Committee on Fuel Poverty

Exploring options for improving energy bill equity for fuel poor households

Technical annex

Contents

Overview

This study addresses the following research questions:

1. What are the structural elements of energy bills that are inequitably borne across bill payers now and into the future?

    a. How do different elements of energy bills (unit rates, fixed costs) disproportionately impact fuel poor households?

    b. How do different elements of energy bills impact different types of fuel poor households?

    c. What are the current and future expected benefits of innovative tariffs? What are advantages or disadvantages of these tariffs for fuel poor households?

2. What options are there to create greater bill equity for those in fuel poverty?

    a. Is there an appropriate level of cost for fuel poor bill payers?

    b. What might be the challenges associated with implementing these options?

    c. What are the trade-offs associated with each option?

    d. Will there be any differential impacts of the options identified on fuel poor households? Who should receive the support? Where should the support be delivered (direct to consumers or via suppliers) How should the support be funded?

    e. How should the support take account of the wider Net Zero ambitions?

    f. What considerations would policy-makers need to take into account when considering a social tariff?

A1: Rapid Evidence Assessment (REA) methodology

A **rapid evidence assessment (REA)** was conducted to collect evidence on the key research questions. This was conducted in November to December 2024.

Search protocol

An REA protocol was designed and developed in collaboration the Department for Energy Security and Net Zero (DESNZ) and the Committee on Fuel Poverty (CFP) prior to conducting the search for literature. The first stage of developing the REA protocol was designing the eligibility criteria for the relevant literature.

The following specific eligibility criteria were included:

- Population: Residential consumers, defined as homeowners, owner occupiers, and tenants.

- Outcomes: In this context, one primary outcome is the impact of bill structure on household impacts (including financial and non-financial impacts). Another primary outcome is any discussion on alternative bill structures for vulnerable households.

- Setting: Household/residential settings only. We excluded other types of buildings (i.e. non-residential/commercial buildings)

- Design: We did not impose any restrictions related to study design.

- Date: Studies conducted prior to 2014 were excluded. This year was chosen in order to capture evidence and commentary related to the main research questions that may be older but still provide relevant insights. However, more recent evidence was prioritised.

- Geographic location: We prioritised studies located within England, given the devolved nature of the policy area, but considered evidence from other UK nations or the UK as a whole as appropriate.

Search strategy

Search terms were used in search engine and database queries to identify relevant literature. To ensure we captured the key papers and relevant literature we undertook an iterative approach. We used higher level search terms as indicated in Figure 1. Initially using higher level search terms allowed us to comprehensively search through combination of the terms. As Figure 1 shows, most terms are relevant to both research questions.

Terms were systematically combined across categories to create queries. In other words, one term was taken from each category and combined into a larger query. For example, one query for research questions 1 was "energy bill unit rate inequality fuel poor impacts".

Figure 1: High-level search terms

After this first iteration of the search, subsequent iterations were expanded upon using an expanded list of search terms presented in the table below.

Table 1 Expanded list of search terms

Search term	Expands into
Tariff	Smart tariff; Time of Use tariff; Dynamic tariff; Future tariff' New tariff; Innovative tariff; Green tariff
Fuel poor	Low income
Impacts	Effects; consequences; costs/benefits
Support	Assistance; price cap; benefits; payment; energy allowance
Energy	Electricity; gas
Inequality	Unevenness; unequal; disparity; imbalance; disproportion(ate)
Cold	Discomfort; warmth
Policy options	Measure; intervention
Bill	Cost; price
Inequity	Unfairness; injustice; inconsistency
Vulnerable	Elderly; disabled; children; health; end of life care
Debt	Rationing; self-disconnection

To identify published academic literature and grey literature, we primarily used Google and Google Scholar. We limited online search results to the first 10 pages. These searches were complemented by targeted searches of research conducted in research centres within universities, organisations and civil societies groups known for producing relevant reports (e.g. Energy Action UK, End Fuel Poverty Coalition), research conducted by energy regulators, or research conducted by statistical agencies.

We piloted the strategy to ensure that the relevant literature was identified. For example, we piloted the search strategy to check it identified key known (a priori) sources.

Screening

The search results were then screened against the exclusion criteria by the study team at London Economics. The screening followed a three-stage process. Abstracts were screened and categorised into three groups (Definitely include (1), Maybe include (2), and Exclude (3)). Those falling under category 2 underwent a more detailed assessment of the paper against the specified exclusion criteria.

The third stage involved prioritisation of the shortlisted papers based on the following factors:

- Relevance to the research questions: Through our search we prioritised papers which specifically reference bill structure in relation to vulnerable or (fuel) poor households.

- Date of publication: We prioritised more recent papers, however, overall we took a considered approach when selecting papers, as to not exclude papers that are less recent but are relevant to the research questions and contribute to a broad and high quality evidence base.

- Location: Studies covering England were prioritised to reflect the devolved nature of energy policy, although studies covering the other nations as well as the UK as a whole were included in the data extraction depending on the content of the research.

- Number of citations: For academic literature, papers with a substantial number of forward citations[1] (as provided in Google Scholar) were considered over those with fewer forward citations.

- Quality: Studies that are identified as high quality based on their published source and methodological approach were prioritised.

The REA search identified 358 academic papers and grey literature. Through several rounds of abstract screening, more in-depth reviews and prioritisation, 34 academic papers were included in the analysis (Figure 2).

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[1] "Forward citations" refers to citations of the paper under consideration after its publication.

Figure 2 PRISMA diagram of the screening and prioritisation stage
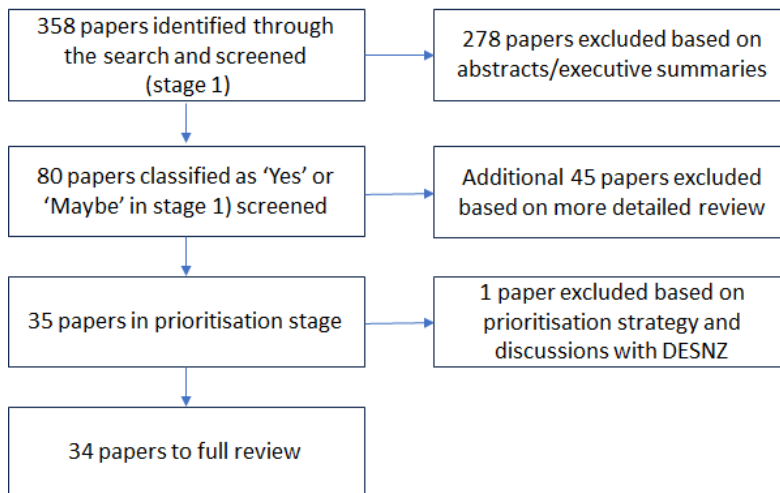
We piloted the strategy to ensure that the relevant literature is identified. For example, we piloted the search strategy to check it identified key known (a priori) sources.

Data extraction

An Excel-based analytical framework was developed by London Economics to extract the relevant data from the literature included in the full review. Data was extracted on:

- **Bibliographical information:** title, authors, publication year, country of publication and publication type.

- **Population**: type of households covered by the research (homeowners, owner occupier, tenant), key characteristics of households (e.g. fuel poor, vulnerable)

- **Summary of findings:** In this context, one primary outcome is the impact of bill structure on household impacts (including financial and non-financial impacts). Another primary outcome is any discussion on alternative bill structures for vulnerable households.

- **Definition of fuel poverty used in the paper (if any):** LILEE definition; 10% of disposable income spent on fuel costs, other definitions

- **Mapping of research to relevant research and (sub-) questions**

- **Methodology**: study design, empirical/methodological approach.

- **Quality appraisal**: A red-amber-green (RAG) methodology was employed to assess quality based on several factors including based on a number of criteria such as its published sources (e.g. peer-reviewed journals, publications from well-established organisations, government departments or recognised experts being the most credible) and empirical/methodological approach (e.g. the study's design, the recruitment process for sampling, the profile and applicability of the sample, the analysis conducted, the reliability of the findings).

The extracted data was triangulated using the analytical framework to collate evidence to answer the research (and sub-research) questions.

The evidence review was also used to inform the design of the workshops. The synthesis provided propositions and hypotheses to be explored in both workshops. For Workshop 1, we summarised the key findings from the literature related to the research question 1 – on how different energy bill components affect different households (particularly fuel poor households) and the potential impacts of new innovative tariffs. For workshop 2, the policy options proposed and/or discussed in the literature were used as a basis for exploration in the workshop.

A2: Workshops methodology

Stakeholders were invited to two reconvened workshops to discuss findings from the evidence review and appraise potential policy options to improve energy bill equity.

- Workshop 1 discussed the impact of energy bill inequity on fuel poor and other vulnerable households
- Workshop 2 discussed options to support greater bill equity for fuel poor and other vulnerable households.

While the workshops did not directly involve households living in fuel poverty, an advisory group comprising 7 people from such households was established to inform the workshop design and content.

The sample, recruitment, and workshop design process are described next.

Sample and recruitment process

Stakeholders with a range of knowledge and experience were identified to take part in the workshops. Stakeholder expertise covered energy retail, energy markets, energy affordability, bill payment options, fuel poverty, and the needs and behaviours of low income and vulnerable groups. It included stakeholders with frontline experience of supporting households living in fuel poverty.

Stakeholders were identified through the following process.

- The project team, the CFP and DESNZ discussed and agreed the stakeholder groups.
- Basis Social identified an initial list of potential participants through desk research and networks known to the research team.
- The CFP and DESNZ reviewed the list and sent an email to additional stakeholders requesting consent to share their contact details with research team.

Through this process, 126 stakeholders were identified as potential participants. Basis Social sent an invitation email to these stakeholders on 11 December 2024 to canvass their interest in attending the workshops. DESNZ also reached out to potential participants. The email provided details of the workshops, plus workshop dates (5 per workshop) to accommodate availability. Stakeholders were asked to attend both workshops, if possible, though this was not made a condition of attendance.

Basis Social sent a confirmation email to stakeholders on 8th January, together with an information sheet and consent form to take part in the research. As part of the consent process, participants were told that workshop discussions were held in confidence, and views would not be attributed to any individual or organisation.

In total, 60 stakeholders accepted attendance at both workshops. Several stakeholders who accepted the invitation were unable to attend the workshops, due to changing diary commitments. Stakeholders were offered alternative workshop dates wherever possible. In total, 46 stakeholders attended workshop 1 and 43 attended workshop 2.

Table 2 shows the stakeholder groups that were identified to participate in the research, plus the recruitment quotas, accepted and achieved sample for each workshop.

Table 2 Quota and achieved sample for the stakeholder workshops

Stakeholder group	Minimum Quota	Invited	Opt out/ not delivered	Confirmed	Attended WS1	Attended WS2
Academics – consumer vulnerability/ behaviour	8	14	2	12	9	9
Academics – energy innovation	8	8	4	5	2	2
Energy advice	8	11	0	4	4	4
Energy retail market	4	5	3	0	0	0
Energy Suppliers	8	25	9	11	10	9
Frontline	10	32	6	18	13	12
Housing	2	5	2	2	2	1
Regulator	1	1	0	1	1	1
Trade Associations	2	2	0	1	1	1
Trusts and think tanks	4	23	8	6	4	4
Total	55	126	34	60	46	43

Workshop design

Workshop 1

Workshop 1 lasted from 2.30-5pm and was held on the following 5 dates in January 2025.

- Tuesday 14th January
- Thursday 16th January
- Monday 20th January
- Tuesday 21st January
- Thursday 23rd January

The workshops were held online on the Zoom platform with sessions ran in plenary and small group discussions. Each group had mix of stakeholders and was led by a Basis Social moderator. Workshops made use of Miro which is a digital collaboration platform that provides a virtual workshop environment.

The purpose of workshop 1 was to review findings from the evidence review and discuss the impact of energy bill inequity on fuel poor and other vulnerable households. The agenda was as follows

- Welcome and about the day
- Discussion session 1: Reviewing the evidence - how different bill elements impact fuel poor and other types of vulnerable households, including:
  - Impact relative to income and energy consumption
  - Impact of redistributing standing charges and unit rates for different households
  - Impact of different payment methods
- Discussion session 2: How innovative tariffs may impact fuel poor and other types of vulnerable households
- Feedback and next steps

To enable discussion, key findings from the evidence review were thematically clustered on the Miro board. Stakeholders were invited to discuss and enrich the findings, with their views recorded on the Miro board by the moderators. To help stakeholders systematically consider impacts for different fuel poor of vulnerable households, six personas were created by the research team, based on findings from the evidence review. The personas covered the following characteristics and energy behaviours.

- Without children, low energy use
- Single parent, high energy use
- Pensioner with long term health condition, high energy use

- Pensioner with long term health condition, low energy use

- Disabled person, low energy use

- Person needing end of life care, high energy use

Workshop 1 guide and personas are provided in section *Workshop materials*.

Workshop 2

Workshop 2 lasted from 2.30-5pm and was held on the following 5 dates in February 2025.

- Monday 3rd February

- Wednesday 5th February

- Thursday 6th February

- Tuesday 11th February

- Thursday 13th February

Workshop 2 followed a similar design workshop 1. It was held online on the Zoom platform with sessions ran in plenary and small group discussions. Each group had mix of stakeholders and was led by a Basis Social moderator.

The purpose of workshop 2 was to discuss options to support greater bill equity for fuel poor and other vulnerable households. The agenda was as follows

- Welcome and about the day

- Headline findings from workshop 1

- Cost of addressing the fuel poverty gap

- Options for policy cost reform

- Options for unit rate discounts

- Options for lump sum payments

- Comparing options and other ideas

- Wrap up (plenary)

To enable discussion, Basis Social presented findings from workshop 1. Options identified in the evidence review were thematically clustered on a Miro board. Stakeholders were invited to discuss and consider the impact of each option, including the challenges and trade offs associated with implementing the option. Stakeholder views recorded on the Miro board by the moderators. Personas developed in workshop 1 were used to help consider impacts on fuel poor households. An additional two personas were created, with complex and intersecting vulnerabilities and needs, to further stimulate discussion.

Workshop 2 discussion guide and personas are provided in section *Workshop materials.*

Workshop analysis

Video and audio recordings from each workshop were uploaded into Basis Social's qualitative analysis platform. Auto-transcription software provided a text summary of the workshop discussion. Basis Social and London Economic jointly developed an analytical framework. It comprised:

- Deductive codes based on the research objectives, findings from the evidence review and characteristics of different fuel poor households
- Inductive codes based on themes that emerged through the workshop discussions.

Each moderator coded their workshops discussion to the analytical framework. Once the data was coded it was quality reviewed by the Basis Social Project Director. London Economics then used the platform to organise the coded data into a matrix for analytical purposes. Post analysis, a working session was held between London Economics and the Basis Social moderation team to discuss findings.

Workshop materials

Workshop invitation

Subject title: Committee on Fuel Poverty – Workshop invitation [BOTH WORKSHOPS]

Dear [name],

Following on from the email from [name], I am writing to invite you to take part in two workshops we are conducting on the behalf of DESNZ and the Committee on Fuel Poverty to consider options to improve energy bill equity for fuel poor households. Your contribution would be highly valuable.

About the workshops

The workshops form part of a research project on energy bill equity. The research involves an evidence review to understand the key factors that lead to energy bill inequity for fuel poor households and other low income and vulnerable groups.

The workshops will discuss findings from the evidence review and consider options to increase bill equity for households in fuel poverty. Specifically:

Workshop 1 will explore the factors that lead to energy bill inequity for fuel poor households

Workshop 2 will consider options to support greater energy bill equity and the challenges of such options

Workshops will involve stakeholders with knowledge and expertise in energy retail energy markets, fuel poverty, low income and vulnerable groups, energy affordability and bill payment options.

We would like to invite you to attend both workshops. The workshops will take place online over Zoom and last to 2.5 hours.

We have the following date options for the workshops and would be grateful if you could let us know your availability

	Date option 1	Date option 2
Workshop 1	Date Jan	Date Jan
Workshop 2	Date Feb	Date Feb

As a thank you for your time, we will make a £500 charitable donation on behalf of all participants to [Shelter from the Storm – a homelessness charity]. We would also look to share findings with participants once the research is finalized.

What do I need to do next?

Please reply to this email if you require any further information or if you would like to take part in the research, indicating your availability.

If you are unable to participate, but think this invitation might be of interest to a colleague, please feel free to forward it to them.

Many thanks,

[Name], Basis Social.

Workshop 1 discussion guide

Introductions and about the workshop (plenary) [10 minutes]

Hello, my name is X, thank you for joining our workshop today.

I would also like to introduce my colleague(s) X, who will be running the workshop with me. We work for Basis Social – an independent research agency who are undertaking this workshop on behalf of the Committee on Fuel Poverty and the Department for Energy Security and Net Zero.

As mentioned in our invitation, the aim of this project is to explore the factors that lead to energy bill inequity for those living in fuel poverty and other vulnerable and low-income consumers. This includes those who a have medical conditions, young children, older people,

people who are disabled and those needing end of life care. We will also identify potential options to support create greater bill equity for these groups.

This is the first of two workshops to discuss these issues.

Today's workshop will last 2.5 hours. In this workshop, we will explore the findings from an evidence review that has explored the inequalities and impacts of energy bills on fuel poor households and other types of vulnerable households.

We will specifically explore how different energy bill components, such as standing charges and unit rates, are borne by different households

We will also discuss how innovative tariffs may impact on energy bill inequity.

The review has been undertaken by London Economics who are leading the project overall and supported by academics at UCL, who have analysed statistics related to energy use and expenditure at a household level.

Our agenda is as follows [show slide]

Session	Timing
Welcome and about the day (plenary)	10 mins
Session 1: Reviewing the evidence - how different bill elements impact fuel poor and other types of vulnerable households (small groups) Impact relative to income and energy consumption Impact of redistributing standing charges and unit rates for different households Impact of different payment methods (pre-payment meter vs. direct debit)	85 mins
Comfort break	5 mins
Session 2: How innovative tariffs may impact on fuel poor and other types of vulnerable households (small groups)	45 mins
Feedback and next steps (plenary)	5 mins

After the intro, in session 1 we will explore how different bill elements impact fuel poor and other types of vulnerable households in terms of three areas:

- Impact relative to income and energy consumption

- Impact of redistributing standing charges and unit rates for different households

- Impact of different payment methods (pre-payment meter vs. direct debit)

After a comfort break, in session 2 we will discuss how innovative tariffs may impact on fuel poor and other types of vulnerable households.

The second workshop will then explore options to help mitigate these impacts.

Does anyone have any questions about the workshop aims or process?

We have wide mix of people with us today, with knowledge and expertise in energy retail energy markets, fuel poverty, low income and vulnerable groups, energy affordability and bill payment options.

Participants have been selected to provide different perspectives to inform our thinking. We're interested in everyone's views. Whilst we're not after consensus, please be respectful of different opinions and provide the space for others to contribute.

Finally, we're planning to record the session today. This is only so we have an accurate record of discussions. Only my research team will have access to this recording. We will be writing a report of the workshop findings, but anything you say is confidential, and we will not attribute any views to yourself or use quotes that would enable an individual or organisation to be identified.

Is everyone ok if we record the session?

We will be running most of the workshop in small group discussions. In the interests of time, we will do introductions in the small groups.

Does any final questions or points of clarification before we move to the groups?

[Allocate participants to rooms]

Session 1: Reviewing the evidence - how different bill elements impact fuel poor and other types of vulnerable households (small groups) [85 minutes]

Moderator to introduce themselves and gain consent again to record the session.

PRESS RECORD

Ask participants to introduce themselves [5 mins]

Name, role and interest/expertise in the area

As mentioned, we are now going to explore how different bill elements impact fuel poor and other types of vulnerable households.

The first area we will focus on concerns how the impacts vary depending on households' income and energy use [20 mins]

In the chat function, would you write your thoughts on what you think the main impact that different bill elements, such as standing charges and unit rates, are for fuel poor and other types of vulnerable households depending on their income and their energy use?

I'll give you 2 minutes to do this.

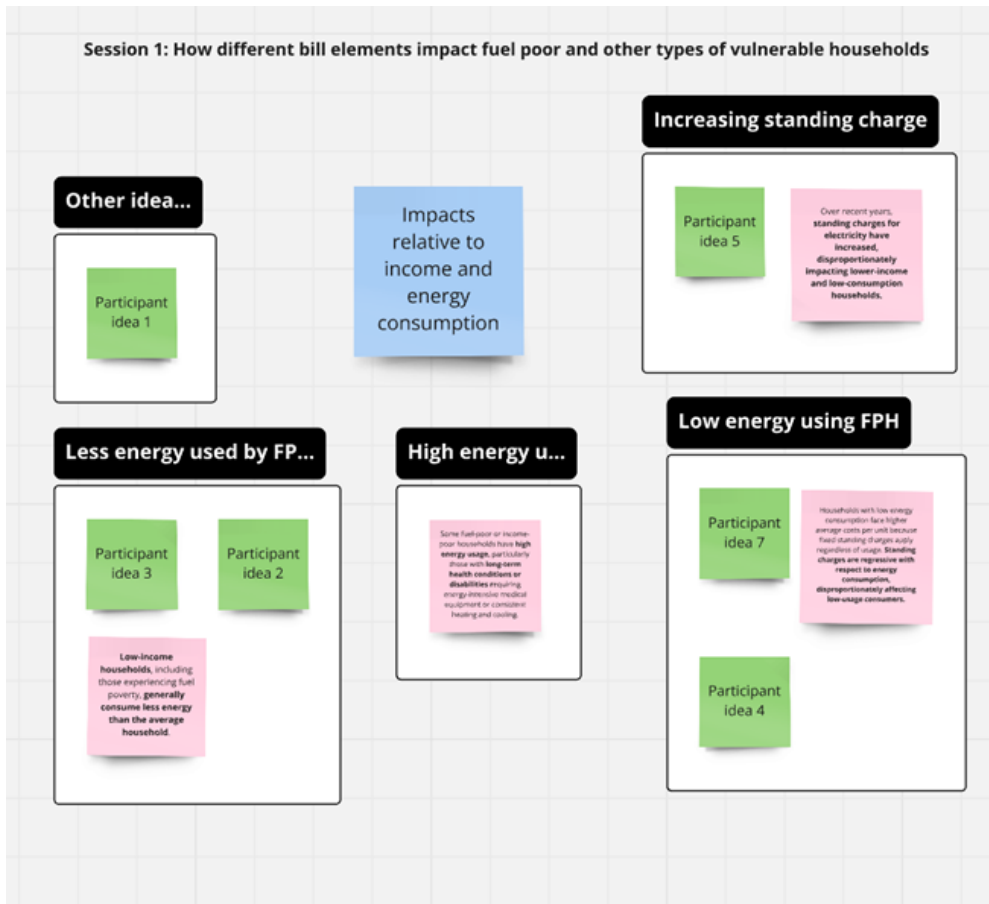I'm then going to share my screen and show you a Miro board.

I'll then paste your thoughts onto a post it on the Miro board and also share some findings from the evidence review.

[Moderator to cluster into themes, linking participants ideas to points from the evidence review, and creating new themes as required]

[From evidence review, already on the board]

- Low-income households, including those experiencing fuel poverty, generally consume less energy than the average household – this can be driven by underheating behaviours.

- However, some fuel-poor or income-poor households have high energy usage, particularly those with long-term health conditions or disabilities requiring energy-intensive medical equipment or consistent heating and cooling.

- Households with low energy consumption face higher average costs per unit under the same tariff because fixed standing charges apply equally to all households, regardless of usage. Standing charges are therefore regressive with respect to energy consumption, disproportionately affecting low-usage consumers.

- Over recent years, standing charges for electricity have increased, disproportionately impacting lower-income and low-consumption households.

[Miro board illustrated below – main question on blue post-it; insights from the evidence review on pink post-it; participant ideas on green post-it – clustered into themes]

Session 1: How different bill elements impact fuel poor and other types of vulnerable households

[Moderator to go through and read out themes]

- What are your thoughts on the themes?
- Do people have anything to add to the themes, based on your experience?
- What is the relationship between themes? Are there systemic issues to address concerning the themes collectively?

NEXT THEME

The second area we are going to is discuss the impact of redistributing standing charges and unit rates for fuel poor and other types of vulnerable households [20 mins]

This means shifting some of the costs that make up the standing charge onto the variable cost of energy (i.e. the unit rate).

In the chat function, would you write your thoughts on what you think the impact of redistributing standing charges and unit rates for fuel poor and other types of vulnerable households? Specifically, we would like to know the benefits and disadvantages of changes, rather than how it should be done.

I'll give you 2 minutes to do this.

I'll then paste your thoughts onto a post it on the Miro board and also share some findings from the evidence review.

[Moderator to cluster into themes, linking participants ideas to points from the evidence review, and creating new themes as required]

[From evidence review, already on the board]

- Proposals to shift electricity costs from standing charges to unit rates may benefit many low-income households, but some vulnerable households with high energy needs would lose out.

- Amongst households with the lowest incomes, whilst five million households would benefit from a measure to shift electricity costs from standing to volumetric charges, one million would lose out.

- Households losing out include some vulnerable customers with high energy needs, like those reliant on medical equipment or electric heating to keep warm, customers who are reliant on electric heating, and those with poorly insulated homes (often private renters or in rural areas).

- Whilst the overall effect would be progressive (lower-income consumers would benefit more from a shift back to volumetric costs), those lower-income households that would lose out would see an increase in their bills by twice as much as gainers would see their bills fall.

[Illustrate on Miro board, as shown in the previous example]

- What are your thoughts on the themes?
- Do people have anything to add to the themes, based on your experience?
- What is the relationship between themes? Are there systemic issues to address concerning the themes collectively?

NEXT THEME

We are now going to discuss the impact of different payment methods on fuel poor and other types of vulnerable households [20 mins]

As before, in the chat function, would you write your thoughts on what you think the impact of different payment methods on fuel poor households?

The main methods by which people pay for their energy is through direct debit, pre-payment meters or standing credit.

I'll give you 2 minutes to do this.

I'll then paste your thoughts onto a post it on the Miro board and also share some findings from the evidence review.

[Moderator to cluster into themes, linking participants ideas to points from the evidence review, and creating new themes as required]

[From evidence review, already on the board]

- Prepayment meter (PPM) customers are more likely to be vulnerable, with a higher proportion being disabled, chronically ill, or on low incomes compared to customers using standard credit (SC) or direct debit (DD). While DD remains the most popular payment method, PPM customers report a higher reliance on government benefits (62%) compared to SC (48%) and DD (31%).

- Historically, customers on different payment methods have faced unequal charges for the same tariffs, with PPM and SC customers paying more than those using DD. This disparity widened during the energy crisis when wholesale costs increased.

- PPM customers often face higher standing charges, which can lead to greater debt accumulation, self-rationing, or even disconnection. In 2023, nearly 1.7 million PPM users reported disconnecting at least once a month.

- In February 2024, Ofgem introduced "levelisation," adjusting standing charges to align more closely across payment methods. This change, implemented in April 2024, reduced standing charges for PPM customers while slightly increasing them for DD customers under the energy price cap.

- Despite these adjustments, PPM customers still face barriers to accessing cheaper tariffs, such as fixed contracts below the energy price cap, which limits their ability to save on energy costs.

[Illustrate on Miro board, as shown in the previous example]

- What are your thoughts on the themes?

- Do people have anything to add to the themes, based on your experience?

- What is the relationship between themes? Are there systemic issues to address concerning the themes collectively?

USING PEN PORTRAITS TO CONSIDER IMPACTS IN MORE DETAIL

Thinking about our discussions across all themes, I now want us to consider impacts of these themes for different fuel poor and vulnerable households in more detail [20 mins]

[In turn, moderator to share the 6 personas on Miro, illustrated below. Rotate order personas shown between groups]. [NB IMAGE IS DRAFT AND WILL BE UPDATED]

Sarah

Sarah is 78, lives alone and has long term health condition.

Home life
Sarah lives in a one-bedroom flat in Leeds. She is a widow. Her daughter lives nearby and visits her weekly.

Income
Sarah receives pension credit and has an income of £218 per week. She has not applied for Winter Fuel Payment, but automatically qualifies for the Warm Home Discount.

Health
Sarah has rheumatoid arthritis and early onset dementia.

Energy use, needs and behaviours
Due to her illness, Sarah needs to keep flat warm in the winter. Its poorly insulated, and her bills are around £140 per month. She's 'not good with technology' and pays her bills by cheque.

[Moderator to introduce Sarah, who 78, lives alone and has long term health condition. Highlight her energy use/behaviours, together with statistics on other pensioners in similar circumstances]

- Are there any themes that we have discussed earlier that may have a unique and/or disproportionate impact on Sarah? Why?

- Is there anything else about people in Sarah's situation that we need to bear in mind when thinking about energy bill inequity related to the themes?

Repeat for other personas.

Are there any other fuel poor and vulnerable households that we have not discussed that you feel are important to consider?

- Who are they?

- [If not mentioned] What about those with learning difficulties? Are there any specific challenges that they might face in relation to energy bill inequity?

- Which themes discussed earlier may have a unique and/or disproportionate impact on them? Why?

- Is there anything else about people in their situation that we need to bear in mind when thinking about energy bill inequity related to the themes?

Thank you

We're now going to take a 5 min comfort break.

Session 2: Current and future expected benefits of innovative tariffs [45 minutes]

(small groups)

Welcome back

In the next session we want to explore how innovative tariffs may impact on fuel poor and other vulnerable households.

READ VERBATIM

- Innovative tariffs refer to novel pricing structures in the energy market designed to better meet consumer needs and promote efficient energy use, in particular when households are using smart metres and/or clean heat technologies. These tariffs are different to traditional pricing models and include features like dynamic time-of-use (TOU) pricing, which makes electricity cheaper during off-peak times.

- There were two main innovative tariffs identified in the literature:

- Time of use tariffs, where pricing is based on overall energy demand across the population

- Rising block tariffs, where pricing is based on the total amount of energy an individual consumes

We will discuss these in more depth in a moment but are there any other innovative tariffs that you are aware of that it would be useful to discuss today.

[For each, ask for a description of what the tariff is and add to the Miro board. Do not discuss impacts yet].

Time of use Tariffs

- Time-of-use energy tariffs offer variable pricing based on the time of day, encouraging consumers to shift energy usage to off-peak periods when rates are lower.

- Economy 7 tariffs (i.e. 7 hours at cheaper energy and then a premium out of those hours) saw that consumers on average paid more for energy than they would on standard tariffs, especially those unable to shift their energy consumption to the off-peak hours.

- Those who cannot move their energy consumption are likely to be worse off with ToU tariffs. Notably, most vulnerable people do not have the resources to buy energy saving technologies which enhance the savings from these tariffs e.g. batteries.

- People who cannot work from home may not benefit from these tariffs.

- Digitally excluded consumers have lower smart meter performance and installation so may miss out from the movement to these tariffs as they are less able to take advantage of it without smart meter information

- Time of use tariffs can be static or dynamic.

- Static prices are set in advance and do not change frequently (e.g. Peak and off-peak times).

- Dynamic pricing (also know as real time pricing) offers a different price per unit of energy depending on the time of day. Dynamic tariffs may be particularly less suitable for vulnerable households since they require more active monitoring of their tariff and energy use, and more uncertainty in terms of prices and total energy bills.

Rising block tariffs

- A rising block tariff would provide all customers with a progressively rising tariff based on their consumption, which would see the high usage customers paying the most on the margin.

- The first block would cover essential daily activities at low or no cost.

- The tariff can incentivise decarbonisation because it encourages lower demand and reduces self-disconnection

- It may impact on vulnerable people who must use a lot of energy due to their circumstances.

- Vulnerable households that require high consumption of energy could have to have additional allocations of energy at the subsidised rate to prevent these individuals from being required to cross-subsidise the low usage customers. Some organisations recommend combining this rising block tariff with a social tariff or other support for this reason.

Taking each tariff in turn [including new ones]

- What are you views on these tariffs?

- How might these tariffs help or harm different fuel poor or vulnerable households? [use personas as prompts]

- Probe: advantages and disadvantages for different groups

- [For TOU tariffs ONLY, probe any differences between static and dynamic tariffs]

- What additional support could make these tariffs more accessible?

[MODERATOR NOTE: Social tariffs are not innovative tariffs. We are not focused on these for this workshop. If they are raised, note the point, but ask the group to focus specifically on innovative tariffs].

Feedback and next steps (plenary) [5 minutes]

- Basis moderator to provide 1 idea from each session per each group

- Basis to thank participants for their time, highlight focus of next workshop and encourage people to attend

Workshop 2 discussion guide

Introductions and about the workshop (plenary) [5 minutes]

Hello and welcome back. My name is X

I would also like to introduce my colleague(s) X, who will be running the workshop with me. We work for Basis Social – an independent research agency who are undertaking this workshop on behalf of the Committee on Fuel Poverty and the Department for Energy Security and Net Zero. The research is being conducted on behalf of the Committee to help address their areas of research interest and evidence gaps, and is not research directly for DESNZ

As we mentioned last time, the aim of this project is to explore the factors that lead to energy bill inequity for those living in fuel poverty and other vulnerable and low-income consumers. This includes those who a have medical conditions, young children, older people, people who are disabled and those needing end of life care.

In the previous workshop, we discussed the impact of energy bill inequity on fuel poor households.

The purpose of this workshop is to discuss potential options to support greater bill equity for these households.

Specifically, today's workshop will last 2.5 hours.

In this workshop, we will:

- Highlight and recap findings from W1 on impacts arising from energy bill inequity
- Discuss options to create greater bill equity
- Consider the challenges and trade offs associated with implementing these options.

As before, we will run the sessions via a mixture of plenary and small group discussions.

Our agenda is as follows [show slide]

Session	Timing
Welcome and about the day (plenary, 5 mins)	2.30-2.35pm
Session 1: Headline findings from W1 on impacts of energy bill inequity (plenary, 10 mins)	2.35-2.45pm
Session 2: Cost of addressing the fuel poverty gap (small groups, 10 mins)	2.45-2.55pm
Session 3: Policy cost reform (Small groups, 35 mins)	2.55-3.30pm
Comfort break	3.30 - 3.35pm
Session 4: Unit rate discounts (Small groups, 30 mins)	3.35-4.05pm
Session 5: Lump sum payments (Small groups, 30 mins)	4.05-4.35pm

Session	Timing
Session 6: Comparing options and other ideas (Small groups, 20 mins)	4.35-4.55pm
Wrap up and close (Plenary, 5 mins)	4.55-5.00pm

After the intro, we will present headline findings from the first round of workshops on the impacts of energy bill inequity. This is mainly for information and to provide you with the opportunity to hear issues raised by other stakeholders.

We will have a few minutes for any clarification questions, but do not propose to open up further discussion on this issue.

We will then move to small groups where we will briefly discuss the costs involved in meeting the fuel poverty gap. This will help provide context for subsequent discussions on the appropriate level of support for households in fuel poverty.

The focus of the rest of the workshop will be to discuss options to improve energy bill equity in greater depth.

The options relate to 3 areas:

- Policy cost reform
- Unit rate discounts
- Lump sum payments

The options are not necessarily mutually exclusive.

Please note, we will have comfort break at 3.30pm.

In considering options under each area, we will discuss

- Appropriate levels of costs/support for fuel poor and vulnerable bill payers
- The challenges and trade offs associated with implementing the option
- Differential impacts on fuel poor households, and consequently who should receive the support
- Where and how should the support be delivered
- What considerations would policy-makers need to take into account when delivering the option, including Net Zero ambitions

Finally, we will compare options across the 3 sessions and identify any other options to reduce bill inequity that have not been discussed this afternoon.

In this context, I want to mention social tariffs. There is the lack of an exact definition of what a social tariff is – for example, in the literature, options from lump-sum payments to comprehensive energy market pricing reforms have been labelled as 'social tariffs'.

The mechanism through which a social tariff operates is likely to be through unit rate discounts or lump-sum transfers, which are already covered in this workshop. If there are other mechanisms you believe we should consider, please raise them in session 6.

Does anyone have any questions about the workshop aims or process?

Like last time, we have wide mix of people with us today, with knowledge and expertise in energy retail energy markets, fuel poverty, low income and vulnerable groups, energy affordability and bill payment options.

Participants have been selected to provide different perspectives to inform our thinking. We're interested in everyone's views. Whilst we're not after consensus, please be respectful of different opinions and provide the space for others to contribute. We have a lot to get through, so please be as succinct as possible – though we appreciate this is a complex area. Please also feel free to make additional points in the chat function if we don't have time cover everything you'd like to raise.

As mentioned, you'll spend most of the session in small group discussions. Where possible, we've tried to keep the groups the same, but there will be some new people to get to know. In the interests of time, we will do introductions in the small groups.

Finally, we're planning to record the session today. This is so we have an accurate record of discussions. Only my research team will have access to this recording. We will be writing a report of the workshop findings, but anything you say is confidential, and we will not attribute any views to yourself or use quotes that would enable an individual or organisation to be identified.

Is everyone ok if we record the session?

Session 1: Headline findings from W1 on impacts of energy bill inequity [10 minutes]

Before we head into the groups, I want to provide a quick overview of the issues you raised in W1 concerning the impact of energy bill inequity on fuel poor and other vulnerable households.

[Basis Social to present, see attached PPT]

As mentioned, we do not want to open discussion on these issues, but does anyone have any points of clarification on what we have shared?

If so, please raise your hand on Zoom, which can be found in the 'reactions' menu on your screen.

OK, were now going to break into small groups for the to discuss options in depth. We will remain in the small groups until the wrap up session at 4.55pm.

[Moderator to open groups]

Session 2: Cost of addressing the fuel poverty gap [10 minutes]

Moderator to introduce themselves and gain consent again to record the session.

PRESS RECORD

Ask participants to briefly introduce themselves

Name, role and interest/expertise in the area

To begin and to help you with your discussion on the policy options later this afternoon, we wanted to share LILEE metrics figures on the fuel poverty gap in England in 2023.

[Basis to share on Miro Board]

MODERATOR TO READ

[CARD]

- The average fuel poverty gap for England in 2023 was estimated at £417
- This is the reduction in fuel costs (or the increase in income) needed for a household to not be in fuel poverty.

[NOTE: if asked, the total cost of meeting the fuel poverty gap is £1.32bn]

Moderator:

- What are your immediate thoughts on the amount of £417 per household to address the fuel poverty gap?
- Does feel right? If not, what figure would you suggest?
- What principles need to be considered when determining an affordable cost?
- Should this differ based on different types of consumers? How?

Session 3: Policy cost reform options [35 minutes]

MODERATOR TO READ

[shown on a Miro Board – copy below]

[CARD]

Policy costs

- Policy costs are levies applied primarily on electricity bills to fund household support and renewable energy generation schemes. A portion of policy costs are recovered through the standing charge.

- Policy costs change over time but have typically comprised 7-15% of the standing charge.

Before we explore options for policy cost reform in more depth… [5 mins]

- What are your overall thoughts on how policy costs should be recovered? Probe:

  o Where should policy costs sit?

  o What should be the mechanism for how those costs are recovered?

  o Is there scope for a tiered or differential level of pricing in relation to how costs are recovered? If so, what should this be based on.

We are now going to explore options concerning how policy costs could be redistributed to address energy bill inequity [shown on a Miro Board as a series of cards – copy below]

MODERATOR TO READ – ALLOW 12 MINS PER OPTION

[CARD]

Option 1: Policy costs are moved to general taxation

- Moving policies costs to general taxation would reduce energy bills for all households with electricity or gas connections.

- It would alleviate the burden on many fuel poor and vulnerable households, as energy consumption does not increase in direct proportion to income.

- However, fuel poor households that rely on unregulated sources of heating (e.g. wood and oil) may see fewer benefits.

- The feasibility of increasing taxation in the current fiscal climate is uncertain

Moderator:

- Does anyone have questions or points of clarification on option 1?

- What are your immediate thoughts on this option?

- What would be the cost implications of this option?

- Probe impact on other bill payers including 'squeezed middle' [NB potential to move people into fuel poverty]

- Is the level of support sufficient?

- Will there be different impacts of the option on different fuel poor or other vulnerable households? [Moderator to use pen portraits as required]

- What might be the challenges associated with implementing the option?

- What might be the trade offs associated with implementing the option?

- Are there other considerations policy-makers need to take into account when delivering the option. Probe:
    - current fiscal climate and acceptability of tax rises
    - impact on other polices, including Net Zero ambitions
    - how to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

OK, thank you. I now want to discuss a second option.

[CARD]

Option 2: Policy costs are (partially) moved to gas bills

- Electricity bills have risen more than gas bills and the UK has some of the largest differences in electricity and gas pricing in Europe.
- While most of the fuel poor households have a gas connection, a higher percentage of households without gas connections are fuel poor.
- A (partial) reallocation of policy costs to gas bills could benefit fuel-poor households without gas connections
- The option would affect households on the gas grid and may drive a bill increase. This would be less than the bill decrease for those off the gas grid.

Moderator

- Does anyone have questions or points of clarification on option 2?
- What are your immediate thoughts on this option?
- What proportion of costs should be moved? Is the level of support sufficient?
- Will there be different impacts of the option on different fuel poor or other vulnerable households? [Moderator to use pen portraits as required]
- What might be the challenges associated with implementing the option?
- What might be the trade offs associated with implementing the option?
- Are there other considerations policy-makers need to take into account when delivering the option? Probe:
    - Future rise in gas network costs (as the UK transitions to electric)
    - Balance between market competitiveness and protecting vulnerable consumers
    - Geographic implications i.e. regions with lower connection to the gas grid (South West, Inner London) compared with those regions with higher connections (North East, Yorkshire and the Humber)

- o Impact on other bill payers (including whether wealthier households able to access solar, battery, EV, heat pumps etc. benefit at the expense of the fuel poor).

- o Impact on other polices, including Net Zero ambitions

- o How to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

Thank you

Comparing options [6 mins]

Now, considering both options, which would you say was the most…

- Fair? Why?

- Equitable? Why?

- Acceptable, in terms of costs associated with the support? Why?

- Efficient or easy to deliver? Why?

- Overall, which option do you feel is better at addressing energy bill inequity? Why?

[Moderator to note this on a post it for use in session 6]

Are there any other ways of redistributing policy costs that we have not discussed? What are they?

[NB: moderator to make note of these and let participants know we will discuss in session 6]

Session 4: Unit rate discounts [30 minutes]

Welcome back. We're now going to explore policy options related to unit rate discounts. We will follow a similar process to the last session.

I'll introduce the options on the Miro Board

MODERATOR TO READ – ALLOW 12 MINS PER OPTION

[CARD]

About unit rate discounts

- A unit rate discount offers a percentage reduction in the variable unit rate of energy bills, making energy consumption more affordable and potentially encouraging increased usage.

- The design of unit rate discounts could vary, including differences in eligibility criteria, the level of support, and funding mechanisms.

- Unit rate discounts could help energy-constrained households and could specifically help households with greater energy needs.

[CARD]

Option 3: Flat rate discount

A flat unit rate discount could be applied, for example 30% with universal or restricted eligibility

Moderator

- Does anyone have questions or points of clarification on option 3?

- What are your immediate thoughts on this option?

- What would be the cost implications of this option? Is the 30% a sufficient level of support? If not, what should be the level of support? How should it be funded?

- If restricted, how? Based on income? Vulnerability?

- Will there be different impacts of the option on different fuel poor or other vulnerable households? What should be the eligibility criteria? [Moderator to use pen portraits as required]

- Probe: dataset(s) used to identify eligible consumers?

- What might be the challenges associated with implementing the option?

- Probe complexity of administration; how to monitor change in income levels

- What might be the trade offs associated with implementing the option?

- Are there other considerations policy-makers need to take into account when delivering the option, including Net Zero ambitions? Probe:
    - Balance between protecting vulnerable consumers and maintaining market competitiveness
    - Impact on other bill payers
    - Impact on low carbon technologies, such as heat pumps and EVs or energy saving technologies
    - How to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

OK, thank you. I now want to discuss a second option. Here, rather than a flat rate, the rate would be tiered.

[CARD]

Option 4: Tiered unit rate discount

A tiered unit rate discount scheme would involve the discount falling by 10-20% for every increase in income decile up to a cut-off decile (above which no support is received).

Moderator:

- Does anyone have questions or points of clarification on option 4?

- What are your immediate thoughts on this option?

- What would be the cost implications of this option? What should be the level of support? How should it be funded?

- Will there be different impacts of the option on different fuel poor or other vulnerable households? [Moderator to use pen portraits as required]

- Probe: dataset used to identify eligible consumers?

- What might be the challenges associated with implementing the option?

- Probe complexity of tracking changes to income; ineligible households just above the cut off decile

- What might be the trade offs associated with implementing the option?

- Are there other considerations policy-makers need to take into account when delivering the option, including Net Zero ambitions?

  - Balance between protecting vulnerable consumers and maintaining market competitiveness

  - Impact on other bill payers

  - Impact on low carbon technologies, such as heat pumps and EVs or energy saving technologies

  - How to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

Comparing options, 6 mins

Now, considering both options, which would you say was the most…

- Fair? Why?

- Equitable? Why?

- Acceptable, in terms of costs associated with the support? Why?

- Efficient or easy to deliver? Why?

- Overall, which option do you feel is better at addressing energy bill inequity? Why?

[Moderator to note this on a post it for use in session 6]

Are there any other ways of discounting unit rates that we have not discussed? What are they?

[NB: moderator to make note of these and let participants know we will discuss in session 5]

Session 5: Lump sum payments [30 minutes]

We're now going to policy options related to lump sum payments.

MODERATOR TO READ – ALLOW 12 MINS PER OPTION

[CARD]

About lump sum payments

- A lump-sum or fixed-value payment provide households with a fixed amount of assistance, not directly tied to their energy consumption.

- Lump-sum payments are less aligned with need than unit rate discounts as they do not vary with energy usage.

- High-energy-consuming households are likely to receive less support from lump-sum payments than from unit rate discounts as a result, though low energy use households may benefit more.

There is some evidence that lump-sum payment support is more effective at targeting the poorest households than unit rate discounts.

[CARD]

Option 5: Fixed lump sum payment

Provide a fixed, one-off energy bill payment (akin to the Warm Home Discount)

Moderator

- Does anyone have questions or points of clarification on option 5?

- What are your immediate thoughts on this option?

- What would be the cost implications of this option? What should be the level of support? How should it be funded?

- Will there be different impacts of the option on different fuel poor or other vulnerable households? What should be the eligibility criteria? [Moderator to use pen portraits as required].

- What might be the challenges associated with implementing the option?

- What might be the trade offs associated with implementing the option?

- Are there other considerations policy-makers need to take into account when delivering the option, including Net Zero ambitions?

    o Current fiscal climate

    o Impact on other bill payers

    o Impact on other polices, including net zero

    o How to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

[CARD]

Lump sum payment

Option 6: A floating lump sum discount

A floating lump sum discount is introduced which varies at certain intervals (e.g. every 6 months) and is tied to changes in the energy price cap.

Moderator

- Does anyone have questions or points of clarification on option 6?

- What are your immediate thoughts on this option?

- What would be the cost implications of this option? What should be the level of support? Would the variable costs of this option matter? How should it be funded?

- Will there be different impacts of the option on different fuel poor or other vulnerable households? What should be the eligibility criteria? [Moderator to use pen portraits as required]

- What might be the challenges associated with implementing the option?

- What might be the trade offs associated with implementing the option?

- Are there other considerations policy-makers need to take into account when delivering the option, including Net Zero ambitions?

- Probe: impact on energy saving technologies

    o Impact on low carbon technologies, such as heat pumps and EVs

    o current fiscal climate, no new tax rises

    o impact on other bill payers

    o impact on other polices, including net zero

    o how to ensure fuel poor don't lose out when delivering net zero ambitions

[Moderator to annotate the option on the Miro board]

[Comparing options, 5-10 mins]

Now, considering both options, which would you say was the most…

- Fair? Why?

- Equitable? Why?

- Acceptable, in terms of costs associated with the support? Why?

- Efficient or easy to deliver? Why?

- Overall, which option do you feel is better at addressing energy bill inequity? Why?

[Moderator to note this on a post it for use in session 6]

Are there any other ways of delivering lump sum payments that we have not discussed? What are they?

Session 6: Comparing best options and other ideas [20 minutes]

I now want us to briefly compare the options that we believed were better at reducing energy bill inequity across each of the 3 areas

Moderator to show the summary post its from the session earlier, and read out benefits and shortcomings

- Considering these 3, overall which option or combination of options is better at addressing energy bill inequity? Why?
- To what extent would they address the fuel poverty gap?
- What might be the impact of these options on vulnerable consumers with intersecting needs

[Show consumer 2 portraits – see slides 9 and 10]

How can each group be best support?

Earlier we mentioned [x]

- Are there any other options that we have not discussed that could help address energy bill inequity?
- Probe what they are, how they would work
- To what extent are they
- Fair
- Equitable?
- Acceptable, in terms of costs associated with the support?
- Efficient or easy to deliver?
- To what extent would these options complement or be optimal relative to the other options we have discussed?

Thank you very much

Are there any other final points you'd like to make, to support greater energy bill equity?

Feedback and next steps (plenary) [5 minutes]

- Basis moderator to provide 1 idea from each session per each group
- Basis to reiterate that the discussion today was anonymous and we will not attribute any views an individual or organisation, or use quotes that would enable an individual or organisation to be identified.
- Basis to thank participants for their time.

Personas

Low-income, high-energy use

ANITA

Anita is 36 years old and lives with her three children.

Home life
Anita is a recently separated 36 year old single mother with three children aged 1, 3 and 7. She lives in a 3-bedroom rented house in Leicester.

Income
Anita receives £435 per week Universal Credit and child benefit. She does not work in paid employment. Her children's father left the family last year and is not currently paying any maintenance or child support.

Health
Anita and two of her children have severe asthma which is made worse by the cold.

Energy use, needs and behaviours
Anita is at home all day with her children and tries to keep the house warm to avoid exacerbating her asthma. Anita pays £182 a month for her energy bills. She pays by Direct Debit.

Low-income, low-energy use

LEON

Leon is 23 and lives by himself.

Home life
Leon lives by himself in a studio flat in East London. He has a zero hours contract as a delivery driver and is mostly out of the house during the week

Income
Leon earns an average of £250-400 a week, but it fluctuates. He does not receive any benefits. He pays £800 rent per month.

Health
Leon does not have any health issues.

Energy use, needs and behaviours
Leon's flat is damp and poorly insulated. The landlord will not make any changes. He has a pre-payment meter which costs him about £3 a day. Most evenings he keeps the heating off and uses an electric blanket to keep warm.

MINESH

Minesh lives with his wife and two sons. He has multiple sclerosis.

Home life

Minesh lives in a 3-bed house in Preston with his wife and teenage sons. He previously worked as a taxi driver but has had to give up work recently. His wife works as a nursery assistant.

Income

Minesh has applied for PIP and is waiting to find out if his application has been successful. In the meantime he and his wife are living off her income and some savings.

Health

Minesh has multiple sclerosis and his condition has recently deteriorated so that he has limited mobility and increasing pain.

Energy use, needs and behaviours

Minesh's current energy bills are £195 a month, paid by Direct Debit. He is currently repaying debt on his bills from falling behind on payments in the past. He is likely to start needing to use more energy as he is at home most of the time.

Sarah

Sarah is 78, lives alone and has long term health condition.

Home life

Sarah lives in a one-bedroom flat in Leeds. She is a widow. Her daughter lives nearby and visits her weekly.

Income

Sarah receives pension credit and has an income of £218 per week. She has not applied for Winter Fuel Payment, but automatically qualifies for the Warm Home Discount.

Health

Sarah has rheumatoid arthritis and early onset dementia.

Energy use, needs and behaviours

Due to her illness, Sarah needs to keep flat warm in the winter. Its poorly insulated, and her bills are around £140 per month. She's 'not good with technology' and pays her bills by cheque.

Low-income, low-energy use

PETE

Pete is 75, lives with his 68 year old wife, and has a long term health condition

Home life

Pete lives in a 2-bed bungalow with his wife and their dog in rural Norfolk. They have a son who lives abroad.

Income

Pete and his wife's joint income is £442.40 per week. He also receives Winter Fuel Payment.

Health

Pete has emphysema, which means that he struggles with sleep and many daily activities.

Energy use, needs and behaviours

As Pete and his wife are at home all day they prefer to keep on, but recently they have chosen to turn the heating off in the bedrooms to keep costs down. Their bills are £174 and they pay by Direct Debit.

Low-income, high-energy use

JOYCE

Joyce is 91 years old and lives with her husband. She has terminal lung cancer.

Home life

Joyce lives with her husband in a 2-bedroom house in Portsmouth. She is receiving end of life care at home.

Income

Joyce and her husband receive a joint State Pension of £339 a week. They also receive an Attendance Allowance. They are paying for some additional home care support.

Health

Joyce has been living with cancer for four years, and was told last year by her doctor that she might have 12 months or less to live. She is receiving palliative care at home.

Energy use, needs and behaviours

Joyce is unable to breath unassisted and uses an oxygen concentrator. She has lost a lot of weight and feels the cold and so they are trying to keep the house at a warm temperature. She pays bills on receipt.

A3: Analysis of Smart Energy Research Lab (SERL) data methodology

University College London (UCL) led the analysis of Smart Energy Research Lab (SERL) Observatory data to supplement the findings from the evidence review related to research question 1. UCL and London Economics selected the indicators to output, which were agreed with DESNZ prior to data processing and extraction.

The SERL Observatory is a longitudinal dataset consisting of household-level smart meter gas and electricity time-series data linked with data about the household occupants, building physical characteristics and weather. The households were recruited from a stratified random sample of GB households with an electricity smart meter in 2019-2020. The sample consists of approximately 13,000 households and is broadly representative of GB households across several building and socio-demographic characteristics, but notably under-represents flats / apartments, private rental households, and households with pre-payment meters due to the roll-out of smart meters at the time of recruitment and non-response bias. The data for the SERL Observatory were all collected by UCL under the EPSRC-funded Smart Energy Research Lab (SERL) research project and consist of participant's smart (gas and electricity) meters for gas and electricity consumption and tariff data (these data accessed with appropriate authorisation via the DCC national smart meter data infrastructure), three participant self-completed questionnaires designed by UCL (one at the time of recruitment, one during the COVID-19 pandemic, and one during the 2022/2023 winter), Energy Performance Certificate data (made publicly available by MHCLG), and local weather data sourced from European Centre for Medium-Range Weather Forecasts (ECMWF). Further information about the dataset can be found in Webborn et al. (2021).[2]

Households in the SERL Observatory dataset were identified as fuel poor using two indicators where information was available: 1) a proxy for the LILEE (Low Income Low Energy Efficiency) indicator where a household was determined as low income based on their self-reported household income and low energy efficiency based on a household's EPC data (low energy efficiency = EPC rating D and below), 2) an expenditure-based indicator where a household spends more than 10% of their estimated disposable income on fuel bills.

The low income classification is determined by whether households had an equivalised disposable income below a threshold of 60% of the national median equivalised disposable income for 2022-2023 (£34,462). Disposable income is estimated based on the household's self-reported gross household income including all earnings from employment, benefits, investments, and other sources before housing cost (such as rent and mortgage repayments). These data were collected via a self-completion questionnaire designed and sent by UCL as part of the SERL Observatory research project to SERL participants in the winter of 2022/2023. The conversion from gross income to disposable income relies on regression functions tailored

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[2] Webborn, Ellen, et al. "The SERL Observatory Dataset: Longitudinal smart meter electricity and gas data, survey, EPC and climate data for over 13,000 households in Great Britain." Energies 14.21 (2021): 6934.

to income quintiles, as derived from data from the Office for National Statistics (ONS). The standard Government method of income equivalisation was used (i.e. first adult given a score value of 0.67, every other adult is given a score of 0.33, etc.).

This provided a primary level of classification for the households:

- Primary classification:
    - A. Low income and low EPC ("LILEE proxy")
    - B. 10% expenditure fuel poor
    - C. Not LILEE proxy
    - D. Not 10% expenditure fuel poor
    - E. All households.

A secondary level of classification (which was crossed with the above) included the following, which includes indicators of subjective fuel poverty (feeling fuel poor) and energy vulnerability, based on available information for the SERL Observatory participants:

- Secondary classification:
    - EPC rating (D and below, C and above)
    - Tenure (owner-occupier, private rental, social rental)
    - Income (low-income, not low-income)
    - Working status (including not working due to long-term sickness or disability)
    - Number of occupants
    - Presence of children (0-15)
    - Presence of adults 75+
    - Feeling fuel poor (self-reported inability to keep warm in living room or difficulty meeting fuel bills)
    - All households i.e. based on the primary classification only.

Except for EPC rating, which is sourced from publicly available Energy Performance Certificate data, the rest of these data were sourced directly from the participants of the SERL Observatory via self-completed questionnaires designed and conducted by UCL as part of the SERL Observatory research project. Data on long-term sickness or disability used in the analysis are derived from the question 'Thinking about the working situation of each member of your household aged 16 and over, including you, how many would you say fall into each category below?' where participants provided a response in the 'Not working because of long term sickness or disability' category.

For each household in the SERL Observatory, based on their available actual smart meter energy use and tariff data, UCL estimated the following variables:

- Average daily gas, electricity, and total energy use

- Gas, electricity, and total energy expenditure

- Fixed expenditure, based on standing charge only

- Variable expenditure, based on unit cost and volumes consumed only

- Total expenditure: variable + fixed

- Fixed and variable expenditure as a proportion of total expenditure

- Average half-hourly gas usage and electricity usage

Where sufficient data was available[3], these variables were aggregated for each household over the time periods below, using the same method as used to produce the SERL annual statistical report (Few et al. 2022)[4]:

- Winter 2021/2022 (Oct 2021 - Mar 2022 inclusive)

- Winter 2022/2023 (Oct 2022 - Mar 2023 inclusive)

- Winter 2023/2024 (October 2023 - Mar 2024 inclusive)

- 2021 (Jan 2021 - Dec 2021 inclusive)

- 2022 (Jan 2022 - Dec 2022 inclusive)

- 2023 (Jan 2023 - Dec 2023 inclusive)

These household-level variables were then aggregated into group-level summaries according to the primary and secondary classifications described above. The outputs for the group-level summaries were:

- Tables of statistics for each of the variables above: number of observations, mean, standard error of the mean,, quantiles (5%,25%, 50%, 75%, 95%).

In terms of data reliability, the energy consumption data derived from smart meters is considered highly reliable. Tariff data from smart meters, while generally consistent with national averages, does exhibit some data quality and completeness issues. In instances of missing data, UCL impute tariffs based on the regional price cap and payment type, which provides a reasonable proxy. EPC data, although subject to limitations, such as potential outdatedness due to updates being required only when properties are sold or rented, is still regarded as a robust source of information on a building's physical characteristics. Survey data, collected directly from study participants via self-completed questionnaires, is subject to the usual limitations of this method (e.g., recall and reporting biases), but was collected and processed in line with established best practices. The inclusion of non-response options such as "prefer not to say" helps mitigate the risk of misreporting. Overall, comparisons between

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[3] For daily energy use estimates we required less than 50% missing data for a month to be considered valid.
[4] Few, Jessica, et al. "Smart Energy Research Lab: Energy use in GB domestic buildings 2022 and 2023." (2024).

estimates derived from the SERL dataset and verified 'ground truth' sources indicate that SERL provides a credible and reasonably accurate match.

All outputs from the secure research environment underwent statistical disclosure control before they were exported to safeguard the privacy of SERL Observatory participants. Access to SERL Observatory data was limited to ONS Accredited researchers on a research project approved by UCL ethics and the SERL Data Governance Board.

More information about the SERL Observatory energy use and tariff data and the analysis of its change during the 'cost-of-living crisis' winter of 2022-2023, can be found in the following reports[5,6].

The SERL Observatory dataset used in this research continues to be collected and periodically released for use by accredited researchers on approved projects. The SERL Observatory dataset has been collected and made available to the UK research community by the Smart Energy Research Lab (SERL) via funding from EPSRC-funded research projects EP/P032781/1 and EP/X00967X/1. The SERL Observatory includes European Centre for Medium-Range Weather Forecasts (ECMWF) ERA5 data. Neither the European Commission nor the ECMWF is responsible for any use that may be made of the Copernicus information or data it contains.

Analysis of time-of-use rates under Economy 7/10 contracts and 'smart' tariffs was not included due to low or negligible presence in the SERL Observatory sample.

[5] McKenna, Eoghan, et al. "Smart Energy Research Lab: Energy use in GB gas heated domestic buildings during the 2022/2023 heating season." (2023).
[6] McKenna, Eoghan, et al. "Smart Energy Research Lab: Energy tariffs, energy expenditure, and price elasticity of energy use in GB domestic buildings during the 2022/2023 heating season." (2023).