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Willand, N., & Horne, R. (2018). "They are grinding us into the ground"-The lived experience of (in) energy justice amongst low-income older households. *Applied Energy*, 226, 61–70.

<https://doi.org/10.1016/j.apenergy.2018.05.079>

Document Version: Accepted Manuscript

Published Version: <https://doi.org/10.1016/j.apenergy.2018.05.079>

Repository homepage: <https://researchrepository.rmit.edu.au>

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Citation:

Willand, N and Horne, R 2018, "'They are grinding us into the ground' - the lived experience of (in) energy justice amongst low-income older households', Applied Energy, vol. 226, pp. 61-70.

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Link to Published Version:

<https://doi.org/10.1016/j.apenergy.2018.05.079>

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“They are grinding us into the ground” – The lived experience of energy (in)justice amongst low-income older households

Abstract

This article contributes to the literature on energy justice by revealing how the principles of energy (in)justice manifest at the domestic scale. We use data from a retrofit intervention trial to reveal recognised and hidden vulnerabilities and practiced distributive and procedural energy fairness in the lived experiences of low-income older and/or frail householders near Melbourne, Australia. Combining the capability and practice approach for the transition to lower carbon housing to provide a rich description, we chart householder functionings of heating and paying energy bills and their choices in keeping warm and affording energy before and after simple retrofits. Energy justice was experienced on four separately distinguishable levels of social relationships: intra-households, household-energy retailer relations, immediate social networks and wider social relations. The outcomes of the trial showed that combinations of simple retrofits improved householder heating capabilities. Policies and programs aimed at transitioning to low-carbon energy systems need to acknowledge and address the changing demand for energy of an ageing population, and acknowledge social differentiation within households. This includes using a capabilities approach to recognising multiple vulnerabilities.

1 Introduction

Energy justice is increasingly advocated for guiding policies, programs and practices (Sovacool & Dworkin 2015). A growing body of research grapples with the tension between energy as an essential good (Walker, Simcock & Day 2016) and the imperative to transition to low-carbon energy systems across multiple scales (Bickerstaff, Walker & Bulkeley 2013; Sovacool 2013; Walker 2012a). Much contemporary work on energy justice has focused on the global scale of energy production, allocation, consumption, distribution and responsibilities on political, infrastructure and economic levels (Jenkins et al. 2016; Sovacool & Dworkin 2014), however there is a paucity of literature on the experiences of energy (in)justice at the household scale.

Current households literature focuses on fuel poverty as the manifestation of energy inequity. This was pioneered in the UK (Boardman 1991), where the risk of the combination of poor housing conditions and low income was recognised as a source of cold homes and potentially adverse health effects. Since then, governments at several levels have implemented housing retrofit policies and programs in response (Boardman 2013). The implications of energy related deprivation in housing for human health and wellbeing have also been brought to attention elsewhere (Howden-Chapman et al. 2005; Santamouris et al. 2014; Thomson, Snell & Bouzarovski 2017).

Much of the existing research on mitigation of energy poverty has evaluated housing retrofits from a building physics or economics perspective, e.g. Oreszczyn et al. (2006). However, energy justice is grounded in the humanistic approach of the social and legal sciences. It addresses the social relationships between people, nations and regions (Day, Walker & Simcock 2016; Sovacool & Dworkin 2015) rather than the thermodynamic links between housing quality and energy performance. Specifically, it concerns ethical and moral values of susceptibility, power, control and human capabilities in interventions (Day, Walker & Simcock 2016). Although there are various

interpretations of energy justice, the term may be understood as the integration of the three elements of recognition, equity or distributive fairness and procedural justice as suggested by Jenkins et al. (2016), and three dimensions of claim-making, i.e. vulnerability, need and responsibility, as posited by Walker (2012b). The translation of justice principles beyond the distributional inequity of the traditional conceptualisation of fuel poverty is emerging to highlight social and political intent, activities and responsibilities (Gillard, Snell & Bevan 2017; Mayne, Fawcett & Hyams 2016). However, the lived experience of energy (in)justice in vulnerable households (Middlemiss & Gillard 2015) and the impacts of retrofits remains poorly understood.

Hence, our contributions to the literature on energy justice are two-fold. Firstly, we seek to address the gap in research by relating the energy justice framework to daily experiences at the microlevel of households. Secondly, in the context of retrofitting housing to reduce fuel poverty, we wish to contribute to a better understanding of the meanings and values attributed to residential energy efficiency interventions beyond energy inequity. Through a case study of simple retrofits of the homes of older and/or frail people in Australia, we aim to show how vulnerability, power and control, fairness and disadvantage were recognised, shaped and expressed, and how simple retrofits of homes related to experiences of injustice. This knowledge is of direct relevance to applied energy studies of energy efficiency to climate change mitigation and is intended to inform both our conceptual understandings of changing energy relations amongst low-income older households and the design of interventions, which is of direct relevance to policy makers and practitioners.

1.1 Capabilities framework and social practices

A prerequisite for interventions aimed at reducing energy injustice is the identification of potentially affected population groups. Several methodologies to identify energy inequity, which is one dimension of energy injustice, have been published. These can be divided into quantitative and qualitative approaches (Healy & Clinch 2004; Tirado Herrero, Fernández & Losa 2012). A recent approach to defining, identifying and mitigating energy poverty has been suggested by Day, Walker and Simcock (2016). Their proposed capabilities framework for energy poverty is based on the capabilities approach as developed by the economist Amartya Sen, the philosopher Martha Nussbaum (Nussbaum 2011; Sen 1995, 2011) and others. The framework promises analyses of fuel poverty across geographical, social and technological contexts, and the integration of influences and expressions of poverty beyond the metaphorical and physical boundary of dwellings. In this study we apply this approach to all three aspects of energy justice, that is including the elements of recognition and procedural fairness.

Energy injustice identified using a capabilities approach would rely on the identification of instances in which the full potential of ‘functionings’ in the sense of valued and meaningful activities or outcomes (Nussbaum 2011) cannot be achieved. Consequently, interventions should aim for specific outcomes in achieving each individual’s potential rather than aiming for an equal distribution of the means, such as income, which has been proven to be a poor predictor of human wellbeing and other valued ends (Robeyns 2005; Sen 1995). Based on these tenets, Day, Walker and Simcock define energy poverty as:

an inability to realize essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realizing these capabilities. (Day, Walker & Simcock 2016, p. 260)

Drawing on the distinction between ‘basic’ and ‘secondary’ capabilities (Smith & Seward 2009), Day, Walker and Simcock (2016) suggest that basic capabilities may concur with Nussbaum’s proposed list of ten “central capabilities” (Nussbaum 2011), while secondary capabilities may be prerequisites and

enablers of these valued endpoints. With reference to the dominant theme in the discourse on energy poverty in European countries, these UK researchers explain that “being in good health” would constitute a basic capability, while the necessary secondary capability would be “being able to adequately heat or cool” the home (Day, Walker & Simcock 2016, p. 259). The inclusion of “taking into account available reasonable alternative means of realizing these capabilities” (Day, Walker & Simcock 2016, p. 260) acknowledges coping and adaptation practices that may enhance the householders’ resilience. With regard to the decision making in establishing these capabilities, they favour a deliberative approach, positing that this would be “most in keeping with the fundamental ethos of the capabilities approach” (Day, Walker & Simcock 2016, p. 263). The element of deliberation raises not only the question of who makes or should make the judgment but also of the factors and preconditions that shape or should shape decisions on who is considered vulnerable, who is considered worthy, to whom priority should be given and which form any interventions should take. These questions relate to the public perception of decision-making processes and, hence, the acceptance of decisions made.

Researchers have previously encouraged the combination of the capability approach with a practice approach to capture the complexity of individual decision making within structural and social constraints and to address shifts in sociotechnical landscapes (Rauschmayer, Bauler & Schöpke 2015). Social practices research on energy consumption in buildings as defined by Shove, Pantzar and Watson (Shove, Pantzar & Watson 2012) has particular relevance to the capabilities approach as it can draw attention to shared perceptions of worth and preconditions that may restrict the freedom of choice. Firstly, the capabilities idea hinges on the concept that freedom to engage in valued functionings is an indication of wellbeing. Social practices may be understood as the enactments of normative functionings, thus highlighting shared values. Secondly, the concept of social practices is bound by the three elements of material, competence and meaning, and this framing can be used to highlight the limitations of opportunities to execute functionings. Hence, this study aims to provide a better understanding of social practices around the secondary capability of “being able to adequately heat”, to explain or expose implicit or latent inequities or unfairness, reveal patterns in recognition of vulnerabilities, and highlight interpretations of procedural justice with regards to the functionings of heating to adequate temperatures and affording energy.

2 Methods

Based on the leading question “How was the freedom to heat to adequate temperatures and to afford energy enhanced or compromised?”, we explored the building or restriction of these secondary capabilities as prerequisites for the basic capability of “being in good health” among low-income older and/or frail householders near Melbourne, Victoria, Australia. The study consisted of a mixed methods evaluation of a quasi-randomised controlled trial of residential energy efficiency improvements.

2.1 Case selection: Victoria, Australia, and the affordability of heating

As in many other jurisdictions, in Australia, energy equity and procedural fairness is related to housing quality and tenure, as homes with sub-standard thermal performance are more likely to be occupied by low-income households and tenants, whose lack of financial resources and agency are likely to prevent them from retrofitting their homes (DCCEE 2013; Garnaut 2008). Accordingly, low-income households spend a higher proportion of their expenditure on heating and electricity (ABS 2011a), are more likely to experience financial stress (ABS 2011b; Azpitarte, Johnson & Sullivan 2015), and are likely to be disproportionately affected by rising energy prices (Simshauser, Nelson & Doan 2011). In Victoria, households in the lowest income quintile and the elderly (65 and over) are the population groups that spend the biggest part of their disposable income on domestic fuel and

power (ABS 2011a Table 5). In this cool temperate climate zone, heating accounts for the biggest share of residential energy costs (Sustainability Victoria 2014).

The Australian Government recognises that low-income households may compromise on adequate heating in winter (DCCEE 2013), which may present a health risk. Although the need to mitigate financial difficulties of tenants through improved energy efficiency of rented housing has been acknowledged for at least 20 years (Burke 1998), there are still no minimum standards (VCOSS 2016). However, numerous schemes exist to address inequities and to support and assist householders in reducing energy expenditure. In Victoria, programs include financial support for eligible households (DHS 2013), energy efficiency assistance (DCCEE 2013) and an online information tool to compare the offers of the 16 energy retailers operational in this state (DELWP 2017).

The study was conducted in collaboration with the South East Councils Climate Change Alliance's (SECCCA) Energy Saver Study (ESS). The aim of SECCCA's ESS was to identify effective energy saving interventions for low-income households (Australian Government Department of Industry and Science 2012). The ESS took advantage of the Councils' Home and Community Care (HACC) services to recruit households. HACC services are an integral part of Australia's Ageing in Place policy (AIHW 2013; MacIntosh & Phillips 2003) and offer domestic assistance, home modification and maintenance to support older people in living independently. Older Australians, who tend to be rich in assets but poor in income (National Housing Supply Council 2009), are likely to suffer fiscal pressures from rising energy prices and health costs.

2.2 Research design

The study recruited 30 households which were quasi-randomised as they signed up to the study into the intervention and control groups of equal size. Energy efficiency interventions were designed in response to an energy audit of the house and implemented by the ESS. They involved free draught proofing measures, ceiling insulation and in one home, a new reverse cycle air conditioner. Control homes received financial and practical assistance with retrofits at the end of the study period according to the householders' preferences. Participating households were visited four times during the twelve-month study period.

The data collection relevant to this paper involved indoor temperature monitoring during the pre- and post-intervention winters, and information collected through householder surveys, semi-structured interviews at the participants' homes, photographs of the homes and field observations during the first and last visits in the pre- and post-intervention springtime.

Half-hourly indoor temperatures, as recorded by HOBO UX100-3 loggers, were normalised and standardised to average winter days with daily mean outdoor temperatures between 9°C and 11°C (Willand & Ridley 2015). The interpretation of the quantitative results in this paper are descriptive and focus on clinical significance. Clinical significance addresses the "extent to which an intervention makes a real difference to the quality of life of the participants" (Onwuegbuzie & Leech 2004, p. 773). Clinical significance is pertinent to the assessment of capabilities, as it acknowledges the relevance of the individual's perspective in the evaluation of an intervention and proposes normative comparisons (Kendall et al. 1999).

Qualitative analysis focused on identifying householder practices and how these were shaped. Energy justice was not the focus of the study but emerged through the analysis. Because participants focused on narrating their every-day energy practices, the householders' experiences of energy justice were implicated in the descriptions and enactments of their routines rather than having been consciously considered during the interviews process. Experience of energy justice refers to

householders' understandings of the processes, capabilities or choices around heating and affording energy and their perceptions and recognition of vulnerability. Perception refers to people's impressions of values or risks that may or may not be interpreted as valid by the researchers. Recognition implies the acknowledgement of the claim of susceptibility or vulnerability that is shared by the researchers. Hence, the investigations of the contextual preconditions of heating and affording energy practices provided insights into how the tenets of energy justice manifested in the householders' lived experience. The analysis of the interviews drew on the principles, guiding questions and dimensions of claims (Jenkins et al. 2016; Walker 2012b):

- Recognition of vulnerability – Who was recognised as being vulnerable and by whom? Whose needs were acknowledged, who was ignored?
- Energy equity – What was distributed? What was the principle of distribution? Who was deemed responsible for imbalances?
- Procedural fairness – Who had control, and who lacked power? Who had access to and could influence the decision-making process?

3 Results

3.1 Household characteristics

The final sample consisted of 16 intervention and 13 control homes. The typical dwelling was a detached house with poor insulation and either a gas central heating system or a room heater in the living room. The typical main participant was a female owner-occupier, over 70 years of age with a long-standing illness or disability, who lived with her husband or alone, and spent the whole day at home (Table 1).

<i>Baseline information for each group</i>		
	Control (N=13)	Intervention (N=16)
Detached house	11 (85%)	15 (94%)
Ceiling insulation <109mm	11 (85%)	13 (81%)
Single glazed window	13 (100%)	16 (100%)
Ducted central heating	7 (54%)	8 (50%)
Room specific fixed heating	6 (46%)	5 (31%)
Portable heating only	0 (0%)	3 (19%)
Female main participant	11 (85%)	11 (69%)
Main participant's age 70-89 years	10 (77%)	14 (88%)
Main participant's age 50-69 years	3 (23%)	1 (6%)
Couple or shared accommodation	9 (69%)	12 (75%)
Someone is at home all day	11 (85%)	15 (94%)
Owner occupied	12 (92%)	11 (69%)
Main participant has a long-standing illness, disability or infirmity	10 (77%)	13 (81%)

Table 1 Baseline information for each group

3.2 Scales of social relations

Energy (in)justice was experienced on four separately distinguishable scales of social relations: intra-household, household-energy retailer relations, immediate social networks and wider society. Findings are presented for each scale. We start with definitions of vulnerability from the literature, describe if and how vulnerability was recognised or created, and reveal how the degrees of choice

around fairness in distribution and procedure were shaped. Shared and single incident practices are reported to show the spectrum of experiences. Participants' names have been changed to protect their anonymity.

3.2.1 Intra-household relations

In keeping with public health guidelines, at the household level we defined vulnerability as the combination of exposure to cold, the enhanced sensitivity to cold due to age and health conditions and the householders' adaptive capacity to maintain bodily warmth (Public Health England 2014). Achievement of the functioning of heating to adequate temperatures was measured by comparing monitored indoor temperatures with the objective temperature thresholds provided for older people who are dressed warmly (Public Health England 2014). The number of homes with valid indoor temperatures differed for the two winters mainly due to technical failures. The findings showed adequate warmth by objective standards was seldom achieved. Exposure to temperatures below guidelines was a common phenomenon in both winters, particularly in the bedrooms (Table 2).

Prevalence of living rooms and bedrooms with unsatisfactorily low temperatures on days with a mean daily outdoor temperature between 9°C and 11°C

	Living rooms with mean half-hourly temperatures below 18°C between 8.00am and 9.59pm.		Bedrooms with mean half-hourly temperatures below 16°C between 10.00pm and 7.59am.	
Baseline winter:				
Number (%)	Valid data for 12 living rooms	8 (67%)	Valid data for 12 bedrooms	9 (75%)
Follow-up winter:				
Number (%)	Valid data for 25 living rooms	13 (64%)	Valid data for 24 bedrooms	17 (71%)

Table 2 Prevalence of living rooms and bedrooms with unsatisfactorily low temperatures on days with a mean daily outdoor temperature between 9°C and 11°C

The analysis of the data for twelve living rooms and twelve bedrooms with valid pre- and post-intervention data showed that clinical significance, i.e. the elimination of underheating in the living room, was only achieved in one intervention home. By contrast, the retrofits achieved clinical significance in achieving comfort as a valued good in four intervention homes. In these homes, the subjective assessment of temperatures on a seven-point Likert-like scale improved from "too cool" to "comfortable" levels. The discrepancy between objective and subjective assessments of temperatures, i.e. between the achievement of recommended temperature levels and the individual perception of thermal comfort levels, was explained by the perceived norm of winter indoor temperatures. In general, being uncomfortable at some time of the day was not regarded as something unusual.

Living room and bedroom temperatures were particularly low in the mornings as, except for in two households, the heating systems were switched off overnight. Even householders with existing respiratory or cardiovascular illnesses seemed to be unaware of possible health risks due to cold stress that may have been associated with the "chill" or "bite" in the mornings. However, many participants had developed coping mechanisms to alleviate their thermal discomfort. Many householders reported to get up in the morning to switch on the heater on the way to the toilet and then to get back to bed until the house was warmed up. This strategy reduced their exposure to cold by two to three hours.

Heating to normative thresholds was not practiced even where the heating systems had

thermostatic controls. In general, householders adjusted their heating levels throughout the day to their subjective levels of comfort rather than being guided by measured or achieved temperatures. Heating was a reaction to feeling cold or a reflection of the householders' mental or physical health rather than a preventative measure.

Doris (73 years): I can't cope when I am cold. And I would get very achy and - Oh it is pathetic, isn't it? [...] I get very miserable when I get cold, and then I have to up the heater.

Having a baseline warmth was not regarded as a necessity. Heating of the living areas continuously during the day was only reported in 40 per cent of the homes. Householders in the other homes coped with extra layers of clothing or keeping physically active during the day. However, feeling increasingly cold and acute health conditions triggered more heating in many households during the second winter. Considering that cold was reported to exacerbate the respiratory conditions of several participants, it appears that householder did not recognise or underestimated their vulnerability and the role of a warm environment in managing their illnesses.

In most homes, the vulnerability of the least healthy and most cold sensitive person was recognised, and heating practices and levels of warmth were adjusted to their requirements or wishes. In these harmonious households, heating took on the meanings of caring. Except for in an Indian household, in which provision of warmth was considered a wifely duty, and a family household, in which the mother would forgo her own comfort for the wellbeing of her children, the responsibility for warmth was not defined by gender but lay with the healthier member of the household:

Natalie (69 years): I wouldn't bother. I'd just put an extra cardigan on, but when you're caring for someone, you've got to put their health first.

However, such practices led to an unequal distribution of cold exposure in some couple households, where the healthier partner got up early and started the daily chores while the house warmed up to give the frailer partner the "courage" to face the day. Here, the healthier, but often also susceptible, partner was exposed to the full duration and intensity of the cold. Other vulnerabilities that were exposed through the interviews centred on the lack of central heating which resulted in cold bed- and bathrooms. Householders used expensive electric devices or polluting unflued gas heaters to achieve quick and temporary warmth. In addition, 'door snakes' to keep the warmth in the living area represented tripping hazards or caused embarrassment (Willand 2016).

Although in many cases, intermittent heating and resultant cold living rooms were due to financial constraints, the interviews revealed that in some cases, the underheating of rooms was voluntary and a result of free choice. In one case, the householder, "a depression child", related how physical activity had been a common coping strategy to raise core temperatures during her school years, a practice that she had maintained until the present by using a stepping machine whenever she felt cold. Another two householders prided themselves on their cold tolerance. In another household, overheating was considered a health risk. The participant reported her house to be "comfortably cool... But, the majority of people would probably say much too cold", and attributed the frequent sicknesses of her neighbour's son to their heating being set to 26°C, " 'cause his body can't cope with the real temperatures."

In not so harmonious households, the descriptions of practices of keeping warm revealed insight into the precariousness of procedural fairness and evidence of intimidation around energy related

practices. The desired level of warmth often varied among different members of the household and heating had to be negotiated. Householders referred to a “spectrum” of perceived comfort, and the interviews prompted arguments on who was “the boss”, or the pros and cons of wearing singlets. Where more than one room could be heated, conflicts were resolved by spatial separation of the members of the household. However, in one shared home, the combination of financial constraints and difference in cold tolerance led to physical punishment, to “a smack if the bills goes up” for the one participant who sometimes turned on a heater during the other’s absence, even though both people shared the burden of the costs equally.

In another household, a father had the power to set and enforce the rules around energy practices. A door was left open around the clock for the dog to access the garden despite the recognised loss of energy and higher costs of heating. By contrast, the covert use of a portable air conditioner by the unemployed adult son over summer, which had led to an unusually high electricity bill, was condemned and the device had been “confiscated”. The needs of the dog, which was referred to as “the little girl [...] she rules the house”, were met, whereas the son seemed to have lost his claims by having broken the unwritten social contract that children leave their parents’ house and become self-sufficient adults.

3.2.2 Household-energy retailer relations

Drawing on the definition of consumer vulnerability (Jourová 2016), we defined vulnerability towards energy retailers as the limited capability to engage in the energy market. This was demonstrated in the diverse calculations in householders’ energy bill, the householders’ lack of bill literacy, their limited access to information and their susceptibility to unethical marketing practices. Although all householders were free to choose, most householders were limited in their competences to research and select the cheapest energy contract. Only a few householders were actively seeking and negotiating favourable energy contract conditions. The structure and language of the bills and discounts varied widely, as did the type and scale of discounts offered by the energy companies, even among households with the same company, revealing that some householders had negotiated good contracts and some had not. Eight householders received no or less than one per cent pay-on-time discounts. Given significant discounts available in the market, this indicates that they were not actively engaging in the energy market. One septuagenarian reported to have been with the same provider for 20 years and to never have negotiated a contract. He did not receive any pay-on-time discount. Most householders were acutely aware of the pay-on-time discount offered by the energy retailers, though not of the variations in calculations. Vulnerabilities that were overlooked centred on the gender role in the payment of utilities and remoteness. In one household the husband oversaw all financial matters. When he fell ill, the household lost the benefit of the pay-on-time discount, as the wife was not able to actualise the payments of bills. Two households in rural locations only had access to bottled gas, which was more expensive than reticulated gas and restricted the choice of retailers.

Vulnerability as a measure of inequitable access to the competitive energy market was created by restricted access to information. Adequate information as a prerequisite resource for choice was limited for many householders due to health conditions and poor information technology skills. Failing eyesight prevented householders from reading the bill details printed in small fonts. Loss in hearing acuity was a barrier to calling retailers. One householder in his eighties, though, described how he played two energy retailers against each other. Eventually, his existing supplier offered him the same deal as the new one, and he was spared the effort of changing retailers. However, only a few householders over 60 years of age used the Internet, and many householders relied on family and friends to negotiate energy contracts. Only two younger householders in their 50s with

professional computer skills were proactive about finding the best deal, compared different offers and were discerning about the type of charge to which discounts were being applied. One of these women changed providers several times a year, admitting that she was not very “loyal”.

The householders’ perception of procedural fairness in energy supply was linked to their interpretations of contractual clauses, transparency of pricing and accountability for bill calculations. Most householders found it difficult to understand energy price contracts, although meticulous filing provided the illusion of control. In general, householders would only look at the amount due that was prominently displayed in large print on the first page of the bill. Paying on time was a priority as a matter of pride and because the precariousness of their health made it difficult to plan cash payments, even when they disputed the accuracy of the bill, and even if it meant compromising on food. One householder described the pay-on-time discount as a form of punishment:

Eleanore (85 years): “A penalty [...] So I pay and make sure, because you never know when you are gonna be sick (laughs) and you can’t get up there.”

An underlying theme in the interviews was that the capability of being able to afford energy was compromised by the lack of alternatives to purchasing energy from retailers. The topic of energy expenses tended to elicit unhappiness even in households that did not report financial difficulties. Many householders felt powerless about the rise in energy prices and expressed dissatisfaction and lack of understanding, especially when bills arrived that were considered too high. Terms such as “burden”, “ridiculous” and “we grudge it” expressed the mental pressure and lack of power many householders felt with regards to their rising energy bills. One householder recounted how she had failed to contest an unusually high bill and had been forced to pay the whole amount by the due date, as she could not afford to lose the pay-on-time discount on top. Mistrust and weariness towards energy retailers was ubiquitous. Talking about retailers’ discounts, one householder said: “I mean it’s all smoke and mirrors isn’t it, you know my feelings: if I could put solar onto the roof, I would.”

He was not the only participant who regarded solar photovoltaic panels as an opportunity for gaining back control from power companies and exercising the freedom to opt out of the energy market. Three households with solar photovoltaic panels expressed their satisfaction with lower electricity bills. Another three were investigating the option of ‘going solar’ due to experiences with self-sufficient recreational vehicles. The aggressive tone that appeared when householders talked about energy providers was an expression of the resentment that householders felt towards the energy providers and the lack of control they suffered over this element in their lives:

George (83 years): The utility companies, they are grinding us into the ground, we are still considering putting solar on the roof. We are getting very, very close to that. I just want to stick it up on them.

The retrofit intervention did not include behavioral advice. Nonetheless, over the course of the study, six households (three control and three intervention households) changed their energy providers in mostly haphazard undertakings. The swap was either triggered by high bills or by a door knocking salesman and the hope, rather than the certainty, of lower bills. The door knocking event suggested the exploitation of a householder, who did not “normally change the supplier”. The justification of her decision, namely that other people in the town had also changed over on that day, provided evidence for her cognitive dissonance, her sense of unease that the decision may, perhaps, not have been as discerning as would have been expected. Because of their financial

precariousness, many householders were sensitive to messages of quick relief from the burden of electricity costs. Other narratives around dubious and fraudulent door-knocking marketing practices involved consultations on solar photovoltaic systems and the sale of unnecessary voltage converters. However, in one household the opportunity to swap energy provider and reduce bills significantly was lost, as the vulnerability of shame seemed to have surpassed the vulnerability of energy stress. This was the only household that had not been able to pay their bills on time. The participants shared a state-supported offer with the researcher but did not investigate it further. They did not offer an explanation but appeared to have felt too embarrassed about their unpaid bills to contact a new provider. By contrast, participation in the study empowered one householder in his relations with the energy retailer, as he successfully challenged an estimated bill. The householder requested his electricity consumption data from the ESS to prove to the energy retailer the inaccuracy of the usage, which resulted in a reduction of the bill.

3.2.3 Immediate social networks relations

With cold homes being recognised as a public health issue (Marmot Review Team 2011), we defined vulnerability within the context of immediate social networks as a measure of the recognition of the exposure to inadequate temperatures and fuel stress as well as sensitivity of householders by family, primary health and community services.

Most adult children recognised their parents' vulnerability to cold related illnesses and tried to protect them. The recounted mitigation efforts highlighted the implicit acknowledgement that adult children felt responsible for the wellbeing of their ailing parents. Help with food, emergency heaters, installation of portable air conditioners or negotiations of energy contracts were accepted with gratitude. However, financial help caused embarrassment and, in one case, was refused due to pride. In one house, the parents misled their daughter by switching on the heater to present a warm house whenever she came to check on them. Concealing that the home had been cold during most of the day counteracted the daughter's effort to protect her parents. Only in one household, an adult child took undue advantage of her parents' good nature and increased their vulnerability. Although the parents did not agree with the purpose, they provided the requested financial help and then compromised on meat, fresh food and heating for weeks after.

The householders' own perception of equitable distribution of warmth was apparent in rules of hospitality and in the demonstrated intergenerational equity between children and parents. The thermal comfort of visitors was given priority over the householders' own wishes, for example to accommodate a daughter who was experiencing hot flushes, by lending the portable heater of the bedroom to neighbours with a baby, or by the willingness to adjust the heating to the interviewer's preferences.

There was little evidence that the medical profession recognised the cold-related vulnerability of householders. In the follow-up winter, in which indoor temperature data was available for most homes, statements of not being able to adequately heat the home predicted colder bedrooms. Medical advice to keep the bedroom warm to alleviate symptoms of a respiratory condition was only reported in one household. Even those householders with acute incidents of heart failures during the second winter had not been advised by their doctors to maintain adequate warmth in their homes.

The purpose of the ESS to assist householders in their capabilities did not influence the participation in the study. The four main motivations for signing up to the Energy Saver Study had been helping people, education, own material advantage, environmental issues and the prospect of social activity. No participant was motivated by the prospects of an improvement in health or winter warmth. In

general, participants felt that the responsibility for the material condition of their homes and wellbeing as well as the power to change these lay with themselves and proudly showed off resourceful do-it-yourself solutions, such as a mattress in front of a window as insulation. In addition, most householders did not consider themselves to be disadvantaged in income or heating. Even those participants who were careful with their expenses or were compromising on heating, nutrition or social activities, considered themselves to be privileged. Several households stated that they were “lucky” or “lived good”, especially when comparing themselves down to homeless people.

The ESS achieved the alleviation of some inequities beyond energy. At the end of study, the intervention households were grateful for the benefits or prospects of better comfort and lower costs. The appreciation of the generosity experienced through the ESS prompted one participant to pay forward by ordering from a charity catalogue. To the participants in the control group, the social aspect of the study had meant the most. They valued the diversion, entertainment and intellectual stimulation provided by the interviews and interactions with the wider project team and tradespersons, the feeling that they had provided valuable help and the sense that someone had recognised their vulnerability and cared about them: “I think the main thing is that it made me aware of is that the people are concerned.”

3.2.4 Relations to the wider society

Energy (in)justice in relation to wider society was explored through the subjective approach of identifying fuel poverty and through the receipt of energy concessions. Firstly, based on the consensual perception of adequate warmth as a basic necessity (Healy & Clinch 2004; Tirado Herrero, Fernández & Losa 2012), we defined vulnerability on a societal level as the combination of cold sensitivity and compromised heating. Secondly within the context of the responsibilities of a social state, we defined vulnerability as not claiming and receiving energy concessions for which householders were eligible. Energy concessions provide a targeted income support to recognised disadvantaged and vulnerable groups and, thus, aim to equalise income differentials and to homogenise the burden of energy costs across the population (DHS 2013). In Victoria, pension card holders are recognised as likely to suffer energy stress and are automatically eligible to the Annual Electricity and Winter Gas Concessions. The Medical Cooling Concession provides a discount for cooling during the summer months for patients with certain chronic diseases, such as multiple sclerosis, Parkinson's disease and fibromyalgia.

To identify vulnerability due to compromises in warmth, we classified households by their own perceived adequacy of heating, affordability of fuel and rating of the warmth in the house as assessed in the surveys (Figure 1). Perceived adequacy of heating referred to financial competences and/or the dwelling quality. In this cohort of older and/or frail people, we considered households that had to compromise on heating, were struggling to achieve warmth or were heating without achieving warmth as being vulnerable.

Figure 1 Classification scheme for heating practices according to affordability of fuel and comfort

The classification of vulnerability was validated by the interviews. Householders in the carefree group considered warmth as an entitlement. Although they were aware of rising energy prices, they did not curtail their heating regimes. They had “decided to be comfortable”, were not prepared to “put up with the cold” and were not “skimping on anything”. Householders in the careful heating group regarded heating as a decency or necessity, but they had to budget for fuel costs and regularly engaged in coping practices to keep warm. Terms like “it costs you”, “we’re always conscious of money” or describing the bill “as a shock” expressed the unease householders felt about fuel costs. “Rugging up”, wearing extra jumpers, using electric blankets, accessing savings and heating only to “take the chill out” were common responses to the resolution that they would “not go cold because of it”.

Householders who were compromising on heating accepted that comfort came at a considerable cost. In some households, high medical costs for acute conditions or incontinency pads took priority in the budget. Heating was often only used at “the coldest times”. Professed extreme or ridiculous amounts of clothing made one woman describe herself as looking “like a Michelin woman”.

Householders who were struggling to keep warm through heating conceded their financial difficulties and/or recognised the poor quality of the dwelling or its heating system as the cause. In one home, the loss of a partner meant financial plight, and reduction terms such as “quite comfortable” and “it’s not too bad” signified a psychological adaptation to the inadequacy of the level of warmth in the home. In other homes, the location of the only fixed heating system in the isolated formal lounge and a central heating system without any opportunity for zoning left half of the houses cold despite the onerous costs of heating.

Householders who were heating their homes without achieving comfortable levels described indoor conditions as “freezing” or “like the Arctic Circle”. Many of these homes had old gas wall heaters in the living rooms or relied on portable electric heaters for all heating. Householders lacked the financial means to run the heating to acceptable levels or the capital to remedy the material problems and recounted at length their various coping practices to keep warm and to save money.

The retrofits reduced vulnerability in a few homes. Based on the premise that compromising on heating is a non-normative outcome, the study found clinically significant improvements in five intervention households who moved up to careful or carefree heating practices. In the control group, only one home experienced a clinically significant improvement, which was due to the

independent installation of a new reverse cycle air conditioner in the living area. One control home showed a clinically significant exacerbation in functioning by dropping from carefree heating to heating without achieving warmth, due to increased cold sensitivity.

Despite the benefit of the retrofits on vulnerability, procedural fairness was compromised in two of the four rented accommodations. One participant requested the removal of the draught proofing around the entrance door. The main reason, that it would make the removal of her furniture after her death more difficult, gave rise to the suspicion that it was her landlord rather than her who disapproved of the measure. In the other home, the householder felt underprivileged, because firstly, she had struggled for several weeks to have her broken heater replaced, and secondly, because the new heater only had an energy efficiency rating of two stars, although a minimum of four stars was recommended (Sustainability Victoria 2015). By contrast, in one rented house, the landlord independently installed internal blinds, adding to the potential benefits of the EES retrofits.

Procedural fairness was enhanced by automatic consideration of the Annual Electricity and Winter Energy Concessions in energy bill calculations. This reduced vulnerabilities and strengthened the householders' capability of being able to afford energy. Despite the householders' poor awareness of concessions, with most participants being confused by questions on concessions and most not being able to name any, at the beginning of the study all eligible householders except for one received both these allowances. Remoteness contributed to vulnerability, as the Winter Energy Concession for bottled gas had to be actively claimed. One octogenarian householder failed to receive this financial support because he had forgotten to put in the claim.

By contrast to the wide reach of the Annual Electricity and Winter Energy Concessions, only one of the six eligible households received a Medical Cooling Concession at the beginning of the study. This participant had gained the information through her workplace. At the end of the study, three more householders had been granted the Medical Cooling Concession. In one case the recognition of eligibility had been triggered by the study survey. The application process, however, proved onerous and a potential source of inequity. It involved a doctor's visit to complete the application form, a process that had to be repeated whenever the householder wanted to change retailers. As the retrofit intervention excluded financial advice, at the end of the study, there was still one eligible household without any concessions.

4 Discussion

This section offers three reflections on the implications of this study for energy justice and ethical decision making in low carbon transitions. Firstly, energy (in)justice at the household level is a social process operating at different scales, each with its specific implications for policies and practices. Secondly, assessments of energy (in)justice need to be understood and addresses within specific social contexts. And thirdly, material improvements may assist in mitigating energy related justice concerns.

Drawing on social practices as enactments of capabilities and rich empirical accounts, the study revealed manifestations of the three elements of energy justice, i.e. recognition, equity and procedural fairness, on four levels of social relations, i.e. intra-household relations, household-retailer relations, immediate social networks and relations to the wider society. With regards to the recognition of vulnerability, some householders and their children as well as the Victorian government recognised the sensitivity to energy hardship of older and/or frail people on a low income. However, some householders failed or underestimated their own susceptibility to cold. Vulnerability due a limited capability of engaging in the energy market or in retrofits was largely

overlooked. Energy retailers did not seem to acknowledge the special needs of older and/or frail people on a low income, as they were not proactive in offering discounts or bills in large prints. Instead, they seemed to exploit vulnerabilities due to social isolation and limited financial literacy. This draws attention to the often obscured but important problems of systems of care that are based upon normative ideas that people in need recognise their needs and health risks and are sufficiently confident, self-deserving, pre-disposed and resourced in the various ways required to proactively access energy services support. This also raises the question in how far medical practitioners could or should have recognised housing-related vulnerabilities among this cohort. Initiatives in Europe already combine carbon mitigation and health promotion, as residential energy efficiency advice as a medical lifestyle prescription is already practised in the UK and France (Heffner & Campbell 2011; Olsen 2001; Richardson & Eick 2006).

Apropos energy (in)equity, distributional fairness in this paper addressed the achievement of the capabilities of keeping warm and affording energy. In some homes, due to the material characteristics of the home and/or principles governing energy-related practices, heating seemingly resulted in winners and losers, in enhanced or restricted freedom within the same spatial confines. The observation of the dog-centred ventilation illustrated the expansion of the capabilities approach to non-humans. The inclusion of animals, plants and even non-living artefacts into moral obligations of justice has been the subject of current debates (Cripps 2010; Nussbaum 2006, 2011; Schlosberg 2013; Sovacool et al. 2017). In a human-centred perception of capabilities justice (Sovacool & Dworkin 2014), this may constitute distributive inequity. In an approach that recognises the equal moral rights of all elements of systems independent of the ability to participate in decision making processes (Schlosberg 2007), this ranking may be allowed. The rights of the son were limited to protect the ability of the father to pay the bills. Such a trade-off may be sanctioned in the capabilities approach (Dixon & Nussbaum 2012).

Regarding wider social relations, few householders felt disadvantaged due to the quality of their houses, the temperatures in their homes or their (low) income, although the large majority lived in homes that, by public health standards, would be regarded as too cold. A discrepancy between quantitative and the consensual definition of energy deprivation has been reported elsewhere (Azpitarte, Johnson & Sullivan 2015; Waddams Price, Brazier & Wang 2012), underlining the social construction of meanings of 'adequate heating' and highlighting that energy inequity happens on a continuum. One interpretation may be that "a formula-based fixed model of acceptable heating, perhaps driven by the 'tyranny of numbers', may give a misleading picture of household needs" (Harrington et al. 2005, p. 266). However, another interpretation may be that householders who are susceptible to cold are putting their health at risk due to ignorance of their own vulnerability, pride, or the "tyranny of thrift" (Chard & Walker 2016; Waite et al. 2016, p. 37).

The study also revealed the importance, and perhaps responsibility, of immediate social networks in achieving energy equity. The apparent children's responsibility for their ailing parents highlighted intergenerational equity as a principle of energy justice (Sovacool & Dworkin 2015). The principle of distribution of warmth over a life time rested with the claim that age and contribution to society afforded an entitlement, and that energy services were rewards that should be fairly distributed between the generations. Based on these criteria, older householders who were not able to heat their home adequately may be considered to have been treated unfairly in a double sense, through energy and intergenerational inequities.

Turning to household-retailer relations, the study revealed inequities in the access to information and affordable fuel choices. Being smart in negotiating energy contracts may be considered a capability for energy equity in a neoliberal energy market. However, accessibility problems with regards to the Internet and phone conversation and ignorance about the possibility of receiving the bill in large print represented missed opportunities to ease the burden of energy costs. In addition, the study suggested that energy hardship that is already manifest in bill arrears may prevent the raising of legitimate claims. Energy retailers did not seem to feel responsible to address any imbalances. These observations concur with the findings on ease of communication and access to information of another Victorian study (Chester 2013) and research in the UK (Fischer et al. 2014) and suggest that this population group needs practical assistance in the negotiation of energy contracts.

Moving on to the principle of procedural fairness, the experiences of control and power were specific to each of the four social scales. Within households, warmth was variously controlled, contested, negotiated and agreed upon. The evidence of the thermal conflicts provided insights into the relationality (Butler, Parkhill & Pidgeon 2014; Groves et al. 2016) of the social practices around the sharing energy services. The study showed how the role of a household member's social position, financial capacity, power and care shaped decisions of distributing thermal comfort, and that the views of some household members were not represented in the decision-making process. Decisions on energy contracts were made largely by the householders themselves with some help by trusted adult children. By contrast, many householders distrusted energy retailers, regarded their policies and processes as biased, perceived their decisions as illegitimate and, hence, resented their power. Solar microgeneration as a way of redistributing power was desired but may introduce challenges for energy justice on a wider social scale (Bickerstaff, Walker & Bulkeley 2013).

The study also revealed that the participants and energy retailers operated on contrasting value principles. While loyalty was stood in high regard by householders, loyalty was not rewarded by energy retailers, and failing to extend discounts to existing, loyal customers appeared exploitative. The dissatisfaction with energy companies does not seem to be limited to this study cohort. Consumer perceptions of being powerless toward rising energy prices also seem to foster the desire for solar batteries (Climate Council 2017). However, a positive finding of this study was that the state-wide process to allocate the two most common energy concessions to pensioners was effective. With regards to the Medical Cooling Concession, the suggestion of one householder to ask medical practitioners to alert eligible patients to the offer and provide the necessary forms seemed a sensible approach to increase awareness and the uptake.

Secondly, the study showed that the perception of energy inequities was context specific, which seems to support that, in the context of rising energy prices, energy equity may be achieved by an adaptation-mitigation response to poor housing. For many householders, living in a cold house in winter was normal and, hence, not perceived as unfair. This finding concurs with other Australian studies that houses that are cold by objective standards even when households are not apparently economically disadvantaged (Daniel et al. 2014; Hitchings et al. 2015; Willand & Ridley 2015). Coping practices to achieve bodily rather than spatial warmth were considered acceptable and sufficient for health. Coping practices as valued functionings and as the expression of the householders' degree of choice seems to support the recent lowering of recommended indoor temperature thresholds (Bone 2014). However, there is little research on the protective factor of thermal clothing for physical health (Barnett et al. 2016), and it may be this "winter unwillingness" (Hitchings et al. 2015) that contributes to the surprisingly high excess winter death rate in Australia (Huang et al. 2015).

Finally, the retrofit intervention proved a capability enhancing mechanism with limitations. The outcomes of the trial showed that combinations of draught proofing, insulation and heating system upgrades improved the householders' heating capabilities, although it did not eliminate underheating. Hence, even small changes in housing quality could enhance the secondary capability of being able to adequately heat the home and to afford energy. However, the study highlighted older householders to be vulnerable in more ways than just to cold exposure, and exposed "hidden injustice and losers with regard to energy justice" (Jenkins, Heffron & McCauley 2016, p. 673) on a domestic scale. These included people who were repressed at home, self-sacrificing mothers, people with little Internet access and energy literacy, people with impaired thermoregulation, as well as the loyal, the frugal and the hard of hearing. The energy justice approach highlighted that to address health risks associated with poor housing and energy stress, initiatives for this population group have to go beyond retrofitting to changing the underlying structural, cultural and social conditions causing cold homes.

While retrofits can be a part of the broader struggle for low carbon housing and justice, if interventions rely on self-recognition, then they may not reach those vulnerable people who do not self-identify as vulnerable or who do not recognise that the conditions in their home may harm their health. Similarly, use of a consensual approach by deliberation among these households would have provided a definition of minimum indoor temperatures that would have been much lower than accepted guidelines. The mostly negative experiences with landlords affirmed the problem of limited tenant agency and the lack of minimum housing and energy efficiency standards for rented properties in Victoria (VCOSS 2016). The one positive example of landlord engagement, however, revealed that some landlords care. Minimum standards protect people who lack resources and agency in this regard. Hence, policies and programs aimed at transitioning to low-carbon and just energy systems need to acknowledge such structural imbalances, address the increased demand for energy of an ageing population, recognise social differentiation within households, adopt a capabilities approach and may consider micro-generation as a way of mitigating procedural injustice.

This paper adds to the body of literature that uses case studies to provide a better understanding of the various applications and experiences of energy (in)justice (Damgaard, McCauley & Long 2017; Simcock 2016). The experiences of energy (in)justice presented in this paper highlight the complexity of values that govern decision making around energy services and the need to improve the interconnections between households, communities and public institutions. That many overt and more subtle capabilities were found to be lacking in this regard is critical in the context of policy objectives towards a low-carbon and just society. The modest expectations, frugality and concealment practices among many of these householders raise concerns about the effectiveness of initiatives that require self-identification. The critical view of energy retailers draws attention to public perception of legitimacy of decision-making processes around energy. Such nuanced understandings are prerequisites for the formulation of just policies and programs (Walker & Day 2012).

5 Conclusion

In this paper we have used energy justice as an analytical framework and empirical data from a retrofit trial to explore the recognition of vulnerability, equity and practices of reward allocation in the homes of older and/or frail householder near Melbourne, Australia. In this case study, the sample was non-random and involved mixed methods, designed to support detailed analysis of individual cases at the fine grained scale. While this does not produce immediately scalable findings, it does provide new insights that would be impossible to establish from larger scale survey type studies. By focusing on the phenomenological investigation of energy (in)justice as experienced by

householders, we have demonstrated the power of the technique in revealing the lived experience of energy vulnerability. The findings are inevitably limited by the interpretations of the researchers and the specific group of low-income HACC recipients, the construction of their homes and the climatic, economic and socio-cultural conditions in Victoria, Australia. They draw on inferences from the interaction of objective environmental factors with social conditions and contextual determinants. Notwithstanding these limitations and given the importance of housing for human flourishing and quality of life, the study demonstrated how the foundational principles of energy justice and claim making may be applied to explore the freedom of choices in heating and affording energy and the impacts of retrofit interventions at the domestic scale. More interdisciplinary research, bringing together the domains of building science, economics, social science and philosophy, in other countries and/or climatic, economic and social contexts should be undertaken to explore the mechanisms that shape experiences of energy justice and how these may shift to provide recommendations for policy and practice. Cross-case comparisons may then reveal patterns which may advance the theory of energy justice and inform equitable and just strategies of low carbon transitions.

Acknowledgments

This article provides an energy justice analysis of a retrofit intervention project to draw attention to the social good of housing improvements. The main findings of this study are presented elsewhere.

We thank the South East Councils Climate Change Alliance's (SECCCA) and the Energy Saver Study team for accommodating this research. Many thanks also to the three anonymous reviewers whose comments to earlier versions of the manuscript helped improve its structure and clarity.

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