

UK Smart Living Demonstrator (Better Energy Futures) – Research Report October 2018

Research Report on qualitative longitudinal interviews on energy vulnerability and fuel poverty in Caerau, South Wales 2017-2018

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Overview

In this document we present detailed analysis of interviews conducted in a South Wales Valleys community during 2017 and 2018, in order to elucidate experiences of fuel poverty and energy vulnerability. By focusing in depth upon these individuals' experiences both via comparative analysis and also by presenting individual household case studies, we seek to illustrate a range of issues that may increase or decrease energy vulnerability, with particular consideration of the circumstances in which individuals may move into or out of fuel poverty.

Executive summary

- In Wales, fuel poverty (FP) is defined as spending 10% or more of a household's income on fuel use. In England, the definition is different, relating FP to a household having a lower than average income and higher than average fuel costs (which may derive from living in an energy inefficient home). This diversity reflects international variances in the EU in official definitions of fuel poverty.
- Understanding the harms associated with being in FP requires a conceptual framework attuned to three different aspects of social justice – distributive injustice (how benefits and harms are shared out), procedural justice (to what extent those who suffer harms are allowed to achieve fair representation of their situation) and recognition injustice (how far the details of the harms people suffer are understood in terms they would themselves recognise).
- Such a framework has been sketched out in scholarly literature, and rests on the concept of capabilities together with that of energy vulnerability. The first sensitizes research to the ways in which FP can undermine people's opportunities to achieve culturally valued activities (like political participation or communicating with others) and states of being (like bodily health or educational attainment). The second sensitizes research to conditions that make a transition into FP more likely (like ill-health, ageing, unemployment, poor-quality housing, private sector rental, and so on).
- The value of qualitative research on FP lies both in the ways it can explore people's own experiences of FP and how it affects their aspirations, and how it can be used in a longitudinal setting to map changes in people's circumstances over time. In addition, it can provide a lens on how valued identities are dependent on access to certain capabilities.
- During 2017, 18 interviews were conducted in Caerau in South Wales, the site of a Flexis project (<http://flexis.wales>) demonstrator designed to test the technical and socio-economic viability of a mine water-based geothermal district heating scheme. These

involved 24 participants aged between their early 20s and late 70s. 22 of these participants were re-interviewed in 2018 after a 12 month interval. Further interviews will be undertaken in 2019 after another 12 months.

- A number of aspects of people's situations were relevant to whether or not they experienced either energy vulnerability or FP. Their social significance can be understood through the tripartite lens of social justice introduced above.
- *Housing* - tenancy status and disposable income had a significant impact on people's ability to make changes to their properties to improve energy efficiency and reduce fuel costs. Whilst people would have liked to make more investments in their properties this was generally not seen as feasible, with investment in renewable energy in particular seen as out of reach due to requiring a high financial outlay
- *Social and community relations* – the area's changing status from fuel production and apparent abundance to a more remote yet convenient relationship to energy has significance for intergenerational understandings and experience of fuel poverty. Whilst the sense of community had changed, ties still appear to be strong with people willing to share resources with one another and generally reluctant to move away from the area. The particularities of place are important in considering the experience of and resilience to fuel poverty.
- *Finances and budgeting* – everyone had experienced bill increases but this gave rise to different levels of concern depending on participants' financial resources and their ability to 'put something by'. Opportunities for work were seen as relatively limited and insecure. Prepayment meters were seen as an indicator of fuel poverty in the wider community. Some found them a helpful tool for managing cashflow from week to week, whilst for others they were an expensive and time-consuming way of managing everyday energy use. Wider poverty – and not just the narrowly defined concept of FP – was seen as important for understanding vulnerability.
- *Energy saving practices* – there is some lack of consensus on what constitutes good ways of using energy, compounded by scepticism when some practices are advocated by energy companies, who are seen to prioritise profit maximisation over consumer benefit. Most people are aware that they should avoid wasting energy and money and take measures to do so.
- *Smart technology* – whilst some are enthusiastic about the greater connection to energy use such devices may provide, there is scepticism that an (energy consuming) device can tell people anything they don't already know, given they already have to be careful energy

consumers to manage on a low income. This suggests a potential contrast with previous research that has emphasised a connection between higher energy use and the ‘invisibility’ of energy in the home. In addition, the range of adaptations to constrained circumstances evident from our data suggests that new innovations will need to be sensitive to how people may adapt practices associated with smart technologies to their own evolving situation.

- *Health* – experiencing a period of ill-health often coincides with a reduction of income and spending more time at home, linked to higher energy costs and thus a potential source of concern and vulnerability. For those with long-term conditions there may appear to be little prospect of their situation improving.
- *Children and care* – the assumption that to care for young children means providing adequate warmth is firmly ingrained and may result in adults restricting their own energy use in order to prioritise children. Beyond heating, high electricity costs are also associated with raising children. Heating is also associated with caring for older generations and for those in ill-health.
- *Essential energy use* – expectations have evolved so access to energy is now seen as a basic right and necessity to be able to participate in contemporary society, especially via ICTs. The main issue with ability to access energy appeared to be cost, given grid-connected gas and electricity supplies were generally experienced as reliable and convenient.
- Overall, attempting to understand FP and energy vulnerability via a ‘bottom up’ approach that takes seriously people’s own experiences and the meanings through which they understand energy use reveals that official definitions of categories of ‘vulnerable consumers’ may bear little resemblance to people’s subjective experiences. Further, people tend not to identify with being vulnerable at all, so long as they feel their lives are characterised by particular characteristics. Among these are *resilience* and especially financial resilience, which is marked by the ability to buffer against uncertainties. Particularly important is being able to save (or to have done so in the past) in order to cover unexpected expenses to which people on otherwise restricted incomes are exposed. Planning for the longer-term can be difficult in such circumstances, which did lead several participants to express concern about what later life would be like. Distinctions need to be made between when interviewees possess the capabilities required for effective budgeting (across the year, for example) and when they describe patterns of experiences where budgeting is restricted to much shorter time frames. It is in cases of the latter where people will often mention that prepayment meters are helpful

(despite their higher costs in the longer term). In addition, where people are able to recount experiences that they feel demonstrate effective agency in responding to circumstances, this is felt to count against vulnerability. But here attention has to be paid to instances where people describe adapting to circumstances and ones where they allude to struggling on, with this kind of observation perhaps itself marking a lack of capability (registered through adaptive preferences, with this experience of lowering one's sights itself pointing to a more intangible source of harm). Being able to renovate a property or make other choices that influence energy consumption and reduce bills is seen as highly meaningful, though such choices are often constrained by e.g. social relationships between landlords and tenants, the costs associated with switching energy suppliers, or the extra costs which come with health conditions. Solutions which demonstrably increase resilience (and a sense of meaningful agency in the terms discussed here) may therefore be evaluated positively by respondents, but socio-technical solutions must also be developed in ways sensitive to how people may adapt energy-using practices to their own evolving life circumstances.

Introduction and relevant concepts

Defining fuel poverty presents complex issues. There is no agreed definition at the EU level. Historically, quantitative definitions of fuel poverty (FP) define it in terms of the proportion of income households spend on energy to keep their home in a 'satisfactory' condition. Such definitions have been discussed in the UK since the 1980s, but it was Brenda Boardman's 1991 book (Boardman 1991) that defined it crisply as a condition in which households who spent more than 10% of their income on energy found themselves. This was adopted in the English Housing Condition Survey's report on housing in 1991, although this used modelled costs to achieve minimum standard heating rather than actual expenditure as a criterion for when a household had entered fuel poverty.

In Wales, fuel poverty became a partially devolved issue after 2006 and in 2010 the Welsh Government published the fuel poverty strategy for Wales, maintaining the 10% threshold (Grey et al., 2017) where a household is classified as in fuel poverty if it spends 10% or more of its income on fuel use and to heat the home to an adequate standard of warmth.¹ The Welsh Government Fuel Poverty Strategy (2010) outlines an ambition to eradicate fuel poverty as far as is practical in all households by 2018. Yet a report on The Production of Estimated Levels of Fuel Poverty in Wales 2012-2016 (2016) estimated 23% Welsh households were in fuel poverty in 2016. The report also indicated that vulnerable households (for which various definitions exist, as we discuss in more detail below) and social housing tenants had higher rates of fuel poverty, which indicates a need to focus on these households in particular. The Welsh Government introduced two major policy-led schemes to target fuel poverty; Nest (or Nyth) and Arbed, which addressed energy efficiency of homes with mixed results. Some studies have shown that people who experienced these interventions reported improved thermal comfort,

¹ England now uses a different measure, which draws on the Hills Review (2012). This proposed that a household should be considered 'fuel poor' if it had lower than average income and higher than average fuel costs, reflecting the ways in which the material condition of a home (and/or the composition of a household) can contribute to moving a household into FP (Hills 2012). The Hills report thus recognised research done within the UK and internationally, which had long established that in addition to income, the condition of the material fabric of housing was important because of how it contributed to the costs being faced by households (Bouzarovski and Tirado Herrero 2017). A problem with the Hills approach is that it fails to take into account the cost per square metre of heating. This tends to bias it towards judging large, underoccupied households to be in FP (Moore 2012).

health and wellbeing (Grey et al., 2017), although they appear to have had little effect on helping households escape fuel poverty as defined by the 10% threshold (Atkinson et al., 2017). Moreover, international evidence shows reductions in fuel consumption from such schemes tend to be inconsistent (Vilches, et al., 2017). There may be unintended consequences of such interventions, as they can have knock-on effects on surrounding properties which have not had retrofits. However, addressing the energy efficiency of homes is only one way of addressing fuel poverty, albeit a very significant one.

Smart technologies have also been put forward as a potential route to alleviating fuel poverty. The promotion of smart meters is intended to improve capabilities to use information to reduce energy use and save money, as well as facilitating tariff/supplier switching. Prepayment meters have been seen as prefiguring this potential future, given that they render energy use more transparent for some and make budgeting easier. Yet expectations about the impact smart meters may have on fuel poverty may be unrealistic, for several reasons. First, for people who are careful in their habits, feedback alone is unlikely to be enough to make a difference, as there may be little opportunity to reduce energy consumption further once they have already taken a variety of measures to economise (Darby, 2010; Hodges et al., 2016). Second, there also appears to be some scepticism about the benefits of an energy efficiency intervention promoted by energy companies and which people are increasingly aware has value primarily to network management and utility companies as a tool for load management/peak reduction (Darby, 2008). Third, as rapid rises in the cost of heating fuels appear to have given rise to increasing incidences of fuel poverty (Anderson et al., 2012) OFGEM reports (2017) have outlined how, unless energy bills fall in real terms, continued slow wage growth could lead to increasing numbers of people being at risk of fuel poverty. Fourth and finally, defining FP in terms of a threshold suggests that fuel poverty is a condition that can be alleviated at best, not eradicated, and that fuel poverty can be separated out from poverty more generally as a condition that can be ‘treated’ through energy efficiency measures alone as a kind of technological ‘silver bullet’ (Middlemiss 2017).

This last point is particularly important as vulnerability to fuel poverty depends not just on the fabric of home, but also on social relationships (such as those between tenants and landlords), health, and the prices charged for energy within energy markets. Action on fuel poverty can thus become disconnected from action to tackle wider drivers of FP, including poverty more widely. Family policy, health policy and housing policy can all have a significant impact on vulnerability to FP (Middlemiss and Gillard 2015).

Looking at technological means of tackling fuel poverty thus needs to be accompanied by investigations into how these measures will interact with other aspects of vulnerability to FP among a range of end-users. A better conceptual framework for understanding what has been called 'energy vulnerability' is therefore required, which has resulted in various calls for qualitative research into fuel poverty as it is important to understand how the fuel poor experience change and how they might be supported in coping (Middlemiss and Gillard, 2015; Grey et al., 2017). Undertaking such qualitative work can help to explain how and why people are vulnerable, in particular how their vulnerability is shaped by their life situation (Middlemiss and Gillard, 2015). To approach qualitative studies of this kind into the specifics of experiences of poverty, the concept of capabilities has been seen as useful (Hick, 2012) and specifically in relation to energy poverty (Day et al., 2016). Capabilities refer to opportunities to achieve different combinations of functionings (being and doing e.g. being well nourished) that people are able to achieve. This distinction is important. People may have opportunities to be healthy, be educated and so forth but may not take up these opportunities for some reason. But if they are denied the opportunity to achieve them, then this should be seen as the root of social injustice, according to proponents of a capabilities approach to social justice like Sen (2000).

This approach avoids focusing solely on what people have, promoting instead a focus on what people are able to do and be. For example, whilst a particular level of income may be associated with deprivation, it is not a good proxy for it as people have varying needs and may therefore require different levels of resources in order to achieve a similar standard of living (Hick, 2012). By moving away from a focus solely on income, the capabilities approach also permits a broader focus on conditions that may constrain human lives (Hick, 2012), focusing on those who have impoverished lives and not just depleted wallets (Sen, 2000:3). A broader focus on capabilities and what conditions lead to them being removed or obstructed may therefore remedy the narrow focus on income and technical measures traditionally associated with much research on FP.

This contribution has two aspects. First, qualitative investigation of individual experiences can help to define exactly what capabilities are at risk under fuel poverty. Understanding the extent to which fuel poverty leads to a range of capabilities being undermined can enable a definition of fuel poverty which is not binary, but more like a continuum, reflecting the extent to which individual and/or linked capabilities are harmed (Moore 2012). In advocating such an approach to energy poverty, Day et al., (2016) seek to highlight the relationship between energy and

wellbeing, and thus to how people themselves believe their lives are going. To highlight this relationship in operationalising the capabilities approach they draw on work by Smith and Seward (2009) to distinguish between basic and secondary capabilities. A basic capability might be being in good health, secondary capabilities would be needed to underpin this (e.g. keeping warm, being able to cook nutritious meals) which require energy services. Day et al., (2016) argue that the capabilities approach can make an important contribution by bringing attention to a wide range of ways in which energy is instrumentally important for wellbeing and quality of life and therefore recognises a diversity of impacts of energy poverty.

Secondly, a *longitudinal* qualitative focus can help researchers understand the conditions under which people may move into and out of FP. In other words, it can help understand how energy vulnerability is produced as well as FP itself. The capabilities approach helps here too, allowing broader concepts of justice and inequality to be developed which enable better comprehension of the emergence and effects of energy vulnerability to FP itself. As well as understanding justice as an attainment dependent on what is shared out (distributive justice), it should also be understood as procedural (what opportunities there are for people to register inequalities that affect them) and recognition (whether people are able to have what matters to them recognised) (Schlosberg 2013).

- Examples of distributive injustice: 1) effect of cold/damp homes on physical health (considered as a capability) is evident, from exacerbating/producing health conditions to increasing premature mortality, especially among the elderly and children. 2) inability to live up to norms of behaviour like hospitality, due to homes being too cold to host friends etc, leading to isolation and psychosocial effects like depression
- Example of procedural injustice: aspects of the energy system, from lack of transparency on the part of utility companies to relationships between landlords and tenants preventing people from giving voice to/acting on preferences.
- Example of recognition injustice: when meaning of practice or activity is assumed without understanding 'emic' significance to participants – for example, self-limitation may be associated with stigma, but it may also be associated with positive identities (frugality, mindfulness). The obverse may also be true: people may undertake practices that are recognised by others as sustainable choices, but may in fact be necessitated by low incomes.

Walker and Day (2012) argue that fuel poverty is fundamentally a complex problem of distributive injustice, or the unequal distribution of access to essential energy services, yet accounting for procedural and recognition injustice in addition allows the greater complexities of fuel poverty and the conditions which create it to emerge. For example, procedural justice may include access to information, legal process and effective influence in decision-making, whilst recognition justice highlights the need to recognise the differential needs and rights of vulnerable groups. Yet rather than rely on crude generalisations of vulnerability, it is important to consider the basic needs of everyone, defined with reference to the society that they operate in (Walker and Day, 2012).

Understanding the extent to which inequality (and potentially injustice) are experienced and what effects they may have must rely on qualitative studies that are sensitive to complex connections between – on the one hand – what people do (practices) and the devices they rely on, and – on the other – to who they take themselves to be and how they feel their lives are going (identity). Further such studies should be longitudinal to make them sensitive to how these connections develop and shift over time. Energy vulnerability may thus be revealed to be a condition that is dependent on the material fabric of housing, but also lifecourse events (both planned and unanticipated); on housing tenure and also on wider issues of poverty and deprivation. With such research needs in mind, this report presents insights from detailed qualitative work with vulnerable energy consumers, in an effort to further elucidate some of these issues.

Method and Sample

Participants lived in Caerau, an ex-mining community in the South Wales valleys (all names used in this report are pseudonyms with the exception of Fiona and Catherine, the interviewers). The community scores highly on a number of measures of deprivation, as outlined by one of our participants

Caerau itself is in the lowest ten percent of postcodes and in the lower groupings for wards and things for most of the deprivation, it comes sixth I think at the moment ... within the worst 20% in Wales. That said, they don't score badly in terms of housing, they don't score badly in terms of environment ok because of the mountains around and because of a lot of work has been done on the housing stock, in particular the local authority or housing association owned housing, has been done up. But they do score very low on things like income, education in adults, things like car ownership is low, you know so people rely on public transport a lot as well. It scores quite poorly on things like health, in particular, numbers of adults with what might be called life affecting illnesses, not necessarily

life-limiting but things like chest infections, asthma and that kind of thing they score fairly highly for, unfortunately, ... School wise, Caerau Primary is one of the biggest primary schools in Wales, it's almost 480 pupils I think this year, this term, over 50% on free school meals and it was over 50% I think on various other registers including needing special support in the classrooms ... There isn't an awful lot of industry, there are some small estates, particularly the one they call Spelter which is down in Nanty[ffyllon] which is building supplies and rubber and various things like that. People travel out of here to work, they travel to Bridgend, a lot down to the industrial estates in Bracknell and Bridgend, some to Cardiff (Pamela, 50s, I1)

Work is currently being undertaken in Caerau to explore the potential for a geothermal community district heating scheme, which will use heat taken from floodwater that collects in disused local mine workings. As part of the scheme, it is likely that energy efficiency improvements to homes will be required and it is hoped that this scheme will help to address fuel poverty in the area by helping to reduce fuel bills. Residents were asked about their views on the mine water scheme as part of broader qualitative longitudinal interviews concerning energy and everyday life, including past lifecourse transitions and experiences, to explore how relationships to energy changed over time. For more detail on the mine water scheme and initial responses to it see our online report². Some of the interviews were conducted under the FLEXIS project, which is part-funded by the European Regional Development Fund (ERDF), through the Welsh Government. A small number of interviews were supported by the Welsh Government's Smart Living Demonstrator – Fair Futures Programme.

During 2017, 18 interviews were conducted involving 24 participants aged between their early 20s and late 70s. In 2018 second-round interviews with 22 participants were conducted, to maintain a 12-month gap between interviews with these individuals. At the time of initial interviews, four participants lived in social housing, six were privately renting and the remainder owned their own homes. Eight participants were retired, eleven unemployed³ and five in employment (a mixture of full-time, part-time and self-employed). Not working meant that participants often spent a lot of time in their homes, which increased opportunities for energy consumption. OFGEM (2017b) defines (energy) vulnerability as when a consumer's personal circumstances and characteristics combine with aspects of the market to create situations where they are

² <http://energybiographies.org/wp-content/uploads/2012/09/Minewater-heating-report-web-version.pdf>

³ All unemployed participants with a partner who did not participate in the interviews also described their partner, where they had one, as being unemployed.

- significantly less able than a typical consumer to protect or represent his or her interests in the energy market, and/or
- significantly more likely than a typical consumer to suffer detriment.

This definition combines procedural justice (representation of interests) with the other aspects noted previously ('detriment' could be taken as detriment to capabilities that fall under any of the three aspects of justice). Other definitions identify varieties of households who are more likely to experience either of these situations. These might include households where consumers are elderly, low income or living with long-term illness/disability (Citizens Advice, 2017). Using such a definition of household vulnerability taken from Jenkins et al., (2011), that is, the dwelling has children, elderly or sick/disabled occupants present, 19 participants in our sample could be described as living in vulnerable households at the time of the first interview. As in the research by Anderson et al (2012), no attempt was made to assess whether the households recruited to the study were in fuel poverty according to official definitions as this would have required detailed assessments of building energy performance and fuel expenditure.

We did not explicitly ask participants for detail of their income, yet some volunteered this information. Although the construct of poverty is useful in describing the interaction between low incomes and cold homes, it is not meaningful to ordinary householders, whose everyday experience is of the specific problems of lack of money and loss of thermal comfort. Therefore, interviews covered questions about fuel poverty, heating routines and how relationships to energy had changed over time in response to lifecourse changes, as our previous work has highlighted the significance of both planned and unanticipated lifecourse change for everyday energy use (Shirani et al., 2017). Participants were asked about fuel poverty and energy vulnerability both in their own lives and in the community more widely. Whilst many people indicated that they had low incomes and fuel bills were a concern, few explicitly defined themselves as being vulnerable or in fuel poverty, despite being members of households that would be classified as such according to official definitions. Fuel poverty can be a difficult issue to discuss as participants may be reluctant to talk about financial insecurity, so it was not always possible to ask about this directly. However, more indirect questions were also included in an effort to establish a broader picture of energy vulnerability.

Comparative Analysis

Housing

Fuel poverty is particularly challenging in Wales due to the poor housing stock in many areas and the rural nature of the nation. For example, Atkinson et al., (2017), citing others, describe how Wales has some of the oldest and poorest thermal performing dwellings in Europe, with approximately 34% having been built before 1919. In addition to poor thermal performance, the occupants that live in these dwellings are at increased risk of having to live in fuel poverty, whilst living in a cold or damp home also increases the risk of adverse health events (Anderson et al., 2012; NEST Report, 2017). Housing in Caerau is largely terraced, with solid walls. Several participants spoke of having black mortar walls and of experiencing issues with damp, particularly when the weather has been wet: *'the other day, when we had all this heavy rain. We had damp patches on the wall'* (Dawn and Paul, I2). In addition, those who lived in more exposed sections of the community described problematic weather conditions such as strong winds and rain, which made it more challenging to heat their homes. One participant, Terry, described Caerau as *'two overcoats colder than Bridgend'* (the nearest large town). Some participants had made energy efficiency improvements to their homes, or had benefitted from schemes in the area that provided these, although some had experiences of what they saw as poor-quality workmanship.

Those participants who had chosen to move to Caerau from elsewhere spoke of doing so because the housing was comparatively cheap for both renters and buyers. For example, Carole described her choice to move to Caerau after the death of her husband in terms of low-cost housing enabling her to have a greater disposable income in order to travel and enjoy leisure activities. However, this was unusual and for most people it was about what they could afford:

[w]ell the reason we chose Maesteg was it's very cheap, the reason we chose this house was it was a hundred pound cheaper than all the other houses. Um, around here, so ... I think we pay £375 for it, so, um, it's really cheap. (Jenna, 30s, I1)

For those who had lived in the area long-term, the specific choice of house was often motivated by cost, with several people – particularly amongst the older generation – describing how they had bought a house in poor condition and done work to improve it themselves, often very gradually.

Price, plus it was on the flat ... But we did it gradually, a little bit here and a little bit there. I took a little job and well I took a lot of little jobs and mostly to stay home because of the children and we managed, because as I said money wasn't

very good then. I think I was earning about, when I came over first I was cleaning buses and I was earning £10 a week and my husband was having about £12, £14. So and what I was earning I was buying a window at a time to get some in [laughs]. (Anne, 70s, I1)

Whilst affordability was clearly an important concern, many homeowners had been able to make changes to their property to improve energy efficiency, such as installing double glazing and insulation, even if it did involve ‘buying a window at a time’. Those in rented accommodation had less control over the condition of the property and appliances, with some describing their frustrations over the energy systems they lived with. For example, Debbie expressed concerns over an inefficient heating system, which the private landlord appeared reluctant to change:

We’ve got no thermostats or anything, so it is purely by on or off. So you either bake or you freeze. There’s no, and quite often we’ve got the heating on and the windows open, to try and regulate the amount (laughs) because you need some heat, but you don’t need that much (laughs). (Debbie, 30s, I1)

By the second interview Debbie’s household had benefitted from having a new boiler installed as part of the Nest scheme, at no cost to the landlord because they were benefit recipients. Several other participants had also had new boilers installed between interviews, with some expressing resentment that they were not eligible for financial support despite having a low-income.

Middlemiss and Gillard (2015) described how in social housing, some interviewees found their housing providers to be pro-active in relation to complaints about damp, cold, inefficient homes and old appliances, while others failed to react. In our own sample; several of our participants were positive about their housing association taking measures to improve properties and keep them updated, without tenants having to ask for this, or responding quickly to concerns about the property. Others described more challenging situations, like Amanda:

Me asking them to do something is always “no, can’t do this, we haven’t got enough money for that” ... it’s only 18 flats over by there and they just won’t do them ... the only time I’ve been waiting was two years for them to do my wall [issue with damp and mould]. In the end, I said “I’ve had enough. You coming out to do my walls, I’ve had enough, I’m phoning environmental health”. They were like “oh, we’ll send someone up”, so they came up and did my wall. I had to threaten them... I moved my daughter out of that room, put her in my room, ‘cause I know my room’s dry, and then we went and slept on the couch. I didn’t want the mould getting into her chest and everything. It’s like ah, it doesn’t matter what happens to us, but my daughter comes first ... They’ve done, they’re doing the next step now, they’ve got to suck all the stuff out of the wall. So

hopefully, I was hoping to be in a bed before Christmas, but I don't know
[whispering] (Amanda, 30s, I1)

Here Amanda's description suggests a difficult relationship with her housing provider where she as a tenant has little power to make changes to her inadequate living conditions. Having to live with the mould problem resulted in moving her child to a different bedroom whilst the adults slept on the sofa, leading to physical discomfort. This is one example where decisions were taken by participants to prioritise the needs of children, a common theme across our interviews, as we discuss later.

Despite some negative descriptions of the area from participants, and lack of work being a key concern, most could not imagine moving away from Caerau because it was 'home'. Many of our participants had several relatives living in the area and these social networks were important (Darby, 2017). Whilst research by Bouzarovski et al (2013) with students focuses on quite a different sample population, their finding that location and particularly closeness to friends were considered important (rather than the quality of the house itself) has some resonance for our sample. Cheap housing being one of the attractions of the area, little incentive may exist for landlords to make improvements to the housing stock. Whilst some participants had benefited from pro-active social housing providers, or grant-funded improvements to their properties, others felt that they had been disadvantaged by poor quality energy efficiency schemes that had resulted in detriment to their property, leaving long-term issues to be managed.

I looked at the Government insulation scheme and I'm not a great lover of that either ... I've been let down badly by them, yes, because they never finished or completed the work because they've actually gone, I don't know whether it's into liquidation or whether it's...you know, but they've gone under anyway and they don't exist anymore, these firms don't and we don't really know who is liable for the work. (Angela, 40s, I1)

These negative experiences led to scepticism about other work being proposed in the area actually being able to deliver what was promised, which may have potential implications for the planned mine water scheme and any other interventions.

Several participants described how they would ideally like to invest in renewable energy technology for their property but that they were unable to do so because of the large initial financial outlay required, or that because of their age they would be unlikely to benefit from the long-term payback of such an investment. Other potential changes to the property to improve

efficiency, such as internal or external cladding, were generally seen as undesirable, partly due to small housing size or concerns about creating problems with damp:

DOUG: I can't think of any other way of lowering the running costs of the house now apart from either external cladding, which, I don't know, takes away six or seven inches of your space. Internal's probably out of the question.

JOAN: Well, houses like this anyway.

DOUG: Because they're not huge houses. So really, the only way of lowering your energy costs is to find a cheaper way of doing it. I thought if I could, I don't know if I could become self-sufficient on electricity, for example, via solar panels. I think that would be a good idea, but the cost of them is just horrendous ... They say 25 years and you start getting your money back. I'll never get my money back. [Laughter]

FIONA: So it's not worth the outlay.

DOUG: No, no. If we were in our 30s and we had the money, yes, I'd say it probably was a good idea. But, yes, I think we missed that bus, didn't we, really. (60s, I2)

The varying ability to make changes to properties (through lack of money, tenancy arrangements or both) meant people were quite differently positioned in terms of making efficiency improvements to their homes to reduce energy costs. At the same time, financial restrictions were a 'bottom line' for most people, although participants generally expressed concern about the environment and support for renewable energy. Even on a smaller scale, when considering making 'eco-friendly' purchasing decisions, some participants felt that the higher cost of these options made them unattainable, though they were happy to engage in sustainable action if it did not come with an associated financial cost:

My van is a good example – you turn it on and there's black smoke everywhere, but I can't afford a new one, so we just have to deal with black smoke. I think people would be more - and we would be more - inclined to embrace an idea if it didn't financially impact us. It's like the recycling. We're happy to do it. Instead of putting it in that bin, you put it in that bin and job's a good 'un. That helps the environment and it doesn't cost us anything. It probably costs us increased council tax, but you don't really see it. You know you can get eco-washing powder and stuff? We just can't afford it, so, we just use Fairy. (Jenna, 30s, I2)

In terms of energy vulnerability, the issue of control over energy use and expenditure emerges as significant. Whether renters or owner-occupiers, many interviewees reported being unable to register preferences and values either within energy markets or in ways that achieve other forms of recognition. A reduced capability to control how energy is used in the home, with knock on effects for health and household income, is apparent in many cases, with Amanda's being

particularly noteworthy. In addition, inequalities of power between landlords and tenants are shown to be significant factors in undermining people's capabilities to make choices and voice preferences within the rental sector.

Reduced ability to improve the fabric of homes is a factor for both owner-occupiers and renters, with negligent landlords identified as significant in the latter case, while the cost of home improvements is a significant barrier for owner-occupiers. This lack of control increases vulnerability to a range of negative consequences. Although many respondents found reason to trust outside agencies (particularly local authorities) to remedy issues (through e.g. retrofits), this was by no means universal, thanks to experiences of bad practice which it was felt had not been recognised and rectified.

Social and Community Relations

In seeking to understand the situation in Caerau and the experiences of those living there, it is important to contextualise current circumstances in relation to the area's history of fuel production and reliable employment. Many of our participants had relatives who had worked in the collieries, and some had worked there themselves, which contributed to an ongoing association of the community with mining, particularly amongst the older generation. The current community situation of unemployment and struggles to meet high fuel costs was on several occasions compared unfavourably with recollections of reliable employment and fuel abundance in previous generations.

PAUL: Yeah, that's, that's what it is in a valley like this because from Croeserw, Caerau down to Maesteg, they used to go and get their own coal, you'd have women up there with carrier bags, all women, like we was talking the other day with our neighbour, his mother lives across the road from us, and they'd always be up there, and the house was always boiling, do you know what I mean? And they took all the fires out then, and it's like, all struggling now, you know what I mean? They miss it like.

DAWN: And it's not a rich place. It's not, Caerau's not a rich place. It's not going to have loads of rich people here; we're just getting through. We're just getting by, you know. (40s, I1)

Those who worked in the mines had been entitled to a coal allowance, with some participants describing how coal could be sold back to the National Coal Board (NCB) in exchange for other heating sources. This largely meant that households with a collier did not have to worry or think about keeping warm.

They had coal yes, yes, because the first lot of central heating we had I think we had to pay about £20 because the NCB paid for the rest of it, they paid for the radiators and everything and the installation ... But we never ran out of coal but as I said that was the main fuel then was the coal and we had to pay for electric I suppose but the coal was free and you'd just chuck it on and forget about it didn't you? (Anne, 70s, I1)

Whilst some participants felt they had inherited an ethic of frugality from their parents, who lived on low incomes, their parents' concerns generally did not extend to energy, given the described abundance of coal.

My mother taught me to be frugal. That's why my sons call me a miser. [laughs] But of course my mother only had one income. She wasn't working, and she had five children ... so she always taught me to look after the cash, um, simply because she never had any. Um, or very little anyway, put it that way. She had enough to bring us up. Um, but no, I, it's, I, I can't see anything, you know, that energy-wise, my father always had a roaring fire. Um, lights were always on. No, not really. (Alec, 60s, I1)

Several participants indicated that surplus coal had often been available to those who were struggling, meaning that even those households without a direct connection to the mines were able to have fuel.

My parents were poor, they and my father was invalided out of the colliery and when my brothers left home we didn't have free coal, so my mother used to have coal from the other neighbours (Cheryl, 70s, I1)

The ability to share energy in this way was no longer seen as feasible with the move to imported fuels that were part of supply chains with which end-users had direct little relationship. A rescaling of economic relationships away from the locality and the pits was therefore related to an attendant loosening of social ties. Despite this, local social networks continued to be important for many (Darby, 2017) with some people in the sample describing how they had helped, or offered to help others in the community who were struggling with energy costs. Such informal borrowing appeared more commonplace than commercial borrowing, which was not discussed except as something that people wanted to avoid (Anderson et al., 2012).

You know they say that people, there are people who could get up in the morning, do I heat or eat, and I can't see it happening around here somehow ... I don't know, only once have it ever happened to me, it was somebody knocked the door, an acquaintance, and said 'Len, I haven't got enough money for the meter' and then I just said 'ah here you are' like that. (Len, 70s, I1)

I, one day, the young lady, single mum [next door neighbour]. She was saying that she hadn't er, hadn't been down to buy the meter, since she's run out of gas. So I said, well, if you want to borrow some money or something? ... I said, well, you can use my gas stove if it's any good to you. But she didn't, she did say thank you very much. (Alec, 60s, I1)

We've become friendly with a good few people that came from here as well and you get some families who are in a bit of poverty, believe it or not, you know and you look at yourself sometimes and you think, the poor dab like, because before I had my children, I was constantly always working because that's what I knew, to go to work, to come home but like these days now, especially being on a low income, it's hard, it is hard and I feel sorry for some families who have less, because it's like, how do they manage? Like, my nan couldn't afford things sometimes and I used to give her some money towards her gas or electric so it's like helping out, or whatever but yeah, it can be hard, I suppose with poverty. (Jessica, 20s, I1)

People look out for each other, help each other. I mean, we've always been the same up here, haven't we, really? We don't waste anything, if there's food left over, neighbours have it. And neighbours do the same for us. We had Chinese yesterday. From my neighbours next door, "Had this on the weekend, do you and Mandy want some Chinese?" "Yes please" ... We won't see anybody go without, if we can help it. You know food or heating, we try and help out each other. Years ago, it was even better, wasn't it, years ago? (Terry, 60s, I2)

It's like cold weather comes in and you know people are going to die. And I'm like I always make sure I look after my neighbour. I've always looked after her. If she's sick I'm there, bowl of soup. Or stew or something. But she's sick, a knock on the door, I know it takes a while for her because she's sick, whatever, stew, and she's like, "Oh, lovely". (Amanda, 30s, I2)

These accounts illustrate how people attempted to help one another through offers of money, energy and food, although sharing heating was no longer as straightforward as providing a neighbour with surplus coal. Some reported helping neighbours out directly, as when Jessica (despite her household having a low income) recounts giving a neighbour 'a little bit towards their gas' during the cold snap (I2). Some people also spoke of energy sharing within families, such as visiting members of the family living locally to save on heating.

Although the community was generally seen as less cohesive than in previous generations, by the time of the second-round interviews in early 2018 a recent experience of energy scarcity in terms of water shortages due to burst pipes in freezing weather had given rise to a sense of solidarity. Some of our older participants described how neighbours had brought them bottled water, without having been asked to do so, or helping to clear snow from the front of houses, whilst younger participants described checking on older neighbours. Despite not feeling particularly

connected to the community, Serena described how a sense of community was more evident during this period of scarcity:

I think that was when you see a bit more of the community, 'cause like Caerau Market Garden up in Caerau, they, one of the way points there, they were giving out like boiled water, and people were going around, it was all over Facebook, and you see a little bit more then, and people were kind of like making sure everyone had water and stuff, yeah. (Serena, 20s, I2)

Few of our participants explicitly described themselves as living in fuel poverty, although struggling to meet the cost of rising energy bills was a common concern. This echoes Chard and Walker's (2016) finding that their participants saw everyone, regardless of income, as experiencing rising energy costs and so it was not a situation confined to them in particular. Dawn describes fuel bills as a common topic of conversation:

It's all to do with the heating and that's what everybody moans about these days, don't they? ... That's over the wall in the mornings, that's when we moan about our electric and gas bills, and, do you know what I mean? ... It's like oh the winter's coming, the gas is going to go up. That's all we have now. (Dawn, 40s, I1)

This is, however, part of a broader picture of increasing costs across the board, especially in relation to food.

It's just general conversation, people just say, "Oh my gosh," you know. It's not just heating. It's, like, food costs as well. Food costs are going up and then, you know, when you've got minimum wage and things like that, just in general, I think, times are getting harder (Angela, 40s, I2)

In relation to the planned mine water heating scheme in the area, many residents saw the main attraction as the potential reduction in bills, with environmental benefits a subsidiary concern.

What do we spend on gas? Probably about 65% of our total energy bill, I would think, so you're probably looking at about £700 or £800 a year for gas. That's for the heating and the hot water. So, yes, if I was going to sign up to it [mine water heating scheme], I'd want it to come in less. If it was going to be more, I'd have to think about it ... That's when your personal experience takes over from your 'I want to save the world' type ... You know, it's all very well me saying, "Yes, they should do more like this." But if it's going to cost loads more, then I'm sorry but I can't afford it. (Doug, 60s, I2)

We're all for the environment, everybody I know is concerned about the environment. But if it's gonna cost a lot, that's gonna be the over-riding factor ... Everybody would love it if it was cheap enough. The cost to the environment is good, it's better for us. We're not burning fossil fuels. We're not, to keep your

house warm, we're using something that we have heritage in, it's providing but at what cost? That will be the bottom line for everybody. (Terry, 60s, I2)

A potential annual saving of £100, which was reported in a BBC news story about the scheme, gave rise to a range of views, with some people feeling that this would be enough to make a difference, whilst others felt it was not substantial enough for them to sign up to the scheme, given the upheaval that they anticipated it would involve. As noted previously, although participants frequently spoke of concerns about rising energy bills, few explicitly described themselves as being in fuel poverty. However, experiences of fuel poverty within the community were articulated through interactions with others.

Yeah, I don't believe everybody is loaded, people they struggle around here yeah, a lot of people struggle around here, my mother included, she struggles as well. (Jay, 20s, I1)

Fuel poverty? Yeah there are a lot, a lot of people who can't afford their bills. Yeah and they've got to go to foodbanks to get their food, so they are poor in a lot of ways you know (Cheryl, 70s, I1)

Fuel poverty because of the costs. Because you know people on low incomes not, but not necessarily on benefits, it's the ones that are earning but who are on low incomes that are caught out. It's the housing stock as well in that sense that okay most of the housing has been renovated since the 80s but it wouldn't be to the standard of doing it now you know so they've not always got the most efficient sources and you know there are still some people running coal fires you know with that kind of issue about that ... When you're like a lot of the community around here in your 70s, 80s, it's more difficult you know especially with people being on fixed incomes and so on. So I mean I am very very conscious of what [people] have to pay and terraced houses around here that have not been renovated and have not had cladding on the outside and they've not had damp-proof courses and things and there are a lot of them find it very difficult. You know and I have seen people huddling around little paraffin stoves and that's the only heating they've got in their house. (Pamela, 50s, I1)

Most people were aware of the food bank operating in the area, seeing this as an indicator of a widespread problem with poverty. One participant who volunteered at the foodbank described how they sometimes helped attendees put money on their fuel meters, although this wasn't an official aspect of the foodbank remit. The loss of Communities First after April 2018 was also expected to have an impact on some of the most vulnerable local residents who had previously

benefitted from activities provided for by this funding, such as training courses, which highlights how policy change in areas outside energy use may have an impact on vulnerability⁴.

The planned mine water heating scheme was seen as potentially being able to help those in fuel poverty, although there were some concerns that it would not be taken up by those most in need:

I get the feeling, because I've noticed that a lot of the people here tend to wear dressing gowns over their clothes because I think they obviously don't run their heating. A lot of that problem is because they're renting their houses, so they're probably on the meter and it's very expensive. I leave mine on 18 and it's on from early morning until nine at night. I think my combined bill is less than £40 a month. And I imagine they're putting a lot more than that in their meters. So if they were on the scheme, I think it would benefit them warmth-wise. But I think the problem is, they'd still be on a meter, so they'd still be paying through the nose for it. And I'm not sure that any of them will have told their landlords about it ... They go around the shop with their dressing gown on top of their clothes, and I think they're doing it because they're not heating their homes properly ... That sort of worries me because they've got children. Invariably, they've got children. (Carole, 60s, I2)

Some people felt that there might be issues with fuel poverty in the area but had limited knowledge of how others might be managing to cope with meeting energy costs, as few people described discussing energy use or heating beyond comments about the weather or increase in bills. Seeing people topping up prepayment meters was something that several participants gave as an indicator of fuel poverty in the area (which we discuss further later).

I can't tell you about fuel poverty, I don't know, apart from the people I have seen getting those keys [for prepayment meters] and things which didn't happen when I was younger. But then there are not the jobs around and people are not working and I suppose they can't, perhaps they can't have meters they've got to pay as they're using it, I don't know but I see a lot of people buying them. (Anne, 70s, I1)

Hitchings and Day (2011) found that many respondents had limited personal knowledge of how the wider generational cohort might be managing, which translated most notably into how some respondents believed particular warmth practices were inconceivable, whilst others in the sample

⁴ Communities First was a communities focused scheme to tackle poverty, which was phased out nationwide by the Welsh Government by March 2018

were living in exactly these ways. This is indicated in Len's quote above (p. 18) where he 'can't see' anyone in the community dealing with a heat or eat dilemma, yet has direct experience of someone requiring help with their heating bills. Hitchings and Day (2011) suggest that social networks could be mobilised effectively if done in appropriately sensitive ways, as other research projects have attempted to promote (e.g. the RECCKN project – 'Reducing energy consumption through community knowledge networks')⁵.

Whilst most participants were sympathetic towards those who could not afford energy costs, recognising that prices had risen alongside declining employment opportunities, a small number felt that some people were in poverty because of poor spending choices (e.g. opting to buy cigarettes rather than food for children). This could lead to resentment amongst some of those on low incomes who had worked and saved whilst they saw those on benefits as being given things for free (such as a new boiler):

- CHERYL: I tell you what, the deprivation is made by their own stupidity.
BOB: We aren't deprived, the people deprive themselves.
CHERYL: They buy big 50" televisions, they spend their money on lottery and cigarettes, and tobacco ... They're having enough money in, but it's what they spend it on.
BOB: We were saying I think when we were younger, obviously we didn't have much, we tried to put some money away, especially Cheryl she was very... frugal and still is, and we still are, and that's why we're still okay, you know? Otherwise we could have spent it all. I could have spent it all.
CHERYL: That's why we can't get any benefits ... The people down there, they've got everything and they have never worked. They've just had their house done again, free of charge.
FIONA: Right, but because you've worked and you've saved and been careful you don't get...
CHERYL: We tried to get a new roof and everybody ignored us.
BOB: If you're claiming, my friend up there got a brand-new boiler, we paid £1000 for that one.
CHERYL: New radiators, we had to pay for all ours, but it's not fair. (70s, I2)

However, this view appeared to be quite unusual within the sample, and this couple also expressed concern for those who had been unable to find work in the area given the lack of employment opportunities. Cheryl's observation that purchasing lottery tickets was frivolous or

⁵ <https://www.keele.ac.uk/greenkeele/researchingsustainability/currentresearchprojects/recckn/>

irresponsible spending is perhaps unsurprising when people are known to be on limited incomes as this could be seen as an unnecessary expense. Yet for some people, a lottery win was the only way they could see of improving their situation, however unlikely, so purchasing lottery tickets could be seen as a way of hoping for a better future. As Anderson and Mitchell (2016) describe; the potential pay-out may be so life-changing that it justifies the small cost of playing.

This contemporary experience of poverty was distinguished by the older generation from their own experience of growing up when 'everyone was poor'. This was often attributed to large families living off one (collier's) wage, although some participants noted how some households in the area who appeared to struggle financially continued having large numbers of children that they could not afford to support. Some participants also described their own decision to have a small family explicitly in terms of seeking to avoid this situation.

Particular periods, such as the miner's strike, were remembered as a time of scarcity, although one where members of the community helped one another, as described by Anne:

FIONA: **What was the miner's strike like here?**

ANNE: To be honest, I was fortunate, because we had some money saved. The council stopped taking rates off us for the year, and my son was working. He wasn't earning a lot, about £15 he was giving us ... I was working for a lady up in [street name], and she was always trying to shove money on me [laughs] ... she would make a sometimes she'd send the daughter down with a little parcel of a bit of butter or whatever, you know. But I didn't like taking anything. But as I said, we managed, we managed. I was earning about £15, and my son was bringing £15. My husband was going on strike watch, which wasn't much, but it was enough for him to go and have a couple of pints if he wanted. So we were having food parcels, which most of it was a load of old rubbish, because it was rice and spaghetti and things that I didn't really want. I had a big food cupboard because I put a lot of tins away for weeks before I guessed what was going to happen. And...

FIONA: **So you were preparing a bit.**

ANNE: ...a lot of stuff, yes. But we survived it. And I didn't owe any money to anybody at the end of it, so. ... But as I said, we coped ... it was a struggle, don't get me wrong. It was a struggle, but we coped. (70s, I2)

Here Anne describes being somewhat prepared for what was going to happen and being able to put food away in advance, which offered some resilience in a situation of restriction. Having the

ability to prepare for a difficult situation in advance was something not all participants were able to do, as we discuss further below.

Fuel poverty is not necessarily seen as particularly visible within the community. Older residents point out that, in previous decades, poverty was universal and therefore solidarity – both in terms of mutual assistance and free coal from the coal board – was also generally expected. While individual choices have always been seen as having some impact on household poverty, the central determinant of household capability to afford a decent standard of living has always been employment. Some markers of fuel poverty are evident, such as people making prepayment meter top-ups and people dealing with cold houses by wearing dressing gowns that they sometimes keep on while out of the house. Solidarity and mutual aid in relation to poverty generally and fuel poverty in particular are also seen as less visible – except in moments of crisis like the recent cold snap – although support is still evident. The contribution of social relationships to capabilities which increase resilience is seen as significant but as something that is dependent on individual relationships rather than general expectations.

Some interviewees have experiences of technological interventions associated with reducing energy use or managing budgets. These include first generation smart meters and prepayment meters.

Prepayment meters

Seven of our participants currently lived in properties with prepayment meters (three in social housing and four privately rented), whilst others in the sample had experienced living with prepayment meters in previous properties. In their study, Middlemiss and Gillard (2015, 2013) highlight that, despite higher tariffs, respondents often report that prepayment makes energy use more conspicuous, thereby enabling real time budgeting. Our own interviews reflected this finding to some extent, with some participants positive about the meters. They felt that prepayment helped them to budget on a low income because it offered a more direct relationship with energy consumption than a monthly or quarterly bill, which can divorce customers from the reality of consumption (Darby, 2010). Some participants indicated that budgeting for prepayment had to be prioritised over other purchasing, including food (see Anderson et al., 2012):

I put a tenner gas, a tenner electric in a week and that's fine, I'm alright then. Sometimes I might, it depends if I am using the tumble drier I might have to go down and put another fiver on just to last the week ... I don't have to worry

about getting the money ready for the gas or like if it was coming out of the bank, I don't have to worry about it then, I just go down the shop, put it in, got gas and electric then for a week (Leanne, 20s, I1)

It is, it is a lot easier, especially when you've only got like, I don't know, 20 quid a fortnight to live on ... It's a hell of a lot easier ... now I've actually got a routine where I get my money, and I top my meters up, then I do my food shopping, and then whatever's left, is my money ... my meters always come first, so I, I make sure I've got gas and I've got electric, and then everything else after that just falls into place. (Kim, 30s, I1)

But it has been a problem with me in the past, just covering it [energy bills]. Like, that's why I'm on a pre-pay meter, because it did get too much to pay a quarterly bill. So that's why I did the bill, then I could see how much I was needing to pay and how much I then could use more ... So then when I was on the key then, I could say oh, I've got to then put that much aside rather than just worrying about it at the end. ... I have had struggles but mainly because I've had money issues as well ... you've just got to struggle through though haven't you? (Stacey, 30s, I1)

These participants are explicit in describing the meters as helping them to budget by enabling them to keep track of energy use. However, for some, this more direct relationship with energy use was problematic, giving cause for alarm when managing on a restricted income:

It's not just that, it's the fact that, like obviously, with a prepayment meter, they charge you as well for the meters so obviously that comes off your money too and obviously we're not on a lot, being out of work, we don't have a lot and you know, sometimes when, like, through the winter, you tend to use more gas because you are trying to heat and it can be that way then where you're obviously spending more money to stay warm and it can affect you that way because you are spending more money to keep warm but I find on quarterly, where I was paying just on the card every week and it coming out eventually, I found it was just easier because you could just flick the heating on and have no care in the world, you could just, you know, turn it off when you wanted but you always had that to fall back on. Yeah but with a prepayment meter, it's harder because, like I said, you've got to go up the shop to put £10 on when you're starting to tick down, you know, it's the fact of, 'I've used that much already!' and you know, you see it go quicker and especially with the charges on the meters, that comes off as well and that comes out of the balance. So, yeah, you do see it come down a hell of a lot more quicker than what you do being on quarterly. (Jessica, 20s, I1)

Others found the forward planning required with prepayment meters difficult, particularly as it made it harder to adapt to fluctuating weather conditions (to which participants saw Caerau as more prone than nearby towns such as Bridgend) as an unexpected severe cold snap could disrupt normal heating routines (Anderson et al., 2012):

[i]t's very difficult to manage, because it's all well and good you working out that on an average week you spend this much money on gas, and this much money on electric. But all you need is for it to, to have a sudden bitter, freezing snap and then all your maths is out. And you can try as you might, but, and then you have to start sort of like put money aside, just in case there's a cold snap, and it's, it's a pain in the bum actually, having to go and get it as well. (Jenna, 30s, I1)

Some participants had rejected prepayment meters because of the additional costs involved in charges for the meters themselves (as Jessica refers to above). After refusing to have a meter, Amanda describes how she is still able to budget carefully on a monthly basis.

No, no I don't do that 'cause I know in a way, it is easier but then it's not because it's five per cent extra they pay on top. And I'm not stupid enough to fall for that. ... I know how to budget so I know how much exactly I need and they're for certain parts of the month so that's how much I leave in the bank ... It's the same every month. I need 30 for my gas and I need 44 for my electric. And the end of the year, in April, when the tax thing comes, I know I get a chunk of it back, 'cause I don't use it all so then I'm normally either leave it in there for winter, 'cause normally come summer, I don't use that much electric or gas so what I do use mounts up and then I know I've got a nice chunk, so I can put the heating on longer. (Amanda, 30s, I1)

The meaning of 'budgeting' here requires some unpacking. For those on prepayment meters and those managing monthly or quarterly bills alike, careful management of energy use was important to avoid running up costs and potential debt. This supports research by Jenkins et al., (2011), who found that respondents took measures to reduce their energy use by being frugal with these resources. Such frugality in energy use is very much connected to a broader approach to budgeting for household expenditure. Attitudes to energy are closely connected to attitudes to expenditure more generally.

Responses to prepayment meters indicate how residents varied in their desire to manage their own energy use and in their judgements on the justifiability of the extra costs they bring. They also differed in how far they valued the assistance of a device that made consumption more conspicuous to do this, and the extent to which this could be seen as stressful if levels of necessary energy use were seen to rapidly rack up fuel bills. Conversely, others valued this close connection as helping them to keep track of energy use. The variation in responses has implications for technological interventions aimed at promoting efficiency where residents could 'set and forget' appliances, or for the introduction of smart technology, to which we now turn.

Smart Technology

‘Smart living’ is promoted in numerous policy documents as a way of empowering consumers e.g. OFGEM, 2017a; DECC 2015). For example, the Government expects that the roll-out of smart electricity and gas meters will deliver a range of benefits to householders, in particular assisting them to understand and reduce their energy usage, receive accurate bills and switch between suppliers more easily (Smart Metering Early Learning Project: Synthesis Report, 2015). This empowerment is largely seen as accompanying a more accurate picture of household energy consumption, which is expected to enable behaviour change and resultant energy savings. Such savings are often expected to help address the fuel poverty, with the Welsh Government explicitly stating that smart meters have the potential to help those living in fuel poverty⁶. However, for people who are already careful in their habits, research suggests that feedback alone is unlikely to be enough to make a difference as there may be little opportunity to reduce energy consumption further, with low incomes being more of a factor in FP than elevated energy use (Darby, 2010; Hodges et al., 2016).

Where smart meters had recently been installed in interviewees’ homes, they often had a novelty value, enabling interviewees to identify particular activities as having specific costs. For example, Jenna’s household had had a smart meter installed the day before our second interview and were working out how best to use it:

Yeah. It told us that we were using way too much gas but what had actually happened is, it was too far away from the meter so it was making things up. It told us we had gone over our £1.27 - apparently that’s what the government reckons we should spend per day on gas. That’s what the gas man said. It told us we had gone way over that but then we’ve put it over there and it’s 60p ... It’s already kind of got me into trouble because I have a fan on every night. If I get too hot, I have really bad nightmares, and [partner] feels the cold an awful lot so already told me the fan used 40p last night. So, I don’t know if it’s going to be helpful or a hindrance. (Jenna, 30s, I2)

Whilst this couple were seemingly jovial about Jenna’s more profligate energy use in comparison to her partner’s careful consumption, the smart meter has the ability to highlight divergences in energy use between members of households, potentially leading to disagreements around control of energy.

⁶ <http://gov.wales/topics/environmentcountryside/energy/fuelpoverty/?lang=en>

The view represented in Darby's and Hodges et al.'s papers cited above, that many people feel that smart meters cannot help them reduce their energy further as they are already frugal, was common. Several participants indicated that careful energy use was 'common sense' and that they did not need a device to tell them about energy consumption. As low-income consumers, they had to be attuned to their energy use to avoid running into debt and were already 'cutting back'. There was scepticism that devices such as smart meters – which themselves were energy-consuming – would be able to tell them anything they did not already know. In addition, there was suspicion that any devices promoted by energy companies would mainly benefit the companies themselves⁷. Some of these issues are highlighted by Terry:

They do go on about this smart meter, but anybody with an ounce of common sense won't use anything they don't want to use. You know, and we can put it on your phone so it comes, comes on when you come in from shopping. Why? You can switch it on yourself. I don't understand this modern technology. They're brainwashing people. You know, I mean, a smart meter. If I can't say to myself, well I don't want to, I, will pay my bill at the end of the month. Standing order or whatever, if I can turn it off when it's warm enough to turn it off, turn it on when it's cold, I'm the smart meter. I don't need something on the wall to tell me that. It's not going to save me money. Plus the fact you're being charged for the installation of it. That goes on your bill as well. They think, they think people are stupid ... Thick, dumb, I don't know, or, is it, they're spraying something in the air today? Because I'm a grown, I know how to do all that. You know, I won't let things run over time. I won't leave things on overnight. I roughly know the cost of it, and the ones I've seen, the needle's going up like that. All the time. So I don't want to be reminded how much I'm using. I'm quite good at cutting back. (Terry, 60s, I1)

Residents who opt in to the mine water heating scheme would have smart home management systems for controlling their heating. Whilst the exact form these will take is still uncertain at the time of writing, many people had heard about (with some owning) other smart management systems, such as 'Hive', and were aware of features such as being able to control heating remotely. This received a mixed response, with some (generally younger) participants enthusiastic about features such as being able to switch heating on before they got home, whilst others were sceptical that it would provide any benefit and was just 'technology for technology's sake' or would encourage laziness. Importantly, due to unemployment or retirement, many participants spent a

⁷ Welsh Water, a not-for-profit utility company, was an exception: it was described as being very attentive to consumer needs during a recent water shortage

lot of time at home and therefore felt that distance control features would not benefit them or others in the same or similar situations:

- PAUL: If people are working it would be good wouldn't it, because like, hour before you come home you can turn the heating on. In the winter. So you're not wasting, you haven't got to have it on all the time.
- DAWN: We're usually in the house, so it don't make a difference to us, it wouldn't, for that side of it like (40s, I1)

Subsequently, many of our participants were unsure what the benefits of smart technology would be for some groups of vulnerable consumers. One exception, however, may be for those with health problems leading to limited mobility, where increased automation could potentially offer greater safety, comfort and convenience, as Joan describes:

When Doug goes to bed, I'll very often just put this light on which, you know, I've only got to go over there, but if I want to go to the kitchen and these lights are not on, all I've got to do is ask it to put the kitchen lights on. And especially at times when I've been ill, it's been handy because we've got two quite large steps out there to go down to the kitchen, and for me to have got down them, you're just asking for a problem. [Laughs] (Joan, 60s, I2)

Here Joan, who had experienced a number of ongoing health problems as well as injuries resulting from a recent fall describes voice activated light controls as enabling her to move about her home more safely. In this case, the device does not have direct benefits for saving energy. Further, the couple had invested in it themselves. Many consumers would be unable to similarly invest in smart technology in addition to meters provided by third parties. People's differing ability to afford smart technology or related devices (such as a smart phone and internet connection), as well as varying desire to engage with such technology, raises the possibility that large-scale rollouts of such technology will exacerbate existing social divides and particularly where capabilities to use IT may be restricted.

I did a bit of volunteering work helping people with their computers and some people haven't got a clue. I know that this would not be as complicated as a computer, but I think some people just have an innate fear about change and new stuff. I think there would have to be – as there was when computers started, you know, with the government, there was that shift where everything, if you wanted to apply for benefits or car tax, there was a shift where it all went online, there was also a lot of outreach IT courses – I think there would need to be something similar to help people. I used to have dinner with an elderly friend and every time the clocks changed, all her heating went up, she couldn't deal with it. It was quite an old-fashioned program box but someone like me looks at it and thinks, okay that

makes sense, and programs it but she had no idea at all. If she didn't see me, she would just spend a few weeks with the heating not working right. I think there's a lot of people like that around. I don't know if education is the right thing but I think there's a lot of people in Caerau that aren't very educated and I think they would struggle with things like that. (Jenna, 30s, I2)

For some participants, technology related to aspects of their lives that they felt made them more vulnerable. For example, Anne did not have a computer or way of connecting to the internet, which meant she was unable to receive preferential rates for banking or paperless energy billing, and had difficulty in monitoring her spending as closely as she would have liked. This has implications for wider rollout of technological interventions that assume ability to connect to the internet.

From our interviews it appeared that participants had little expectation that smart technology would make much difference to their financial situations, given those on low incomes already have to develop adaptive capabilities for managing and planning energy expenditure. Examples like Joan's indicate possible benefits for vulnerable consumers living with enduring health conditions, an experience pertinent to several people in our sample. At the same time, smart technology beyond predominantly first-generation meters is currently only available to those who can afford to invest in it.

Current practices

The development of adaptive capacities in response to restricted incomes can be understood in more detail by looking at the specific practices people engage in when using energy, helping flesh out what is meant when respondents say (as many do) that not wasting energy (from a financial and/or environmental perspective, see Thomas et al., 2017) is just 'common sense'. Practices may be understood as combinations of skills or competences, apparatus (the 'kit' needed to perform the practice), and shared meanings through which people can articulate what the point of a given practice is and what it means to perform it well (Shove, Pantzar, and Watson 2012). Some talk around waste takes on moral as well as pragmatic overtones, indicating how even everyday practices are tied up with ethical values (Groves et al. 2017).

I mean I will go around switching lights off after my wife and put draught excluders up and don't do anything that's, but I am saving myself pence ... I know it's miniscule but it all counts innit? And when people are trying to, you know like I say I was trying to save energy, every little helps. (Len, 70s, I1)

We'd have to have a new boiler soon but we're trying to, it's thousands of pounds isn't it so we're trying to put it off as long as we can ... We do put jumpers if it's, but if it is miserable we put the heating on ... Yeah she [wife] gives me a hot water bottle. Anything to save bloody money! (Bob, 70s, I1)

I'm forever going behind the kids and knocking things off. I'm all for that. Sometimes it can be like Blackpool Tower in our house and I'm just going around knocking the lights off and yeah, it's just literally after the kids have been in the rooms and I'll go up and make sure the switches are off. I think in a way, I've taken over my mother's role that way too and making sure the switches are off if they're not being used and you know, it's general common sense I find it. They don't need to be on. Why have them on if they don't need to be on? (Jessica, 20s, I1)

I think so, people are more aware now. They've got to knock switches off. They've got to save electricity. Save gas. Rather than leave things on overnight, or, you know, because of the cost. I mean, it is going to come to either eat or heat. And it's, they've been on about it for the last few years now, but it's actually happening. You see a bill and, when you get your gas bill, the electricity bill, and you think, god we're not using nothing, and still paying twice the price for it. (Terry, 60s, I1)

Some explicitly described themselves as 'miserly', 'mean' or 'tight' (e.g. Alec, page 18 above), albeit in an apparently jovial way as it was general accompanied by laughter, possibly as an effort to disavow the stigma generally associated with such identities (Hards, 2013). Whilst many people put restrictions on their energy use, these were often lifted when guests visited, or with young children present as it was seen as important to provide a warm environment for children (as we discuss below) and comfort for guests.

Oh of course yes, we'll go, you know, if we've got people here, we'll switch it on anyway, and until they say well, it's warm enough, you know ... We're not like that. We wouldn't let everybody stay in the cold (laughter). (Terry, 60s, I1)

There were a few exceptions however, of people who did not change their energy use for others either because they hadn't really thought of doing so (because their own level of comfort was seen as a marker for others), or assumed that guests should adjust to their host's way of doing things. In these instances, there was no indication that restricted heating was seen as a source of stigma. For some participants, not changing their heating routine in these circumstances was justified in relation to issues of affordability.

No not really, if people come to my house they'll have to adapt to my life I'm sorry ... if somebody said they were cold in my house I'd say well put a coat on, because if I was warm then there's no way I'm putting the heating on. (Jay, 20s, I1)

No they [visitors] can freeze [laughs], I'm not wasting my electric and my gas, they can freeze! But no, it's just normally the same, (Amanda, 30s, I1)

Not adjusting energy use for others might also be seen as justified if others' energy consumption was seen to be careless. Cheryl was one of the participants who did not increase the heating when her grandchildren were present, instead giving them extra layers or blankets to put on, because she saw the heating use in their own homes as excessive, as she indicates below.

The youngsters are like that right? They come out in shorts and t-shirts from the house, they go straight into the car, they don't walk, the school is only a couple of minutes' walk from here, they drive from the next street up there and take the car to the school and they come out in shorts and t-shirts. So they've got the heating on in the house haven't they? And their heating is on in the car so they're not cold. So they are not saving energy at all. I know my daughter is the same, she, they're burning heat like fun up there but they're sitting with t-shirts on. (Cheryl, 70s, I1)

Like Cheryl, several participants spoke of their perception that older people were more careful with energy use whilst the younger generation were more frivolous. Some young people were seen as wasteful because they did not have to pay for energy themselves (see also Shirani et al., 2013). For example, Dawn and Paul spoke of their high energy consuming teenage son using multiple electronic devices, with the expectation that their household consumption would reduce dramatically once he moved out (this wider picture of energy use is something that we consider further below). One of our younger participants, Jay, lived with his mother and whilst he did contribute towards bills, always put in a set amount, meaning his mother would cover any excess, giving him little motivation to reduce energy use. His personal high consumption of electricity in his own room was therefore a source of disagreement.

My electric is on all the time, like I don't even turn my switches off, no never. My phone charger will be in the wall and I don't think I have ever turned that switch off once. My TV, my mother is different downstairs but in my bedroom it's just like I've got an adapter with five things and they're all on constantly but I pay for the gas in the house so if she pays for the electric so I am not too bothered ... If my mother goes in my bedroom she goes a bit crazy because they're always on but I don't know, like turning the Sky off and the TV, oh the Sky takes ages to come back on as well so I am not willing to turn it off, I won't do it ... downstairs my mother turns absolutely everything off, all the time so probably most of the energy is coming from my bedroom [laughs]. (Jay, 20s, I1)

There were of course exceptions to this generational divide, with some young people describing being more careful energy consumers than their parents. This might be because of financial necessity, or greater environmental awareness.

Oh, it's just with me, it's like they [parents] know they've got money. I know I haven't so I've got to make sure I've got enough there to pay the bill so I'm always pinching somewhere here or there, if I know I don't need it, I don't buy it. (Amanda, 30s, I1)

MARK: We're definitely more energy conscious and more efficient with our energy than their generation was, it was all like even the technology has come forward hasn't it? So their hot water, they've still got an immersion heater.

SERENA: My dad has still got an immersion heater in his house ... and this other tank which because they've also got solar panels, it's a really weird system. I don't know what is going on.

MARK: He did it [installing solar panels] purely for the financial benefit ... he got it really cheap and he'd had just to save himself some money.

SERENA: Yeah, which is great but yeah, I don't think he did it for the right reasons [laughs].

MARK: He has gone for something quite progressive like that but then they've just bought themselves a hot tub so [laughs] not very energy efficient.

SERENA: Yeah I think that's the exact, that's the mindset though isn't it where they don't think about it, there's no like he doesn't think I've got solar panels and like he is thinking that means I can use more energy, do you know what I mean? It's more like so everything is on all the time in their house. (20s, I1)

As Mark and Serena note, people may engage in energy practices that are publicly marked as 'green' even if this is not necessarily done for the 'right reasons' or accompanied by the competences needed to engage in the practice. This may suggest that the reverse could also be true; that people engage in inefficient behaviour because they think that, based on other values or priorities, it is the right thing to do (Groves, et al. 2016). What was considered to be good energy practice varied quite a bit over the sample. Whilst there was general consensus that switching things off when not in use was good practice (with some notable device exceptions, such as Sky TV, as Jay highlights above and as we have discussed elsewhere, Shirani et al., 2017), there was variation in the extent to which people did this, with children seen as particularly unreliable as they did not have to worry about the responsibility of paying the bill. Aside from wasting energy and money, there were other reasons that people switched off appliances when not in use, such as fire safety:

Oh I turn everything off, every night I go round the house, every plug is off. ... I'll check all the plugs in the kitchen, the only ones I leave on is the fridge freezer. My TV is off by the wall, everything is off by the wall. Someone said to me why don't you just turn the mains off, I said no because my fridge freezer will defrost. But I got to, I am paranoid about it ... About the house catching fire, I hate it. When I was a child someone up in Croeserw up over the hill, their house caught on fire in the middle of the night and they barely got the kids out alive but they did, and it was caused by a plug socket, it sparked and it caused the house fire ... I weren't even there when that house caught on fire though, I lived down here. And just because I heard about it and I heard that the kids nearly died all because of an electric switch. I think it scared me. (Leanne, 20s, I1)

Therefore, as discussed above, whilst such actions may have implications in terms of energy saving, this was not the primary motivation.

In relation to heating, there was some variation in what participants thought was a correct and competent way to heat their homes, from leaving the heating on constantly to switching it on for short periods.

I've got a gas boiler but I have got a thermostat on the wall that I constantly run it at a certain temperature because I find if you knock it down or knock it off onto a timer, when you're out the house is getting really cold and it takes longer then to, so by keeping it at an even temperature, I find my bills stay the same, you know, they don't tend to go really, you know if you think, 'it's really, really cold, let's knock it up' and then you've forgotten you've knocked it up and then until you're actually taking off layers of clothes and you've got to rush and knock it back down well of course, you've burnt too much energy then so I keep it at a level that's comfortable for the house so if I walk in and the house is at, and it's guaranteed to stay at a certain temperature then ... 21 because my house is a cold house and it's at 21 all the time. When it's really cold, I will knock it up the maximum is 23, I don't go up any higher than that because I could never afford the bills. You know, if I'm cold then I put a jumper or blanket around me. (Angela, 40s, I1)

For some participants, like Angela, the temperature shown on the thermostat was an important way of regulating and understanding comfort. Again, the fabric of the building was seen as relevant, with having a 'cold house' setting a low baseline that mandated particular heating practices. For others, a numerical measurement of temperature seemed to be less useful. Here Jay describes how the radiators being 'boiling' was his main concern.

FIONA: **Do you have it set to like a particular temperature or does it just...**

JAY: It's quite high I believe, if I remember correctly now, I think I have it on 40, 30 degrees which maybe isn't that high is it? ... Yeah it warms up quite quick and then when you turn it off it goes freezing

again, maybe I'm doing it wrong, maybe I should put it lower ... I am sure it's faulty, it might not even be degrees, it might be something completely different.

FIONA: **But the number doesn't really mean a lot to you it's just you turn it on when...**

JAY: Yes and as long as the radiators are boiling that's all that matters.

FIONA: **Yeah ok. Well what about, I mean do you tend to put the heating on rather than putting jumpers and stuff on or do you**

JAY: Yeah yeah. Well I wear jumpers all the time anyway so and if I put too many jumpers I feel like I am smothocating [sic] so I'd rather just chuck the heating on. (20s, I1)

Alternatively, what could be seen as constituting 'official' good practice may not be adopted in everyday life because it is deemed unaffordable, as Terry outlines:

They tell you the cheapest way to do it is to keep it [central heating] on low. You can't do that; they're charging you a fortune on low. You've got to judge it, so that right, it's going to be warm this afternoon, we'll put it on for an hour in the morning, put it on for an hour in the evening, until this fire warms up, and that's how you've got to judge it. And that's the best way to run it. If you leave it on all day, cost you a fortune ... I've got a friend, 'oh, I leave it on low all the time'. His bills are a lot, lot higher than mine. (Terry, 60s, I1)

Again, Terry reiterates the importance of careful monitoring of energy use rather than leaving it on constantly and not having to think about it. Terry also indicates that messages about good heating practices he cites here are ones he believes are coming from energy providers, who are motivated by making money rather than saving energy. Consequently, he sees them as advocating practices that might not be in consumers' best interests and which therefore need to be approached critically.⁸ Being able to trust the provider of energy saving advice is therefore an important consideration. A perspective like Terry espouses also has implications for the potential adoption of smart technology that would allow residents to 'set and forget', as some residents may well be sceptical of reducing the level of tangible control they have over energy use.

A number of energy using practices and justifications for them are discussed by interviewees. These show a range of adaptive variation, as people find in everyday practice scope for responding to restricted finances, cold homes, and negotiating what it means to avoid waste and maintain thermal comfort. People are motivated by different appreciations of what is warm enough and what is not wasteful, and what signs and markers within their homes enable them to

⁸ It is significant that the 'keep it on low' line of advice Terry quotes is not in fact generally advocated by energy companies. Misattribution of this advice is, of course, in itself interesting.

establish whether they or other members of the household are being wasteful, or whether the home is too hot or too cold. In relation to everyday practices, the range of meanings people use to establish what practices are good and which are not brings us back to the idea of recognition justice – the extent to which interventions acknowledge and take due note of what matters to people. The reasons people act in particular ways might relate to moral values (e.g. frugality) rather than pragmatic ones (affordability). They might relate to what people see as acting competently in their particular circumstances (checking the radiators rather than the thermostat). In any case, accompanying often difficult financial circumstances we found the practices people engage in exhibited adaptive capability. This capability is sometimes, as Terry makes clear, manifested in critical reflections on ‘official’ advice. Introducing new technologies (such as smart energy management) into contexts where people may not only be sceptical of it, but will also already be highly engaged in working out what constitutes ‘justifiable’ uses of energy, has to be sensitive to these everyday dimensions of using and making sense of energy, and also to how people may tinker with practices attaching to these technologies and perhaps with the technologies themselves.

Health

As noted above, there is now a substantial body of evidence linking cold, damp homes to adverse health outcomes (Anderson et al., 2012; NEST Report, 2017), and thus to the loss of vital capabilities. It is important to recognise that ailing health is not just an effect but also a cause of fuel poverty (Middlemiss and Gillard, 2015). Whilst there were differing views on what constituted wasteful energy use, there was widespread consensus that adequate heating was important for health (see also Chard and Walker, 2016).

Seven of our participants were unemployed or had taken early retirement due to ill-health, and an additional three participants described how their partner was unable to work due to ill-health, with one of these three having to take early retirement to become a carer. This meant that ill-health was a significant issue of concern across the sample. All these participants described having worked previously, but being unable to continue due to how their health condition had changed at different points in their life. For some, these were long-term conditions such as epilepsy, or respiratory or mobility problems, which would mean working again was not possible. Others felt that their unemployment was a temporary phase and hoped to return to work in the future if their health permitted.

Moving from work to unemployment or early retirement had meant learning to live on a more restricted income, which took ‘a lot of getting used to’:

DOUG: Yeah, I think changing jobs from my point of view meant that the more as I progressed you get more disposable income and you do tend to become a little bit blasé about your usage of stuff so you think I’ll pay for that, no problem. And I think now, we’ve got to the stage now where we are considering more the fact that we can’t do that anymore you know? ...

JOAN: It’s taken a lot of getting used to mind doing it that way, (60s, I1)

For Doug and Joan, one of the ways that they managed their restricted income was by shopping around for cheaper deals, which they were able to do now they had more time due to not working.

[w]e’d do our shopping in Sainsbury’s and that was our Saturday gone. Whereas now we have got enough time and we’re only just coming around to this mind aren’t we? Where we’re willing to go around down to Aldi’s to get things, up to Asda if they’re cheaper, Tesco’s if they’re cheaper because they’re cheaper in different places. So that has definitely changed hasn’t it? (Joan, 60s, I1)

However, this strategy was largely possible because they had their own transport. Others could not afford to run a vehicle and therefore were more restricted in their shopping choices:

Can’t afford to run a car. So if we go anywhere it’s by taxi or public transport. So we’ve got to plan everything, make sure we’ve got enough. (Terry, 60s, I1)

Forward planning at the same time as living ‘week to week’ (Terry) due to limited income, was an approach described by several of our participants who used pre-payment meters, as discussed above.

Whilst some participants were able to cut back on energy expenditure, for others, health conditions (their own or others within the household) meant that ensuring their homes were adequately heated was increasingly important, and also adjusted their sense of what ‘adequately’ might mean.

Obviously, you know, say, for example, ten on gas, ten on electric and your other bills and yeah but when it comes, like I said, to the winter then, like personally, we use a lot of gas, especially with the kiddies because our eight year old has [details

of medical condition]... especially in cold weather now he'll be in his wheelchair a lot because we've got a chair and it can fluctuate, obviously between a good day and a bad day, there's more bad than good but it's normal for us, it's our normal. You know but yeah, in the colder weather, we tend to use a lot more heating because it can set him off, you know, he tends to be very uncomfortable and painful when he gets got. So, yeah, but with the children anyway, you've got to keep the house at a maintained heat, you know, we try to knock it off as well, but it can be costly, it can. (Jessica, 20s, I1)

Here Jessica articulates the necessity of heating for helping to alleviate painful symptoms of her child's disability. Despite this being costly, it was viewed as a necessity. In her account, Jessica refers to an assumption that heating is necessary for young children, an issue we return to later. Heating was also seen as necessary in caring for others during intermittent periods of ill-health. For example, Terry described the necessity of using the central heating more frequently than usual when his wife had returned home following an operation and had limited mobility, which gave rise to concerns about paying a big fuel bill.

For others in the older generation, health issues related to working in mining had sometimes meant that, due to health-related early retirement, they missed out on the fuel benefits that this occupation had provided, which, as we discussed earlier (p. 17), were seen as particularly important in this community.

No it's, it was, my husband wasn't so upset about it [mine closure] because he had asthma and then he has emphysema, and he had to retire at 49 and then we couldn't have any coal and we had to go to gas because with the coal fire you had to keep it burning all the time, with the gas you can turn it off if you don't want it. And his pension didn't come out until he was 65, he had a pay-out don't get me wrong but we had a young girl and my son wasn't very old so it was a struggle and the full year that he wasn't working at all and there was no money coming in, but we managed, we managed. (Anne, 70s, I1)

Experiencing ill-health often meant that participants spent a lot of time at home, thus needing to heat their home for longer at a time when income would most likely be reduced, which could give rise to anxiety. Ill-health and FP can thus interact in ways which are mutually reinforcing, as Mould and Baker (2017) note.

Whilst heating was the primary way in which energy use related to health issues, some forms of ill-health could increase other energy costs too. For example, Jenna described how mental health issues gave rise to high energy consumption.

I have some OCDs, so I have to wash, I have to do the washing up in a very specific way, so we are eligible, but we haven't done it yet, for um, I think it's called a community tariff on the water, so I think we might be eligible for a community tariff on the gas as well, which is a slightly reduced scheme, for people that are a little bit special ... I cannot, I know how to wash up like a normal person. I just can't do it. It doesn't matter how many medications I take; it doesn't matter how much therapy I have, it has to be done like that, and that's the end of it. ... [and later] when I'm feeling okay, I tend not to watch that much television. But when I'm not okay, I literally sit there all day, just watching TV, and there's nothing, there's nothing I can really do about that. You know, I'm, I try and not to do that, but it is, you know, and I don't like being cold either, as, you know, so, I think when I'm ill, I do use a lot more energy, well, like gas and electric. (Jenna, 30s, I1)

Whilst heating costs are often the focus of work on fuel poverty, cases like Jenna's illustrate how illness may give rise to high energy use elsewhere. Being unable to use energy in ways that were perceived as necessary could therefore potentially jeopardise the capability of physical and perhaps also mental health. Conversely, long-term ill-health or even chance periods of sudden ill-health could lead to decreased income and increased costs, as could retirement and old age more generally. With these potential harms in mind, a wider household picture of energy use – and what counts as essential and inessential, based on a range of values – is important to consider, an issue we return to below.

Children

Having young children in the house was seen by many as leading to an inevitable increase in energy use and this was associated with being a good parent. Stacey outlines how there is now a 'different meaning' to her energy use since becoming a mother, incorporating different routines but also the continual interruption of routines:

Having a child, yeah. 'Cause when you don't have a child, you don't worry about the washing until you got to the end of the clothes pile [laughter] ... main change was having a child 'cause everything is, there's more of everything, there's different reasons to have stuff on. You put the TV on to quiet them down three o'clock in the morning [laughs] so there's more electric and washing and everything, isn't there. And heating's on, you don't care when you don't have, if you think, oh, got £10 electric, that's got to last me for two weeks. I'll try and find a way to get more electric because my child needs it, 'cause there's just a different meaning for it, isn't it, everything's more prerogative. You've got to have more, got to find that extra bit for that gas because you've got to keep that gas on, 'cause when you're on your own you just put more layers on. Can't promise your kid's going to keep that blanket on all night, can you? [laughs], but yeah, it's mainly that, just having a child. (Stacey, 30s, I1)

Several studies concerning energy vulnerability and fuel poverty have noted the way in which the wellbeing of children was prioritised by adults, leading to heating being organised around children's routines, whilst adults themselves may adjust their own consumption and endure greater cold (Anderson et al., 2012; Middlemiss and Gillard, 2015). This positions heating when children are present as a 'bottom line' of what is considered essential energy use (Jenkins et al., 2011). The health and wellbeing of children thus represent a bottom line other than that of affordability (p. 16 above), justifying changing patterns of energy use. The expectation that use of central heating is important when caring for children was widely articulated across our sample. This was evidenced in a number of people describing how they planned their heating schedule around children's presence and routine in the home, even if meeting energy costs was a struggle.

Yeah, he comes, if my grandson comes up and I know he's coming up, then the heating goes on earlier. In the wintertime. In summer of course it's not necessary. But in the wintertime yeah. Just, a, about an hour or so before I usually knock it on anyway. For his benefit, not mine. (Alec, 60s, I1)

When we have grandchildren down here, I mean, we make sure they're warm, and keep the heating on for them then ... And make sure they're warm, and if they're warm enough then we knock it off, and, we make sure they're alright. (Terry, 60s, I1)

Here Terry and Alec refer to making changes in the presence of grandchildren, which meant heating alterations were more intermittent (and these demands less visible) than in households where children were permanent residents.

I just turn it up and down so it's always off on zero and then I put it up to 25 for about three, four hours. It warms the entire place up and then I knock it off then when the baby goes to bed, 'cause we, well, we don't really need the heating on. If I get cold, I just throw a blanket over me ... Well normally put it on say half an hour before she gets up, warms her clothes up and warms the room up and knock it off when we go out then. And then I normally turn it on then before when I pick her up from school so then the place is nice and warm and then when she goes to bed, I knock it off. (Amanda, 30s, I1)

[w]e tend to put it on when the kids come home or before they come home. It's really on the day we compare it by because when they are coming home from school and it's raining, I like to put it on a little bit earlier so when they get in it's warm, you know, strip off out the cold wet clothes ... In the evenings, I like to knock the heating off around about 7 o'clock or whatever, before then or on that time because when the kiddies go to bed, I don't want it too hot up there for them because my son, like I said my oldest, he suffers with asthma so sometimes it can affect the chest being too hot up there ... sometimes it comes to that, like in the evenings, come 9 o'clock or whatever you start to feel a bit of a nip in the

air, like, we'll just have a throw each and chill out. Like the kids have got their blankets, they're tucked up warm in bed, so you know, it's okay for them while they're sleeping. When they're sleeping, they don't care but like I said I wouldn't turn the heating on at that time of night because it can affect their chests and I am one for trying to keep them healthy. (Jessica, 20s, I1)

Both Amanda and Jessica describe turning off heating when their children are in bed, with adults using blankets in the evening to keep warm. This routine of prioritising the children is seen as important for providing warmth, heating and drying clothes and generating comfort.

Interestingly, the link between health and warmth is reversed in Jessica's account once the children are in bed, with too much heat linked to chest and breathing problems. In this way, her heating routine is positioned in terms of prioritising the health of her children at all times.

This perception that children needed heating was called into question by some participants. Jay described arguments with his mother over her using the heating excessively (as he perceived) for her young children, whilst Stacey talked about having a 'hot child' who was running around and didn't feel the cold.

There is loads of disagreements because she [mother] will put, she will put it on all the time and the kids, for the kids I think she thinks it's cold but they're not cold, but she just thinks they're cold so she puts it on all the time ... she didn't used to put the heating on hardly ever, she used to put it on maybe once, one or two hours a day and that was that but it seems to be on a lot more now since she had new kids ... they're not, she just thinks that they're cold. (Jay, 20s, I1)

Yeah, I just put it on when I want to put it on 'cause sometimes I wake up and it's fine and my son's a hot child, so he's constantly like this [indicates running movement], he doesn't need to heat, he's constantly on the run [laughs], so I don't put it on a timer, (Stacey, 30s, I1)

Instances like these called into question the assumption that additional levels of heating were necessary for young children, which was often taken for granted by many of our participants, challenging the view that some lifecourse stages are necessarily associated with particular energy costs. Some spoke of using heating in this way because they had unpleasant memories of living in a cold house during childhood and felt that wasn't a good way to bring up children, whilst others felt a cold childhood home had had a longer-term impact on their sense of thermal comfort.

- MARK: Not using a lot of heating. My mum, growing up, she was raising five of us on her own so like had no money, so it was always very, didn't want to spend the money on heating so naturally we just don't use a lot.
- SERENA: I think that's why you never touch the heating do you? He doesn't even think of it, even if it's cold in the house, he doesn't put the heating on whereas I am like ok it says it's like 13 degrees in here I am putting the heating up. (20s, I1)

Whilst heating has been a major focus of work on fuel poverty, some households have high energy costs in other areas. For example, there was frequent discussion of the energy-consuming devices that children seemed to desire and use frequently. Whilst some made attempts to cut down, others felt that this form of entertainment should not necessarily be curtailed. This may particularly be the case for households with little money to spend on forms of entertainment outside the home, or where some residents have mobility problems that make other activities difficult (see also Middlemiss and Gillard, 2015).

I wouldn't like to have a houseful of children right now. Because everything they play with is electricity dependent, I think. Um, and they charge everything. We've got phones, and, computers and, but, with children, it's lights on, it's TVs on. They've all got to have their own TVs and, how not, I'd be in debt if I brought up children now. Energy debt. I'm sure I would be. It must be hard when, my grandchildren are hard enough to, you've got to follow them round the house, and, knock it off. 'Why?' 'To save on electricity'. 'Why? We don't knock it off in our house?'. See. That's what, that's the difference. I think the older people are more conscious. Younger people are too tired, too worn out to do it. Because if you've got three children in the house, they're running around going crazy, especially in this weather, you are using up electricity and gas, aren't you? (Terry, 60s, I1)

I don't know really because that's about it, it's just boys with their toys, you know [games console use]. Obviously, the baby would have batteries for the toys, my girls use their tablets but obviously they get charged up via like, the socket and I'm a parent who likes to play with the children and take them out and I don't believe in them constantly being on something, even though my eight year old is like a zombie... I'd rather go out, that's me and that's the way I've been brought up, but as soon as we get through the front door, my little boy's off, he's upstairs! [to games console] (Jessica, 20s, I1)

These instances highlight that it may not be heating costs that position a household as energy vulnerable or in fuel poverty, raising questions about how heat-saving measures can go to alleviate the symptoms of energy vulnerability for these consumers (Jenkins et al., 2011), where high electricity costs may give rise to concerns.

Vulnerability and resilience

Thus far we have looked from a number of angles at how certain situations and lifecourse transitions can create conditions which, the academic literature suggests, may create energy vulnerability, and also at how people adapt practices to these situations. The second round of interviews to date has given us a greater opportunity to also explore residents' subjective understandings of vulnerability (Middlemiss and Gillard 2013). Some of those who may be considered vulnerable according to official measures saw their own lives in rather different terms. For example, Cheryl and Bob had saved for retirement during their working life and did not feel vulnerable to any deterioration in their standard of living, despite being members of an officially vulnerable group. Instead, they reported that they 'cut their cloth accordingly' (a phrase used by several participants, particularly amongst the older generation). This discrepancy between official definitions and personal experience is exemplified by Doug and Joan, who would be considered vulnerable consumers due to Joan's health problems.

- DOUG: I know we're getting to the age now where we are probably starting to get classed as vulnerable people, but I don't see that myself.
- JOAN: If they came in to see me, if they did a test on me, they'd be saying, "She's very vulnerable." [Laughs]...
- DOUG: Personally, I think it's people who can't afford to put their heating on. Or if we had a next-door neighbour who I knew wouldn't put her cooker on, I'd probably invite her in for meals or something, wouldn't we?
- JOAN: Yes. That's the type of thing we would do if necessary.
- DOUG: As far as coping with it, as I say, I'd turn the heating up. If it costs money, it costs money, I'll save it in other ways. If it's snowing outside and they [dogs] want to go out, I don't mind. I've got proper walking boots; I can dress up warm...
- FIONA: I think in some definitions, you'd count as vulnerable consumers, with health issues to consider. But you said you don't feel like you're vulnerable because you can afford to do what you need to.**
- DOUG: Oh, yes. If we'd run out of something and it was snowing and we desperately needed it, I haven't got a problem with walking down to town. It's only a mile and a half, you know, three miles there and back. If I can do that, I don't consider myself in any way vulnerable. (60s, I2)

Doug articulates that he is not 'in any way vulnerable', suggesting that whilst the household would be considered vulnerable due to Joan's ill-health, in reality that is not their experience because Doug is able to ensure that their needs are met. Since Doug stopped work (around a year before our first interview) the couple's income has been reduced. However, in interview two, Doug describes how he had been preparing for this transition for some time, meaning that he had been

able to pay off debts (such as mortgage and credit card) as well as save money ‘for emergencies’ (such as replacing a leaking window) in addition to ensuring that they could meet their everyday bills. A delay in the age at which Joan was eligible for a state pension was also compensated by an unexpected private work pension from a previous employer for Doug. Heating was very important to the couple and not a bill they expressed concerns about meeting, although they were now more careful about other spending and saving up for bigger expenses. Their careful longer-term planning for their current situation may have helped them have greater resilience to financial challenges than those who unexpectedly found themselves out of work. However, they still described a different kind of living and spending pattern compared to when they were working:

- DOUG: So, yes, the whole house has gradually been upgraded. But obviously now, since not working for the last couple of years, those sorts of things are more or less a bit on hold at the moment because of the low income as we are now ... So there’s not so much savings or disposable income, you know, like we used to have when we were both working.
- FIONA: So is it more of a case of waiting and saving up for those sorts of things?**
- DOUG: Yes. It’s going to be a bit of waiting game ... So at the moment, we’re on a sort of a waiting game [until eligible for state pensions] where we’re just, you know, biding our time.
- JOAN: And if things are emergency, like that
- DOUG: Yes. Do things as we need to.
- JOAN: That window was an emergency, then we’ll get money to do it. But, as you say, got to keep a little bit in for emergencies
- FIONA: So are you managing to sort of put a bit aside for emergencies like that?**
- DOUG: Well, not so much put it aside.
- JOAN: We find it somehow, don’t we? ... It would be nice to have a bit more coming in, but...
- DOUG: Yes.
- FIONA: But that’s something that you can foresee happening in a couple of years, you know, with the state pensions coming in.**
- DOUG: That’s right, yes, yes. And, as I say, at the moment, we’re managing, and that’s fine. (60s, I2)

Vulnerability, for Doug and Joan, is a condition in which someone is unable to provide for essentials (such as heating), not cope with emergencies, and to not be in a position where they can offer help or solidarity to others.

Echoing their remarks about the importance of saving to avoiding vulnerability, Carole described how she has always ‘put something back on a regular basis’ in case of an unexpected expense or big bill. Whilst the amount she is able to save has decreased since retiring, she is still able to make

regular savings. In the second round of interviews following the experience of the cold snap, some residents noted that they had noticed a difference in their expenditure thanks to their practice of budgeting over a longer term for gas and electricity, setting aside a fixed amount per month for both fuels. This allowed them to save some money on gas during the summer months and keep it aside for winter use.

‘through the summer you're not using gas, so why not top up your electric that bit more what you would use from your gas’ (Jessica, 20s, I2)

‘I just leave it build up, it's like through summer we didn't really, didn't really have to use my gas so I got about, I got £200 or something in there, a good chunk’ (Amanda, 40s, I2)

Some participants noted that saving up for larger items of expenditure was a lengthy process, and one which meant other expenses (such as family birthdays) that came along regularly might be unaffordable. For example, at the second interview Terry had just had a new stair carpet installed, which he felt had needed doing for some time and had saved up for. However, this meant that other unexpected expenses were hard to meet, such as fixing a faulty door that was difficult to open:

TERRY: We've been waiting a long time for that carpet, we've had to save, we've had to cut back. We don't go on holiday this year. We cut our cloth to our means. We can't go on holiday and have a new carpet and kids birthdays and things like that ... So, we do the important things first. Stopping water coming in. Any maintenance on the house will be done this summer, if we can afford it. That's the main thing, the house, we've got to keep it maintained, we've got to stop water coming in. The moment you let it go, everything's ruined.

FIONA: **Yeah, and it exacerbates everything else. How easy is it to be able to save?**

TERRY: Very hard. Finding how much it costs and then you've got to save towards that cost ... If we need it, we've got to save for it. Like I said, there's a job that needs doing around the door to stop water coming in, so that needs to be done. There's a job on the gutter that needs to be done to stop water coming in. Back door, we need a new back door, we can't afford it. To shut it, you've got to lift it, the hinges have dropped, so you've got to lift it and shut it. We can't afford it, can we?

FIONA: **It's about trying to make sure the stuff that really needs doing gets done.**

TERRY: Priority, as long as that back-door shuts, and stops the draught –

MANDY: We get locked out the back ... We had to get a crowbar. (60s, I2)

Others described greater difficulty or inability to make regular savings given their already restricted monthly incomes. For example, in her remarks quoted above on page 16, Jenna describes being unable to afford to replace her inefficient van with another vehicle so they ‘just had to deal with black smoke’. Jenna ‘reluctantly’ described herself as a vulnerable consumer because of mental health issues and relying on benefits, which meant the household had little disposable income and capacity for saving. Whilst others had referred to the ability to make savings by switching energy suppliers, Jenna felt that this was not an option available to her because of payment overlap between suppliers:

- JENNA: [w]hen you’re on benefits, it’s hand to mouth. So, it’s like, if you swap an energy supplier, doing that on benefits is really silly because you can’t do it because as soon as you stop with this company, they want anything that you owe up to date then, and then this new company starts you off. So, you end up paying twice as much that month and you can’t do it. I think a lot of people got into debt with things like that. I think a lot of people worry about debt. ... I think a lot of people get themselves in a mess about it and they maybe take Wonga loans and end up getting in quite a tizz about it ... I think something like that could potentially happen. I don’t think we’d be able to cope with an overlap.
- FIONA: You said being on benefits is a hand to mouth type of thing. Does it make it difficult to plan ahead? Is it difficult to save for things and put money away?**
- JENNA: I think it is. We’ve got small savings but, yeah, I think every month there’s something, every month. For all your best intentions, a lot of the time it doesn’t happen, to save. So, I don’t think as far as electric bills and stuff, we couldn’t save to make that any easier on ourselves.
- FIONA: Or if you’ve got an unexpected expense, I guess. Like, if something happens with the van.**
- JENNA: Yeah. We’ve wiped out a lot of our savings on the van and we didn’t have that many savings, so it’s just gone. (30s, I2)

Even where households have longer time horizons for budgeting, related to fixed points within the year like ‘a very expensive time of the year like Christmas’ (Jessica, I2), the ‘week to week’ rhythm of cash management associated with receipt of benefit payments creates particular rhythms of coping with expenditure that shrink the time horizon of financial management.

Jenna’s experience bears some similarities to the accounts of participants in Middlemiss and Gillard’s (2013) study, where there was some scepticism about switching energy supplier, with one participant ending up paying two suppliers simultaneously while the switch happened. Therefore, whilst customer advice organisations may advocate switching suppliers regularly to access the best

tariffs (Walker and Day, 2012), this strategy may not be feasible for those on very low incomes because of unplanned extra expenditure. The potential challenges of managing such an overlap also has implications for the establishment of the mine water scheme.

Conversely, some participants who would be classified as vulnerable consumers were not eligible for any additional support because their income was not considered sufficiently low, but this did not mean that energy bills were not a concern.

LEN: You pick up an advert, 'are you over 65? You're entitled to a free boiler'. You're only entitled to a free boiler if you're in pension credit. I'm on the lowest income of a person in, I researched it yesterday, my wife and I's income is the borderline, but oh, I don't know.

FIONA: But you're not in the eligibility...

LEN: No. I'm not eligible for anything, can't have anything, DLA. I've got miner's knees; both of these are strapped up as we speak. Through kneeling down, you know, and all through your young life you're kneeling down. Wear and tear on the knee.

FIONA: Yes. Does that make it quite difficult then? Are you quite conscious of what you're spending and what you're doing in relation to energy?

LEN: Yes, yes.

FIONA: Do you think that's more so now than it was in the past when you were...?

LEN: Yes. It is, definitely. (70s, I2)

Whilst not necessarily vulnerable consumers themselves, others discussed why there might be particular vulnerabilities and susceptibility to fuel poverty in Caerau more widely.

It is. It's always going to be an issue. You're always going to have families that are going to think, "Do I put food on the table, or do I keep the kids warm?" And they can't afford both. There are a surprisingly large number of families around here that use cards [for prepayment meter] ... which is an expensive way of paying for your gas and your electricity. Much more expensive than having it on a meter ... Oh, it is an issue. It's a big issue really. But until they reduce the tariffs for people, what can you do? ... It's an issue partly because of the number of people that are just on state pensions up here. Okay, they get a winter fuel allowance, but it's not an awful lot of money and they don't have any income coming in. And the other end of the spectrum, there are lots of families where neither mam nor dad work. And in some cases, their grandparents didn't work, and some of them are third generation not working. And they've lived all their lives like that ... It becomes a cultural thing because people don't expect to have jobs. "Mum and dad lived on benefits, why can't I live on benefits?" It's an education thing as well, or lack of, which is a big issue up here. (Pamela, 50s, I2)

Lack of education was discussed by some other participants who were involved with the local food bank as being problematic in the area. For example, not knowing how to cook (or having the facilities to do so if homes only had microwaves) meant reliance on pre-prepared options, which were more expensive.

Older people were seen as particularly vulnerable to fuel poverty because of expectations that they would have greater heating requirements and poorer health and mobility. Some of our older participants were encouraged by their children to use heating and not worry about the cost:

FIONA: So you said through that period [of snow] you could see your heating bill going up.

ANNE: Oh yes.

FIONA: Was that a concern for you, or was it just...?

ANNE: I shouldn't be really concerned, the money's there. I'm not short of money. I haven't got a lot of money, but I'm not that I got to sit there and say, oh, I've got to turn the heating off, I'm, you know what have you. And my son goes nuts because I don't turn it up and put it on, and I said well I'm in...

FIONA: Ah right, so he's telling you to...

ANNE: Oh, yes. "Keep warm. At your age, you've got to keep warm!" (70s, I2)

Other older people we spoke to did not feel vulnerable in relation to energy costs and attributed this to having prepared for retirement through savings during their working life, as discussed above. However, given the steep rise in bills that many had described, it was possible for people to foresee a situation when they would become vulnerable in the future:

ALEC: I worked all my life. I'm safe. I put plans in place for our retirement.

FIONA: So when you were working you were able to prepare for the period of retirement when your income was less?

ALEC: Less, yes ... Not to the degree I'd like to, because I couldn't afford to. But at least something.

FIONA: But you have it so it's not a big concern for you?

ALEC: At the moment, no ... But if things keep going up and my income isn't going up, it will be in the very near future. (60s, I2)

Preparing in advance for a situation of reduced income was not something that all participants were able to do. For example, those who had been on benefits for long periods due to ill-health had little ability to make savings in their day-to-day lives as their income was seen as very restricted. This gave rise to some concerns about how they would manage further into older age and whether they would be worse off.

Some participants felt that vulnerability stemmed from reliance on energy as an essential part of modern life (as we discuss further below), which meant dependence on energy companies who were motivated by profit maximisation. From this perspective there was little that consumers felt able to do as they could endeavour to use energy efficiently but could not stop price rises

We're a slave of the electricity company. It's something we've got to have. So, we end up paying for it and we've got no choice in how much we pay. You phone round and get different suppliers, but eventually, their prices go up as well so, you've got to keep changing and swapping suppliers to benefit, haven't you? So, you're a slave to them. I try to do without. Knock the lights off in the night. There's one standard lamp on in the evening, TV and the fire. (Terry, 60s, I2)

Overall, then, people who fell into categories which might be associated with vulnerability and energy vulnerability in particular often did not identify as vulnerable. The capacity to exercise adaptive agency and forward planning – made possible in most cases by the ability to economise (while meeting essential needs) while also diverting income into savings – seems often to be central to this refusal to identify. Where someone's situation was complicated by additional costs (e.g. from supplier overlap while energy switching), insufficient income to provide savings, or being in a marginal situation where a low income is accompanied by a lack of access to assistance, then feelings of vulnerability were more common. A sense of lack of control appears to exacerbate feelings of vulnerability, whether this is associated with future expectations of reduced income and/or volatile energy prices, or the increasing energy-dependence of modern life. For some, being able to reassert agency in face of such expectations actually led them to talk about ideas of living off-grid, which was associated with more restricted energy use but greater control over it. This association between the tangibility of off-grid reliance on energy and control, and favouring such arrangements over the convenience yet vulnerability (to increasing prices and escalating energy usage) of grid connected living is explored in Groves et al (2016).

Essential Energy Use

Our data on experiences of energy vulnerability underline the importance of understanding what households consider to be essential energy use, given that an inability to provide essential energy services is associated with feeling vulnerable. Walker et al (2016) found that a range of energy-dependent items were deemed necessities by their participants, relating to diverse aspects of everyday life. People see the category of essential energy services as extending beyond survival, encompassing energy uses that have become customary and normal in a particular societal time

and place, often being associated with values like hospitality or dignity. During our own interviews we asked participants about what they considered to be essential energy use, in order to try and understand what kinds of values were prioritised.

Many participants listed appliances such as fridge, freezer, cooker and washing machine as things that they could not live without, as these were seen as basic necessities for everyday life. For some households the TV was seen as very important. This was particularly the case where restricted incomes made it harder to pay for entertainment outside the home, particularly where young children were present – or where residents experienced health issues that meant they were home for large amounts of time. Some participants mentioned that they could do without the TV themselves but that it was considered essential by their children, making it a household necessity. Most people mentioned heating as an essential. For older participants, central heating appeared to be highly valued, particularly because they could remember a time without it. Len describes the long-term importance of an electric blanket in keeping warm at night:

Oh I couldn't do without the central heating, no. Electric blanket, it's one of those things it's so comfortable. I mean we lived in a house so cold, we had no central heating and my aunty, 51 years ago, bought us a top of the range dual controlled electric blanket and that was absolutely heaven you know we'd get up in the morning there would be ice on the inside of the windows, the condensation would have frozen and there we were under this, so we have never ever been without an electric blanket it's just one of those things that we like and people say oh what the bloody hell, you're warm within three minutes, there's nothing like climbing into a nice warm bed, that is our big indulgence. (Len, 70s, I1)

Len's description suggests the electric blanket has gone from an essential (in a cold home) to a 'big indulgence' (in a centrally heated home) but is nonetheless still important later in life because of how it provides everyday thermal comfort, even in a warmer house. The exact meaning of 'luxury' energy use (which the electric blanket might be counted as) is thus placed in question here. Once the blanket was essential to Len. Its meaning has changed as he has become older, but it remains a signifier of comfort and homeliness precisely because of its original meaning.

At the same time, while many people identified heating as essential, some were prepared to qualify this when considering the issue a little further.

DAWN: I would say they have to put electric in, but they could scrimp with the gas more.

PAUL: I think they scrimp more with the gas.

DAWN: You have to have lights wouldn't you I suppose but with the gas they could think, "Oh right well I won't put that in now".

PAUL: "I'll just put it on for an hour" say. (40s, I2)

It appears here that 'essential' does not preclude decisions being made between different ways of using energy in some circumstances. One difference here lies in the material effects of heating, which endure for some time after radiators are switched off, which means it can be designated as essential but also as being used with differing levels of intensity.

The value of connectivity as an energy service was stressed mainly by younger participants, talking about the importance of their smartphones or internet connection, and the links to the world outside the immediate community these represented.

Yeah, I might have a little bit of an issue if my tablet wasn't charged, at least one of my tablet or my phone ... I'd need to be connected to something; I think the problem with living in a place like this is that you do feel quite disconnected. Um, you know like when the mist comes down, it's like you could be living on the moon. Because you can't see anything, and it's nice to feel connected. (Jenna, 30s, I1)

I'm trying to decide between hot water and Wi-Fi [laughs]. (Serena, 20s, I1)

Some participants' explicitly articulated views that represented access to energy services in terms of basic rights, and indeed, in relation to specific capabilities (like access to communication or education). Adequate lighting and heating were seen as fundamental, and with energy readily and conveniently available in the UK (with gas central heating at the push of a button in contrast to the more laborious process of heating a home with coal), price volatility was explicitly seen as a distributive justice issue.

PAUL: Yeah, it's surprising how some people live. They only put the heating on, do you know what I mean? If they can't afford it like.

DAWN: That's not right, in this day and age either, you should be able to afford to have at least gas and electric. It's there isn't it? And, I mean, I know, years ago they'd have candlelight, but we haven't got to these days, have we? So we're not going to. But yeah, I think that's something that everybody should be entitled to I think. And at an easy rate that you can afford as well innit? (40s, I1)

Continuing the discussion of basic rights, Jenna articulates the centrality of energy to communication and participation in society, including the ability to complete forms and apply

for benefits online requiring an internet connection and suitable access device. Other participants also mentioned the use of iPads in schools and for homework as representing another technological device that families were obliged to engage with.

I think, in this country, it should be a basic right. I think in all countries it should be a basic right, but I think there's countries that are struggling to get water as a basic right. I think it's getting ridiculous. For some people it's become almost elitist where pensioners can't afford it. I think that is just wrong. I don't think in Britain we're geared to cope without energy. All the things the government want you to do are all online, so you need to have a computer or a tablet, and then you need the internet, and then you need to charge it and all these things take up energy. We've got to eat. I think there's a basic need, yeah ... It's evolution, isn't it? That's a basic standard now, or it should be. I'm not sure that it is. (Jenna, 30s, I2)

Between the first and second interviews participants were sent multimodal materials to respond to, which also included questions about essential and wasteful energy use. Alongside more general statements about the importance of not wasting energy because energy is essential, energy for cooking and heating featured most frequently. One participant used the form we provided them with to describe essential energy use as: 'heating, cooking, lighting and all other things in this modern world', again suggesting the change in what is considered to be essential energy use over time and highlighting the reliance of contemporary lifestyles on everyday energy use.

Summary of comparative analysis

In this preliminary analysis we have outlined a number of issues of concern for Caerau residents in relation to energy vulnerability and fuel poverty. Rather than focus explicitly on financial issues, our discussion has highlighted a range of factors that relate to energy vulnerability and the maintenance or erosion of important capabilities. Price volatility was a concern for many, particularly when there was apparently little scope to make changes to properties in order to improve efficiency. Particularities of place (in terms of geographical position and historical patterns of infrastructure deployment) also gave rise to certain challenges for Caerau residents. As Darby (2017) argues, geography matters to energy policy because whilst gas and electricity may be the same in any place, they are not bought, used and valued in the same way in any place. Experience of wider costs and poverty beyond FP are significant here. Rising energy costs were exacerbated by a lack of work in the area, presenting additional challenges for people in relation to transport. Relatively infrequent bus transport to other nearby towns made a car important to access a wider set of employment opportunities, meaning that being unable to afford a car

limited employability. Despite these place-related challenges, few would be prepared to leave the area given close relationship and identity connections. With people unwilling to move, little incentive therefore exists for landlords to make improvements to the housing stock, the inefficiencies of which were frequently discussed.

Health issues were a major theme in these interviews, with a number of participants being unable to work due to ill-health or becoming carers for others. Whilst some had been able to make preparations for living on a restricted income in these circumstances, for others their conditions were unexpected, or there had been little opportunity to make savings because of limited incomes, meaning they had to manage on a 'day-to-day, week-to-week' basis and struggled to deal with unplanned expenses. Being unable to think about the longer-term future gives rise to some challenges, particularly in relation to financial planning, as we have discussed in previous work (Shirani and Henwood, 2011), and is reported by respondents as increasing a sense of vulnerability. Ill-health often meant that participants spent a large amount of time at home, increasing the time that they would ideally need to heat their home, whilst some conditions required additional energy use to manage or to avoid exacerbating symptoms. The combination of these factors at a time when income was restricted due to lack of employment makes ill-health a significant issue in terms of moving into fuel poverty. Having the resources to be able to deal with an unexpected lifecycle event is likely to be a challenge for those who cannot divert income to savings. Whilst several participants spoke about having been able to save for their retirement, there was still a sense of finding it challenging to manage on a restricted income, particularly in light of energy bills rising at a faster rate than income.

Despite everyone discussing having a low or restricted income, few people were prepared to explicitly identify as vulnerable consumers. This may indicate problems with existing definitions of vulnerability, which bear little relationship to people's subjective understanding of their situations. Alternatively, it could suggest that issues of shame and stigma remain pertinent in such discussions, making people reluctant to accept a label associated with a stigmatised identity. Being able to save, pay for essential energy services and offer help to others if it were needed were all seen as reasons not to identify as vulnerable. In addition, being able to identify others who were worse off meant that participants did often not see themselves as vulnerable in comparison. Other markers of agency were identified, including the ability to make changes to properties (perhaps limited by housing tenure as well as income), and physical ability to cope with cold conditions had an impact on resilience.

In our previous work we have highlighted the relevance of the concept of linked lives for understanding everyday energy use (Shirani et al., 2017). From lifecourse theory, 'linked lives' refers to how changes in lives can impact on others, with expectations of care and responsibility for others being particularly relevant. In the interviews presented here we have illustrated the impact on energy use associated with being a parent, with a largely unquestioned expectation that young children require warm environments, meaning parents and grandparents make sacrifices in terms of their own comfort to provide this. Beyond heating, high electricity costs were also often associated with young children, particularly for entertainment purposes when there was little money for entertainment outside of the home, or there were safety concerns about children playing outside. Aside from looking after children, higher heating costs were associated with hospitality and ensuring visitors were comfortable, although were not universally adopted. Exploring these connections between people is important in eliciting a comprehensive picture of everyday energy use and vulnerabilities. It is also relevant in relation to concepts of recognition justice, where some groups may be more readily recognised as vulnerable than others, and families with children are often overlooked (Middlemiss and Gillard, 2013). The relationship between heating and care was evident although less pronounced in relation to the older generation, with the assumption that older people were more vulnerable to the cold weather and had greater needs for warmth. Beyond direct familial links, relationships within the community remained important, despite a perception that the sense of community had declined in recent decades. These ties were evident in discussions of offers to share resources, such as money, fuel and food, and were particularly invoked in accounts of recent water shortages.

A capabilities approach could be seen as relevant in interpreting many of these discussions, which highlight an understanding of energy as a basic right. Energy vulnerability (influenced by income, energy costs, employment opportunities, tenant-landlord relationships, and social solidarity) can be seen as pointing towards the erosion of central capabilities (such as health, education, communication, social participation and the achievement of dignity through being able to offer help and hospitality to others). As the literature suggests, the centrality of such capabilities derives from how they can support the pursuit of valued functionings (Sayer, 2011; Sen, 2000). Through this analysis we have highlighted that energy and key services which rely on it are material prerequisites for the provision of key capabilities, but also that the maintenance of what are felt to be key capabilities (such as health and a warm home, or healthy finances) is conditioned by the adaptive skills available to households, and is also dependent on the values

which people hold. The effect of access to affordable energy on capabilities is a matter of distributive justice (income and material condition of dwellings), but is also a matter of procedural justice (the ability to articulate inequalities and preferences within market and civil society forums), and of recognition justice (the ability to have the specificities of one's situation and how one is trying to deal with it acknowledged and responded to).

The data presented thus far provide some indications of how individuals and households might experience energy vulnerability, but to further explore more dynamic accounts of movements into and out of positions of energy vulnerability, we now turn to some case study examples.

Individual Household Case Studies

Mark and Serena – interview 1

This young couple had moved to Caerau several years prior to our first interview, choosing to buy their first house in the area as it was ‘crazy cheap’ and therefore presented an affordable housing solution. The house needed work and still presented a few problems – such as a damp storage space – but the proximity to scenic outdoor environment was seen as particularly important and helped to make up for some of the issues with the property itself. It had been a challenge to get a mortgage as Serena was starting out in self-employment, whilst Mark was in an assistant’s role, meaning income was limited.

Yeah because I am self-employed it’s quite difficult to get a mortgage because obviously and plus I’d only just started out so I didn’t have any proof of how much I’d earned or anything like that so we were quite limited to how much we could get. But we got this house really really crazy cheap [laughs]. (Serena)

Mark described an upbringing where use of heating was not always feasible due to restricted income. Unlike some of our other younger participants who had similar experiences and now use the heating more frequently than their parents (several of the older participants didn’t articulate experiences of cold childhoods, perhaps because of the apparent abundance of coal as discussed previously), Mark sees his childhood experience as behind his current sparing use of heating:

MARK: Not using a lot of heating. My mum, growing up, she was raising five of us on her own so like had no money, so it was always very, didn’t want to spend the money on heating so naturally we just don’t use a lot.

SERENA: I think that’s why you never touch the heating do you? He doesn’t even think of it, even if it’s cold in the house, he doesn’t put the heating on whereas I am like ok it says it’s like 13 degrees in here I am putting the heating up.

Despite this comment suggesting that she would prefer to use the heating more frequently, Serena also described herself as being a low energy consumer, who preferred to wrap up in a blanket rather than turn on the heating. She recounts being told off ‘constantly for putting the heating on’ during her childhood when the family had a prepayment meter, again due to parental concerns about cost. Both Serena and Mark described uncomfortable experiences of visiting relatives where the houses were too hot, making them feel ill – ‘I get a migraine every time I go up there’ (Serena). Whilst many people in the sample described keeping warm as important for good health, this comment shows that being too hot was also seen to negatively impact on health (as illustrated in

Jessica's comment on page 42 above about children being too hot at night). In this way, being low energy consumers is positioned as positive in financial, environmental and health terms.

Despite this apparent propensity to withstand the cold, both had struggled in their previous accommodation – a privately rented property in another valley, which proved particularly challenging to heat:

- SERENA: [...] it was a rented house but it was a cottage that only got an hour of sunlight and it was only upstairs so it wasn't even like the downstairs floor, it was a freezing house and the only, it had heating but it wasn't very efficient.
- MARK: It was terrible.
- SERENA: It was terrible heating and you had to re-pressurise it like all the time, there was something wrong with it I think. And so there was a log burner and so we were constantly having to buy wood just to heat the house up and now I am thinking we spent quite a lot of money on wood ...
- MARK: The fire would be on all day every day because you'd wake up in the morning and you'd be able to see your breath even in the middle of summer.
- SERENA: It was freezing, it was such a cold house.
- MARK: Concrete floors and...
- SERENA: And yet, like we'd put the heating on and I think that's why it shows if you have good heating if you have good insulation in your house then it certainly makes a difference because that house was shocking, it was terrible.
- MARK: I think the experience of it, we couldn't keep, the kitchen got so cold and damp we couldn't really keep fresh food for more than a couple of days.
- SERENA: It would get mouldy really quickly ... That's why we moved out.

These comments illustrate some of the challenges faced by renters, in terms of the relative powerlessness to make any changes to their property in order to improve energy efficiency in homes which may be particularly challenging to heat. Many felt that if the landlord would not benefit financially from making improvements, or would at least not incur any costs (e.g. others described landlords as supportive to updating the boiler if this could be done for free because the tenant was on benefits) then there was no incentive for improvements to be made. Being able to buy their own home gave Mark and Serena the opportunity to alleviate some of these challenges.

Mark and Serena described themselves as low energy consumers and seemed proud of this, seeing themselves as environmentally friendly, which was informed by education and love of the outdoor environment. Despite acknowledging that they had a house that others may find cold, they had

‘never thought about’ adjusting the heating to suit guests. Instead they advised guests to wear jumpers or provided them with a blanket (particularly Serena’s grandmother, highlighting perceptions that older people were more vulnerable to the cold). In their account then there was no sense of shame or embarrassment about having a cold house (in the way that has been described in the literature) as they experienced it as a more pleasant environment than homes that were excessively heated.

Both referred to themselves as being ‘tight’ with money and energy use, again as a result of necessity given a restricted income. Since moving to the area, Mark has moved to a more senior position at work (and in an office closer to home, so travel costs are less of an issue) and Serena has more regular work, meaning their income has increased. Despite this, they suggest that their spending habits have not really changed and they remain cautious.

- MARK: And a few years back like when you were first starting the [self-employed role] and I was in an assistant’s role instead of the main role, our money was a lot tighter so we were just naturally more tight with our energy use.
- SERENA: Well it’s only recently where we have started to actually have a bit more extra money that we have realised that we are acting quite tight [laughs]. And we’re still not going out, oh no wait we can now.
- MARK: When we went on our first abroad holiday like for years and it was like ooh should we be spending the money on this? It’s like we haven’t been away for like ten years.

Whilst their income had increased, it was still not at a level that enabled them to make long-term investments in domestic green energy infrastructure – such as a biomass boiler or solar panels – which they would otherwise have liked to do. However, they were also uncertain about staying in the area longer-term, which may have influenced their inclination to invest in such assets, which would be tied to the property. In this respect they see themselves as similar to others in the local area, albeit in a somewhat less precarious financial position.

- SERENA: Yeah and especially around here I think it’s just generally the people who live up in this area don’t have as much money.
- MARK: No.
- SERENA: And so they’re more concerned about the more day to day stuff than putting down something that would potentially save them money in the future ...
- MARK: I suppose we’re in the same boat really, we can’t invest in it at the moment but we’re not worrying about getting food on the table every week are we? At least we’re sort of stable in that fact.

Whilst Mark and Serena did not explicitly articulate ever having been in fuel poverty, and did not have characteristics that would classify them as energy vulnerable, they did describe long-term experience of being restrictive with their energy use due to financial constraints. This couple had moved from a situation of restricted income (including during their childhoods) to one of having more disposable income, yet their energy use had not changed in line with this. Their experience differs from some participants in our previous Energy Biographies research project, who described restricted energy use in childhood and more profligate energy use and waste in adulthood once they had the resources that enabled this (Henwood et al., 2016). Mark and Serena's continuing low consumption may be because the change had been relatively recent in relation to their longstanding experience of restriction, or because they proudly saw themselves as environmentally conscious low-consumers and saw no need to change this as a result of their raised income.

Interview 2

By interview 2, Mark and Serena had a young baby and Serena was taking time off work to care for her. Being self-employed meant a limited maternity allowance, but there was no sense that this had created conditions of vulnerability, despite the move to parenthood meaning their household could now be classified as energy vulnerable. One of the main changes having a baby in the house had brought about for the couple was an increased need for heating.

MARK: We have the house a little bit warmer, that's the main difference. Not much warmer 'cause we're quite used to it being cool. But other than that, no, I think we've maintained pretty much the same. But we're using a bit more energy because the washing machine seems to be going constantly. But other than that, it's all pretty much the same with energy usage.

FIONA: **Yeah, so it hasn't made too much difference. How have you found having the house a bit warmer, 'cause I know before, you said you're always hot**

MARK: [whispers] it's terrible. I, we visit friends who have got babies, and their houses are roasting hot, and we think are we doing this too cold? But I just can't deal with the heat.

SERENA: She's fine.

MARK: She seems okay.

SERENA: We've just got it at the lower end of what I think it's supposed to be like a normal temperature. But we're so used to it being cold, it's been bit of a, mind you, I was boiling when I was pregnant, so we didn't really have the heating on at all, and now it's on, it's a bit...

MARK: You can't win, but we'll obviously go for whatever is best for her ... We were over one of our friend's, it was like 22 degrees on in the house when we got there, and there was load of us in a room,

it was boiling. I was getting stressed. Lily was getting a bit unhappy about it.

SERENA: She was a bit sweaty, wasn't she?

These comments echo the assumption discussed above that heating is essential for young children. Whilst the couple have made these changes to accommodate the expectation that caring for children requires heating, they maintain the connection to lower temperatures being preferable for them and better for their daughter than an overly heated home, which has a negative impact on health. Another changed aspect of energy use was the increased use of the washing machine. Both heating and the washing machine were now considered essential energy use, when they had not been included as such in the initial interview. Given how frequently the washing machine was raised as important in the previous sections of the interview, the interviewer raises it here when the participants do not immediately do so:

FIONA: Well, last time you were talking about what you might think of as essential energy use and things like hot water, Wi-Fi [laughter], and cooking ... would you still see the same things as being essential, is there anything you'd change now?

MARK: Yeah, I think so.

SERENA: Heating. We didn't say heating, did we?

MARK: It's not essential.

SERENA: It would be, it's essential now.

MARK: You can get a blanket.

SERENA: Get a blanket! [laughs]. Yeah, I would add heating now.

MARK: Okay.

SERENA: We can regulate our temperature.

MARK: This is true.

FIONA: And a washing machine?

SERENA: Oh Gosh yeah, and the washing machine. Oh, I suppose if the worst comes to the worst, I could get you washing all the poo out in the sink, but...

MARK: Yeah, washing machine is essential [laughter].

SERENA: Oh yeah, how things change [laughs].

Despite the increases in what they considered to be essential energy with heating and washing machine use, the couple still saw themselves as relatively low energy consumers. This was confirmed when they had a smart meter for a short period (which they had been unable to use very recently after switching to a green energy supplier). In their initial interview, both had been keen to get a smart meter to see if it could tell them more about their energy use, but finding that this was not the case it appeared to have little impact on their everyday routines. In this way their

experience bears similarities to other participants who saw themselves as low energy consumers and felt that smart technology could not tell them anything that they were not already aware of.

- MARK: Yeah it was nice...
- SERENA: But then saying that, you were the one that looked at it all the time. I was completely unbothered by it. It didn't affect what I did with energy in the house at all.
- MARK: The main difference is, the only real difference it made was not having to send off our meter readings, 'cause it didn't really change much of what we did.
- SERENA: It didn't really change anything, no...
- MARK: Yeah, and we thought with someone being in the house all the time, it would be higher than I thought it would be, but it really wasn't, we were really quite good. We buy everything with a good energy rating to make sure.

The couple did not express any concerns about their fuel bills, again re-iterating that as relatively low consumers the cost of energy was not a concern. Serena's whispered confession that she did not see the bills was echoed in other couples in our sample where one partner took responsibility for managing energy bills and usage.

- FIONA: I guess, when we talked about it being a bit colder over the last winter than normal, do you have any concerns about your fuel bills or is that sort of usually quite manageable?**
- SERENA: [whispers] I don't actually see them [laughs]
- MARK: You haven't got any concerns...
- SERENA: No, I don't see them!
- MARK: Our bills are still quite low.
- SERENA: We've always been quite low though, haven't we? We're not really high.
- MARK: We're quite low usage. They are going up, but then I've made the conscious decision for the green one, so we're paying more but that's because we've decided to. But it's still not overly expensive at the moment for us. At the moment we don't spend a lot

By opting to switch to a green energy provider, they had chosen a tariff that resulted in paying more than they had done previously. At several points throughout the interview they referred to 'going green' with their energy use and changing the tariff as related to their concern to be environmentally friendly:

The, it costs marginally more, but I thought well, if I'm going to use energy, I'd prefer to know that at least I'm putting something towards creating some green energy. It was more like a conscience thing, really. (Mark)

The couple re-iterated a longer-term desire to live in a property that incorporated renewable energy technology, such as solar panels and a wind turbine. However, since the arrival of their daughter their desire to move away from the area had increased as they saw Caerau as an undesirable environment in which to raise a child. This was largely due to local people's apparent disregard for the environment as demonstrated through extensive littering and fly tipping, as well as apparent drug abuse problems in the area. This meant that they would not consider making further changes to their current property as they would be concerned about not making a return on their investment, particularly given house prices were so cheap in the area. However, they had made a number of changes to their property during Serena's pregnancy, which had helped towards energy efficiency; such as installing a new front-door and removing a draughty open fireplace. This had been replaced with a small electric fire, which the couple admitted rarely using but had installed because it created a better ambience for the room. These changes to the house and preparing for the baby meant that they had been spending more money recently, although saw it as a relatively temporary phase:

- MARK: We've spent a lot of money recently, but it's all been on...
- SERENA: Baby.
- MARK: Baby and improving the house. So we're still day to day, we're quite frugal really. I feel bad, spending money.
- SERENA: Yeah. I don't like to spend, I don't like to buy things that I do think, is it necessary? It does get a bit like, do I really need that? [laughs] with the baby, it's like you need everything. Although we were very lucky, because it's like the first baby in my family for about 20 years. So everyone's got really excited and has bought us things, so that side of things is that's not so bad [laughs], 'cause it's like we've not had to really spend a huge amount of money ...
- FIONA: But I mean you haven't sort of changed a lot then in having more income and be spending in different ways.**
- SERENA: We just spent it on the house, really. But that's almost like an investment, isn't it? And it's stopped now anyway, 'cause we've got all the stuff done, it's kind of all we need. We've gone back to kind of not really spending anything [laughs], on us.
- MARK: Yeah. We haven't got time to go out and do anything anyway if we wanted to [laughs].
- SERENA: Yeah, that's true.

This spending is justified in terms of investment in the property and necessity for the baby, and distinguished from spending money on themselves, which is subsequently positioned as a more frivolous form of spending. In the initial interview, Mark described his cautious spending as a

result of being brought up on a restricted income, which he reiterated again, bringing this into contrast with the profligate spending of Serena's mother.

- SERENA: Oh yeah, definitely. Like my mum wants new things...
- MARK: Oh yeah, she likes to have the new...
- SERENA: Yeah, she likes to have a new thing, even when something is not broken...
- MARK: She's the throwaway society
- SERENA: She is very much throw away ... So that for me, I see that, and it bothers me, so I try not to be like that in a way. But you've always been pretty good, you don't tend to throw...
- MARK: I, my mum's always struggled for money for years, so growing up in quite a poor household, we're kind of used to not spending money.
- SERENA: And you were one of five, a lot of brothers and sisters.
- MARK: Yeah. Food bill must have been insane [laughs]. So yeah, my mum's the same, she doesn't really spend money unless she has to.
- SERENA: Yeah, I don't think we've changed in that respect, have we?
- MARK: No, hopefully.
- SERENA: No, and they're definitely the same [laughs].

This extract illustrates how the couple clearly position lower spending and consumption as preferable, in contrast to excess consumption as part of 'the throwaway society'. In discussing why they held these views, the couple raised a number of possibilities, including their age and university education. However, the main reason they felt was their love of the natural environment and subsequent desire to act in environmentally sensitive ways. In this respect they felt they differed quite significantly from other young people in Caerau, who showed little concern for the environment or interest in renewable energy. This was seen as part of a wider culture in Caerau (which was also remarked upon by other participants) and part of the reason that Mark and Serena were keen to leave the area in the longer-term.

Despite rising income, the couple had not made changes to their energy consumption as the moral identification with being low consumers continued to be resonant. Whilst the arrival of a child had resulted in changes to what was considered acceptable levels of energy use, it had not resulted in a substantial difference to their views on the benefits of low consumption or cooler than average temperatures. It is important to note that the couple were in a position of financial choice; opting not to heat to higher temperatures rather than being unable to afford to do so, which was not necessarily the case for other participants in the sample.

Amanda – interview 1

At the time of the first interview, Amanda was in her mid-30s and living in social housing with her partner and primary-school aged child. Amanda had been unemployed since her pregnancy, when she developed epilepsy and was no longer able to continue working in her previous role or to find a new job, saying ‘nobody will take me’ because of her condition. She is also unable to drive because of the epilepsy, which restricts the possibility of her being able to find any suitable work. Her partner was also described as currently being out of work due to ill-health, with no sense that he was likely to return to employment in the near future. Amanda has spent most of her life in Caerau, moving into her current property during her pregnancy. Unlike other participants who were positive about their housing provider taking proactive steps to improve properties, Amanda expressed discontent at the way her home was managed, with particular reference to a recurring damp problem, which had rendered one of the bedrooms uninhabitable and meant the adults now slept in the living area:

I have no idea, they’re, I have no idea really. Me asking them [housing association] to do something is always no, can’t do this, we haven’t got enough money for that ... it’s only 18 flats over by there and they just won’t do them ... the only time I’ve been waiting was two years for them to do my wall [issue with damp and mould]. In the end, I said I’ve had enough. You coming out to do my walls, I’ve had enough, I’m phoning environmental health. They were like oh, we’ll send someone up, so they came up and did my wall. I had to threaten them... I moved my daughter out of that room, put her in my room, ‘cause I know my room’s dry, and then we went and slept on the couch. I didn’t want the mould getting into her chest and everything. It’s like ah, it doesn’t matter what happens to us, but my daughter comes first ... They’ve done, they’re doing the next step now, they’ve got to suck all the stuff out of the wall. So hopefully, I was hoping to be in a bed before Christmas, but I don’t know [whispering]

Despite repeated requests to the housing provider, the problem had not been rectified to Amanda’s satisfaction, again highlighting the powerlessness many tenants face in being unable to make changes to their property. In this extract, Amanda describes the importance of ensuring the health of her child, being less concerned about the adults in the household, and thus echoing other participants in our sample who prioritised their dependents at their own expense. This is evident in the way the heating routine is oriented around her daughter’s needs:

I just turn it up and down so it’s always off on zero and then I put it up to 25 for about three, four hours. It warms the entire place up and then I knock it off then when the baby goes to bed, ‘cause we, well, we don’t really need the heating on. If I get cold, I just throw a blanket over me ... Well normally put it on say half an hour before she gets up, warms her clothes up and warms the room up and knock it off when we go out then. And then I normally turn it on then before when I pick

her up from school so then the place is nice and warm and then when she goes to bed, I knock it off.

Amanda was one of the few people who explicitly referred to her household being in poverty. As she had a young child, she was eligible to apply for help with her fuel costs, a scheme she learnt about from a neighbour:

Oh, yeah. It's like I put in for my winter warmer discount now, so I can have more electric ... winter warmer discount is if you're poverty ... they'll give you £140 towards your electric, so you don't have to worry that you haven't got any electric for the winter ... so I've been applying every year ... As long as you've got like a child and it's, but if you're, something wrong with you or you're claiming certain things or if you've got a child that's on is it meal token thingies and paid for, it's like you can get it.

Amanda referred to her herself as a low energy consumer, particularly in comparison with friends and family in the local area, as she was careful to switch things off and only used what was necessary in order to save money. This required vigilant management of energy and money, as she described how she would 'pinch the pennies sort of thing', which led to careful shopping practices:

As I said I'm morally conscious about what I spend, I budget to what I need. I don't buy anything that I don't need, well, if I want something, I'd say no, but if I need it, I will buy it. I'm not one of these people who just buys it 'cause it's there or on offer ... I always just well, write a list, what's on the list, I get and if it's not, I don't get.

Here Amanda describes a moral consciousness around spending, intimating that waste could be seen as immoral. In this way, low consumption could be positioned as ethical rather than a cause for shame and embarrassment, bearing some similarities with Mark and Serena's account. However, such an association could be problematic if used to justify under-resourcing energy costs.

Amanda's household was also unusual amongst our participants in rented housing for not being on a prepayment meter. She described her choice to pay quarterly in terms of avoiding wasting money on meter costs.

No, no I don't do that [prepayment meter] 'cause I know in a way, it is easier but then it's not because it's five per cent extra they pay on top. And I'm not stupid enough to fall for that. 'Cause I'd rather pay monthly and get with the same

company for the electric and gas and then I'll get a ten per cent discount ... in a way with the pre-payment ones, you can see how much money you've got left and all and how much you've used and you can just top it up, that's, but it's like with mine, I know I've got money there, and I know it's, so I normally just sort of budget, leave as much as I can that I need, 'cause as long as I've got money in the bank, sort of thing and a roof over my head, and food in my cupboard, I know I'm fine.... I know how to budget so I know how much exactly I need and they're for certain parts of the month so that's how much I leave in the bank ... It's the same every month. I need 30 for my gas and I need 44 for my electric. And the end of the year, in April, when the tax thing comes, I know I get a chunk of it back, 'cause I don't use it all so then I'm normally either leave it in there for winter, 'cause normally come summer, I don't use that much electric or gas so what I do use mounts up and then I know I've got a nice chunk, so I can put the heating on longer.

Like many of our participants on low incomes, Amanda states 'I know how to budget', but here in particular the timeframe across which she is able to budget is annual rather than week to week. This knowledge was seen by some residents to render tools such as smart meters – which offered the ability to keep a better track of energy use and spending – obsolete, as they were careful energy managers anyway through financial necessity. For Amanda, this energy consciousness was something she had learned, as her own lifestyle was quite different to her parents' more liberal energy use. She described how her parents did not need to be careful about energy because they could afford to pay for it.

Oh, it's just with me, it's like they know they've got money [parents]. I know I haven't, so I've got to make sure I've got enough there to pay the bill so I'm always pinching somewhere here or there, if I know I don't need it, I don't buy it.

During her parents' earlier married life, Amanda's father had worked as a coal miner and as such was eligible for a coal allowance:

Yeah, well it was before I was born that was. My mother had like was it, all the fires going back then because they had enough coal coming in 'cause dad worked in the mine. 'Cause I remember they were telling me, when the coal trains that used to go back down, they tipped over and everybody was up there with a bucket getting all the free coal sort of thing, and then running off, yeah.

This contrast between seemingly abundant free fuel in previous generations and the high energy costs experienced by current consumers was remarked upon by several participants (and discussed earlier in this document). This contrast is particularly marked in a community that has gone from fuel production to solely one of consumption and is experienced in the everyday realities of families

such as Amanda's. The potential of the proposed mine water heating scheme to return energy generation to the area is also particularly interesting in this context.

Amanda's transition into a position of energy vulnerability came about as a result of health problems that developed during pregnancy. With a young child to care for and no income from employment, her costs increased at the same time as income reduced, meaning that she has had to become careful at budgeting in order to meet energy costs. Despite the restrictions, it is clear from her account that sufficient warmth to ensure the health and comfort of her daughter is regarded as non-negotiable, and therefore meeting these energy costs is essential, even if it means going without elsewhere. Her account illustrates the salience of the linked lives concept in considerations of what constitutes essential energy use, with her daughter's wellbeing at the centre of how energy is consumed in the home. Beyond this central relationship, comparisons drawn with more affluent or profligate others (such as parents and friends) serve to highlight Amanda's position as a low consumer. Whilst this is justified in terms of a moral consciousness, unlike Mark and Serena it is not a choice to restrict spending but a necessity.

Interview 2

During the second interview, Amanda reported that relatively little had changed in her personal life, other than in relation to her house. She had obtained new second-hand bedroom furniture from her landlord, and the landlord had 'sorted out' damp problems in the front bedroom, after Amanda had complained: 'I was on the phone screaming'. While seen as a positive development, this had some unexpected health consequences.

AMANDA: Because I'm so used to sleeping on the couch. When we got back, got the bed and got in, oh I was in so much agony. My back, my shoulder and my hips.

CATHERINE: Oh, because you're not used to sleeping in the on the bed.

AMANDA: I'm not used to sleeping in a bed. I could sleep on the floor, I could sleep on the couch, but it was a nice memory foam bed.

CATHERINE: Oh wow. It's because it was posh bed.

AMANDA: I laid on it and I was like, I was like, "Yeah, stick a plank of wood there," I'll have probably slept fine. But ...

At the same time, other improvements that Amanda said had long been required remained pending:

We've been asking and asking when are they going to render and pebbledash the outside and they were like, "Oh, I don't know, I ..." I was like, "Oh ..." If they did that it would solve a lot of the problems in the flats and everything around us because when it rains it's going through the bricking in the wall and everything's

damp inside. It would sort the lot out that ... They need to sort out the roofs and the walls and everything would be fine then. But they don't listen to us, do they?

The relationship between landlord and tenant here remains one in which Amanda feels relatively powerless, though she affirms that, even with the cold snap in March, she remained able to cover heating costs, alluding as in the first interview to her practice of putting aside in the summer money she had budgeted for gas so that she would be able to draw on it in the winter, together with Warm Homes discount:

AMANDA I just leave it build up, it's like through summer we didn't really, didn't really have to use my gas so I got about, I got £200 or something in there, a good chunk.

CATHERINE: So, it's a bit like saving in a way?

AMANDA: Yeah, so when it comes to winter I can leave it on a little bit longer.

CATHERINE: Yeah. So, you didn't – it didn't cause you a problem then the last, the cold winter we've just had?

AMANDA: No, because I get that ... was there a warm house discount as well. I get that on top so I know it's electric but I can transfer it over to my gas if I want to.

Reflecting on her situation and on the possible benefits of smart technology in relation to energy saving, Amanda – like other participants – demurred in favour of her current energy saving practices over any potential benefits of technological change: *'I'd said it's brilliant if you could get that in but I'm happy the way things are. I know where everything works. It's like what's ... if it's not broke why fix it?'* Waste features again in this interview as something she is keenly conscious of wanting to avoid. As with Mark and Serena, the different heating practices of others is experienced as physically uncomfortable, with excessive heat being positioned as detrimental to health.

My parents have always got the heating on so as soon as you walk in it's walking into a sauna...it's terrible because we are so used to a certain temperature and when we walk into my mother's house you're like, "I can't breathe, it's too warm". And then we're sitting there falling asleep and it's just, yeah.

To demonstrate a contrast with her own practices, she immediately describes how layering clothes is much more acceptable to her, and illustrates how this is more sufficient by using her daughter as an example of why doing more than using the heating for limited periods (such as just before bedtime to make bedrooms comfortable) is unnecessary:

And if it's alright don't bother. If you've got a couple of layers on, it's just that's it. It's like she'll [daughter] come home from school, she'll put her onesie on, jump on the couch, cuddle under her fluffy blanket, watch her cartoons. She's roasting ... And she has her food sort of thing. We'll spend a couple of hours and then

she's off to bed. But I always put it on around say, well, when I'm doing the cooking sort of thing so when she goes to bed the rooms are warm.

While noting that she is currently able to budget across the year, she does feel that her situation may be more exposed to vulnerability in the near future, thanks to the coming shift to Universal Credit, which will replace (for her) Jobseekers' Allowance and other benefits: 'it's a nightmare transferring from one to the other'. She also notes that, in relation to the levels of insecurity and vulnerability experienced by many in Caerau, this is often exacerbated by political authorities (local and national) that do not demonstrate they are aware of the specific circumstances in which residents of places like Caerau live:

'It's more vulnerable people up here because who cares about Valley people? It's more cities and towns and all that. It's just us people, we're just back and beyond and people forget about us.'

Her comments about powerlessness (in relation to her landlord and to Universal Credit) can be juxtaposed with her sense of Caerau and places like it being low on the list of priorities for the authorities, her remark that her household is currently outside the planned mine water heating demonstration area ('It's a good idea [...] I wish like it came down to us') and also with her comments about the risks of energy use, of constantly needing to be vigilant in case too much is used. This (common to most interviewees) sense that being connected to the grid may bring risks (of overuse and thus rising costs) as well as obvious benefits is interesting in relation to a remark Amanda makes when considering some of the question prompts shown on a set of cards brought to the interview by the interviewer(s).

I would love to have a solar panel. That would save me on electric. So I can use that in the day, well then we're back on the system in the night there and then just nick all the power that you stored through the day if you haven't used it. So, if I can do all my washing and all that through the day then I won't be using it much electric. But they've done it up in Tudor [social housing estate] and all that and but it's only a select few. I think I would love to have that. I can do a load of everything through the day then. Well, I can do extra and I won't have to worry about ...

Her positive evaluation of renewable energy here can be contrasted with her views on the wind farm across the valley, which '*destroys our landscape*'. One of the primary reasons for dislike of the turbines (also expressed by several other participants) was that they were not seen to benefit the community directly, despite the community having to bear the (aesthetic) costs of having them.

Ideas about energy independence for her household – and to a lesser extent expressed in this interview, for Caerau – may be taken to reflect broader ideas about power and inequality and how they relate to the spatial and political relationships in which Caerau is positioned, and which create vulnerability due to restricted access to valued capabilities – both in the accepted sense of energy vulnerability and perhaps in terms of the broader socio-material interdependencies within which people are implicated.

Terry – interview 1

At the time of the first interview, Terry was 64 and living with his wife in Caerau, both were unemployed. Terry was brought up in the area and identified with it strongly, saying '*I am part of the valley, and the valley is part of me*'. The couple still lived in the home they had bought over 40 years earlier, when, rather than waiting for a council house they had saved for a deposit and had a loan to do essential work to the house.

And the house was full of damp. And it was falling apart with woodworm. So I had to gut everything. The walls, the ceilings. We lived in one room upstairs for 12 months. My wife was back and fore to her mothers, and I was working and doing it out with a few mates, er, more or less changed everything in here. Done it all myself ... me and my friends built the extension ... used to be a small little kitchenette and bathroom attached, and I made it modernise it, built the kitchen. The kitchen is hand made. I made that. So, it's a, but we had no choice. We had no money, and we had a bit of a flood, ah well, here around the flat roof split, and water came down, it came through the walls, so everything had to be chucked out and, as we had no money, I had to make it.

Like others in the sample, Terry had wanted to stay in the area and his choice of property was based on what was affordable at the time, even when it meant a long period of saving and doing work on the property themselves; for a year a family of four living in one room. This was similar to the accounts of many older generation participants in our sample. Whilst working, Terry and his wife Mandy had managed to pay off their mortgage. The house had a lot of significance for the couple, who were reluctant to think about downsizing when they had put so much time and effort into creating a home, which was associated with memories of raising their children there and where they regularly hosted family members.

Terry had worked in carpentry and vehicle maintenance most of his life, but had also experienced long periods of unemployment, describing how he 'couldn't believe it' when an industrial employer he had worked for a lengthy period closed down and he struggled to find

work elsewhere. He described this as a particularly challenging period when he had young children to support and had to go without himself (e.g. by stopping holes in his shoes with cardboard) in order to provide for their needs. He had been discouraged by his collier father from working in the mines due to health concerns so pursued work elsewhere. Terry became unable to work due to ill-health; his current health problems included a progressive lung disease (he suggested that respiratory problems were prominent in the area due to the mining history) and severe arthritis, which he was waiting to be operated on. In the last few years he had also experienced chronic health problems such as pneumonia and sepsis. His wife Mandy was also not working and awaiting an operation. Although they had done a lot of work on the house, they could no longer afford to make changes to improve energy efficiency, such as new double glazing, which they felt were needed.

At several points during the interview Terry commented that one of the main issues for the valley was lack of work since the colliery closures. This absence of employment was seen as causing significant problems for the local community.

Well, if they keep putting up the [energy] prices, what are they supposed to do? You know. There's no work, there's no, the wages don't go up. And, for god's sake, we've got soup kitchens or, what they call cans now, where they used to have soup kitchens in the, before the first world war, we've got them now called food banks. And people can't afford to eat. It's, um, what year is it? 2017. We put a man on the moon, we can't sort out the eating problems of Great Britain, like. It's absolutely terrible.

Terry was conscious of poverty being an issue for Welsh valleys communities because of these kinds of circumstances and felt that many people in the area struggled to afford energy costs, as he did. Despite finding things difficult, Terry suggested it would be harder if they had young children to care for:

I wouldn't like to have a houseful of children right now. Because everything they play with is electricity dependent, I think. Um, and they charge everything. We've got phones, and, computers and, but, with children, it's lights on, it's TVs on. They've all got to have their own TVs and, how not, I'd be in debt if I brought up children now. Energy debt. I'm sure I would be. It must be hard when, my grandchildren are hard enough to, you've got to follow them round the house, and, knock it off. 'Why?' 'To save on electricity'. 'Why? We don't knock it off in our house?'. See. That's what, that's the difference. I think the older people are more conscious. Younger people are too tired, too worn out to do it. Because if you've got three children in the house, they're running around going crazy, especially in this weather, you are using up electricity and gas, aren't you? ... if we can keep, if

we can do something to keep them from using electricity. Not purposely, but, rather than play a game, we'll play a board game. Or we'll do it the old-fashioned way. We'll get the cards and, that sort of thing. But they, there's, if there's something there they can push a button, they'd rather push a button, wouldn't they? You know. The unpaid babysitter, they call it, don't they?

Although they did not have children living with them, Terry and Mandy regularly looked after their grandchildren and would prioritise the young children when it came to heating arrangements, despite their own children (parents of the grandchildren) telling them to '*turn the bloody heating off*'. Prioritising the grandchildren was also evident in other spending decisions, beyond energy costs, which led to careful budgeting:

I mean, we're struggling now. Living from week to week, month to month. If we can save a little bit, we do try and save a little bit. Christmas on your doorstep. You know, we're thinking about Christmas now [August]. Not so much for ourselves, but for the grandchildren.

Here Terry refers to 'struggling' and 'living from week to week, month to month', indicating some of the challenges of their current situation. Because of this short-term time horizon, living on a limited income meant they had to plan their spending carefully in advance:

Can't afford to run a car. So if we go anywhere it's by taxi or public transport. So we've got to plan everything, make sure we've got enough.

Without the flexibility to shop around that may be afforded by having a car, as described by some of our other participants, the couple plan a fortnightly shopping trip using public transport and taxis as most economical. This juxtaposition of living week to week at the same time as needing to plan ahead created a challenging living situation and gave rise to a sense of vulnerability. Terry in particular articulated a sense of being 'a slave' to the energy companies, with no control over increasing bills due to energy price rises.

Terry felt that he was 'very conscious' of his household's energy use, because he couldn't afford to be otherwise. Ensuring that they were not wasting energy was seen as 'common sense' and he was already quite proficient at 'cutting back' given relatively long-term experience of a restricted income. As Anderson et al., (2012) note, interviewees who had lived on a low-income for a long time were the most likely to have come to terms with the constraints on their lives and worked

out how best to cope. Subsequently, Terry had little time for the idea that a smart meter would help him manage his energy use

I mean this smart meter, the gas and electricity going to put in for both things, it can tell you how much it uses. When to knock it off, when to knock it on. I'm quite, I'm a grown-up, I know how to do that. I'm not, you know. They must think people are very stupid. Thick, dumb, I don't know, or, is it, they're spraying something in the air today? Because I'm a grown, I know how to do all that. You know, I won't let things run over time. I won't leave things on overnight ... I'm quite good at cutting back.

Whilst he didn't talk about changes in fuel poverty across generations in the same way that other participants had mentioned, he did feel that this awareness of the need to restrict energy use was more widespread currently than it had been in the past. A lack of employment opportunities and rising energy costs compounded the problem:

I think so, people are more aware now. They've got to knock switches off. They've got to save electricity. Save gas. Rather than leave things on overnight, or, you know, because of the cost. I mean, it is going to come to either eat or heat. And it's, they've been on about it for the last few years now, but it's actually happening. You see a bill and, when you get your gas bill, the electricity bill, and you think, god we're not using nothing, and still paying twice the price for it. You know, what are you going to do? They've got a gun to your head haven't they?

The heat or eat dilemma was raised again in the interview in reference to decisions about how to heat their home. During the August interview, the couple spoke of 'dreading the winter coming' because of high heating costs. A few years ago, Terry had decided to install a wood burner, which was now an important source of heating for the household, which they described being unable to afford to heat on gas central heating alone.

[i]f you're cold, put another cardigan on then in the evening don't we? That [wood burner] goes on end of September, October, start lighting the fire. And takes us through until it's really bad. If it gets really bad up here. The heating, the gas central heating goes on for an hour or two and until that warms up. Yeah. Because, to run it on the gas central heating alone, I couldn't do it. Couldn't afford it.

Although energy costs were seen as high for everyone, the conditions in Caerau were seen as more difficult than elsewhere, with Terry describing it as 'two overcoats colder than Bridgend', making heating costs more of a concern. By installing the wood burner, Terry and Mandy had a backup source of heat that could provide warmth without the costs of central heating:

Um, wood, I mean I've got a wood burner now, I can, any spare wood I get goes towards the heating here. And I've got a friend who's a builder; he can let me have some wood. And my lads cut it up for me then and that. So that keeps me ticking over quietly. And I'm glad I've got it, because again, it's not costing me nothing to warm a room. It's when I've got to switch the central heating on we are very careful.

Installing the wood burner was a deliberate strategy to guard against high central heating costs, providing the couple with an alternative to unaffordable energy bills. Investing in it a few years earlier when they had the resources to do so has offered the couple some resilience to the cold weather in more recent times.

Despite having lived on a restricted income for most of his life, Terry's current situation was particularly acute, being unable to work due to ill health but not yet having reached the age to receive a state pension. Throughout his interview, steep rises in energy prices were highlighted as particularly problematic, suggesting that these difficulties are likely to become more pressing in future. Terry described his priority as being able to maintain his health as long as possible in order to spend time with his grandchildren. He thought working again was not likely so was waiting until eligible for a state pension for another source of income, although one which would still require spending restrictions.

Interview 2

At the second interview the couple had been through the winter they had previously been 'dreading', which was considerably colder than previous years, including periods of snow and water shortage. During this time, Terry's wife Mandy had had her operation and returned home quickly to be cared for. Given expectations that care required heating, as discussed above, Terry had run the central heating more than he would usually have liked and was awaiting the bill for this period with some concern, although having the wood burner had helped to minimise some expense:

TERRY: Well, I just about managed to keep the log fire going, 'cause I'm running out of wood. My friends will drop a van-full off now and again. Otherwise, we would've had to use more heating. We've used more central heating than we normally do, but don't forget, my wife had an operation, she had to have the heating on as well. So, for about two weeks, we used it constantly. I'm still waiting for the bill.

FIONA: **Does that concern you, that bill?**

TERRY: Well, a sharp intake of breath when we open it, probably. Like I said, it doesn't matter how little income you're on, you've still got to pay your bills. You've got to be wary of what you're using.

Terry mentioned being aware that during cold periods some people in the community would 'go out visiting' because they did not have the money to heat their homes. Whilst in previous years Terry and Mandy would have gone for a walk on a cold day to warm up, this strategy had not been feasible more recently given their health issues. Instead he described energy bills as like a 'brick wall' that had to be got over before anything else could be done. The couple had made efforts to reduce their energy use, such as getting rid of their tumble dryer as it was unaffordable to run, yet this raised other challenges, such as struggling to dry clothes in wet weather without the heating on, finding the damp exacerbated health problems. Terry described how being able to pay bills was more of a concern now than it had previously been, at the same time as having adequate levels of heating was of particular importance given health issues. These are also seen as exacerbated by the cold, wet climate in Wales.

TERRY: But we've always paid our way. Always paid our bills. It's more a concern now than ever, I think. This last ten/fifteen years with me being out of work as well. It's been a concern, yeah ten/fifteen years. It just seems to get dearer and dearer and harder and harder to pay ...

FIONA: Do you need a certain level of heating for your health?

TERRY: Yeah, without it, my health would be worse. It goes for everybody. The colder you are, the worse your health is ... Because of where I live and because of my illness, I think it's more important now than ever. My wife's got arthritis as well so, it's more important now than ever.

The couple expressed dissatisfaction with their level of income, feeling that they were unable to do many of the things they would have liked to, particularly for family members, because it was a case of surviving from 'week to week':

TERRY: I don't want to paint a black picture altogether. We've tried hard to get on, haven't we? We've paid our way everywhere for everything, nobody's helped us that much. I know I'm on benefits at the moment. It's only what I've paid in over the years.

MANDY: It's like these youngsters now, today "can your parents put up the deposit?" I wish I had the money to do it, but I haven't got the money to do something like that you know what I mean, it's ridiculous...

TERRY: At the moment, I'd be coming up to retirement age anyway, I'd be looking forward to retirement. But it's not the same when you're

not working, you don't look forward to much at all. You survive from week to week, literally. And anybody who tells you any different is, you know, not right

As Mandy alludes to here, the couple saw their children (in their 20s and 30s) struggling to get on the housing ladder despite regular employment but were not in a position to help them, despite wider social expectations that parents would be able to do so. They described how one of their children was paying more in rent than he would on a mortgage because he did not have enough monthly financial flexibility to save up for the initial deposit. The couple were also restricted in what they could spend on more regular occurrences such as family birthdays. This led Terry to contrast his current situation with that when he was working, in particular the different experience of 'choice':

TERRY: When I was working, years ago, I'd slap the money on the table and get what you've got to get ... When you've got money, you've got choice. When you haven't got no money, you haven't got choice. That was a saying I learned a long time ago. When you've got money, you've got choice, if you haven't got money, you haven't no choice.

FIONA: **You mean in terms of what you can buy, what you can do?**

TERRY: What you can buy, what you need. "We need a new fridge" "You'll have to make that one last" that sort of thing. When you've got money, you can say, "Yeah, there'll be another one in tomorrow". That's the difference.

This absence of choice was a statement reiterated by other participants on benefits, with lack of financial resources as associated with lack of choice seen as having repercussions across all areas of everyday life. Unlike others in the sample, such as Doug and Joan, Terry did not see his forthcoming state pension as helping to alleviate current financial concerns, but potentially exacerbating them, within a wider social context of people struggling to afford increasing bills:

TERRY: [State pension] Won't make us better off, we'll struggle on.

MANDY: Might be worse off.

TERRY: Worse off, might be worse off, I don't know. We'll just have to wait and see. I mean, the government made a statement today that Wales is the poorest area, one of the poorest areas in Europe. Child poverty everywhere. I mean, what do we get a year, to live on, ten/twelve thousand a year?

MANDY: About twelve thousand a year.

TERRY: To live on, I suppose it's not a lot, is it? ... No. You've given your best and then when it comes to your time to ask for help, it's not there.

FIONA: **Do you think that's always been the case or do you think that's changed over time?**

TERRY: I think it's changed. It's changed the last twenty/thirty years.
 MANDY: It's harder now, isn't it?
 TERRY: It's a lot harder now. You get less to live on.
 MANDY: And everything's going up, the cost of everything's going up and nothing else is, your money's not going up.
 TERRY: Your money's not going up, you've still got to pay for the same things, haven't you?
FIONA: The prices go up without the income going up?
 TERRY: It's people who are working who are struggling as well. It's not just the people that are on benefits. They're not getting just rewards, are they?
 MANDY: That's ridiculous, you shouldn't be struggling.
 TERRY: Not since the twenties have you seen soup kitchens. We've got a food bank down here. That's the same as the soup kitchens in the twenties, when people were starving. People are literally going without food. I can't get over it.

The concern with being unable to afford food is close to home for the couple, who felt that it was only being able to install the wood burner a few years earlier that had prevented them from being in this position:

I'm glad I got it [wood burner]. I put it in at the time when I could afford it and I'm glad I did it because it's saved us a few bob on heating. Without it, I wouldn't be able to have heating. That advert on TV, 'Eat or Heat?' we'd be the ones going without heating. We couldn't afford to do both.

As in the first interview, the wood burner featured prominently as a way of coping with the cold weather and could be seen as a source of resilience for this household as they could often find or were given free fuel rather than having to rely on paying for central heating.

Also similarly to the first interview, Terry continued to express scepticism for smart devices as an aid to help consume energy more efficiently. He reiterates his view that such a device would not tell him anything that he did not already know given he had to keep a close eye on energy use and expenditure due to living on a low income:

I can't make any more savings than I am making. Unless I'm getting it for nothing. I'm running around the house checking that every light is off. We only use gas for cooking, some days. So, we're trying to save as much as possible ... I've got a good idea how much I use. They've phoned me up a couple of times, "We're coming to put your new meter in", "No, you're not". I won't put it in. I don't want it. I'm intelligent enough to know how to save money. You're not gonna save if you've got the heating on all day, are you? If you've got light burning all night. You've got to knock every switch off, make sure you only use what you need.

Whilst this is not the first period in Terry's life when he has experienced the challenges of managing on a restricted income, his current situation is exacerbated by poor health and increasing expenditure, leaving him with little sense of resilience to meet these challenges or little hope of things improving in future. Relationships to linked others are important in Terry's account as he and Mandy reflect on their efforts to care for children and grandchildren whilst being unable to support them in the way they would like to (purchasing requested birthday presents or helping with a deposit for a house).

Summary

By presenting data in case study format we are able to give a more detailed, dynamic view of changes over the lifecourse in relation to energy vulnerability and fuel poverty. Mark and Serena were unusual in our sample in having moved to a higher income, where many more had found themselves more restricted, or had always been so and saw little possibility of this changing. Whilst both had grown up in households with restricted income, Mark and Serena had access to resources such as university education and funding to support Serena's business, which arguably helped the couple to move from a situation of restriction to one of greater income. However, despite changing circumstances they continued to uphold an identification as low energy consumers, presented as a moral and ethical choice. The financial ability to make this choice distinguishes their experiences from how our other case study participants present their own situations. Both Amanda and Terry's case studies again illustrate the significance of ill-health as associated with energy vulnerability; finding themselves unable to work and experiencing rising energy costs at a time when they were spending more time at home and thus likely to have greater energy demand. Such circumstances led to careful financial management and budgeting in order to keep track of costs and avoid accruing debt. Their case studies demonstrate, however, an important distinction that can be made in relation to budgeting.

The language of living 'week to week', as used by Terry for example, contrasts with the timeframes that typically characterise reference household budgets that represent income and expenditure across the year or between years (Preuße 2012). This foreshortened time frame reflects unpredictability in circumstances and an inability to save, and embodies vulnerability. While language of adaptability is commonly encountered as a way of bolstering people's efforts to represent themselves as coping with resilience, the idea of struggling on or making do may fit more closely with the temporal horizons of week to week cash management.

The experiences of these participants pose questions about the utility of devices such as smart meters (which have been positioned as themselves having the potential to address fuel poverty) given they have a close grip on their energy consumption as it stands. These experiences also contradict work that views the links between mundane practices and energy use as lying largely invisibly in the 'background' of everyday life, as vulnerable consumers have full awareness of the connections between practice and energy use (Middlemiss and Gillard, 2013).

Whilst at different lifecourse stages, the accounts of Amanda and Terry illustrate many similarities, with both giving little sense that their circumstances were likely to improve. Whilst some financial measures (such as top up benefits like the winter warmer discount Amanda referred to) could help to alleviate pressure, they appeared to make little difference to taking these households out of poverty, as at best they provide short term financial buffers which ease somewhat the level of financial pressure felt from week to week through the winter months. Both participants also referred to changes that they thought were required to their properties to improve efficiency and functioning, yet neither were in a position to effect these changes. In presenting these detailed accounts we have made efforts to elucidate the meaning of fuel poverty as directly lived and experienced.

Conclusion

In this analysis we have highlighted a number of areas that relate to the experience of everyday energy use and vulnerability. Some of these are issues that have been highlighted by existing literature and are already the focus of interventions – such as poor-quality housing targeted by energy efficiency schemes like Nest and Arbed in Wales – yet not all vulnerable consumers are encompassed by the remit of such programmes. Poor health also remains a particularly salient issue relating to vital capabilities and their loss, often accompanied by reduced income and increased energy needs, which can give rise to anxiety. Being unable to work due to ill-health may come as the result of a long-term deterioration or a sudden onset illness or accident. The nature and timing of illness is likely to impact on people's ability to plan for coping with this period in advance in order to provide some level of resilience. However, even those who could plan ahead and save did not always find their resources adequate in the context of rapidly increasing fuel bills. Low incomes that did not rise at the same rate as fuel bills were perhaps unsurprisingly a continuing area of concern.

The community has high levels of deprivation and many participants remarked on things within the community that they saw as associated with poverty (such as the presence of the foodbank) and thought that people were likely to be struggling even if they did not know anyone personally. Explanation for this deprivation centred most prominently on the lack of employment opportunities since the colliery and industrial closures. Regardless of their perceptions of local deprivation, many of the participants felt that there was a good sense of community in the area, albeit not as strong as it had been in previous generations, which was particularly evident amongst those who had lived in the area all their lives. The strength of these ties to related others, as well as friends and neighbours more generally, was apparent in discussions of sharing resources and looking out for one another during a period of scarcity. Such ties seemed to be a crucial aspect of why most participants would be unwilling to consider moving away from the area, and may be an important contributor to a sense of resilience in adverse circumstances, and an indicator of the achievement of valued capabilities.

Whilst many believed there was an element of ‘common sense’ about what constituted good energy practices in some respects – such as turning off appliances when not in use – there was also considerable variation in others – such as whether constant use of heating or turning it on and off was the most efficient way of heating the home. Where running heating at a constant temperature was advocated, there was scepticism amongst some people given that this was seen (and perhaps misinterpreted) as an approach promoted by the energy companies, which would not necessarily be in the best interest of consumers. Even if this was thought to be the advocated approach, it was not an option for some of the most financially restricted consumers as deemed unaffordable. This relates to the frequent comments that participants already had to be very aware of their energy use given limited incomes with which to pay for it. Subsequently, any interventions that provided participants with more information about their current energy use (such as smart meters) were likely to be seen as of little value to a significant proportion of the community. Our findings about the range of adaptive variations in energy-using practices adopted by people in order to save money and increase efficiency also have relevance for new socio-technical innovations intended to promote energy efficiency: can lessons be learned regarding how people may tinker with the practices that such new innovations will require, or even with the technologies themselves?

Identifying as a vulnerable consumer was not something that many participants were prepared to do; potentially due to the general nature of current definitions overstating the extent of

vulnerability, or possibly related to an unwillingness to adopt a stigmatised identity. The language used elsewhere in interviews, and particularly that which frames ‘budgeting’ in terms of short-term temporal rhythms of cashflow management and ‘struggling on’, points towards a resurgent sense of fragile coping capabilities in some cases. It should not therefore be assumed that denials of vulnerability coupled with the language of adapting or resilience should be accepted at face value. The possibility that people are expressing adaptive preferences – adjusting their ‘sights’ thanks to difficult circumstances (Teschl and Comim 2005) – should not be discounted, and nor should the observation made in the literature on this theme that such adaptation may itself be considered a deprivation of a more positive sense of identity and capability (Liebow 2016). The presence of young children was one criterion that rendered a household potentially vulnerable given the assumption that they require greater levels of heating. This was evidenced through the way many of our participants oriented their heating routines around the presence of children, positioning it as an important element of good parenting. The centrality of heating to understandings of care was also apparent in relation to older people, who were seen as more vulnerable to cold temperatures. Beyond heating, the presence of children was often seen as related to higher levels of electricity use due to expectations of technology for entertainment (TV and games consoles), security and comfort (such as leaving a light on overnight) and lack of awareness about turning things off (given they did not have to be concerned with paying bills). Therefore, whilst discussions of fuel poverty are generally oriented around heating costs, other areas of energy use are relevant.

Discussions of the link between heating, care and good health were apparent within the broader context of what could be considered essential energy use. Access to energy was considered to be a basic right or necessity given the increasing reliance on technology in contemporary society; such as needing to apply for jobs or benefits online. Without adequate energy it was seen as difficult to fully participate in society, which could potentially lead to social isolation. In this sense, a strong link between access to energy sufficient to provide some essential services and the achievement of particular capabilities can be made. Most people were happy with the convenience and reliability of their current gas and electricity supplies (which raises issues for alternative energy schemes seeking to replace these) but it was the cost at which these services were provided that remained the biggest issue within this community, and was also perceived to be the main concern in society more widely.

In light of goals to reduce energy demand in order to decrease reliance on carbon intensive fossil fuels, an understanding that people may like to use more energy than currently if it was affordable to do so may be concerning. Walker and Day (2012) argue that whilst fuel poverty is a problem of energy under-consumption, it is occurring within an overall climate of energy overconsumption and the two issues must be addressed in an interconnected way. It would be simplistic to present current energy conserving behaviour amongst low-income consumers as laudable from an environmental standpoint. Yet conflating frugality and efficiency would constitute a form of recognition injustice in overlooking the relevance of choice, which was a fundamental issue for many of our participants. Lack of income was seen as related to the lack of the capability to choose particular services and from a range of different devices that can help provide such services. With greater choice participants may not necessarily just consume more energy but may opt for more efficient or environmentally friendly practices, which are currently seen as unaffordable.

By taking a qualitative longitudinal approach, we are able to explore the experiences of participants in detail, including how they change over time in relation to lifecourse developments. This enables us to go some way to addressing the gap identified in the literature concerning the lived experience of vulnerable energy consumers. We are continuing to develop our work in this area, with subsequent rounds of interviews designed to expand these insights further.

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