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.

Head scratching at the HackDay

'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' organised by Octopus Energy – demonstrating that with some clever coding, household devices in the future could respond to regular changes in the cost of electricity by turning on and off, or in this case, pestering their owners to take advantage of cheap power.

Greg Jackson is the CEO and Founder of Octopus Energy (he does have a Tesla), and the somewhat crude, amusing, and rather tongue-in-cheek hybrid hoover was quickly created by the start-up company Ecopush early in the HackDay – a competition for energy and tech companies to explore energy solutions that could be unlocked via Octopus' new 'Agile' energy tariff.

The tariff is the 'world's first' to respond to half hourly electricity price fluctuations, which allows customers to take advantage of low wholesale power prices and even make money from using electricity at times of negative pricing on the grid (when renewable output is high and demand is low).

Ecopush, which had made the mobile pestering device in the morning (perhaps part of a wider game plan to distract the other HackDay teams) ended the day by presenting a tumble dryer (which one of the Octopus team had gone out and bought for them from Argos that day) that had been modified with a mechanical button to turn it on or off depending on the price of electricity, and which could talk.

The team had enabled Amazon's virtual assistant, Alexa, to tell potential Agile users what the price of their electricity was and when it changed, through an Amazon Echo that was twinned with the tumble dryer.

'What we've done is build an interface that allows you to talk to the internet and return information about current electricity prices in the UK, and the carbon intensity of that electricity,' said Tom Berman from Ecopush. The use of the robot button enables the ability to 'retrofit even non-internet connected devices and add intelligence to make them aware of price and environmental impacts,' he said.

Opening up data

Octopus' HackDay was dreamed up to allow organisations in the utility, tech and innovation sectors to help 'build the future of energy'. It was made possible by Octopus Energy releasing an 'API' (application programming interface) for its Agile tariff – essentially allowing coders and developers access to the building blocks and data behind the tariff, to enable front-end applications to be created on top of it.

This means that third party systems or devices can be integrated freely with the API (which is available to anyone online) – allowing devices from heaters and washing machines to electric vehicles to optimise their operation for when electricity prices are the cheapest, and to respond to fluctuating energy prices.

Octopus enabled developers to look at current and historical half hourly electricity prices in the UK, and also gave them access to real world, anonymised smart meter data from the company's customers – to allow teams to identify patterns and potential economics around electricity use, and to develop their ideas.

Twenty-two teams competed in the HackDay, and they presented their ideas and solutions in the evening to judges from Tesla, National Grid and Sky News.

Wandering around the tables during the day offered an insight into this hubbub of brainstorming, head scratching and blue sky thinking about the possibilities a truly flexible energy future could bring.

Ideas

Alongside Ecopush, which went on to win the 'Technically Interesting' award by essentially allowing customers to ask: 'Alexa, turn on my tumble dryer when electricity is cheapest (or greenest)', other teams were looking at solutions from clever electric vehicle charging to optimising heat pumps.

Disruptors to watch

As well as Octopus Energy, other energy start-ups are pushing innovation in this space and keeping traditional suppliers on their toes. Here are a few more to keep an eye on.

Limejump
Picking up the accolade this year of a Bloomberg 'New Energy Pioneer' (the only UK-based company to be so), Limejump uses proprietary cloud-based software to link distributed, flexible generation and consumption assets and form a 'virtual power plant'. It does this by acting as an aggregator that connects data capabilities and renewable generation to the grid – thus optimising the value of distributed energy assets, and enabling them to more easily access power purchase agreements, and demand response and Capacity Market payments.

At the time of writing, a countdown on the company's website, set to expire on 27 June, is teasing 'something very new'. 'Get ready to change the game, again' the text under the digital ticker says. By the time you read this, who knows, the game may have indeed been changed.

OVO energy
An independent UK supplier that began operations in 2009, OVO has long offered 100% renewable energy tariffs but earlier this year launched the 'world's first widely available' domestic electric vehicle (EV)-to-grid charger – enabling users to feed electricity back into the grid from their EV when needed.

This, and another smart EV charger, were launched in April together with a proprietary platform 'VCharge', which can remotely connect and coordinate an unlimited number of small-scale household batteries and storage devices in real time. This will enable the grid to 'symbiotically react to changes in demand and supply', says the company. OVO says that this will in the future lessen the need for costly grid investment.

Electron
Blockchain. You can't look at anything in the tech sector these days without a mention of this distributed ledger technology, which underpins the cryptocurrency Bitcoin. It could have disruptive applications in energy, enabling efficient 'peer-to-peer' energy trading on a very local level – ie from PV-enabled household to household – thus enabling these assets to be used more efficiently.

Electron is one of the pioneers in this space in the UK, and as well as peer-to-peer is looking to facilitate a smarter grid by enabling smart meters to be connected to a shared registration platform, which would speed up the process of switching electricity providers. By a lot – ie from a number of weeks to 17 seconds, as the company's COO Jo-Jo Hubbard told us last year (see *Energy World* July/August 2017).

As well as Octopus' Agile API, a lot of teams were also using another API from National Grid that enabled access to data on the UK's carbon intensity. This allowed teams to develop solutions that, as well as price, also took into account the carbon emissions per kWh of the GB grid. National Grid has very recently updated this to work on a regional level.

The HackDay's award for 'Biggest Impact' went to the Energy Systems Catapult team, which tackled heating in social housing by teaming up with PassivSystems and Daikin. It used the API to design a fuel switching technology for hybrid heat pumps – a solution it called Chameleon – which used day-ahead prices to optimise when the heat pumps should switch from gas to electricity, offering the most affordable way to heat homes.

Moixa, a smart energy storage and solar power company, was looking at how to use the variable tariff combined with solar power profiles to further optimise times for battery charging and discharging from a customer point of view.

National Grid Ventures focused on a mobile phone app to provide a simple solution and customer experience for managing the charging of electric vehicles. They did this by taking the API and turning it into an easy programming language called NODE-Red, which other (non-coding) individuals, suppliers and developers could use and adapt.

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A glimpse of the future

The 'gamification' of getting your bill and seeing how well you are shifting your consumption might sound like something more for an active prosumer, but Octopus' interface does make it particularly easy to see where the cheaper periods are, and it will alert you when prices drop. Based around an ethos to create a simple, straightforward billing system, the company's idea is for consumers to quickly understand their consumption and spending with a cursory glance at a mobile phone screen.

Octopus Energy's CEO Greg Jackson points out that as well as being 'an incredible step forward for the real-time application of smart meter functionality in UK homes', the ideas generated on the day demonstrated 'a breakthrough moment for electric vehicles, the Internet of Things, and indeed any other industry that may be interested in products around pricing fluctuations.'

'The HackDay allowed people to work directly with our developers, designers and data scientists so that we learned from the participants and they learned from us,' he tells me. 'This rapid knowledge share is the magic enabled by open systems.'

These open systems will be 'critical to decarbonisation and to reducing the cost of infrastructure', he says.

But why would a company like Octopus, which already has a good handle on pushing forward the usability of products like Agile, want to allow others to get in on this space? Having eventual home solutions with appliances that rely on tariffs like Agile is one obvious benefit. MyEnergi has already launched an integrated EV charger and EV tariff offering on the back of it.

'I see tiers of engagement – companies who simply use our API to power their services without even engaging with us, right through to full-on integrated offerings,' Jackson tells me. 'Just like many websites carry Google Maps without discussing with Google, and others like Uber's app have massive integration with Google.'

Jackson also points to the role of smart grid technology in reducing carbon emissions, as well as a smarter grid saving potentially billions of pounds in network reinforcement costs by spreading loads to quieter times.

Ultimately, using data openly and collaboratively like this will enable these innovative solutions to take advantage of and feed back into the fully smart grid of the future. A fully enabled 'internet of energy', where connected nodes on the network harmonise to create a responsive and distributed clean energy system.

That may be closer than we think. But, more immediately, from a consumer point of view the pertinent question might be: 'Alexa, should I do my washing now or in half an hour?' ●