ESO

Consumer archetypes: why you matter

Key messages

- Demographic data is vital to understanding how different parts of the UK will participate in the journey to Net Zero
- Consumer archetypes are a profile of a specific type of consumers, with in-depth knowledge of their behaviour and their likely interaction with the energy system
- The mix of archetypes vary per region, driving our modelling outputs such as the uptake of new technologies or the response to particular policy changes
- Consumer archetypes should be considered in policy at a national and regional level
- ESO have partnered with the Centre for Sustainable Energy (CSE) and Element Energy to develop a series of end-user archetypes to be used in scenario development and available for use by electricity and gas network operators and other interested industry stakeholders in GB which will be available in 2023

Introduction

To meet the UK's Net Zero emissions targets by 2050, our energy system will need to rapidly transform to accommodate new technologies. Our Future Energy Scenarios (FES) have set out the pathways for the decarbonisation of the energy system. Consumers play a vital role in the success of this transition but, until now, customer behaviour has not been modelled in detail in our analysis. Consumer behaviour is pivotal to decarbonisation - how we all embrace smart technology and react to both market and policy changes will be vital to meeting Net Zero targets.

As we advance towards Net Zero, we believe the solutions to decarbonising the energy system are partly driven by demographics. Our FES projections set out a range of credible pathways for the energy system, however we don't expect just one scenario to materialise, but a mixture of all four. Demographics are a driver of the analysis that we undertake as every scenario we forecast relies on some degree of societal change. Demographic data can help us to build archetypes of the average consumer per area. From this, we can form better insights into our scenarios by reducing the uncertainty of how much consumers can be relied on to offer flexibility. By considering the different types of consumers we have, we can ensure that there is a 'just transition'- the journey to Net Zero is fair to everyone.

Who are you?

Predicting consumer behaviour is complex because people are complex. Their demographics, including factors such as finance, age, political preferences, and knowledge change over time. We are introducing consumer archetypes into our FES modelling in order to reflect the diversity of these behaviours.

A consumer archetype is the name given to the profile of specific types of consumers, reflecting in-depth knowledge of their behaviour and their likely interaction with the energy system. By using demographic data within our consumer archetypes, we can understand what influences groups of individuals to make the choices they make, and this enables us to forecast the energy and technological needs of the future.

Demographic data is the statistical data accumulated about the characteristics of the population. Applying this statistical lens can help us to understand consumer behaviour and which factors contribute to trends and how different groups of people within the same region may see very different pathways to Net Zero.

Our Empowering Climate Action[1] report from October 2021 involved 4,211 members of the public, who were polled to understand their view on the UK's climate change agenda. The members of public polled were categorised by demographic groups including, age, gender, social grade, region they lived in, and voting intention. This was used to group participants into 'segments' that contain individuals who are similar to one another in their responses. These segments are shown in Figure 1 and show that different consumers can encounter a range of barriers and motivators to engaging in climate action and the energy transition.

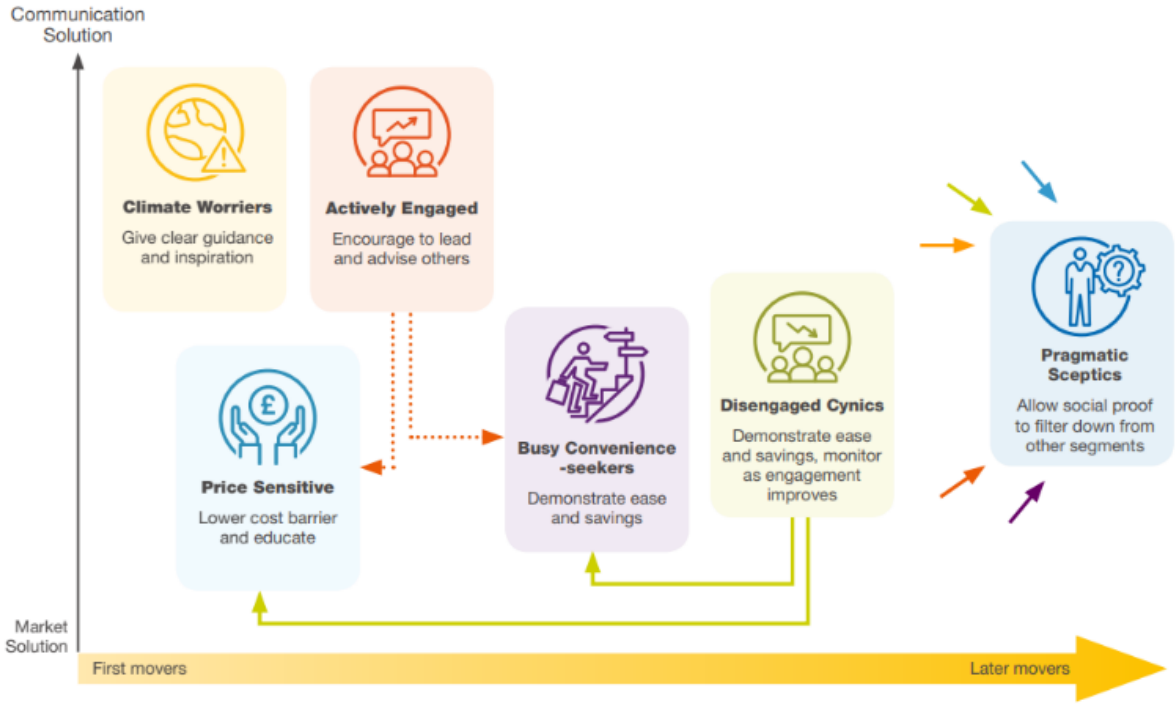

Figure 1: Engagement Roadmap

Where are you?

The recent shift to regionalise our FES analysis is to strengthen GB insights with local outputs and whole system scenarios. The regionalisation of FES is closely linked to the further adoption of archetypes within our modelling, as the bottom-up approach focuses on individual regions' needs and how they differ across GB. The use of demographic data will help to highlight hotspots due to a larger proportion of a certain demographic, for example how the more ageing population of a town such as Eastbourne may adapt differently to the student population in Manchester.

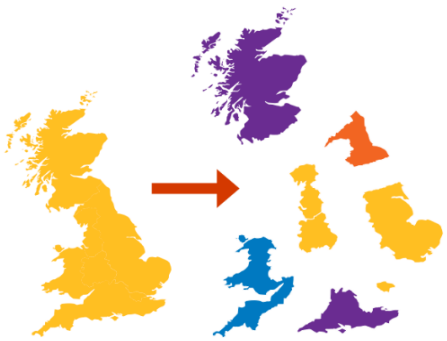

Figure 2.1: Previous modelling of GB broken down based on regional assumptions

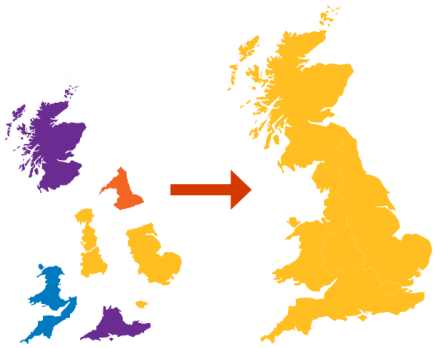

Figure 2.2: Future GB modelling becomes summation of regional results

[1] Please follow this link for a more detailed breakdown of the data collected.

We want to enhance our modelling and insights to better reflect how different demographic groups could decarbonise in different ways. Understanding how different consumer archetypes interact with the energy system will allow us to reflect each individual journey to Net Zero. Regionalisation of FES allows the ESO to broaden our engagement across GB, inviting new voices and perspectives thereby enhancing our knowledge of consumer behaviour. Not only do we need to know who is where and what they are likely to do to accurately forecast, we also need common language to improve collaboration across organisations. We want to help people – to better understand their wants, needs and expectations for their journey to Net Zero. This information will play into policy and advisory roles to shape what the energy sector and government can do to support individuals during this process.

Consumer Archetypes in use: How do we heat our homes?

In our Future Energy Scenarios, we explore a wide range of solutions for decarbonising heat across our different pathways. A lack of policy direction for decarbonising heat results in many different options for modelling, pathways, and outcomes.

Our spatial heat model uses building archetypes to model the GB domestic and commercial building stock and its heat demand. For housing stock, the model includes the tenure status of the property and considers the disposable income regionally. By looking at tenure status and disposable income combined, we can understand the consumer willingness to pay for certain heating systems. This allows us to gain insight into which heating systems are most cost optimal in certain areas based on how the housing types vary regionally and demographically.

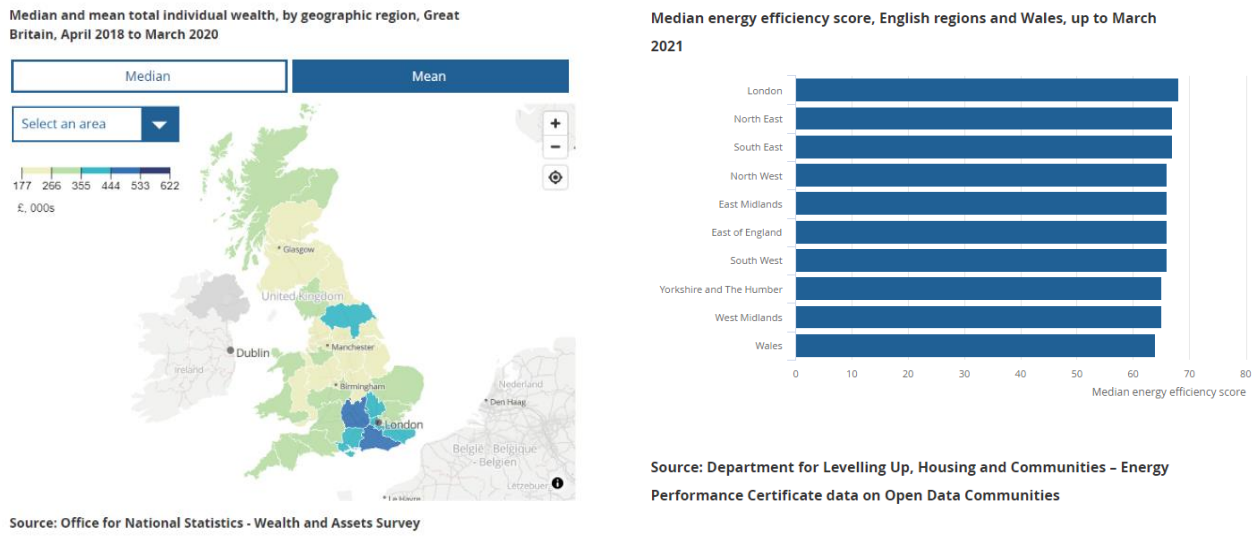

Figure 4: Mean total individual wealth per region in Great Britain[2], and the Energy efficiency of housing in England and Wales, from retrieved from ONS

An EPC indicates the energy efficiency of a building. It is based on data about a building's energy features (for example, the building materials used and the heating systems and insulation). The lower the EPC rating of a household means it has lower energy efficiency, poor insulation, and therefore consumers may face **higher bills** as it would take more energy to heat their homes.[3]

The ONS states that in England and Wales, 1 in 10 local authorities had over half of their dwellings with an energy efficiency score equivalent to band C or above; two thirds of these were in London or the South East. This suggests that certain regions have dwellings that are better equipped for energy efficiency and therefore are less effected to shocks in wholesale energy prices, as we have seen recently with the price of gas.

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2 Distribution of individual total wealth by characteristic in Great Britain - Office for National Statistics (ons.gov.uk)

3 Henretty, N. (2020, Sept 23). Energy efficiency of housing in England and Wales. Retrieved from ONS: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/energyefficiencyofhousinginenglandandwales/2020-09-23

To upgrade a property to a higher EPC rating involves significant upfront costs. In areas with a lower average income, consumers are less likely to be able to afford to invest in energy efficiency improvements even when these lead to lower ongoing running costs. There is support available for some consumers, such as housing associations providing support to upgrade the energy efficiency of social housing stock. Strong policy targets in heat, transport, and power sectors, as well as payment support mechanisms will be required to ensure mass and scalable take-up of new technologies and energy-efficiency measures.

Services such as the ESO's Demand Flexibility Service require consumers to have a smart meter to participate as they provide a much more granular view of energy demand. The ESO, together with electricity suppliers, aggregators, and other stakeholders, will learn from and improve the operability of future services, to enable consumers to participate and benefit from a flexible energy system. We are particularly keen to ensure future schemes are more accessible. Reducing demand is not the only way consumers can offer flexibility to the grid, in future demand turn up at times of high renewable generation output will be increasingly important. Work will be needed to establish the appropriate markets and incentives for this and offer consumers opportunities to participate and engage further with the energy system.

The pathway to decarbonising residential heat is not simple but, with quality consumer-behaviour based insights, it can be made less complex. There is no singular GB wide solution since differences in consumer preferences, and the proximity and availability of resources and infrastructure differ geographically. We need to understand how the end-user will be affected and how this will impact the whole energy system.

How do we use transport?

To successfully decarbonise transport, we must have the appropriate supporting infrastructure including suitable tariffs and market incentives to facilitate change in consumer behaviour. Despite the increased number of Electric Vehicles (EVs) on the roads, there is more needed to be done in order to reach government targets. Barriers to the wider adoption of EVs by consumers include higher up-front costs and the availability of charging infrastructure.

A key driver of our transport model is consumer behaviour-driven decisions. The model uses consumer archetypes to understand the level of uptake of smart charging and vehicle-to-grid in each scenario. By modelling the propensity to uptake residential smart charging, we can forecast the likelihood of the adoption of smart technologies and the subsequent increase in electricity demand on the network.

Since the 2050 Net Zero target was introduced, we have seen a range of government incentives and policies considered and implemented to encourage the adoption of new technologies, including EVs and smart charging. In FES 2022, consumer engagement with smart EV charging ranged from 43% in Falling Short to 92% in Leading the Way in 2035. Improved consumer archetypes would allow our transport model to forecast the effects in uptake from policy and consider how specific demographics react to these. This could enable us to both understand different adoption curves and also assess whether certain regions and groups of people are all afforded the same opportunities in this transition. From this, we could form valuable insights showing the benefits of targeting specific demographics – for example 'attract more of demographic A and B, save £x Billion' or that to meet 2050 targets legislation will be required to capture certain demographics/archetypes.

Despite the known and regular use of archetypes and demographics today across a variety of sectors, the data available is not as advanced as it needs to be for our energy modelling purposes. This would require more sophisticated modelling including archetypes that are more useful to us, either having the data built in or more reliable data sources. Our current models are based on econometric data and market indicators, such as price point, but we acknowledge that these are no longer the only indicators of how the future will look – consumer behaviour is a key driver.

Next steps: Consumer Building Blocks Project

The ESO have partnered with Centre for Sustainable Energy (CSE) and Element Energy to develop a series of end-user archetypes to be used in scenario development and available for use by electricity and gas network operators in GB. These archetypes are to be used as an input to our modelling of the Future Energy Scenarios and will allow us to gain further insight into the characteristics of energy consumers and what drives their behaviour and decision-making to improve our modelling of future energy systems.

The need for this project is increasingly necessary as other energy market participants also consider the impact of consumer behaviour. Unless this is a standardised procedure, this may result in companies basing their modelling off considerably different consumer behaviour assumptions and/or not being able to share and compare statistics and figures. The project will form standardised assumptions on how the energy system and societal changes are foreseen in the FES scenarios, and how this will alter the behaviour and attributes of consumers and their buildings and appliances. It will be vital to understand how consumers participate in anticipated technology advancements, market development and service changes. Having this will not only allow us to understand and communicate in a common language but also to influence consumers based on their archetypes. For example, we could model how this behaviour will change over time such as through the regulation of appliances and buildings, income changes or shifts in social attitude.

Get involved in the conversation

We are keen to hear more from stakeholders about your views on different aspects of our FES modelling. If you are interested in sharing your thoughts on consumer archetypes and our modelling for FES 2023 and beyond, please email us at FES@nationalgrideso.com.

To access our current and past FES documents, data and multimedia at: nationalgrideso.com/future-energy/future-energy-scenarios

Get involved in the debate on the future of energy and join our LinkedIn group Future of Energy by National Grid ESO

For further information on ESO publications please visit: nationalgrideso.com

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