The impact of domestic demand side response on consumers and their energy behaviour

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Six minutes
Customers desert the Big Six in great green energy switchover

Exclusive: Tens of thousands of families reject leading power providers that rely on fossil fuels

Tom Swarren | @BenaderTom | Thursday 3 September 2015 02:12 | 2 comments

Big Six energy suppliers raise prices by up to £76 a year – but switching could save you £389

Profit margins at big six energy firms hit highest level on record

Average pre-tax margin rose to 4.48% in 2016 despite falling wholesale and environmental costs, says Ofgem

Ex-energy chiefs warn Big Six to ‘adapt or die’

Are the Big Six suppliers losing their grip on the UK energy market?

Just six energy suppliers monopolised the UK energy market after the gas and electricity networks were privatised, but over 60 smaller rivals have since emerged as effective competition. Is the stranglehold of the Big Six energy suppliers coming undone?

Ex-energy chiefs warn Big Six to ‘adapt or die’

Big Six energy companies rank lowest in Which? customer satisfaction survey

Big energy firms make £1bn profit despite loss of millions of customers

Ofgem says big six electricity and gas suppliers charged higher prices to consumers who failed to switch
UK Energy Emissions

- Transport: 26%
- Energy Generation: 25%
- Business: 17%
- Residential: 14%
- Agriculture: 10%
- Waste Management: 4%
- Other: 4%
• Domestic & business energy supplier

• Launched to market in 2016, and grown rapidly since

• Highly tech-focused, with proprietary systems

• 100% green: all energy we supply originates from renewable sources

• Customers are at the heart of everything we do
Engaging energy customers
Leicester Business Power

Our Leicester Business Power Tariff

SMEs spend an average of six minutes a year thinking about energy. We’re determined to change this, so we set about creating a regional tariff that helps bring a sense of community to the energy we supply. As our second home, Leicester was a natural place to start for us!

Here’s what the tariff offers:

- Powered by great value 100% renewable electricity, sourced from our Seaton Road solar farm in Uppingham, Leicestershire

- For every business that signs up, a £25 donation will be made to Leicester Charity Link

- For every 25 business sign ups we’ll also plant 25 trees in the local area

- Tools to help business shout about their commitment to green energy, such as a certificate, digital logos and window stickers, plus an annual report on how much carbon has been offset by the business going green

- Tariff identity designed by local school children from Spinney Hill Primary School

We launched the tariff at the end of June in the King Richard III Visitor Centre, the first business to sign up to the tariff. The event included speeches from Greg and Zoisa, and Directors from the KRIII Centre and Charity Link.

We took elements from our five winning children’s designs and digitised them. They appear on the website and will feature heavily in all future marketing materials.

Key partnerships:
- East Midlands Chamber of Commerce
- Leicester Mercury
- Leicester City Council

Members of the team headed to Seaton Road solar farm the day before with a drone and took footage used in the launch – whilst being very lucky with the weather!
Redacted
"Of course... size will depend on your consumption."

"I knew it was called Octopus Energy, but this is ridiculous!"
The Agile Tariff
What underpins energy pricing?
Typical breakdown of the unit rate

- Wholesale: 45%
- DUoS: 22%
- BSUoS: 1%
- RO: 14%
- FIT: 4%
- CFD Supplier Levy: 3%
- CM Supplier: 4%
- TNUoS: 7%
Daily Unit Rate Fluctuation

Half-hourly period
Demand Profile – Different Classes
Domestic Daily Demand

% Usage

Half-hourly period

Usage:
- 0.000% to 0.500%
- 0.500% to 1.000%
- 1.000% to 1.500%
- 1.500% to 2.000%
- 2.000% to 2.500%
- 2.500% to 3.000%
- 3.000% to 3.500%

Half-hourly periods:
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- 10 to 12
- 12 to 14
- 14 to 16
- 16 to 18
- 18 to 20
- 20 to 22
- 22 to 24
- 24 to 26
- 26 to 28
- 28 to 30
- 30 to 32
- 32 to 34
- 34 to 36
- 36 to 38
- 38 to 40
- 40 to 42
- 42 to 44
- 44 to 46
- 46 to 48

Graph showing domestic daily demand with usage percentage against half-hourly period.
Why is half-hourly important?

Half-hourly period

% Usage

Average Commercial | Restaurant Actual | Bakery Actual

Half-hourly period
How does Agile differ for the customer?

- Given daily updates on their half-hourly energy pricing, tied to wholesale rates for the next 24 hours.
- Customers are able to view their usage data and consumption patterns, helping them plan when to use their energy.
- Customers pay a 21p standing charge which covers the fixed costs of supply.
- No exit fees or contracted periods.
“Plunge Pricing pays you to take excess energy off the grid
Across the UK, whenever more electricity is generated than consumed, energy prices fall – sometimes to the point where prices drop below zero, and suppliers are paid to take energy off the grid.

Agile Octopus introduces Plunge Pricing – a world first that lets you take advantage of these negative price events, and get paid for the electricity you use. Receive SMS alerts whenever prices drop below zero, or use our API to program your smart devices.

Over the last 12 months, unit prices dropped below 2p / kWh 31 times and below 0p / kWh 4 times.”
Price Cap Protect keeps you safe from surge prices

When more electricity is being used than generated, wholesale prices rise. While price spikes are short-lived, typically lasting 30 minutes to an hour, they do happen. Agile Octopus includes Price Cap Protect, which ensures you’ll never pay more than 35p / kWh for your electricity, guaranteed.
Working 9-5

Saving vs Big 6: £110 a year

Half-hourly unit rates over the last 12 months, averaged across all regions (including VAT).
Calculating customer savings

\[
\text{Daily Saving} = \sum_{i=1}^{48} U_i (r_{\text{average}} - r_i)
\]

where:

\(i\) = settlement period (half hour)
\(U_i\) = usage in half hour
\(r_{\text{average}}\) = average 'big 6' unit rate
\(r_i\) = Agile half hourly unit rate

*assuming consumption behaviour doesn't change*
Night Chargers

Saving vs Big 6: £180 a year

Half-hourly unit rates over the last 12 months, averaged across all regions (including VAT).
Family Home

Saving vs Big 6: £55 a year

Half-hourly unit rates over the last 12 months, averaged across all regions (including VAT).
Will customers change their usage pattern on Agile?

If not, how could we help them to do so?
So how can we build on the Agile platform for everybody?
Not so smart meters: How energy readers cut bills by just £11-a-year
Octopus Go Tariff

- Electric vehicle charging up to 70% cheaper than typical Big 6 rates
- 10 times cheaper than the same mileage for fossil fuels
- Four-hour night rate at 5 p/kWh
- Smart chargers to automatically charge during the cheapest period (unless overridden)
Redacted
Start building the smart grid for real

Octopus Energy has released an API for its groundbreaking Agile Tariff – a green energy tariff which varies with the wholesale price every half hour.

For the first time, this tariff allows consumers to shift demand in response to realtime energy prices – a critical part of moving to a more sustainable future.

We’re inviting engineers, data scientists and designers to help build the future.
Some ideas...

- Optimising charging for EVs
- Using pricing to optimise charge and discharge timing for home batteries
- Analysing potential savings for DNOs in upgrade costs
- Modelling potential savings for the fuel-poor
- Switching time of use on high load appliances
- Making lifestyle recommendations to maximise savings
- Modelling ideal electric heating patterns
- Using machine learning to identify household energy patterns

Decarbonisation will grow electricity demand dramatically

With a need to electrify transport and heating and an insatiable appetite from consumers for ever more sophisticated consumer tech in the home, industry and business must constantly iterate to develop ever more innovative propositions.

Balancing the grid for renewables

The UK has signed up to ambitious decarbonisation targets, but renewable power puts unusual pressure on the grid - a sunny day might deliver a surge in solar generated power. To maintain stability, we must look to more innovative ways of balancing demand.

Commercialising the smart meter roll out

With government targets to have a smart meter in every home by 2021, the focus must be on unlocking their potential to drive value for both consumer and business. The commercial opportunity to link smart, IoT, business and consumer opportunities remains a critical question to answer if we are to deliver true value.

The hackday will feature

- **Octopus Agile API**
  Our API enables developers to read both current and historical prices (and a whole host of other detail) - opening up the world of the smart grid, enabling devices to optimise time of use and to provide deep insight and analysis.

- **Real (anonymised) usage data**
  With anonymised real world half-hourly smart meter data from thousands of households and a year’s worth of historical Agile prices to allow teams to identify patterns, qualify ideas, train machine learning engines and quantify potential economics.

- **Octopus developers & designers**
  Our team will be on hand all day to help with any questions or give hands-on technical and design help.

Judges

- **Google**
  Biggest impact
  We’re all trying to make the world a better place, so let’s do it right. What can you come up with that will have the biggest impact to the most (or most deserving) people.

- **Tesla**
  Technically interesting
  The best kind of interesting. Wow our judges with your creative use of data and tech to create something that will leave them scratching their heads.

What they’ll be looking for

- Decarbonisation
- Agile
- Real usage data
- Developers & designers
- Technical and design help

Decentralised grid will grow dramatically

With a need to electrify transport and heating and an insatiable appetite from consumers for ever more sophisticated consumer tech in the home, industry and business must constantly iterate to develop ever more innovative propositions.
Hackday Results
A three-way dream team of the government-backed Energy Systems Catapult, Daikin, and PassivSystems, the team designed a fuel switching technology for heat pumps using the Agile Octopus open API.

They took home the Hack Day prize for **Biggest Impact**, offering a solution that pioneered the most affordable way of heating social housing, with prices to match, or even beat, gas heating.

See the video played in the presentation at: https://www.youtube.com/watch?v=ZtOe5nFmQ_w
National Grid Ventures focused on a real world solution, by translating the Agile Octopus API into an easy programming language called Node-RED, so that non-coders could easily play around and benefit from this new technology.

See the video played in the presentation at: https://www.youtube.com/watch?v=VhSzEaiqNvg
Start-up business, Ecopush, were named the **Most Technically Interesting** of the day, with their Amazon Alexa-based solution. This super-smart hack allowed customers to say “Alexa, turn on my tumble dryer when it’s cheapest/greenest/right now”.

They also came up with a simple robotic button which would turn any home appliance into a smart device for very little cost.

See the video played in the presentation at: https://www.youtube.com/watch?v=NCzYVeI_Acc
DIGITAL

Hacking the future of energy

What happens when you give teams of developers access to flexible electricity tariff and smart grid data, and tell them to come up with innovative ideas for the electricity system of tomorrow? Marc Height found out.

‘Where is Greg Jackson? It’s time to charge your Tesla.’

So (repeatedly) said a circular robot hoover, spinning around tables at Westminster’s Sky Loft, through a small speaker that had been glued to its back. This rather haphazardly constructed, sort of chimeric demonstration device was put together by a team of developers at a ‘HackDay’...
IoT?
Deeper granularity?
DMU!