CrowdFlex

Show & Listen

October 2022

- We will start at **10:02am**
- Please keep your **camera off** and **microphone muted** during the presentations
- We will be **recording** this session
- We are looking for **your feedback** in this session rather than questions. Please see the links for engagement opportunities.

Virtual Energy System

Powered by National Grid ESO

nationalgridESO

Agenda

- Introduction to CrowdFlex
  - Mark Sunderland, ESO
- Work Package 1 – System needs and statistical-type approaches
  - Freddie Barnes, Element Energy & Kieron Stopforth, Octopus Energy
- Discussion
- Work Package 2 – Consumer engagement for trial
  - Daniel Lopez Garcia, Centre for Net Zero & Iain Walker, Ohme
- Discussion
- Next Steps
  - Mark Sunderland, ESO

CrowdFlex

Introduction

ESO: www.nationalgrideso.com/virtual-energy-system/crowdflex

SNP: smarter.energynetworks.org/projects/10027180/

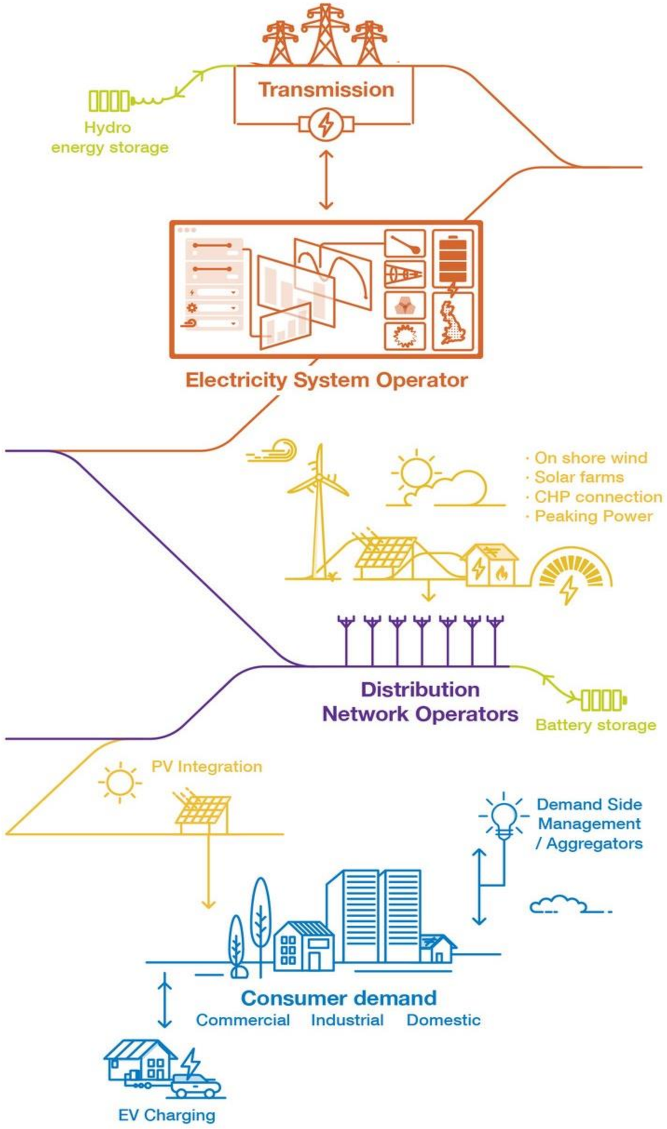
Problem to address

Challenge

- More **renewable generation** which is **non-dispatchable**
- More **electric vehicles** and **heatpumps** which **increase demand**
- So **flexibility** must shift from **supply-side to demand-side**
- A **smart, flexible and reliable** energy system is needed

Opportunity

- **Domestic consumers** offer a nascent, but large **flexibility resource**
- Currently largely **untapped**, due to **limited understanding** and existing **market design**
- Crowdflex explores novel **stochastic flexibility services**, reflecting the **statistical and distributed** assets
- Could enable **lower cost and lower carbon** system operation and reduce capacity and network **investment costs**



CrowdFlex aims to establish domestic flexibility as a reliable energy and grid management service

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Project Overview

Objectives

1. **Needs:** to understand and align **ESO/DNO requirements** for flexibility services and consider interaction with the **statistical nature** of domestic flexibility
2. **Trial:** to identify the **technology capability** and **consumer behaviour** parameters to explore in a **real-world trial**
3. **Model:** to understand how the **statistical nature** of flexibility can be developed into **reliable modelling** of domestic demand and flexibility

SIF Discovery: **feasibility** study, Mar-Apr'22 (complete)

SIF Alpha: **design** of trial/model, Aug'22 – Jan'23 (in progress) nationalgrid octopusenergy Centre for Net Zero Powered by Octopus Energy Ohme elementenergy an ERM Group company Scottish & Southern Electricity Networks

Work Package 1.1

Freddie Barnes, Element Energy

Virtual Energy System
Powered by National Grid ESO

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Objective: understand what system needs domestic flexibility is suited to and how it can solve them

Context

- CrowdFlex seeks to unlock the **nascent and largely untapped source of domestic flexibility** to help solve the broad physics-based system needs of transmission/distribution systems
- National Grid ESO and Distribution System Operators (DSOs) currently **address these system needs** through the encouragement of external market incentives to serve system needs, **the procurement of commercial flexibility services**, and infrastructure investment
- To ensure that a CrowdFlex large-scale consumer trial remains relevant we want to **ensure that the results of a trial are adaptable** to the changing energy system

Objectives

1

Define the categorisation of the **current broad physics-based system needs** that pose challenges to National Grid ESO and the DSOs

2

Understand how these **system needs align** with the ESO's current suite of commercially procured Balancing Services and DSOs' current local **flexibility services**

3

Account for how decarbonisation and other factors may **change these system needs** in the medium to long term

4

Reflect on the extent to which **domestic flexibility could effectively serve each of the system needs**

ESO/DSO system needs, services, & suitability for domestic flexibility

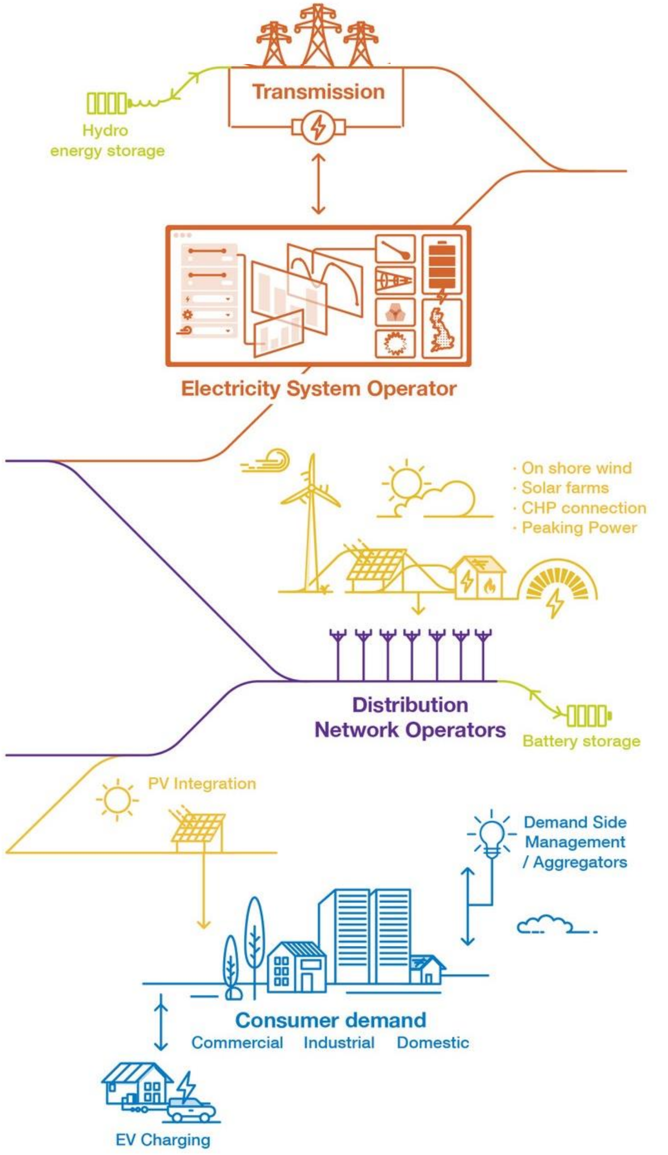
System need	Commercial service	Current commercial product	Response rate	Response duration	System cost 21/22	Suitability for domestic flex
ESO Needs & Services						
Frequency	Response	Dynamic Containment / Dynamic Moderation	1 sec	15-30 mins	£341m	
		Dynamic Regulation / FFR	10-30 secs	30-60 mins		
	Reserve	Quick/Fast Reserve	15 mins	15 mins	£920m	
		Slow Reserve/STOR	15-30 mins	2 hours		
	Energy balancing	Balancing Mechanism	~ secs – 1 hour	30 mins	£110m	
Stability	Inertia / Short Circuit Level / Dynamic Voltage	*Pathfinder product only*	0.5 secs	12 secs	N/A	
Voltage	Reactive Power	ORPS/ERPS	Continuous		£190m	
Thermal	Constraint management	Balancing Mechanism	~ secs – 1 hour	30 mins	£1,474m	
Restoration	Restoration	Restoration	8 hours	120 hours	£63m	
Adequacy	Capacity Market	Capacity Market	4 hours	No limit	£1,671m	
	Day-ahead adequacy	Demand Flexibility Service	24 hours	30 mins (3 hours max)	N/A	
Within-day flexibility	Energy Arbitrage*	Wholesale market	24 hours	1-3 hours	-	
DSO Needs & Services						
Constraints	Reduction of peak demand on network	Sustain	Contract Stage	30 mins	£58k**	
		Secure	Contract Stage	30 mins	N/A	
		Dynamic	3 mins	30 mins	£398k**	
	Replacement of Load Managed Areas (LMAs)	*Currently undecided*	-	-	N/A	
Voltage	Reactive	Reactive	N/A	N/A	N/A	
Restoration	Restoration	Restore	3 mins	30 mins	N/A	

*Energy Arbitrage is not an ESO Service but the Wholesale Market is the current primary mechanism used to incentivise Within-day flexibility

**Data comes from NGED

Recommendations for trial services to test in CrowdFlex

- Based on the high-level assessment of all ESO/DSO system needs and services we have **identified a shortlist of areas to explore further** & scope for a large-scale consumer trial
- This accounts for both the **technical requirements** of the services to address system challenges as well as the **expected cost** of resolving the system challenge both now & in the future
- **ESO system needs & services shortlist:**
  - Maintaining network frequency at slower time scales (i.e. provision of **Reserve** & entry of domestic assets into the **Balancing Mechanism**)
  - Resolving **short-duration thermal constraints** (providing demand turn up/down on either side of constraint)
  - Provision of system adequacy via a ''first-resort', enduring, BAU **evolution to the Demand Flexibility Service**
- **DSO system needs & services shortlist:**
  - Constraint management by **reducing peak demand on both the HV & LV networks** via a routine daily service,
  - **Mitigate potential future constraints** by providing an alternative method of introducing diversity in domestic appliance to **Load Managed Areas** switching



Work Package 1.2

Kieron Stopforth, Octopus Energy

T1.2 Trialling statistical methods

Statistical methods can manage variability of flexibility

- **Today services work on a point source or deterministic basis** – providers forecast a single expected delivery MW or MWh, submit this to the system operator and are penalised for deviating.
- **Domestic flexibility is inherently variable & there is a limited historical dataset** – making accurate prediction difficult and increasing uncertainty of stated MW.
- **Statistical methods can provider and system operator reduce uncertainty** – improving models can lead to better forecasts, quantifying the uncertainty can help integrate the resource and manage the system (e.g. when uncertainty range is high, using more back-up).

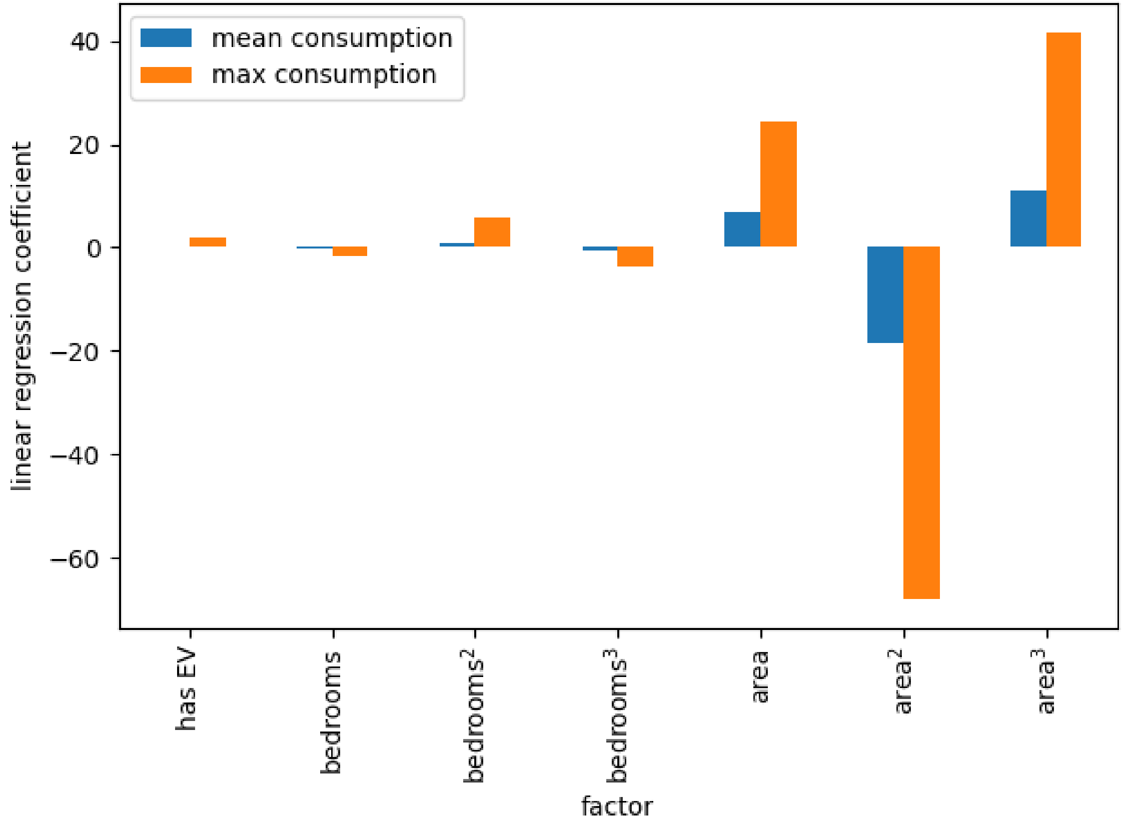
Modelling flexibility is a three-step process for flexibility providers

- i) Demand Forecast; ii) Flexibility Potential; iii) Expected Outturn.
- Each of these steps can be done with an expectation value and a distribution of outcomes at different probabilities.
- In initial CrowdFlex trials, this may have to be simplified to a limited number of pairs of expected MW/MWh and probability.

T1.2 Trialling statistical methods

Factors informing demand

- We looked at impact of different variables on demand for a representative sample of houses, including:
    - EPC rating
    - presence of an EV
    - house type
    - house location (e.g. “large urban area”)
    - number of bedrooms
    - floor area
- We found that floor area was the most important variable, followed by number of bedrooms, followed by EV presence.
- Other factors above had model coefficients less than 100 times the others and were removed.



T1.2 Trialling statistical methods

Proposal for the trials

- **Service type:** one or more of the services identified
- **Stakeholder issuing the service:** system operator trial partner. Trial must align to existing processes.
- **Implementation in current operational approach:**
  - System operator specifies need
  - Flex provider forecasts using three-step process – expectation and distribution
  - Flex provider translates into MW-probability pairs and submits to system operator
  - System operator accepts pairs (virtual market price)
  - Flex provider dispatches and reports
- **Other SO measures:**
  - Trial the display of a probabilistic forecast of total domestic demand in the ESO Control Room.
  - Investigate the effects of forecast displays on reserve volume and using qualitative surveys of Control Room engineers.
  - Trial (simulated) probabilistic bids and offers in the Balancing mechanism.
- **Trial market and dispatch technical requirements:**
  - Suggest P376 with in-day adjustment baseline – aligned to Demand Flexibility Service
  - Metering at settlement grade (i.e. COP or MID compliant). We propose that we use half hourly smart metering, as this has widest application in homes, unless a mass market alternative can be put forwards.
- **Accounting for under / over delivery:**
  - Any penalty regime should be tied to direct costs or benefits to the system operator.
  - We suggest that payment for over or under delivery should be compensated through imbalance rather than de-rating or penalty fees.

Work Package 1.3

Freddie Barnes, Element Energy

T1.3: High-level cost benefit analysis to assess value of statistical declaration of capacity & energy

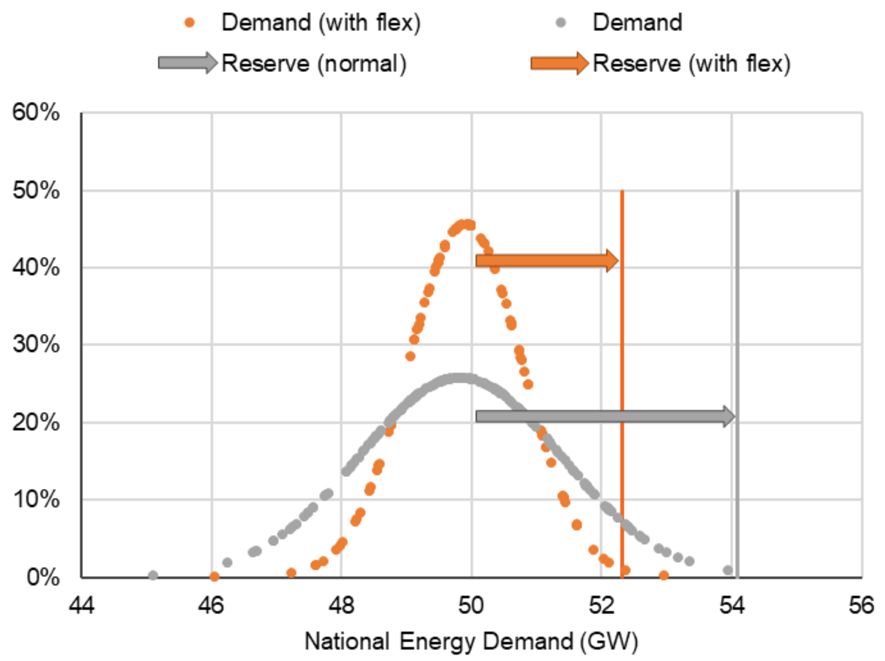
Significant derating of Capacity for statistical assets

- Counter the significant derating (loss of value) that occurs if flex assets required to declare capacity deterministically.
- Derating increased with Standard Deviation (SD) of the prediction of the asset capacity

SD (% of expected capacity)	Derated capacity
0%	100%
3%	92%
10%	72%
25%	31%

Whole system approach leverages greater value of domestic flex

- Modelling (right) showed that domestic flex assets can be dispatched to significantly reduce deviation of net-demand from expected value
  - 1GW (up/down) domestic flexibility assets can replace 2GW of centrally held "Reserve" Capacity
  - System-critical nature of Reserve provision means CF Trial exploring ways of "proving" this impact to ESO (via feedback in control room)



24hr ahead predictions of national demand: 50GW expected with 1.5GW standard deviation. This time period requires 4GW Reserve capacity to meet 99.7% confidence standard.
Dispatching 1GW(up/down) of resi flex asset to bring net demand closer to expected value, reduces traditional Reserve by nearly 2GW

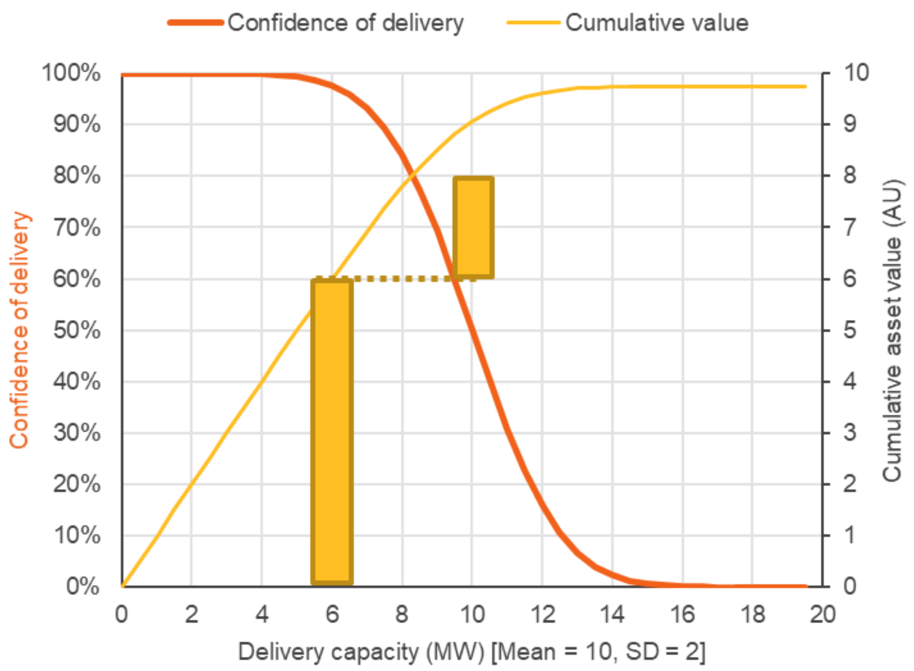
T1.3: High-level cost benefit analysis to assess value of statistical declaration of capacity & energy

Statistical declaration of energy delivery prediction

- CrowdFlex is focussing on the balancing mechanism. Currently the BM requires bid/offer pairs with high confidence of delivery (penalties for under delivery)

- We are exploring declaring bid/offer pairs, each with confidence level included.
  - Under-delivery can be addressed by the counterparty (ESO) via over-procurement on its side
  - The cost of this is met through reducing the market value of bid/offer pairs when confidence <100%

- In the example on the right:
  - Firm bid/offer is 6MW x 100% market value
  - Additional bid/offer is 4MW x 50% (conservative) market value



This example shows a notional 10MW asset with a standard deviation of 2.
At lower capacities, the confidence to meet/exceed the required capacity is high. (6MW delivered with 99.7% confidence, gains full market value)
At higher capacities, lower confidence reduces market value
Additional 4MW achieved with 50% confidence, hence only 50% of value per MW.

Discussion

- Please share your feedback on what you’ve just heard.
- Do you have any additional insight that could add value to these work packages?
- Do you think there are any aspects missing in any of these work packages? If so, where can the project acquire the data/insight?

Work Package 2.1

Daniel Lopez Garcia, Centre for Net Zero

Centre for Net Zero
Powered by Octopus Energy

CrowdFlex WP2
Literature review findings

Contents

Need for flexibility

More renewables

As more intermittent renewable generation comes into the system the electricity grid needs to become more responsive to possible changes in both demand and supply to avoid curtailment and displace gas.

Increased electrification

Changes in consumption patterns and more intermittent generation have modified the way demand behaves, creating a much more complicated scenario if we only provide flexibility through supply-side assets such as peak load power plants or by curtailing generation.

Doubling demand

The Climate Change Committee forecasts that electricity demand will nearly double by 2050 due to electrification of heat, transport and hydrogen generation. 'Intelligent Demand' involves embedding the concept of domestic demand flexibility into the energy market.

15 TWh curtailed by 2030 (NGESO)[1]

24th Nov 2021:
£60 million spent on balancing (NGESO)[2]

£17-40 billion can be cumulatively saved to 2050 if flexibility is properly harnessed (Carbon Trust)[3]

References: 1) "Future Energy Scenarios 2022 Report". National Grid ESO. https://www.nationalgrideso.com/document/263951/download 2) "ESO Balancing Market Review 2022", National Grid ESO. https://www.nationalgrideso.com/document/263921/download 3) "An analysis of electricity system flexibility for Great Britain", GOV.UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/568982/An_analysis_of_electricity_flexibility_for_Great_Britain.pdf

Potential of flexibility in residential households

In principle, the amount of demand response that can theoretically be provided depends on the size of the load available and how long this can be influenced, and therefore depends on the controllable household assets. The potential flexibility therefore is driven by three main factors:

LCTs

Low Carbon Technologies (LCTs) - such as electric vehicles (EVs), heat pumps (HPs) and Solar PV micro-generation are of particular interest

Consumer attributes

Household routine and their ability and willingness to effectively participate in a response event will have an effect on the technically possible provision of flexibility.

Time

Temporal factors that affect flexibility provision: time of day, day of week and month of year (season).

EVs

everywhere?

Automated responses result in larger responses literature suggests[1,2,3]

Literature has focused on EVs due to their potential for flexibility. The average demand reduction of EV owning households is much higher than non-EV owning households overnight. Customers with EVs provided 50% of the overnight reduction in Big Dirty Turn Down events.

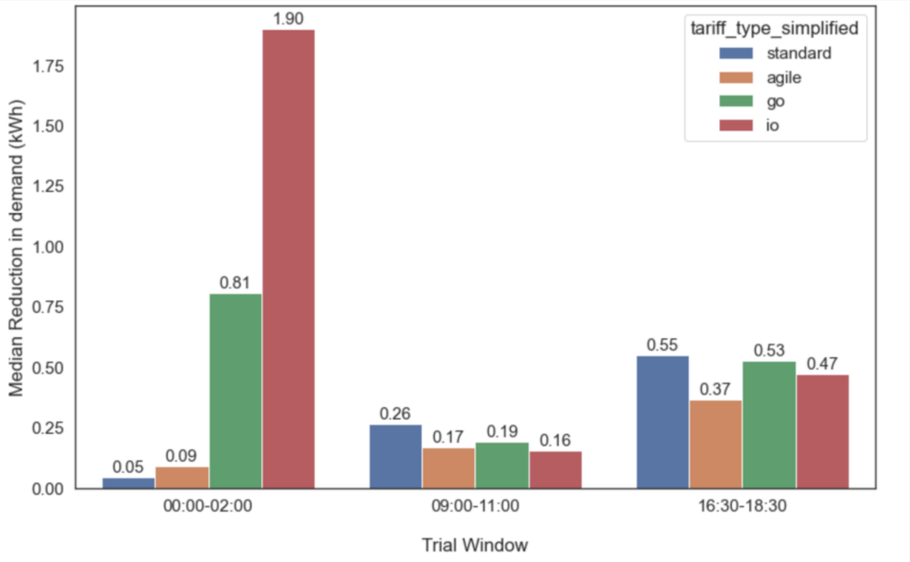


Figure 1: median demand reduction of all participants by event window and tariff type. Demand reduction is relative to predicted demand (“four-week average”).[4]

References: 1) A. N. M. M. Haque, M. Nijhuis, G. Ye, P. H. Nguyen, F. W. Bliek, and J. G. Slootweg, ‘Integrating Direct and Indirect Load Control for Congestion Management in LV Networks’, IEEE Transactions on Smart Grid, vol. 10, no. 1, pp. 741–751, Jan. 2019, doi: 10.1109/TSG.2017.2751743. 2) “Demand Side Response in the Domestic Sector - A Literature review of Major Trials”, Frontier Economics and sustainability First. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48552/5756-demand-side-response-in-the-domestic-sector-a-lit.pdf 3)“Customer Acceptance, Retention, and Response to Time-Based Rates from the Consumer Behavior Studies”, U.S. Department of Energy. https://www.energy.gov/sites/prod/files/2016/12/f34/CBS_Final_Program_Impact_Report_Draft_20161101_0.pdf 4) “Domestic Reserve Scarcity Trial. Final Report” National Grid ESO. [Unpublished report]. Centre for Net Zero, Octopus Energy and National Grid ESO. 2022

Other LCTs

needed!

But non-automated responses considerably add flexibility, especially during peak hours[1]

Solar panels, HPs and other appliances can also provide flexibility as efficiently as EVs, especially during grid peaks. Given appropriate incentives to opt-in, there may be significant potential for demand shifting from households who do not who EVs or other LCTs during grid peak times.

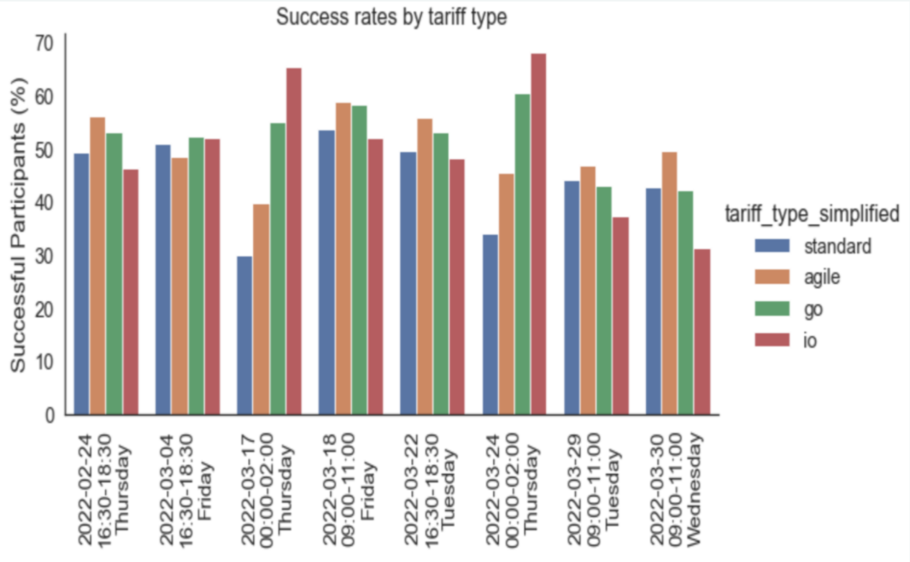


Figure 1: shows the proportion of successful participants by tariff type. Success is defined relative to the predicted demand ("four-week average").[4]

References: 1) "Domestic Reserve Scarcity Trial. Final Report" National Grid ESO. [Unpublished report]. Centre for Net Zero, Octopus Energy and National Grid ESO. 2022

Affluence is just one brick of the wall: we need to consider other socio-economic factors

Flexibility capital

Defined as the capacity to responsively change patterns of interaction with a system to support the operation of that system. Many degrees of diversity across and within different societies have been identified as determinants of flexibility capital, making it unevenly distributed. It depends, amongst other factors, on age, gender, household size, occupation, geographical situation, levels of digital inclusion, and, what it is considered to be the clearest interaction, affluence.[1]

The interaction is subtle

The more affluent benefit more from flexibility while others do not? On the contrary, some being able to provide energy services paves the way to the provision of service quality costs for those who in principle do not have that ability. Crowdflex should note and consider the system cost benefit from a proportion of the total possible market of domestic households, and quantify the cost savings for those who do not actively engage in flexibility, not just those who do.[2,3,4,5]

Low income customers

Previous studies have already focused on the importance of the inclusion of low income and vulnerable (LIV) customers. In the context of this project, it is important to identify potential barriers that could prevent many customers from accessing and purchasing smart products that could potentially provide flexibility and provide incentives for these consumers to participate in the electricity market.[6,7]

References: 1) G. Powells and M. J. Fell, ‘Flexibility capital and flexibility justice in smart energy systems’, Energy Research & Social Science, vol. 54, pp. 56–59, Aug. 2019, doi: 10.1016/j.erss.2019.03.015. 2) “Distributional Impacts of Time of Use Tariffs”. Ofgem. https://www.ofgem.gov.uk/publications/distributional-impacts-time-use-tariffs 3) Hledik, Ryan, et al. "The value of TOU tariffs in Great Britain: Insights for decision-makers." Citiz. Advice Final Rep 1 (2017): 1-63 4) L. Nicholls and Y. Strengers, ‘Peak demand and the “family peak” period in Australia: Understanding practice (in)flexibility in households with children’, Energy Research & Social Science, vol. 9, pp. 116–124, Sep. 2015, doi: 10.1016/j.erss.2015.08.018. 5) T. Yunusov, M. J. Lorincz, and J. Torriti, ‘Role of household activities in peak electricity demand and distributional effects of Time-of-Use tariffs’, presented at the British Institute of Energy Economics 2018, Oxford, UK, 2018. Accessed: Sep. 02, 2022. [Online]. Available: https://centaur.reading.ac.uk/79505/ 6)”Smart and Fair? Exploring social justice in the future energy system. Phase 1”, Centre for Sustainable Energy. https://www.cse.org.uk/downloads/reports-and-publications/policy/energy-justice/smart-and-fair-phase-1-report-september-2020.pdf 7) “How can innovation deliver a smart energy system that works for low income and vulnerable consumers? Project InvoLVe”, BEIS.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/994845/project-involve-smart-energy-system-low-income-vulnerable-consumers.pdf

Consumer segmentation and engagement and tariff understanding

Different trials show a variety of customer segmentation approaches. Even though behaviours and socio-economic factors impact these segments, the relationship between the two has not been properly studied. It is recommended to maintain the same segmentation introduced in Crowdflex Discovery Phase.

Consumer preferences towards incentives varies over different segments. As a summary

- There is some degree of general understanding at a market level, and a decent understanding on very niche areas like EV ownership and relationship with deprivation and general wealth
- Across the domestic market there is good evidence that consumers react to incentives to varying degrees, but much is driven by behaviours and access to technologies
- Specific segments are poorly misunderstood, or simply have not been researched yet

Key learnings for trial design

- Relatively poor understanding as to what defines a vulnerable customer in the literature. Need to consider usage patterns, access to technologies as much, if not more, than simple socio-economics. Affluence is a reasonable indicator, but multi-faceted.
- Segmenting based on technology will allow for some benchmarking with previous research, but the following may prove instructive when defining the consumer segments:
    - Energy consumption patterns and behaviour over time
    - Primary motivations for charging behaviours
    - Effects of beliefs and social norms on behaviours
    - Access to technologies that enable change

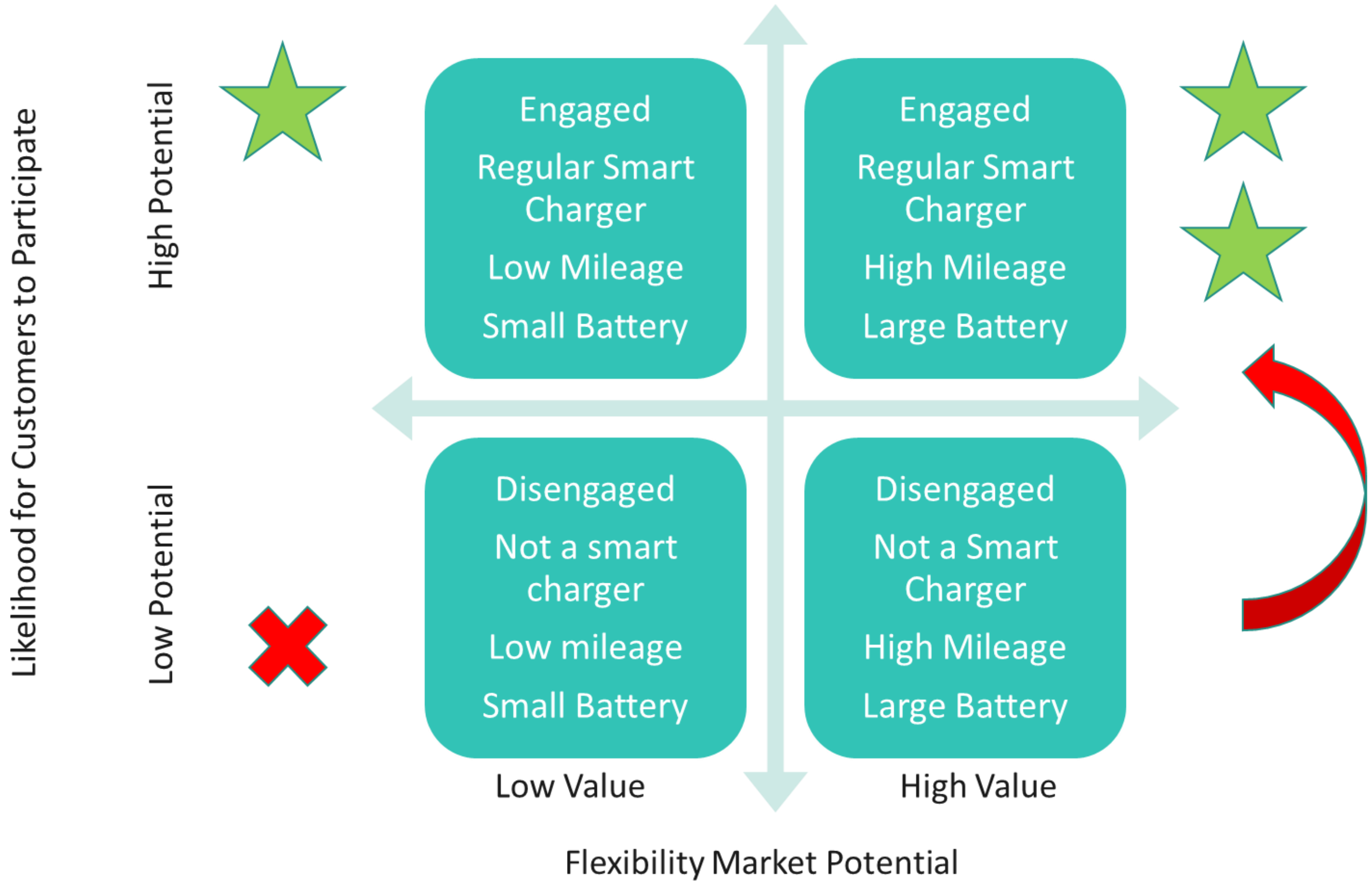
Work Package 2.2

Iain Walker, Ohme

CrowdFlex WP2 Segmentation

Ohme

The initial segmentation model proposed a simple 2 x 2 recognizing Flex value and potential to participate



Learnings from Lit Review / additional asks

- Low Income Vulnerable households, (LIV’s) / demographics
- Turn Up / Geography
- 5 key data attributes
  - Energy Consumption
  - Consumption Behaviours over Time
  - Primary motivators for changing behaviours
  - Access to technologies, including automation
  - Tariff information – smart / non smart

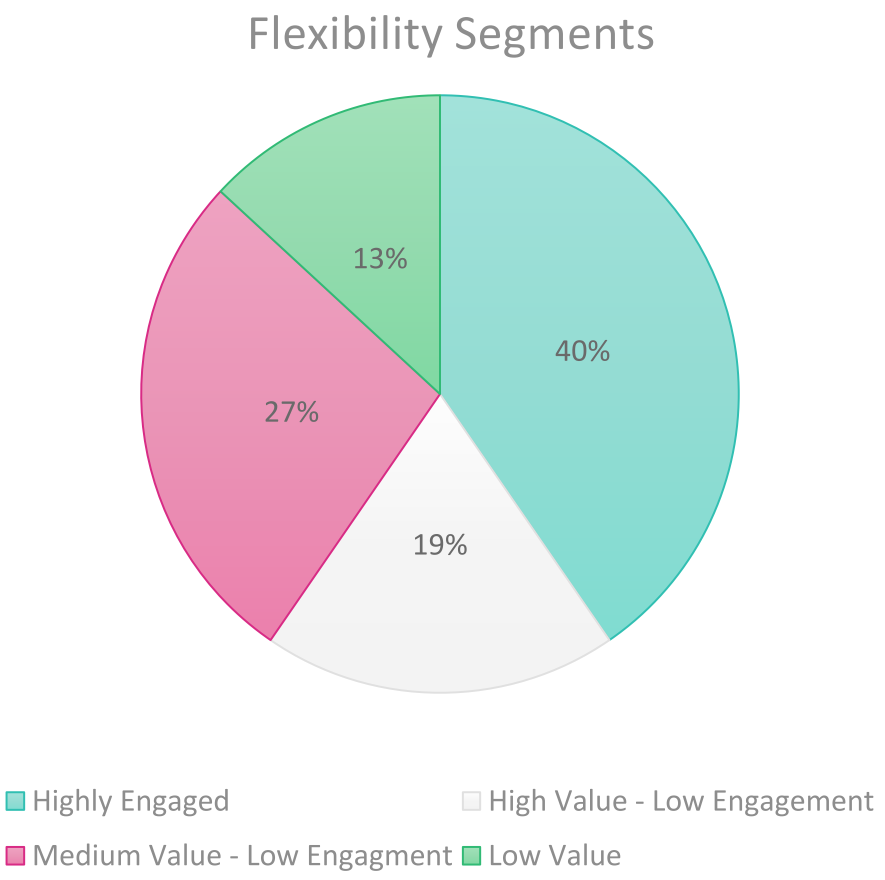
Revised attributes to enable segmentation across Ohme and CNZ datasets

	Values			
Row Labels	Very Engaged	Large Less Eng	Medium Less Eng	Small
Average of Average kWh per Session				
Average of Average Weekly Consumption kWh				
Average of Average Car Efficiency Wh/km				
Average of Small Batteries				
Average of Medium Batteries				
Average of Large Batteries				
Average of Home Charging				
Average of Average Session Duration hours				
Average of Average Active Charging during Session %				
Average of Average Idle during Session %				
Average of Weekly Sessions				
Average of Night Plug-in %				
Average of Morning Plug-in %				
Average of Afternoon Plug-in %				
Average of Evening Plug-in %				
Average of Plug-in Consistency (1 very cons, -1 random)				
Average of Plug-out Consistency (1 very cons, -1 random)				
Average of Session duration Consistency (1 very cons, -1 random)				
Average of kWh consumed per session Consistency (1 very cons, -1 random)				
Average of Max Charge Sessions %				
Average of Early Adopters %				
Average of Inactive Users %				
Average of Session Price Cap Activation %				
Average of Average Weekly Offline Messages				
Average of Battery SoC provided cars				
Average of Session Smart Tariff selection %				
Average of Session Dumb Tariff selection %				
Average of Session Peak Charging % (charging between 16 and 22)				
Average of Session Off-peak Charging %				

Categories
Energy Consumption
Consumption behaviours over time
Primary motivators for changing behaviours
Access to technologies, including automation
Tariff information
Sub Clusters

- Data set reduced to 29, case sensitive and significant dimensions – aligned to 5 data categories,
- Clustering Algorithm; **K-Means**

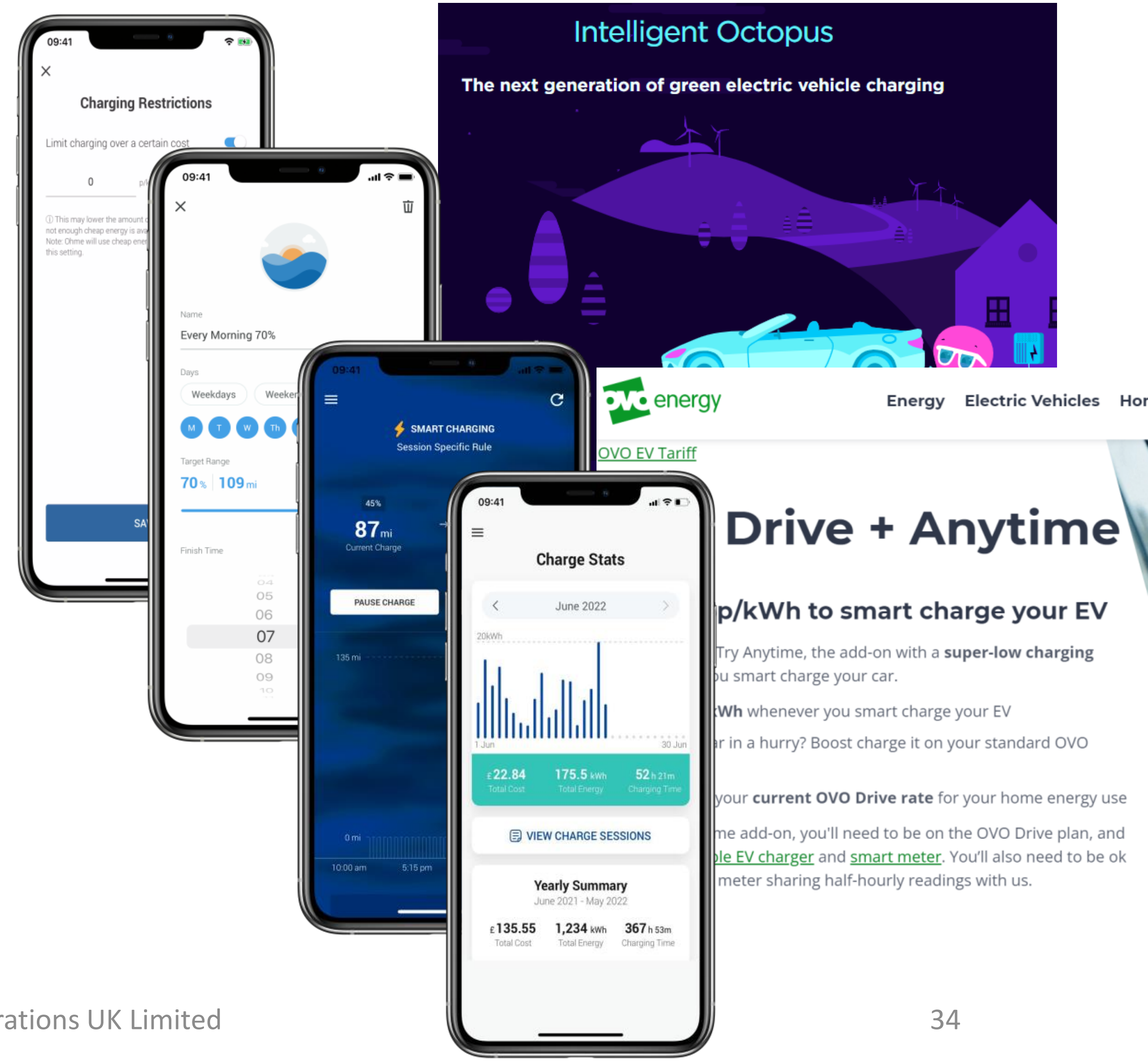
Revised Segmentation



- 4 significant segments
- Increasing granularity resulted in very small segments
- Household affluence can be sub-segmented
- Geographical split turn up / turn down applicable across all

Customer Archetypes – (1); Highly Engaged

Highly Engaged – 40%
Longest charge session duration
Highest ‘idle’ time – therefore highest flex potential
Highest evening and night plug-in, (after 6pm)
Very consistent plug out behaviour
Lowest ‘Max Charge’ – highest flex potential
Highest ‘early adopters’ < 2021
Highest ‘price cap’ activation
Highest API integration – State of Charge accuracy
High smart tariff selection
High degree of ‘off-peak’ charging



Customer Archetypes – (2); High Value / Low Engagement

High Value / Low Engagement – 19%
Highest weekly consumption
Lowest plug-in consistency
Lowest early adopters
Low ‘price cap’ activation
High ‘dumb tariff’ – Fixed price / SVT
High Index of peak charging – between 4pm and 10pm
Highest mix of ‘expensive car’

British Gas

Ohme

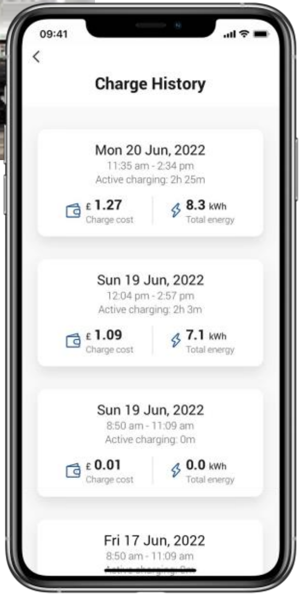
Customer Archetypes – (3); Medium Value / Low Engagement

Medium Value / Low Engagement – 27%
Best Car Efficiency
Highest active charging during session
Highest morning ‘plug – in’
Most random ‘plug – out’ consistency
Lowest ‘early adopters’
Lowest ‘price cap’ activation
Low API integration
Lowest smart tariff adoption
Highest peak charging
Highest share of LIV customers

Ohme

Customer Archetypes – (4); Low Value (Currently)

Low Value Currently – 13%
Small Battery - PHEV
Lowest weekly consumption
Highest # of weekly sessions
Highest mix of afternoon sessions
Very consistent charge, i.e. they top up when battery empty
Lowest API integration
Highest Max Charge



Additional data to be captured through Qual / Questionnaire

- Total Household consumption
- Use of electric heating – Storage heaters / Heat Pumps
- Other ESA devices in the household; PV / Battery, White Goods
- Access and use of Smart Controls / Home Energy Management System
- Demographics – LIV or More Affluent
- Smart v Dumb Meter

Further sub-segmentation – LIV's / "Turn Up" potential

- Low Income / Vulnerable H/H's should be sub-segmented
  - Medium Value / Less Engaged
  - Very Engaged

- Turn Up potential can be accessed across all four segments
  - Similar mix; 19-23% mix in each segment
  - SSE (North), SPEN (Distribution), ENWL, NPG

Next Steps - Segmentation

- Align proxies with CNZ / OE
- Compare clusters across both data sets
- Agree further Qual data / 3rd party data and approach
- Feed segments into Trial Design approach

Trial Design – Elements to Consider

1. Comms Channel – Digital vs Non Digital
2. Automated Dispatch – Yes vs Manual / Opt In per event
3. Incentive to Participate – Financial, (cost saving / reward), vs Non Financial, (e.g. plant a tree / charity contribution…)
4. Price elasticity – different incentive levels
5. Messaging (positioning) – e.g. Saving Money, Saving the Environment, Helping Society
6. Flex product – What is it and what is the potential benefit to the end consumer?

Discussion

- Please share your feedback on what you’ve just heard.
- Do you have any additional insight that could add value to these work packages?
- Do you think there are any aspects missing in any of these work packages? If so, where can the project acquire the data/insight?

Next Steps

Mark Sunderland, ESO

Alpha Next Steps

Trial Design

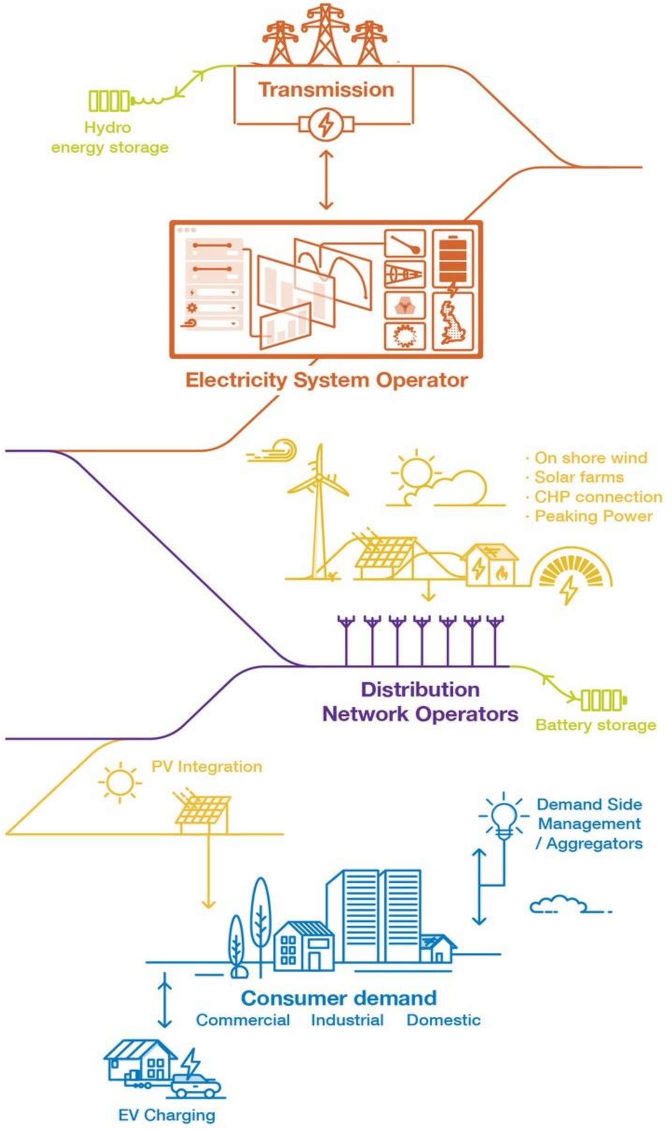
- Develop **consumer engagement** approach
- Select **priority "trial-services"**, including specifics for **ESO/DNOs**
- Check technology suitability for "trial-services"
- Assess **commercial viability** and design **customer incentives**
- Trial design specification

Model Specification

- Select **priority Use Case** for statistical demand and flex modelling
- Identify **data needs & modelling approach,** align with Common Framework for **VirtualES integration**

+ Stakeholder Engagement

- Engage with **Ofgem/BEIS and industry** to gather **feedback** and **disseminate** learnings
- Consider **collaboration** with other **innovation projects** and possible **consortium members**



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Beta

Launch

- Opens: end-2022
- Response Deadline: Q1-2023
- Delivery: 2023
- Aim: **Deliver** large-scale trials **implementing** the plan developed in Alpha.

CrowdFlex learnings can:

- **Lower customer bills**
  - through system wide **savings** and **revenues** from services
- **Reduce costs** of system balancing and network reinforcement
  - through **access** to and **confidence** in domestic assets
- Enable **greater market participation** on the demand side
  - through novel **statistical approaches** to flexibility services
- Increase use of **renewable generation** and **lower carbon** emissions
  - through the **demand-side** supporting the energy transition

Engagement Opportunities

Show & Listen sessions with industry:

- Session 2 towards the **end of the project**
- Email **innovation@nationalgrideso.com** to **register interest**

Findings:

- Trial Plan & Final Reporting **end-January**
- SIF outputs: www.ofgem.gov.uk/strategic-innovation-fund-sif

Further Info:

ESO: www.nationalgrideso.com/virtual-energy-system/crowdflex

SNP: smarter.energynetworks.org/projects/10027180/

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