Agile Octopus

A consumer-led shift to a low carbon future

octopus energy

Our smart energy system is taking shape. Not only will it deliver cheaper energy for consumers it will also help us meet our climate change commitments by ensuring our energy use is more flexible and efficient and so the electricity system can accommodate more renewable generation.

Our recently updated smart action plan outlines the benefits a smarter system will bring to consumers, the energy industry and wider economy - worth up to £40 billion over the next few decades - all the while creating high quality jobs and UK Intellectual Property. We've passed the half-way mark in delivering this plan and we're investing a further £70 million into smart energy innovations to overhaul our energy system.

Smart meters are the key to unlocking these benefits which is why we are committed to all homes and businesses being offered a smart meter by the end of 2020. They are the key link in the chain, ensuring our cleaner, smarter energy future works for consumers, putting them back in control of their household energy bills, and giving them access to innovative products and tariffs such as those that reward consumers who use energy at off-peak times.

Products like the time-of-use tariff explored in this report are giving consumers more information about their energy use, and it's exciting to see real case studies of people changing their behaviour, and saving energy – and money – as a result.

Combined with smart charging, for example, these tariffs enable electric vehicle owners to charge their cars during cheaper periods and save money. This is a game-changer for the increasing number of electric vehicle owners on our roads and part of our plans to be world leaders in EVs. As well as rolling out smart meters across the UK, we're requiring all new electric vehicle chargepoints to have smart functionality and investing £400 million to accelerate the deployment of charge points, ensuring EV drivers can charge on our motorways and petrol station forecourts, as well as plugging in at home. Lowering emissions, cutting costs, and giving households more control – exactly what the smart revolution is all about.

With Government delivering the framework, it's for the private sector to develop the smart products and services which will bring the smart system to life, and I'm delighted that Octopus is playing its part.

The Rt Hon Claire Perry MP,
Minister of State for Energy & Clean Growth

Agile Octopus is the first smart time of use tariff of its kind, and the only one to be tested in-market.

There has been a long-held belief that it is very difficult to change consumer behaviour in energy. After all, most customers don't switch suppliers even when they could save hundreds of pounds.

Octopus likes to challenge long-held beliefs. We know people don't act as hyper-rational economic bargaining units, but respond to a wide variety of factors like whether a decision is easy, makes sense, has immediate impact or makes them feel good.

This report contains the first set of real world findings from a half-hourly time of use tariff, and the results are exciting. Agile has shown that by helping people make decisions that feel natural to them, energy consumers do change their behaviour.

People totally understand that price varies with supply and demand - whether it be peak and off peak pricing in transport and hotels, or seasonal pricing in supermarkets. It's therefore bonkers that suppliers do not give consumers any reason to charge a car when there is ample cheap electricity on the system, or to do their washing when the sun is shining.

We built Agile to help consumers take advantage of this and, in doing so, provide huge benefits to the energy system as a whole.

Empowering citizens to shift their electricity use away from peak times will be critical to avoiding a £40bn bill for upgrading energy infrastructure. As we decarbonise, shifting consumption times will also enable more rapid uptake of electric vehicles and renewable generation.

Now we've demonstrated that the technology works, we welcome the opportunity for more consumer and market-led approaches to get the most out of our grid, rather than traditional command-and control mechanisms.

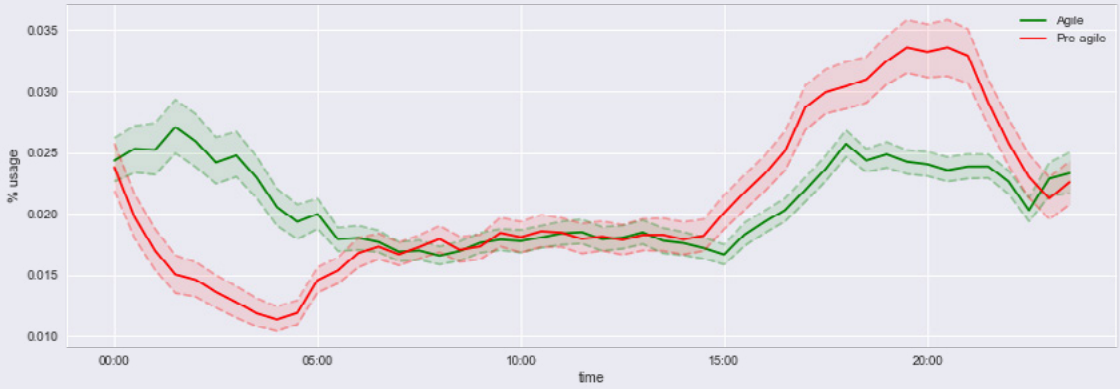
Well done to policy makers and regulators for making the smart grid possible, and enabling companies like ours to deliver innovation like this. Grasping the opportunities of disruptive business models and breakthrough technology will enable energy consumers to reap the rewards of progress they have benefited from in so many other consumer markets.

Greg Jackson,
Octopus Energy CEO

Agile Octopus: paving the way to a low carbon future

The first half-hourly time of use tariff demonstrates significant impact, with consumers shifting their consumption away from peak times - reducing the strain on the system, lowering carbon emissions, and saving money.

- The First results from our Agile Octopus half-hourly time of use tariff shows consumers shifted electricity consumption out of peak periods by 28%
- Engaged consumers reduced their consumption at peak times by 15.62kWh per month - equivalent to 11 washing cycles - and saved 4.5kg carbon dioxide per month
- Electric vehicle (EV) drivers reduced peak consumption even further, by 47%
- 95%* of consumers paid less than they would on Octopus's cheapest fixed tariffs, and all paid a lot less than a typical legacy supplier standard variable tariff
- The average Agile customer would save £188 per year compared to legacy standard variable tariffs, and £45 per year compared with Octopus Energy's 12 month fixed tariff



Agile customers shifted their electricity use from peak to off-peak times, reducing the burden on the grid.

** 5% of customers paid £2/mth more than previously at the 95% confidence level.*

The challenge: Engaging consumers with energy

At the moment, consumers engage very little with their energy. For example, in spite of typical savings of £200 - £300 per year for those who switch their energy supplier every year, industry estimates show that only 5% of people opt to do so. This contradicts the common sense assumption that customers are more likely to change their behaviour when financial incentives are larger.

Getting consumers to change their behaviour therefore cannot be purely about cost. The 5p 'plastic bag tax' shows that it's as important to provide a compelling 'prompt' for consumers as it is savings. We therefore wanted to show that smart time of use tariffs can be the 'plastic bag tax' breakthrough for energy tariffs, providing a 'nudge' that helps shift consumer behaviour, while also delivering savings.

As well as bill payers' wallets, lack of consumer engagement is a problem for the energy system as a whole. As we decarbonise, the energy system is being put under greater strain - both through moving from carbon intensive forms of generation to renewables, and through huge consumer uptake of electric vehicles. To ensure there's enough electricity to go around when everyone wants power at peak time, we are either going to have to spend billions reinforcing the system, or get people to spread when they consume electricity.

To achieve the latter, getting consumers to engage with their energy use is imperative. Encouraging consumer engagement was the rationale behind the Government's smart meter rollout. Smart meters are designed to unleash the benefits of smart time of use tariffs, like Agile. However, up until now nobody has developed the technology to do so. We therefore decided to see if it was possible to show that consumers would engage with their energy if they were given the tools to do so in a real market situation.

Launching Agile Octopus

In February 2018, Octopus Energy launched the first smart time of use tariff, Agile Octopus.

Unlike other suppliers, Octopus Energy's systems have been designed for smart time of use tariffs, unlocked by smart meters and half hourly settlement.

We therefore wanted to create a tariff, Agile, that proved it was possible to drive positive consumer behaviour change in real-life context.

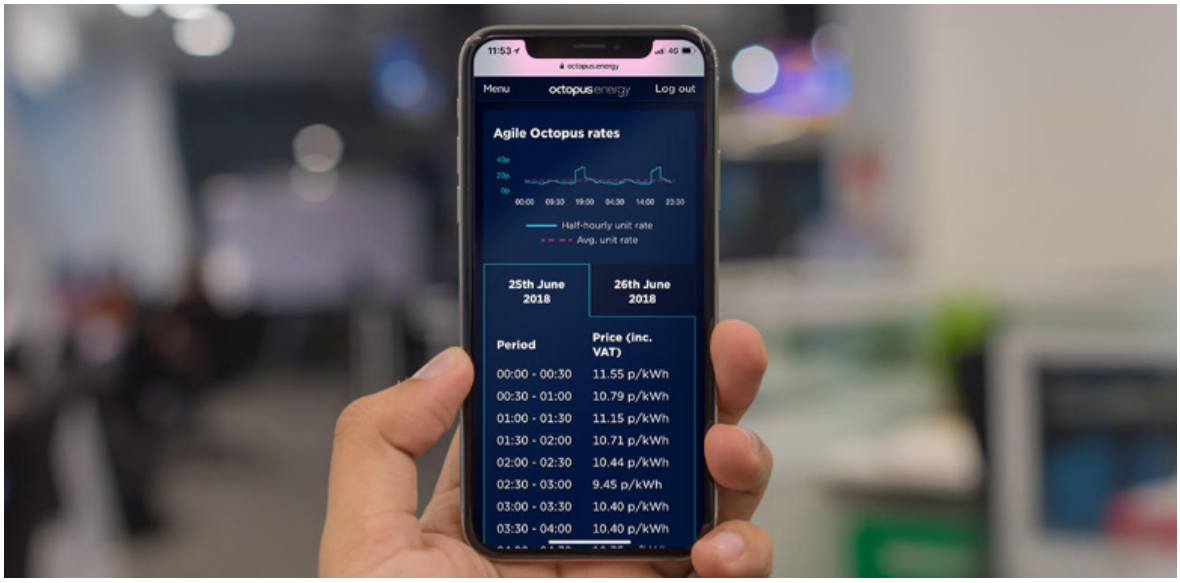
In doing so, we hoped to show that:

- People would change the way they consumed electricity after moving from a non-time of use tariff to Agile;
- Once on Agile, consumers would save money by shifting their electricity use away from peak times; and
- We could ensure that customers that did not change their behaviour would not be detrimentally affected

How does Agile work?

Smart meters allow customers' electricity use to be calculated and billed in half hour periods, and so open the possibility for those half hourly prices to reflect the real price of electricity as it changes throughout the day.

Agile's half-hourly prices reflect the real prices of the electricity that Octopus buys a day ahead, which are made up of wholesale costs and extra charges for things like use of the grid.

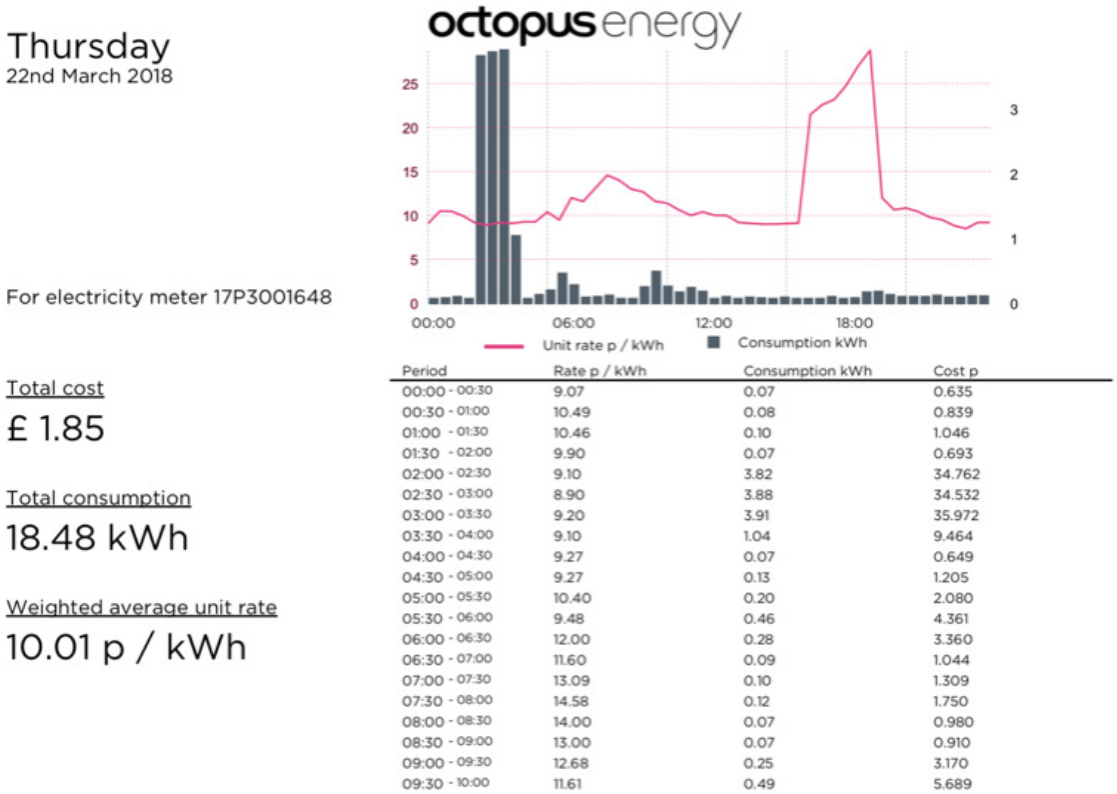


Agile customers are able to check energy prices for the following day online and through the Octopus app at 4:30pm every day. This allows them to see when the cheapest windows will be the next day, giving them control over their consumption and a better idea of their daily spend.

As a simple rule of thumb, because there is always a large peak between 4pm and 7pm, all Agile customers need to do is adjust their consumption away from that time to benefit overall from the tariff.

While extreme price spikes are rare and short-lived, typically lasting 30 minutes to an hour, they do happen. To protect customers from this, Agile includes Price Cap Protect, ensuring customers never pay more than 35p per kWh.

At the end of the month customers receive a statement. The front page looks like a usual bill, but for those who like more detail there is also a full line-by-line breakdown of customers' daily consumption by each half hour, summarised for each day with a graph and their average price per kWh.



Thursday
22nd March 2018

For electricity meter 17P3001648

Total cost
£ 1.85

Total consumption
18.48 kWh

Weighted average unit rate
10.01 p / kWh

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Period	Rate p / kWh	Consumption kWh	Cost p
00:00 - 00:30	9.07	0.07	0.635
00:30 - 01:00	10.49	0.08	0.839
01:00 - 01:30	10.46	0.10	1.046
01:30 - 02:00	9.90	0.07	0.693
02:00 - 02:30	9.10	3.82	34.762
02:30 - 03:00	8.90	3.88	34.532
03:00 - 03:30	9.20	3.91	35.972
03:30 - 04:00	9.10	1.04	9.464
04:00 - 04:30	9.27	0.07	0.649
04:30 - 05:00	9.27	0.13	1.205
05:00 - 05:30	10.40	0.20	2.080
05:30 - 06:00	9.48	0.46	4.361
06:00 - 06:30	12.00	0.28	3.360
06:30 - 07:00	11.60	0.09	1.044
07:00 - 07:30	13.09	0.10	1.309
07:30 - 08:00	14.58	0.12	1.750
08:00 - 08:30	14.00	0.07	0.980
08:30 - 09:00	13.00	0.07	0.910
09:00 - 09:30	12.68	0.25	3.170
09:30 - 10:00	11.61	0.49	5.689

This helps drive customer engagement by allowing them to see how their behaviour affects the cost of their electricity.

Findings

Consumers will engage with their energy if given the tools to do so

After being on Agile for six months, customers adjusted the way they consumed electricity - reducing their usage during peak hours and moving their consumption to off-peak times when prices were lower.

28% showed a statistically significant change in peak time usage, dropping peak usage from 16% to 11.5% of their daily consumption. This behaviour change reduced peak demand by an average of 15.62kWh per month.

Overall, peak use was reduced by 28.19%, suggesting that wider uptake of smart time of use tariffs could significantly shift overall demand at peak times, which would bring huge system benefits.

Consumers who engage more can save more money

We found that Agile customers who engaged more, saved more money, with the most engaged 25% of customers saving £91 compared with an Octopus 12 month fixed tariff, and £229 compared with the average large legacy supplier standard tariff.

In particular, electric vehicle drivers - who have large, shiftable electricity loads - changed their behaviour the most and achieved the greatest savings, with the average EV driver saving £132 compared with with an Octopus fixed tariff.

The most active Agile EV customers dropped the proportion of power they used in the peak period by a massive 47%.

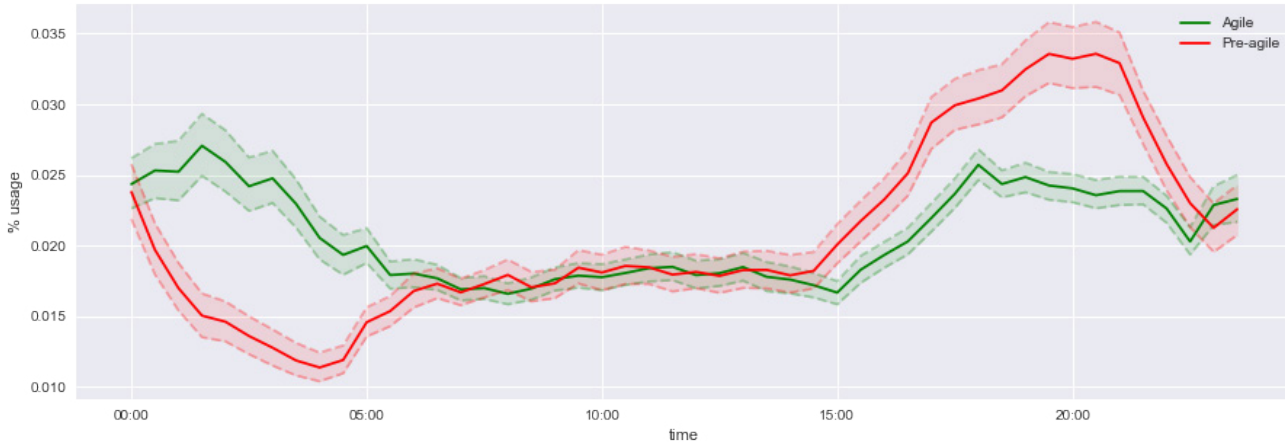
Even consumers who don't engage are still better off than on a legacy supplier SVT or even an Octopus fixed 12 month tariff

On average, customers whose engagement went down or stayed the same still benefited. The least engaged 25% of the study broke even (with a saving of 80p) compared with an Octopus fixed tariff, and saved £170 compared with the average large legacy supplier standard variable tariff (SVT).

Results in depth

Consumers trialling Octopus Energy's Agile tariff have significantly shifted their electricity consumption away from peak periods

The graph below shows the electricity usage of the entire cohort by percentage in each 30 minute block. The red 'before' line closely resembles the average profile of standard customers, while the green 'after' line is flattened by comparison, showing reduction in peak usage and an increase in usage during the cheap overnight period.



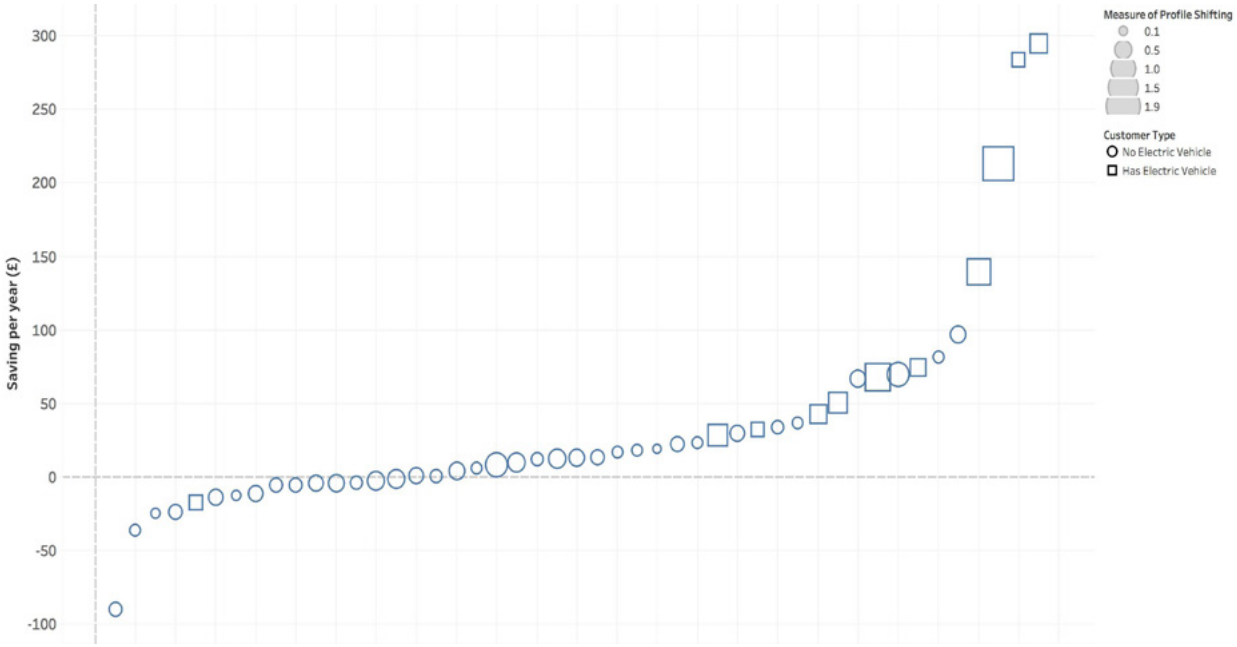
Dotted lines show the range of variation of usage. Bootstrapping methods have been used to estimate the variances in statistics to provide 95% confidence intervals.

The graph shows a clear picture of customers shifting their behaviour to reduce their usage during peak hours, and moving their load to times when prices are lower, with the peak hour seeing particularly high reduction.

We found that 28% of Agile customers showed a statistically significant change in peak time usage, and overall peak use was reduced by 28.19%.

Those who engaged more benefited from reduced bills

The chart below shows each Agile customer ranked by money saved per year, compared with if they had been on Octopus Energy's 12 month fixed tariff. The size of the shape indicates their level of engagement - how much each customer changed their behaviour from before they were on Agile compared with six months usage on Agile. You can see that all those who display behaviour change have saved money, while all those who have not saved money have not changed their behaviour.



The square shapes are those customers who are EV drivers. It is noticeable that these show the greatest savings, and the greatest behaviour change. This makes sense – EV drivers have large, shiftable loads and so are the biggest burden on the grid at peak times and have the most to gain by shifting their use.

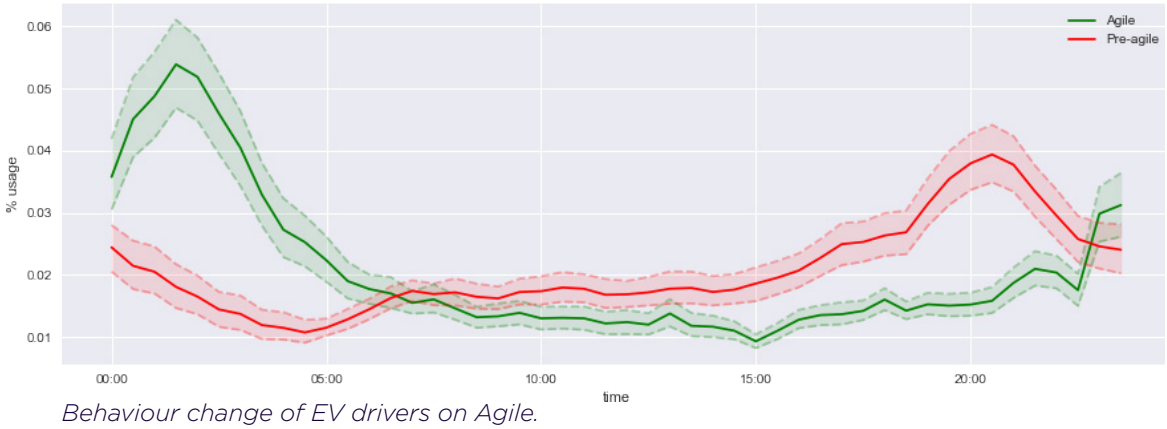
The shape of the graph is skewed above the 'zero' line showing that most people on the tariff saved money. The majority of those who did not save money saw less than 80p per month difference with the Octopus 12 month fixed tariff – still saving £188 per year compared with a typical legacy supplier SVT.

Some customers have saved money without changing their behaviour much, because they were already using electricity outside of peak hours before they went on the tariff – imagine, for example, a working family who already eat after 7pm and use washing machines later in the evening.

Expressed differently, the table below shows the money saved by various cohorts of Agile customers.

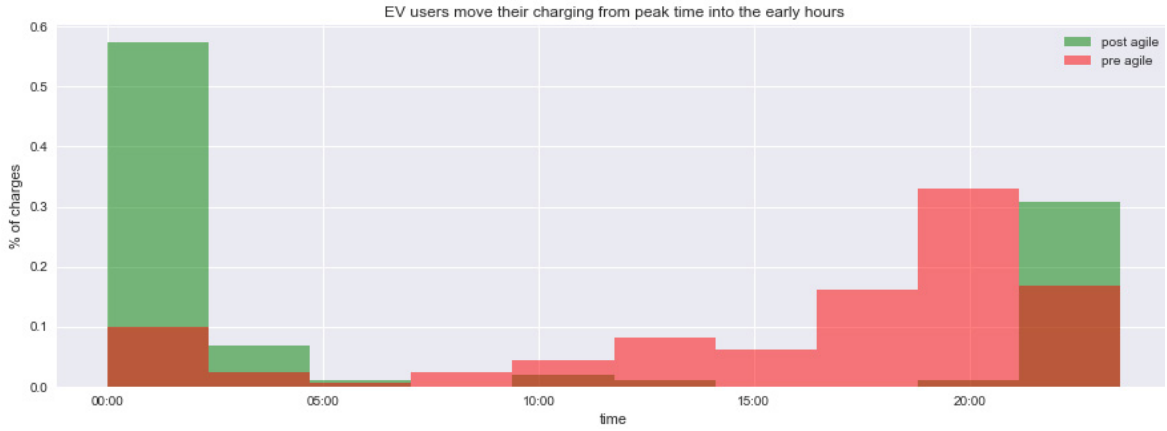
Agile customer cohort	Annual savings vs Octopus 12M Fixed	Annual Savings vs legacy supplier average SVT
Full sample	£45	£188
Most engaged 25%	£91	£229
Least engaged 25%	£0.80	£170
EV drivers	£132	£338

EV drivers demonstrate the greatest sensitivity to price signals



Behaviour change of EV drivers on Agile.

Potentially of greatest significance to immediate questions of policy and regulation are the results we have seen from EV drivers. The graph above isolates the data from the customers we have identified as EV drivers, showing a very clear picture of behaviour change when compared to the sample as a whole.



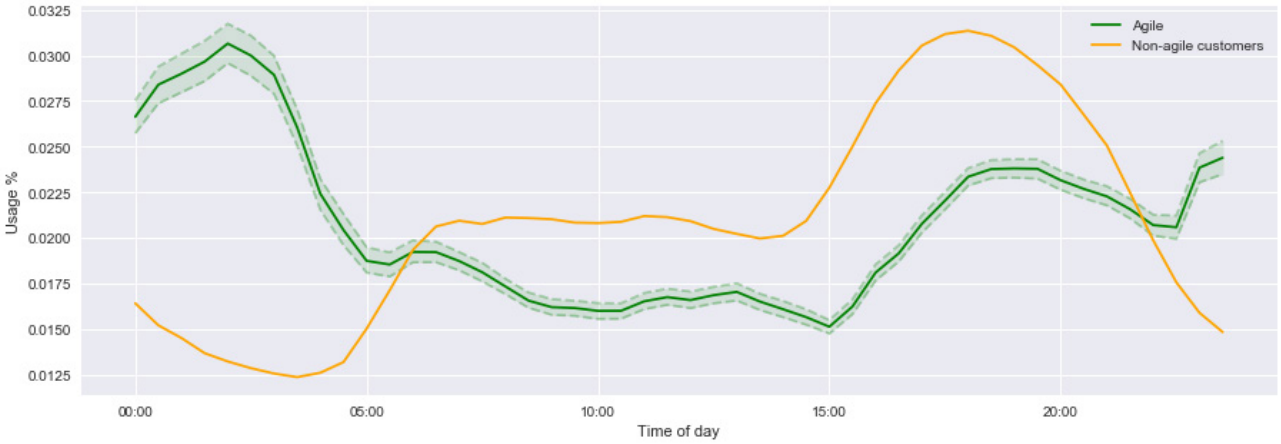
Movement of the EV charges into off-peak

Looking at the data another way, this graph shows the movement of charging periods out of peak times .

For EV customers only, 45% showed a statistically significant change in peak time usage and the most active Agile EV customers dropped the proportion of power they used in the peak period by a massive 47%.

The overall pattern is also reflected when you compare all Agile customers with our smart meter customers on standard tariffs

To ensure our analysis of customer behaviour change was robust, we only studied customers for whom we had sufficient 'before Agile' and 'after Agile' smart meter data. However, comparing the full Agile customer base with all of our 'non-Agile' customers for whom we have smart meter data shows a similar difference in shape, giving us high confidence that the pattern will be replicated as we grow the number of customers on Agile.



Comparing all Agile customers, including those for whom we don't have 'before' and 'after' data, displays the clear contrast between Agile customers usage and non-Agile customers.

Case Study: Alex and Justin Emery, Nottinghamshire

Justin supplies ventilation and heating systems to the agriculture industry, and was spending £700 per month on diesel for his car. He realised it would be cheaper for him to drive an electric vehicle, and so he bought a Tesla.

Before joining the Agile Octopus tariff, Alex and Justin tried to use their dishwasher and washing machine during sunny periods when they could get cheap energy from the solar panel on their roof. However, Justin would still charge his car at service stations because it worked out cheaper than home charging with their previous supplier. But once they installed a Tesla Powerwall home battery, they decided to do more to optimise their electricity use across all their home technology and switched to Agile.

Now, Justin sets the timer on his Tesla apps to charge the car and the battery at off-peak when prices are cheap. He and Alex follow a general rule of thumb not to use the dishwasher or washing machine during peak times, 4-7pm, and instead use the battery for any electricity they need. While Justin finds all the technology interesting, he says the intuitive website and reliable updates make it an easy customer experience that anyone could use. Since joining Agile, Alex and Justin have saved £67.63 on their energy bill

Next Steps

While these early findings are encouraging, we want to see smart time of use tariffs like Agile galvanise more positive behaviour change and shift demand away from peak times, providing greater benefits to even more consumers and the system. We plan on:

Expanding the sample

The initial findings demonstrate large net consumer benefit and very little downside for any customers. Next, we will expand the cohort to include much larger numbers of participants and from a broad spread of demographics.

Using A.I. to help customers when they're not making the most of Agile

Data analytics of Agile customers' electricity usage can be used to help consumers make the most of the tariff. By analysing when consumers are using electricity, we can help them save money by sending them push notifications advising them of when the savings are greatest. And, if the data shows that they may be better served by another tariff because they consistently need to use electricity at peak times, we will advise them on tariffs that will suit them better.

Building for products that can automatically interface with smart time of use tariffs to optimise home energy use

Smart home products can help unleash the benefits of smart time of use tariffs like Agile, making life as easy as possible for electricity consumers.

In May, we invited businesses including Google, Tesla and National Grid to a hack day to develop products designed to interface with Agile. Results included programming a command for an Amazon Alexa to turn on household appliances when electricity was cheapest, and enabling consumers to buy and sell power to and from the grid by using smart electric vehicle charging.

We plan to enable more smart tech to harness the Agile tariff so that people's homes and businesses can be optimised to automatically use electricity off-peak.