Assessing the distributional impacts of economic regulation

ofgem

Making a positive difference
for energy consumers

This document sets out our approach to assessing the distributional impacts of our policies. It will be of interest to those that want to know how we consider impacts on different groups of consumers in Great Britain.

Please provide any comments to ImpactAssessment@ofgem.gov.uk

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1. Introduction

1. Ofgem's primary objective is to protect current and future energy consumers. As the energy market takes a more decentralised, decarbonised and digitalised path, we need to understand how the policy decisions we make can affect how the costs and benefits of using energy and participating in a smart energy system are distributed across different types of households. This is why in our Consumer Vulnerability Strategy[1] we committed to strengthening our approach to assessing the distributional impacts of our policies.

2. To this end, we have developed a framework that we can use, as appropriate, to understand the impact of our policies on particular groups of consumers who may be in vulnerable situations. It can also help us aggregate the impacts of our policies over time. Although it focuses on energy regulation, it is sufficiently general to contribute to wider discussion on distributional impacts of policies in other regulated sectors. It is designed to accompany our recently updated Impact Assessment (IA) guidance,[2] and provide more detail for those who wish to understand our approach better.

3. This paper is structured as follows. In section 2 we provide a high level overview of our framework. In sections 3 and 4 we describe the framework in detail, and provide examples of how it can be applied in practice. In the annex we discuss the main dataset that we use in the framework and illustrate how energy expenditure varies for different groups of consumers across disposable income deciles.

4. This paper is intended to provide a general overview of our framework. Our IA guidance sets out precisely how and when we will apply it internally, which will depend on the specific considerations of the policy being considered. Although we may not be able to use the framework for every IA, we will decide whether it is appropriate to do

[1] Ofgem (2019) "Consumer Vulnerability Strategy 2025" p.59
https://www.ofgem.gov.uk/system/files/docs/2020/01/consumer_vulnerability_strategy_2025.pdf
[2] https://www.ofgem.gov.uk/publications-and-updates/impact-assessment-guidance

so at the start of the IA process. Where we decide not to use it we will explain the reasons for that in the IA.

2. An overview of the framework

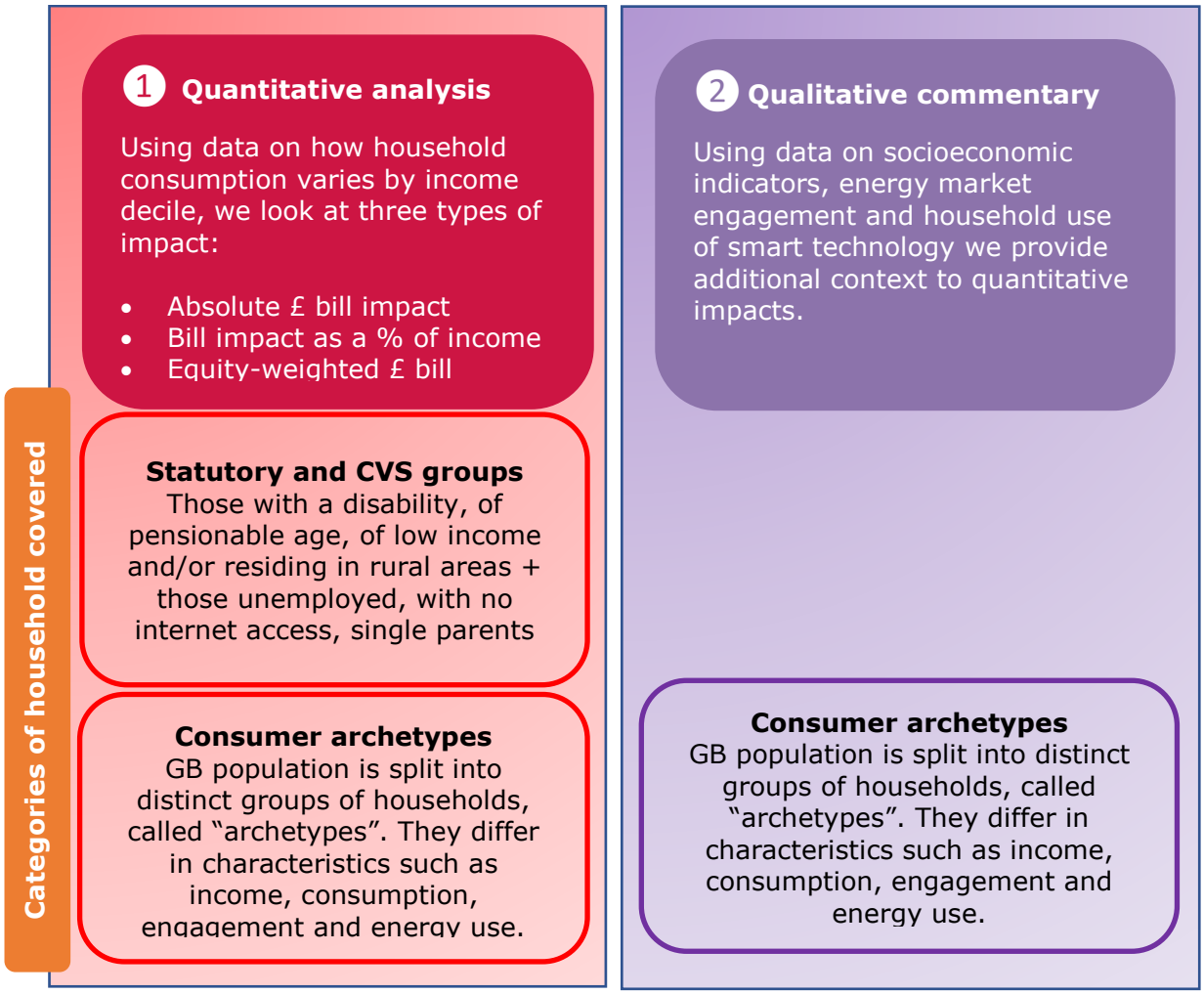
5. Our framework has two parts, illustrated in Figure 1 overleaf. The first is the quantitative analysis of how a policy affects the bills of households that differ in income and other characteristics. It allows us to produce these bill impacts for:

   - each of the statutory groups[3] of consumers that we must have regard to when making decisions.
   - some consumers we identified in our Consumer Vulnerability Strategy.[4]
   - a wider set of consumers that we have categorised into distinct groups of GB households ("consumer archetypes").

6. The second part of the framework allows us to produce qualitative commentary on how these consumer archetypes differ in socioeconomic and attitudinal characteristics. Combining this with the quantitative bill impacts, we can provide a more complete picture of how different types of consumers may be affected by a policy.

[3] These are: low income; disability / chronic illness; pensionable age; and rural areas.
[4] Data is not available for all characteristics of vulnerability identified

Figure 1: Components of the framework



7. Our framework uses three groups of data to help us assess impact:

   - Disposable income and energy expenditure – to assess how a policy may affect how much consumers spend on energy as a proportion of their income.
   - Socio-economic factors such as age, disability status, and employment status – to assess how a policy may affect vulnerable groups.
   - Attitudinal and technology adoption, such as engagement in the energy market and electric vehicle uptake – to give insight into how policies may affect those with different attitudes towards and experiences of the energy market.[5]

3. Quantitative analysis - impact on energy bills for different groups of consumers

8. We use three metrics to calculate how the distributional impact of policies vary with income for different groups of consumers:

   - Absolute pound (£) savings or costs.
   - Savings or costs as a percentage of disposable income.
   - Equity-weighted pound (£) savings, capturing the fact that an additional unit of income improves the welfare of a low-income household more than that of a higher-income household. This is standard practice and recommended by HM Treasury Green Book when carrying out distributional analysis.[6]

9. The framework is sufficiently flexible to handle a range of different policies that we may implement. This ranges from policies whose impacts are straightforward in that they affect all consumers in a similar way, such as reducing their bills by a given percentage, to cases where the impact on consumers – and in particular whether or not

[5] In time we aim to build on this data with more information on consumers' actual consumption profiles and the extent to which they can shift their consumption flexibly throughout the day.
[6] This is based on the standard economic principle of diminishing marginal utility of income. In addition to providing absolute (£) savings, it is standard practice to apply equity/distributional weights, as set out in HM Treasury (2018, p.78) "The Green Book: Central government guidance on appraisal and evaluation".

they benefit from the policy – will depend on their level of energy consumption.[7] To illustrate these two cases, we provide examples based on the statutory groups of consumers set out previously, but results could also be produced for a wider set of consumer groups for which we have income and expenditure information. We discuss this in the final part of this section.

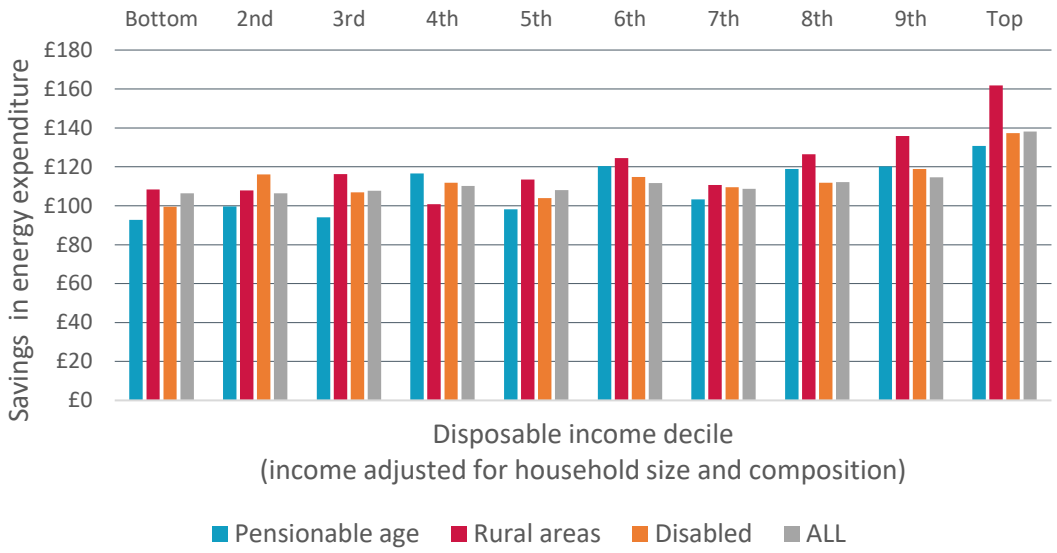
Simplest case: everyone's energy bills decrease or increase by the same percentage

10. It is possible to have a policy that decreases or increases the bills of households by the same percentage across all types of household, independent of their level of consumption. So while the absolute pound savings will vary with energy consumption, the percentage change in the bill will be the same for all. In such a case, we can calculate distributional impacts by assuming that the energy expenditure of all consumer groups changes by this fixed percentage. Consider a policy such as the Default Tariff Cap (DTC), which sets the maximum amount that suppliers can charge per unit of energy consumed for customers on default and standard variable tariffs. Our impact assessment[8] shows that this would save a consumer with typical consumption on these tariffs around £95 annually, or around £0.006 per unit of energy.[9] If the overall energy consumption of any given household remains relatively unchanged in response to this policy[10], our data on energy expenditure suggests this saving corresponds roughly to a 10% reduction in the bills of default and standard variable tariff customers, on average.

11. Using the Office for National Statistics' Living Costs and Food Survey data on energy expenditure by income, we can show that this 10% reduction in energy expenditure results in the absolute £ savings shown in Figure 2.

[7] Again, we aim to build on these examples and adapt the framework in time for examples where impact may vary according to consumers' consumption profiles.
[8] Ofgem (2018) Statutory Consultation – Default tariff cap - Draft impact assessment
[9] In practice, we set separate DTC levels for gas and electricity (rather than per unit of energy). The DTC also sets the standing charge.
[10] I.e. energy needs do not change a result of the reduction in price, and consumers do not feel the need to consume more.

Figure 2: Absolute £ savings in household bills

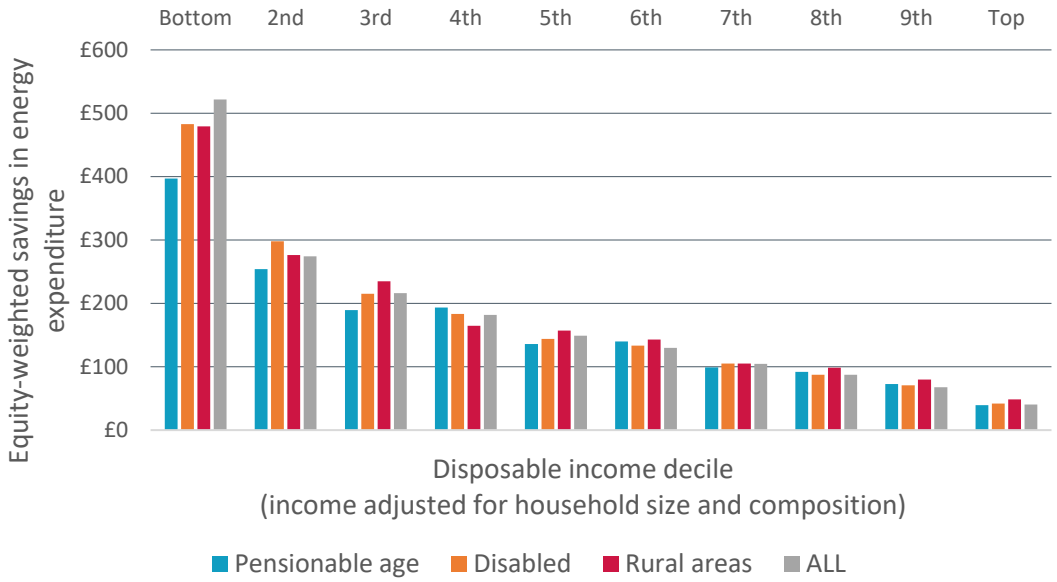


Source: Ofgem analysis of data from ONS Living Costs and Food Survey

12. Households in the top income decile generally have the highest energy consumption and so their absolute savings are higher, but the differences in savings across the remaining nine deciles are smaller. Within a decile we can see significant variation in how the savings of the statutory groups of consumers compare to the average; in a number of cases their savings are higher due to higher energy use. In general, there may be substantial variation of consumption between different households in the same income decile, and thus also variation in savings.

13. We can then show the impacts based on equity-weighted savings. This approach increases the value of each £1 of savings to those of lower income. As Figure 3 shows, this results in a much higher value of saving to the lowest income consumers than is the case in Figure 2.

Figure 3: Equity-weighted savings

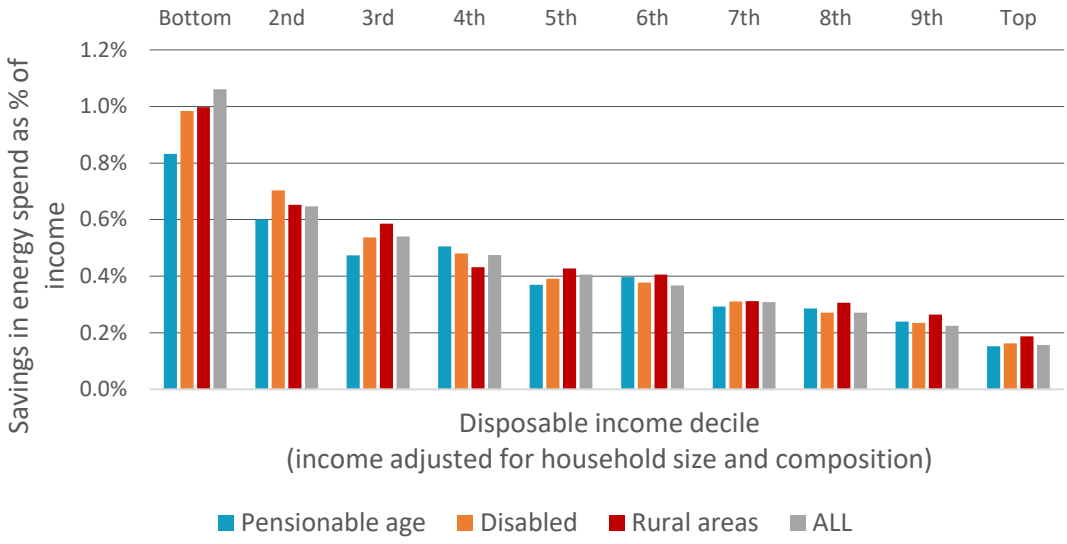


Source: Ofgem analysis of data from ONS Living Costs and Food Survey.

Note: These figure are not real pounds, but adjusted savings to capture the higher value of an additional pound of income to a low-income household than a high-income household. For a discussion, see HM Treasury (2018, p.78) "The Green Book: Central government guidance on appraisal and evaluation".

14. The savings as a percentage of household income are shown in Figure 4. As energy expenditure is a higher proportion of income for lower income households, the percentage savings are decreasing across the income deciles.

Figure 4: Savings as a percentage of household income



Source: Ofgem analysis of data from ONS Living Costs and Food Survey

Complex cases: A matrix of winners and losers, where the percentage impact on bills depends on energy consumption

15. The framework can accommodate the assessment of more complex cases, where the percentage impact that a policy has on the energy bills of a household will vary depending on the level of consumption. There are a range of potential scenarios. To better understand these we:

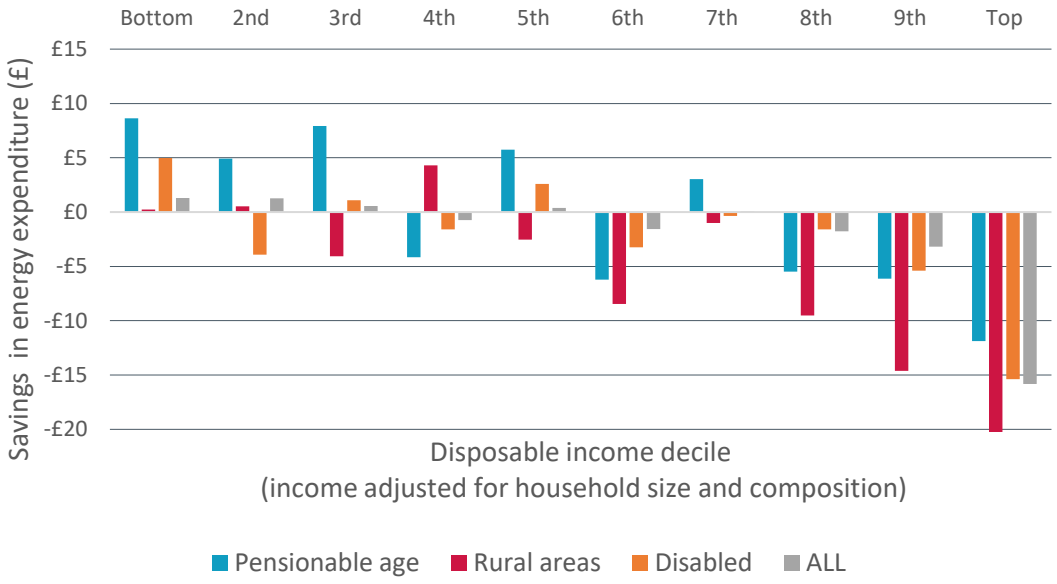
    i. Estimate the relationship between savings and consumption, ie, what the level of savings would be at any given level of consumption. We do this by calculating the absolute £ savings that the policy would generate for each of the low, medium and high categories of Ofgem's Typical Domestic Consumption Values (TDCV)[11] for electricity, gas or both combined (depending on which is relevant to the policy). To illustrate how this works, consider a hypothetical policy that has the following

[11] Typical domestic consumption values are calculated by taking the lower, median and upper quartiles of household energy consumption, averaged over two years. See Ofgem (2020) "Decision on revised Typical Domestic Consumption Values for gas and electricity and Economy 7 consumption split".

effect: households with a low TDCV pay £30 less as previously; those with medium TDCV consumption pay the same; and those with high consumption pay £10 more. We can use this information to derive a continuous relationship between consumption and savings; we call this the "savings estimator".

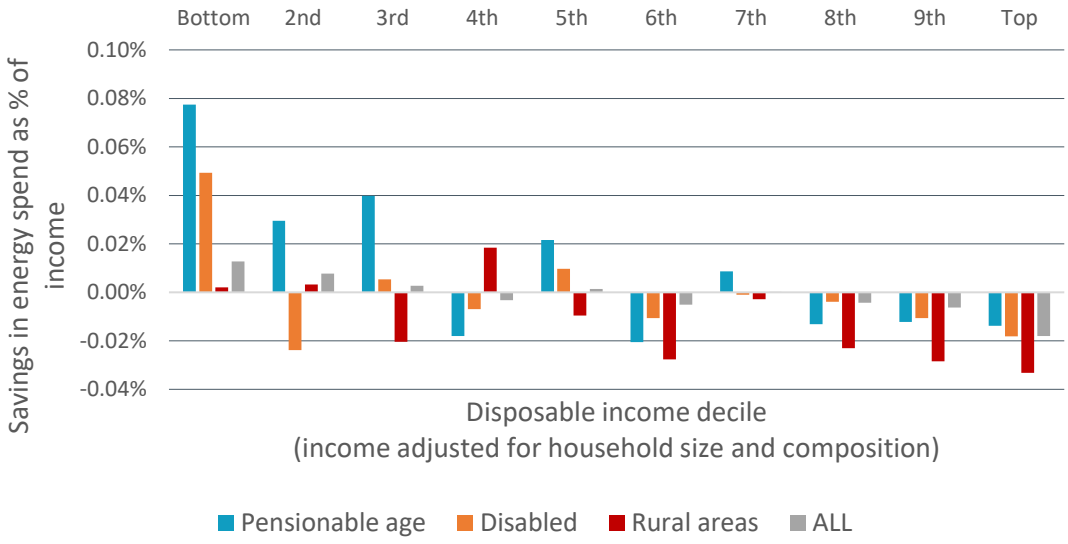
ii. We use the savings estimator to calculate the average level of savings that each type of household would get, given their level of energy consumption and income. The results are presented in Figure 5, which shows which of the statutory groups win (positive bars) and lose (negative bars). As in the previous example, we can also generate results as a proportion of income (Figure 6) and equity weighted savings.

Figure 5: Absolute £ savings in household bills, when there are winners and losers



Source: Ofgem analysis of data from ONS Living Costs and Food Survey.

Figure 6: Savings as a % of household income, when there are winners and losers



Source: Ofgem analysis of data from ONS Living Costs and Food Survey

Estimating bill impacts for a wider set of consumers - Ofgem's Consumer Archetypes

16. While the above examples focus on the statutory group of consumers that we must have regard to, we can calculate these types of bill impacts for any group of consumers that we have income and expenditure data for, such as the consumer archetypes.

17. As part of our extensive work on consumer vulnerability, we are able to segment the GB population into distinct groups of households, called "archetypes", that differ in a range of socioeconomic and behavioural characteristics.

18. Ofgem previously commissioned the Centre for Sustainable Energy (CSE) to develop an initial set of archetypes.[12] In October 2019, when we published our new Consumer Vulnerability Strategy, we committed to updating the archetypes to ensure that they

[12] Centre for Sustainable Energy (2014) "Beyond average consumption" https://www.ofgem.gov.uk/sites/default/files/docs/2014/06/cse_14_beyond_average_consumption_report_to_ofgem_march_2014_update.pdf

are representative of consumers in the market today. CSE has developed a new set of 13 archetypes using new sources of data (including the Ofgem Consumer Engagement Survey), adding more detail and variety of indicators. There are four stages in developing the archetypes: 1) Compiling an energy consumer data set, 2) Calculating energy consumption data, 3) Generating energy consumer archetypes, and 4) Analysis, profiling and reporting on the archetypes.

19. The archetypes contain four years' of data from the LCF on important indicators such as energy spend and household income, age, disability status and whether they live in a rural area. They also contain a wider set of socioeconomic and attitudinal indicators.

20. The archetypes are summarised in Table 1 below and the full CSE report is published alongside this document.[13] Columns (2), (4), (5) and (6) provide the quantitative information we need to calculate the average bill impact for any given archetype. For each archetype, we also have information on how energy consumption varies across each disposable income decile, allowing us to produce impacts by income decile and graphs similar to those in Figures 2 to 5 if required.

[13] https://www.ofgem.gov.uk/publications-and-updates/impact-assessment-guidance

Table 1: summary of the 2020 consumer archetypes

Archetype	Numbers of hhlds	Heating fuel	Average hhld income (BHC) (GB avg: £34k)	Average Elec kWh (GB avg: 3,980)	Average Gas kWh (GB avg: 13,180)	Main attributes (key words)
A1	2,761,000	Mains gas	£48,000	3,250	9,650	High incomes, owner occupied, working age families, full time employment, low consumption, regular switchers.
A2	2,916,000	Mains gas	£54,600	4,920	20,520	High incomes, owner occupied, middle aged adults, full time employment, big houses, very high consumption, solar PV, environmental concerns.
B3	3,674,000	Mains gas	£28,600	3,670	15,350	Average incomes, retired, owner occupied - no mortgage, electric vehicles, environmental concerns, lapsed switchers, late adopters.
B4	2,323,000	Mains gas	£40,600	4,090	15,630	High incomes, owner occupied, part-type employed, high consumers, flexible lifestyles, environmental concerns.
C5	1,922,000	Mains gas	£15,200	2,570	11,270	Very low incomes, single female adult pensioners, non-switchers, prepayment meters, disconnected (no internet or smart phones).
D6	1,547,000	Mains gas	£18,100	3,920	12,340	Low income, disability, fuel debt, prepayment meter, disengaged, social housing, BME households, single parents.
D7	1,205,000	Mains gas	£34,000	4,140	15,600	Middle aged to pensioners, full time work or retired, disability benefits, above average incomes, high consumers.
E8	2,356,000	Mains gas	£23,400	3,620	11,950	Low income, younger households, part-time work or unemployed, private or social renters, disengaged non-switchers.
E9	3,093,000	Mains gas	£37,000	3,200	10,440	High income, young renters, full time employments, private renters, early adopters, smart phones.
F10	1,912,000	Oil, Electric	£38,900	5,750	0	Middle aged to pensioners, full time work or retired, owner occupied, higher incomes, oil heating, rural, environmental awareness, RHI installers, late adopters.
G11	1,510,000	Electric, Oil	£30,200	5,250	0	Younger couples/single adults, private renters, electric heating, employed, average incomes, early adopters, BME backgrounds, low engagement.

Archetype	Numbers of hhlds	Heating fuel	Average hhld income (BHC) (GB avg: £34k)	Average Elec kWh (GB avg: 3,980)	Average Gas kWh (GB avg: 13,180)	Main attributes (key words)
H12	644,000	Electric, Oil	£14,500	4,030	0	Elderly, single adults, very low income, medium electricity consumers, never-switched, disconnected, fuel debt.
H13	526,000	Electric, Oil	£22,000	5,360	0	Off gas, low income, high electricity consumption, disability benefits, over 45s, low energy market engagement, late adopters.

4. Qualitative - assessing broader impact on groups of consumers

21. Income analysis is important. However, on its own, it is limited in what it can tell us about the complexity of non-average households. There are a multitude of socio-economic variables that we can use to describe these households, and which we can then use as the basis of assessing qualitatively how policies could affect them.

22. This is where consumer archetypes bring a richness to understanding the impacts of policies and improve our analysis of impacts. In addition to the income and expenditure data that we illustrated in section 3, they also contain wider indicators of vulnerability such as energy debt, households in poverty, and whether there is internet access at home. These are particularly important for improving our understanding of the number and characteristics of households with characteristics of vulnerability.

23. The archetypes also inform our understanding of consumers' attitudes to the energy market and related technologies. For example, they use information from Ofgem's Consumer Engagement Survey to identify consumers' history of engaging in the energy sector, whether they use smart phones to access the internet, and whether they have a hybrid or electric vehicle. As data on consumption profile becomes more available in future, we aim to add this to the archetypes as well.

Using the archetypes to qualitatively assess impact

24. In addition to calculating the average bill impact that a policy has for a given consumer archetype, we can look at the other characteristics to see if they are likely to experience a comparatively positive/negative impact as a result of the policy.

25. For example, for the DTC, a household that is retired, has internet at home and has a positive attitude to engaging in the energy market, is more able and likely to investigate their tariff options, or they may already be on a cheaper tariff despite the cap. Low income households that work full time and have not engaged in the energy market may be more likely to benefit from the policy that caps the unit price of their standard variable tariff.

26. In the context of the number of households affected and the total and average impact on bills, we can provide a qualitative commentary for each of the consumer archetypes. The extent to which we do this will depend on the policy under consideration. Table 2 below shows a few selected archetypes as examples.

Table 2: impact descriptions for selected archetypes of a simple policy, illustrative

Arche-type	House-holds	Key characteristics compared to GB average	Impact on energy bill and income (AHC)		Commentary
			Average	Total	
A1	2.7m	• Higher income • Lower consumption • Children in home • Internet in home • Engaging in energy market	£20 bill decrease 0.04% gross income increase	£54m bill decrease/ gross income increase	This group sees a smaller % income increase given their high income levels. They engage in the energy market so are likely to look at their tariff options even if prices go down. They experience a positive but minimal impact from the policy.
A2	2.9m	• Higher income • Higher elec and gas consumption • Children in home • Internet in home • Engaging in energy market • EV/hybrid	£40 bill decrease 0.08% gross income increase	£116m bill decrease/ gross income increase	This group sees a smaller % income increase given their high income levels. Nonetheless they are high consumers and therefore see a larger bill decrease. They engage in the energy market so are likely to look at their tariff options even if prices go down. They experience a positive but minimal impact from the policy.
…					
H13	0.5m	• Lower income • Higher elec consumption (no gas) • Pensionable age • Disability benefits • Poverty • Debt to energy supplier • Rural	£40 bill decrease 0.2% income increase	£20m bill decrease/ gross income increase	This group sees the largest % income increase given their low income and large bill decrease. They are more likely to have a disability and be in poverty, and so experience a positive and major impact from the policy.
ALL GB	**26.39m**				

Combining the quantitative and qualitative analysis

27. Bringing the quantitative and qualitative analysis together gives us a rich picture of how our policies could affect consumers. It helps us to understand where our focus needs to be, and if we need to mitigate any negative impacts. So for example for low income consumers, the DTC:

    - benefits low income consumers more than higher income consumers – they experience a higher saving as a proportion of household income. Low income consumers of a pensionable age benefit the most.

    - these consumers are more likely to have experienced fuel debt, to have no internet connection, and never to have switched.

28. The framework helps us to build evidence of distributional impact over time, allowing us to show how we predicted our policies would affect different groups of consumers. We can aggregate quantitative impacts for different policies for each of the consumer groups, and look at the qualitative analysis as well. This helps us check if any groups have been unduly disadvantaged.

5. Opportunities for further developing the framework

29. This framework brings greater consistency and transparency to the distributional analysis that we do in our impact assessments. It provides us with a strong foundation, but we recognise there will be opportunities to develop it further in time. For example, the framework cannot easily help in assessing impact on consumers where it depends on their usage throughout the day. However the roll-out of smart meters will provide us with more information on consumers' consumption profiles and how they use their energy day-to-day. If we can match this with our socio-economic data, it will help us understand how different groups of consumers may respond to our policies in future.

30. We welcome comments on the framework and how we might develop it in future. Please send any views to ImpactAssessment@Ofgem.gov.uk

Annex - Understanding how energy spend varies with income

31. In order to calculate how the bill impacts of a policy vary with household income and other characteristics, we need to understand how energy expenditure and consumption varies with income and other relevant characteristics.

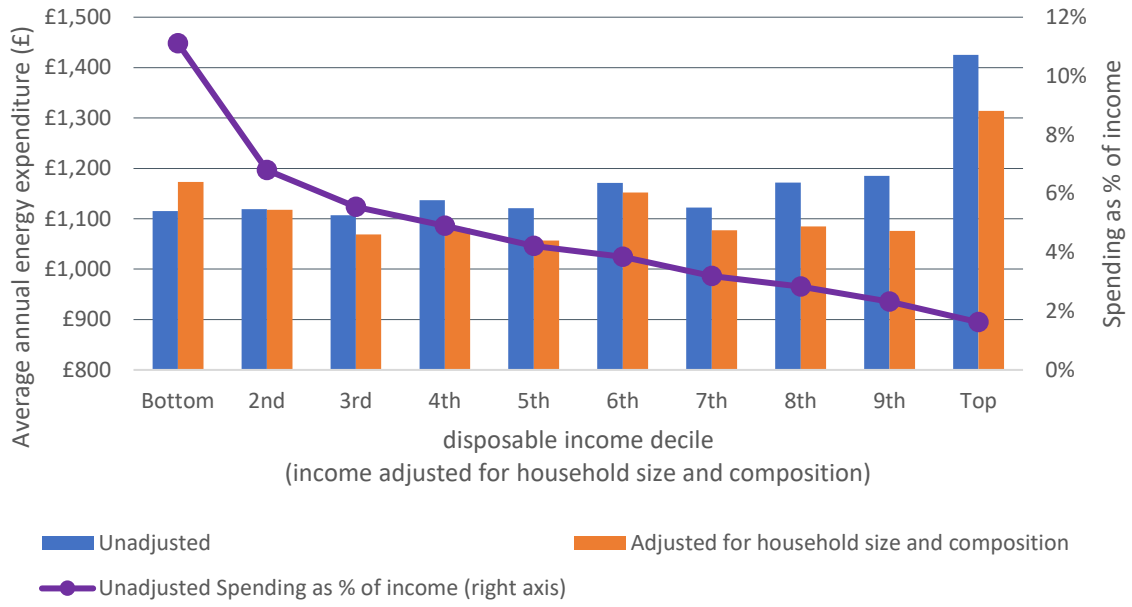
32. The LCF is the primary source of information on household spending across the UK. Data from this survey forms the empirical foundations of our framework, both for assessing impacts by income decile and across consumer archetypes.

33. Households differ in size and composition. We follow standard practice and adjust incomes to capture the fact that a large household requires more income to attain the same standard of living as a smaller household.[14]

34. Figure 7 illustrates how energy expenditure varies with disposable income, both in absolute terms and as a percentage of income. The unadjusted bars show the absolute level of energy expenditure, on average, of households in a given decile. Meanwhile, the adjusted bars scale expenditure to control for household size. In both cases, we see that the highest income households have the highest energy expenditure, but energy expenditure does not in general rise monotonically with income. In particular, there are some low-income households with high energy expenditure relative to their household size. This may be, for example, because they are living in poorly insulated homes or have electric storage heating.

[14] This process is called equivalisation, as set out in HM Treasury (2018, p.79) "The Green Book: Central government guidance on appraisal and evaluation." We use a version of the OECD modified equivalence scale, where the first adult has a weight of 0.67, both a second adult and a child aged 14 or over each have a weight of 0.33, while a child aged under 14 has a weight of 0.2.

Figure 7: Annual energy expenditure by equivalised disposable income decile



Source: Ofgem analysis of ONS (2020) "Disposable income and energy expenditure for different fuel type households and household types, UK: financial year ending 2018."

Notes: Energy expenditure figures are averages across households that consume both electricity and gas. The results do not materially change if we average across all households.