software support. See https://www.which.co.uk/news/article/smart-products-abandoned-by-big-brands-after-just-two-years-aqf4o6V6VlE3

For further information please visit
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