

Meeting Date: 16 March 2023

OCTOPUS ENERGY PRESENTATION ON DEMAND RESPONSE

SECURITY AND RELIABILITY COUNCIL

This paper introduces a presentation from Octopus Energy on its experience in New Zealand and overseas with Demand Response, and the role of demand response in supporting power system security and reliability.

Note: This paper has been prepared for the purpose of the Security and Reliability Council (SRC). Content should not be interpreted as representing the views or policy of the Electricity Authority except where specifically noted.

Demand Response – a participant perspective

- 1.1.1 The SRC has asked the secretariat to provide information on demand response, as part of the SRC's demand response theme for the Q1 March 2023 meeting.
- 1.1.2 As part of a suite of papers, the secretariat has arranged for a paper and presentation from Octopus Energy on its experience with demand response in New Zealand and the U.K. The aim is to provide SRC members with a candid participant perspective to aid deeper consideration of the issues.
- 1.1.3 Octopus Energy's demand response work in the U.K. offers additional insight in line with the SRC's interest in drawing experience from other power systems and regulatory frameworks.
- 1.1.4 The Octopus Energy presentation (Appendix A) highlights a key driver of demand response being its ability to cost-effectively integrate intermittent renewables into a power system.
- 1.1.5 The presentation (slide 4) provides a link to a U.K. paper on the "*Role and value of flexibility in facilitating cost-effective energy system decarbonisation*"¹. While this reference paper is not essential reading for the purposes of this meeting, the *introduction* (pp1-5) and *value of flexibility* chapters (pp6-20) provide useful background for those less familiar with the topic. Members can access the paper via the link in the footer and clicking through to the PDF article from the landing page.
- 1.1.6 A core component of demand response is the need to engage with customers to demonstrate its value. Octopus Energy's presentation illustrates how this can occur through early adopters - exposing customers to price signalling, and engaging customers through opt-in arrangements, data sharing and manual dispatch requests, ahead of moving toward greater automation and direct integration in devices.
- 1.1.7 The presentation includes confidential headline results of trials², indicating both interest in the service and, at a high-level, an indication of the role of financial incentives in supporting the update of demand response required in a power system with increasing levels of intermittent renewable generation.
- 1.1.8 The presentation also provides an example of automated EV management in action in the U.K., providing a point of comparison with trials in New Zealand. Also included are examples of two-way power flows in action through vehicle to grid (V2G) and potential replacements for ripple-relay technology through smart meter hot water control.
- 1.1.9 Representatives from the Octopus Energy team will present and be available for questions.

¹ <https://iopscience.iop.org/article/10.1088/2516-1083/abb216>

² Which will not be published at this stage.

Questions for the SRC to consider

The SRC is asked to consider the following general questions.

- Q1. What further information, if any, does the SRC wish to have provided to it?**
- Q2. What advice, if any, does the SRC wish to provide to the Authority?**

Appendix A: Octopus Energy presentation– Demand Response

Consumers and demand Response

Security and Reliability Council

16 March 23

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Agenda

1. Overview of Octopus Energy Group
2. Why demand response is so important
3. Types of demand response
4. Examples:
 - a. KrakenFlex
 - b. Saving Sessions
 - c. Intelligent Octopus EV charging
 - d. Hot water control
5. Discussion/ Learnings

Octopus Energy Worldwide

5m+

customers
globally

**AI Gore puts \$600M into UK Green
energy-tech startup Octopus Energy
Group**

2,500

strong global
team

9

countries

**Octopus Energy partners with
Tokyo Gas to enter the Asian
market**

45m

customers
license our
en-tech
platform —
Kraken

**UK's Octopus Energy Launches In
NZ, Lighting The Way For A
Sustainable Future**

£4bn

renewable
asset portfolio

**How Kraken is waking up
customer service for global
partners**

**£1m paid to Octopus Energy customers
as part of power saving scheme**

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Why we want to enable the demand side

Enabling a low cost lower carbon energy system.

- Flexibility allows more cost effective integration of intermittent renewables
<https://iopscience.iop.org/article/10.1088/2516-1083/abb216>
- Flexibility helps reduce producer market power
<https://ieeexplore.ieee.org/document/8187674>

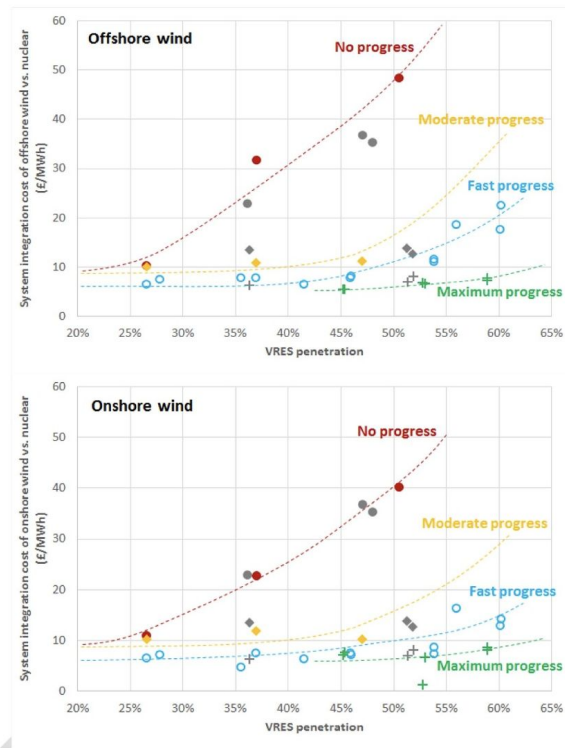
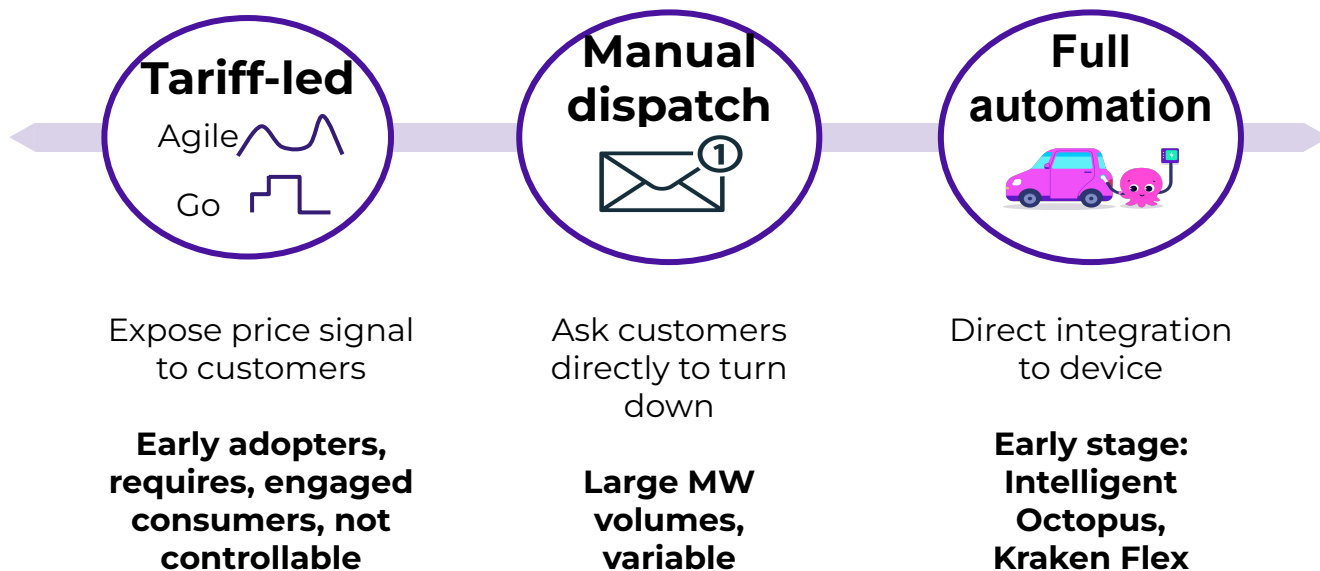


Figure 23. System integration cost of offshore and onshore wind for different penetration levels based on UK studies [70].

Demand side response / flexibility

There are different routes for procuring domestic flexibility - manual dispatch has a role bridging to automated future.



**Example: KrakenFlex a tool for
managing distributed energy resources
<https://dashboard.krakenflex.com>**



KRAKENFLEX

PART OF THE octopusenergy group

Total Power

1.34 GW

Contracted

4.6 GW

Assets

23,070

Commercial

Domestic

⚡ Power

1.19 GW

● Battery	573 MW	48%
● Solar	482 MW	41%
● Wind	129 MW	11%
● Generator	4 MW	0%
● Flexible Load	2 MW	0%
● Heat Pump	0 MW	0%

📈 Asset growth (last 12 months)



~ MW growth (last 12 months)



📊 Data

116.91 GB

processed yesterday

13,532

readings processed per second

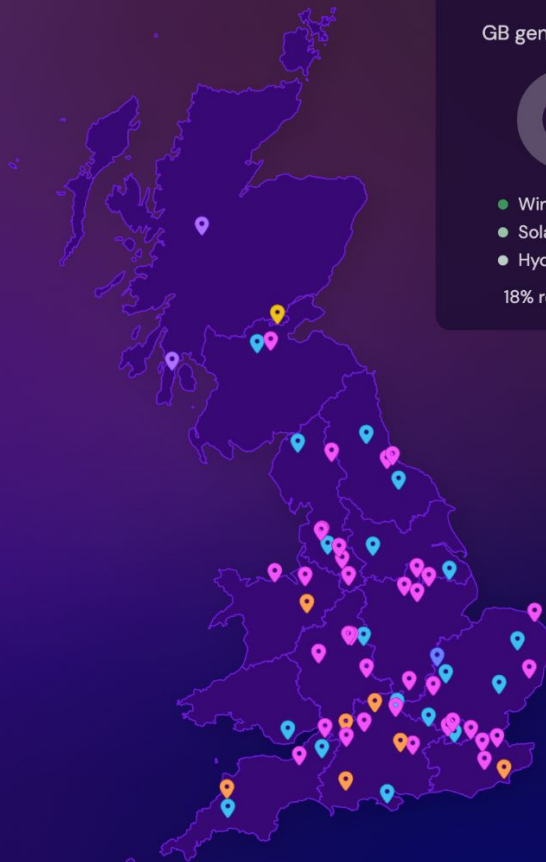
1,169,126,688

readings processed per day

GB generation mix



● Wind	15%
● Solar	0%
● Hydro	4%
18% renewables	



20:01 PM



Total Power
1.34 GW

Contracted
4.6 GW

Assets
23,070

Commercial

Domestic

⚡ Power

152.71 MW



Tesla	88 MW	57%
Jaguar	11 MW	8%
Kia	8 MW	5%
BMW	8 MW	5%
Audi	5 MW	3%
Other	32 MW	21%

📈 Asset growth (last 12 months)



📈 MW growth (last 12 months)



📊 Data

116.91 GB
processed yesterday

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1,169,126,688
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GB generation mix



● Wind 15%
● Solar 0%
● Hydro 4%
18% renewables



20:03 PM



**Example: 'Manual' Demand response
to avoid capacity shortfalls/ or
generation curtailment**

National Grid's Demand Flexibility Service is a landmark for domestic flexibility

Overview

Key NG tool for managing system stress this winter

Homes + C&I paid balancing revenues for reducing demand at key times

Open to anyone with a smart meter through their energy supplier

Process



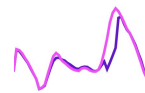
Grid alerts providers
2.30pm day before,
providers bid



If successful,
provider asks
customer to turn
down



Customer
opts-in and
turns down



Provider
sends results
to NG

Octopus trials laid the groundwork for Demand Flexibility Service

Turn Down Trial (Big Dirty Turn Down)

octopusenergy nationalgridESO

105,320 customers

197 MWh total turn down across eight events

20p median payment per event

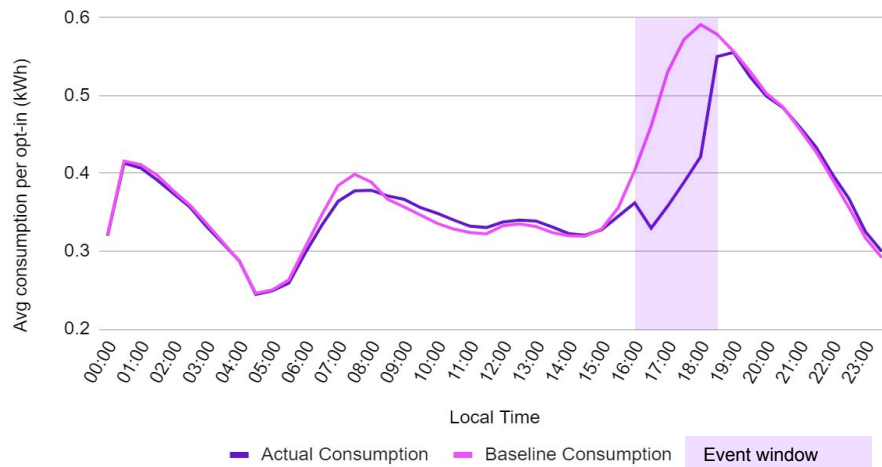
Turn Up Trial (Windy Day Fund)

octopusenergy SP ENERGY NETWORKS


2,500 customers

20 MWh total turn up across six events


Demand profile for Big Dirty Turn Down - Event 1



Our customer offer: Saving Sessions

 Menu

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Account 

SAVING SESSIONS



Octopus Saving Sessions

Earn rewards for using less at peak times this winter

Cutting down on energy at certain times of day can have a bigger impact on the planet, the energy system, and your wallet.

With Saving Sessions, we reward you for using less power - and give you the chance to win mystery prizes too.

[Join now](#)

It's entirely free to get involved, your tariff and energy payments won't change, and you can opt out any time.

"Customers could get £100 for cutting energy use"




"Octopus energy customers could get £100 for using power at off-peak times"



"Octopus to pay customers to save power this winter"



 Menu

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Log out

SAVING SESSIONS



The next Saving Session:

Today for 1 hour between 17:30 - 18:30 GMT

Earn 1800 OctoPoints - worth £2.25 - for every unit of power you cut down ☺

Opt in now to earn rewards

 You've opted in

Headline results so far



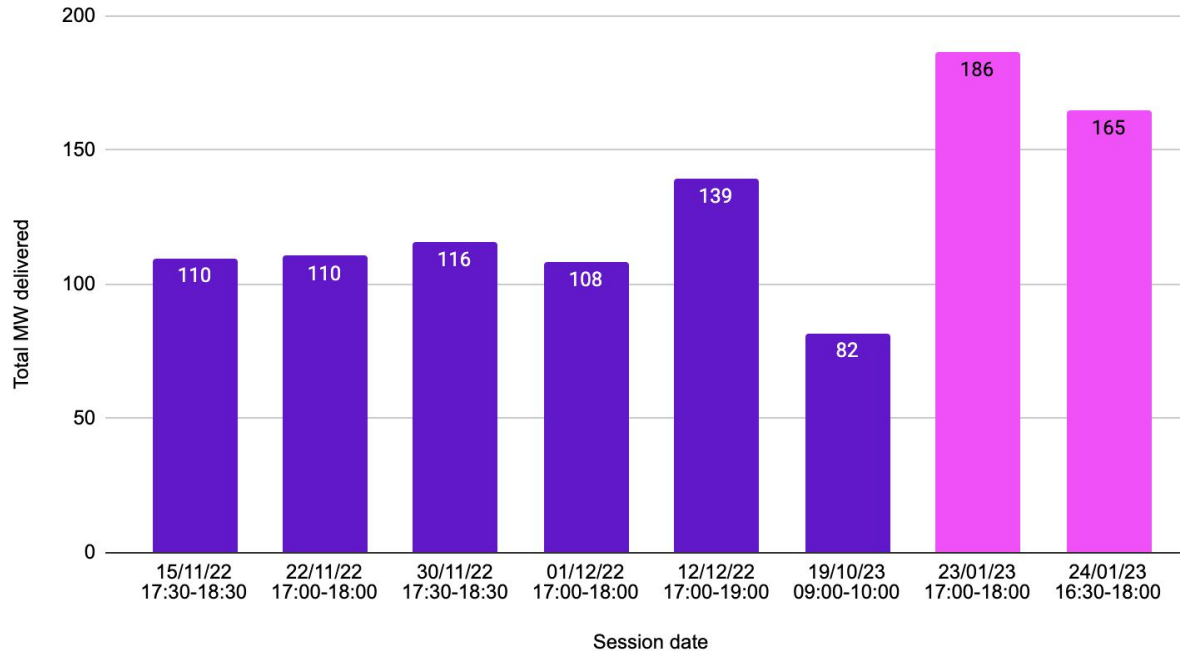
**>600,000
sign ups**

**>1GWh
demand
shift in
9.5 hours**

**>£3.7m
customer
payments**

We've seen consistent demand response so far, with 130MW delivered on average per Saving Session

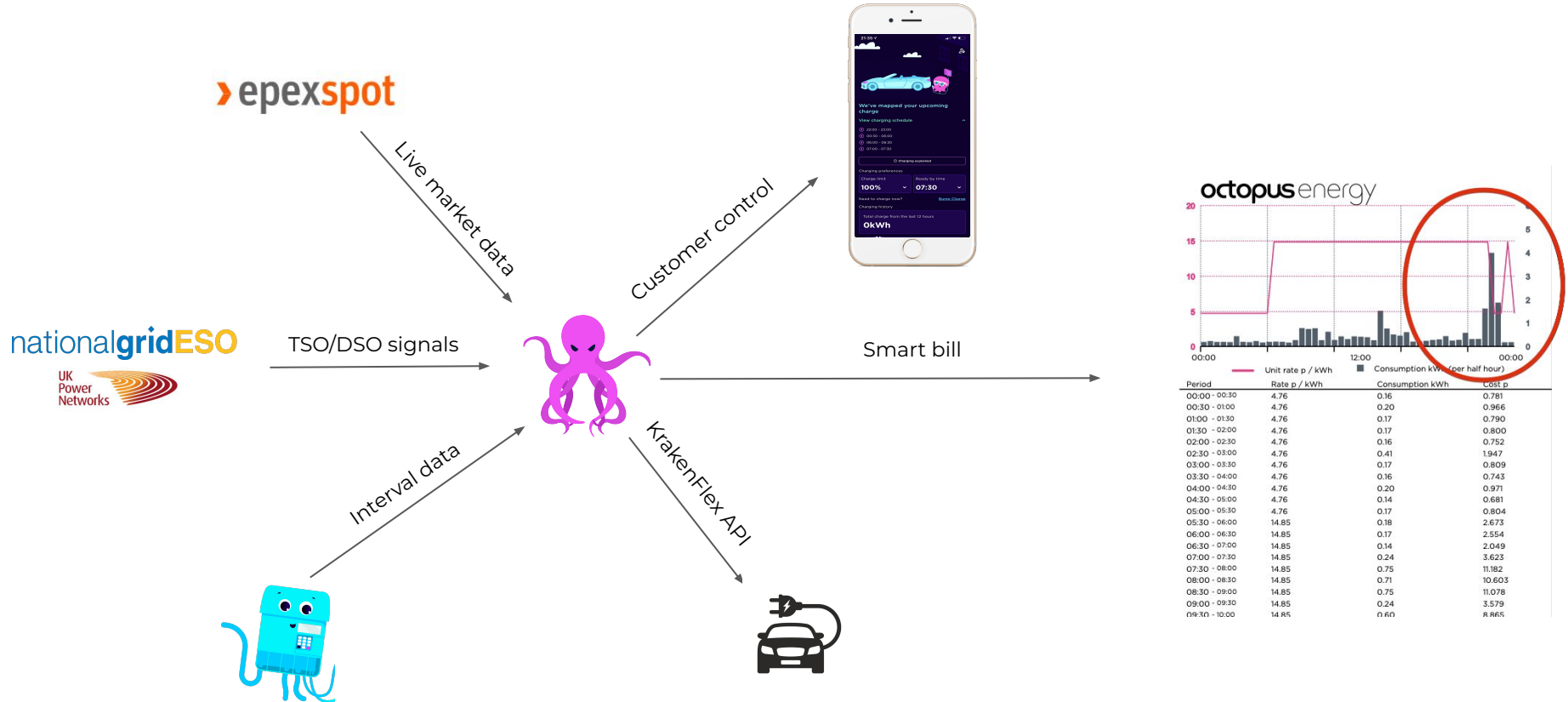
Total MW delivered per Session



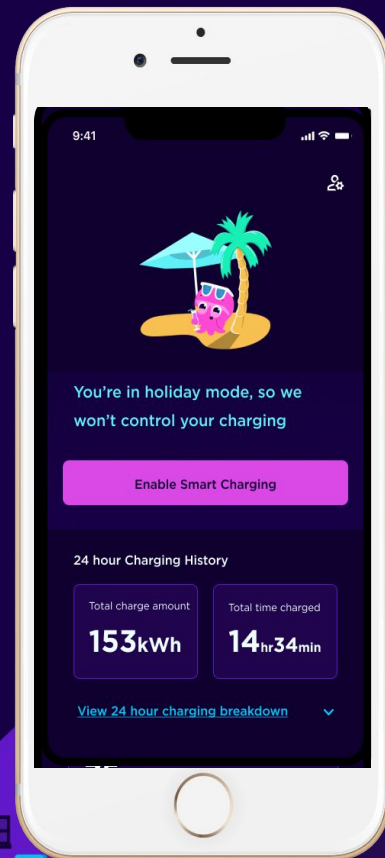
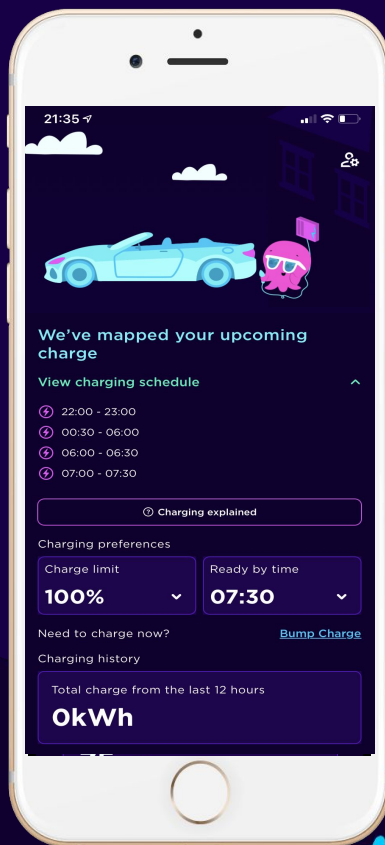
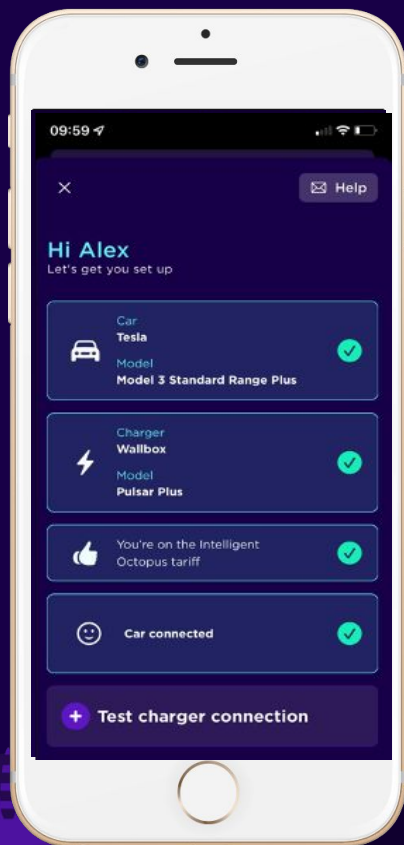
Note: Sessions 23/01/23 and 24/01/23 were “real” DFS events - dispatched for actual grid requirements, at a higher incentive rate (£3.37/kWh and £4.00/kWh respectively).

**Example: 'Automated' EV
management to avoid network
congestion issue**

Intelligent Octopus Dispatchable Dynamic Time of Use



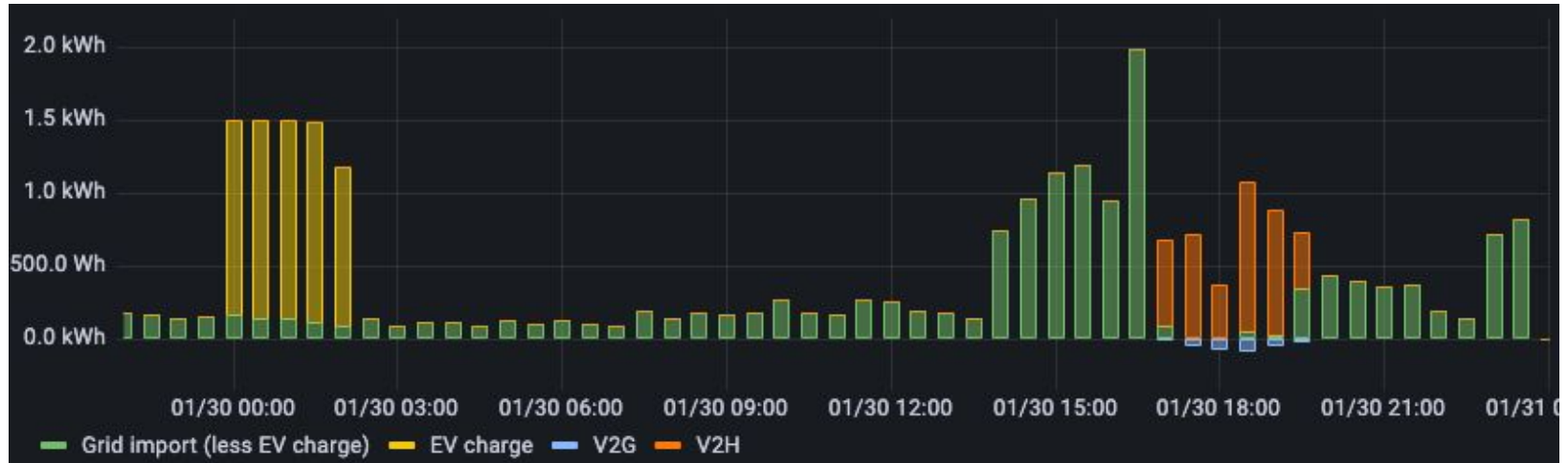
Intelligent Octopus - ultimate simplicity for users



Intelligent Octopus: Dispatch over 1 day in a specific distribution zone



V2G Alpha control testing

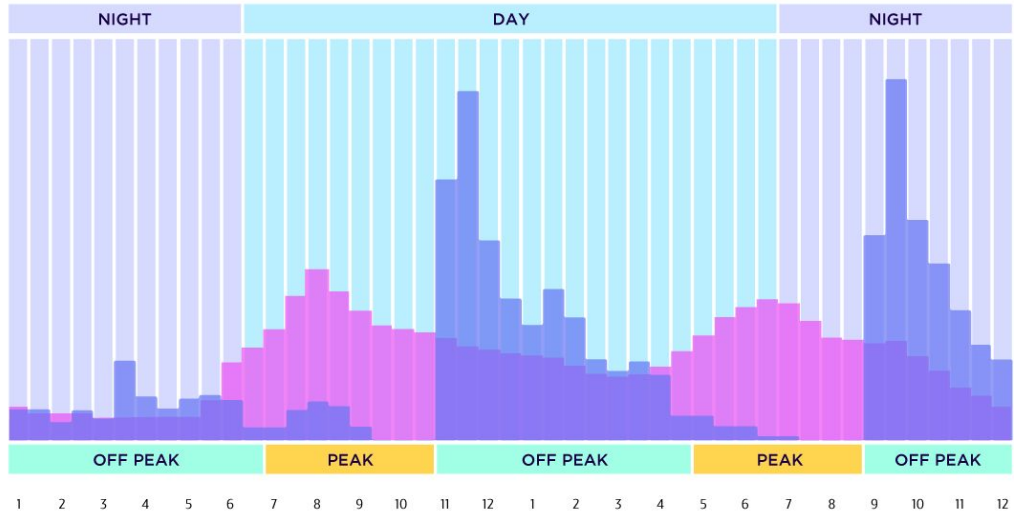
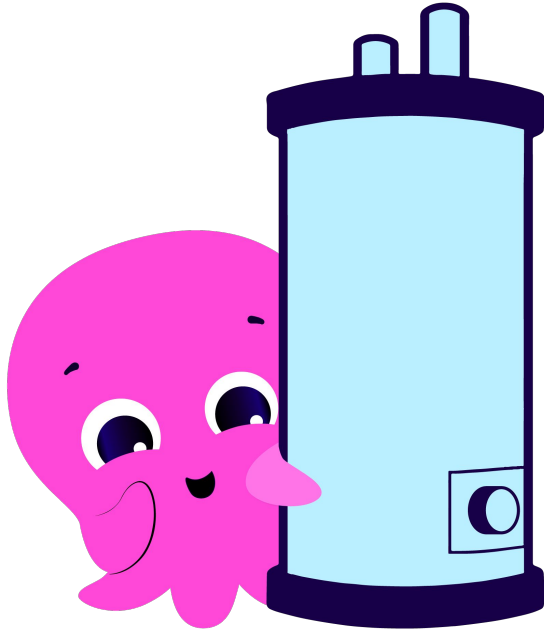


Example: 'Automated' Hot water control for energy procurement cost minimisation and grid/network congestion.

Smart Meter Hot Water Control - Shift and save

The purple in the chart shows the times we've shifted hot water heating for the people on the trial. The pink area shows the time hot water cylinders consumed power prior to the trial.

You can see there is almost no consumption through the peak periods when you're paying the most for electricity.



SRC Questions

1. Octopus Energy's experience with Demand Response in the UK and New Zealand and its impact on security and reliability.
2. Learnings from overseas that Octopus Energy is able to apply in New Zealand.
3. How you plan to use DER capacity?
4. Existing Demand Response technologies and future options being considered
5. The role of EVs in Demand Response: planned and aspirational
6. The role and expectations of the consumer in Demand Response and Octopus Energy's experience engaging with them
7. Whether the current market settings are right for encouraging DR investment?
8. Whether the current market settings are right for DR innovation?
9. Are there any roadblocks or hurdles Octopus Energy has experienced?
10. Any thoughts about what the Authority can do to further the role of Demand Response (and DER)?
11. Areas of risk the SRC should focus on to support its advice to the Authority on security of supply and system operator performance?
12. To what extent can Demand Response support our capacity/peaking challenge?
13. System security – how the system operator can tap into demand response in an emergency?
14. What is the effect on the power system if Demand Response fails?
15. What is the impact if Code changes are not made or no workaround available?
16. Are the current regulatory arrangements suitable to incentivise continued investment in ripple or other load management technologies?
17. If the same DER is captured by two different purposes, how do you reconcile the potential conflict?
18. What is the potential for DER to provide longer term energy management, for example a participant offering to manage their international portfolio to allow medium term energy restraint in a given country?

Thank you



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