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Re-configuring practices in times of energy crisis – A case study of Swedish households

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ABSTRACT

During the autumn, winter and early spring of 2022/2023, Europe faced rapidly increasing energy prices and threats of power cuts. The situation was consequently labelled an "energy crisis", and one sector that was severely affected was households. In response to the situation, European households made efforts to reduce and time-shift their energy use to mitigate the effects of the crisis. Considering that domestic energy practices are often difficult to change, particularly in the long term, we find this effect of the energy crisis on households important to understand more deeply. In this paper, we use social practice theory to investigate how Swedish households responded to the crisis and what changes they made in terms of re-configurations of their practices. The aim was to contribute knowledge on how households adapt to a changing energy system with volatile prices, limitations in electric power, and threats of energy crisis. We conducted two rounds of semi-structured interviews with 9 households in single-family houses in the middle and south of Sweden during and after the crisis, in total 18 interviews, to examine what re-configurations of practices emerged and which persisted over time. The results show that significant changes were apparent in primarily the practice domains of heating and hygiene. While some of these changes were temporary, other re-configurations of energy practices persisted beyond the months of crisis and high prices, indicating that meanings of frugality and sufficiency were strengthened. Our results demonstrate that households were reminded of certain electricity use that is otherwise typically backgrounded in homes and that the energy crisis stimulated re-configuration and re-examination of norms as well as reflection on electricity use in general. Finally, we discuss the effects of the energy crisis on household practices in comparison with other crises and disruptions, and point to the importance of communicating clearly with households about the societal effects of their efforts, in order to manage the legacy of this crisis for similar future crisis situations.

1. Introduction

During 2022, following Russia's invasion of Ukraine, the financial aftermath of the Covid-19 pandemic, problems with nuclear power plants, and low water levels in hydro reservoirs, Europe faced a volatile electricity market with aggressively rising electricity prices and threats of power cuts [1]. In media and political debates, the strained energy situation was consequently labelled an "energy crisis" [1,2]. This had a significant impact on households globally [3], leading to a call for researchers to be agile and act fast to increase knowledge on how such extreme changes to the energy systems affect society, for example "which old and new energy-using practices emerge" [2]. In this paper, we respond to this call by shedding light on households and how their social practices were impacted by the 2022 energy crisis. We contribute insights from an interview study of Swedish households in December 2022 (during the crisis) and June 2023 (after the crisis).

In the southern parts of Sweden, which this study focuses on, the day-ahead electricity price was 3–4 times higher in November 2022, compared to the same month in 2020, and about 6–7 times higher in December [4]. At the same time, there was increasing attention to the electricity situation from Swedish media, politicians, authorities, and energy companies across the country. Swedish households were encouraged by their electricity suppliers and governmental authorities to decrease their electricity consumption as well as shift their electricity

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use from peak hours to off-peak hours. Using a similar narrative as the Public Health Agency of Sweden during the Covid-19 pandemic, the Swedish Energy Agency encouraged Swedes to "flatten the curve", but this time referring to the diurnal electricity use and price curve, rather than the spread of infection [5]. What followed was a remarkable reduction in electricity use in households during autumn 2022, in Sweden as well as in other European countries [6]. In fact, the reduced electricity consumption in households by up to 10 % was an important contributing factor to avoiding power cuts during the strained winter [7–9].

During the spring of 2023, prices went down and the general attention to the electricity situation decreased. Remarkably, compared to the same period in previous years, Swedish households did not return to their pre-crisis level of electricity consumption [8,10]. Rather, a part of the electricity reduction persisted over time [8,11]. This can be likened to other crises such as experiences of droughts in Australia and South Africa, where certain water conservation behaviours persisted after the crisis [12,13]. Although water is arguably more tangible than electricity to households, they are comparative in the sense that both water and electricity are important provision services that can be perceived as abundant, reliable, and unlimited depending on the configuration of infrastructure and how it affects everyday life [14,15]. In sum, it seems the past year has meant significant changes to household energy practices. Considering that domestic energy practices are often difficult to change [16–18], particularly in the long-term [19,20], we find this effect of the energy crisis on households important to understand more deeply. Therefore, the aim of this paper is to contribute knowledge on how households adapt to a changing energy system with volatile prices, limitations in electric power, and threats of power cuts. We do this by reporting on a study of Swedish households during and after the strained winter of 2022/2023. To illuminate the complexities involved in modifying domestic electricity consumption, we use social practices [18] as a theoretical perspective to shed light on how households' electricity use is shaped by e.g. material arrangements, knowledge, social contexts, and the rhythm of everyday life.

The study was guided by the following research questions:

- How are domestic energy practices re-configured in response to the strained electricity situation?
- Which re-configured energy practices persist over time?

2. Domestic electricity use, social practices, and crises

In the sub-sections below, we introduce social practice theory and its application to research on domestic energy use and demand response. We then present previous research showing how different types of disruptions and crises related to systems of provision can affect household practices.

2.1. Domestic electricity use and social practice theory

It is often suggested that households can contribute to solving the challenges of matching electricity supply and demand by changing the way they use electricity [21]. This can be done, for example, by reducing electricity use or shifting electricity use from peak hours, the latter meaning that households are flexible in time with their electricity use. However, the amount of electricity that can be shifted or reduced varies; empirical studies show mixed results, ranging from almost no changes to some short-term changes [22–25]. The variation depends on activity, incentives, technologies, competence and motivations involved [26].

One way to understand the complexity of changing electricity use at household level is to investigate social practices. Social practice theory emphasises that electricity is not used for its own sake but rather to perform tasks or services in everyday life which have other meanings [17,27]. 'Energy practices' and 'energy services' are commonly used concepts that illustrate the way in which energy is embedded in ways to achieve different purposes or needs in everyday life [27]. The theory of social practices, attributed to e.g. Schatzki among others [28], and developed and applied to energy contexts by for example Watson et al. [18], Shove et al. [17], and Strengers [29], understands human activities and behaviours as reproduced patterns of enactment consisting of linked elements. These elements are often categorized into knowledge, meanings, and materials [18,30]. The elements are linked together and the practice itself is configured depending on these links. For example, daily showers are dependent on materials such as showers and sewage systems, as well as water and electricity prices; knowledge on how to wash oneself; and meanings such as wanting to be clean and maintain good hygiene. Social practice theory thus demonstrates how practices, infrastructures and material artefacts affect each other as they interact and co-evolve, creating norms of comfort and convenience in the process [30].

Regarding changing *when* activities are performed, social practice theory offers an explanation as to why time-shifting electricity use is often difficult to achieve. Households' energy practices are attached to their everyday context with routines that often are sequenced, synchronised and affected by material configurations [16]. Sequenced means they are part of a chain of events that interact with each other. An illustrative example is how parents of young children use bath time to relax their children before bed [22], and bath time then depends on the bed time and is thus difficult to shift. Household energy practices are also sometimes synchronised, meaning that several practices or people come together at a time or place, for example at dinner time [16]. Finally, energy practices are also strongly affected by the materials with which a practice is linked [14,16]. For example, the amount of showering that can be done at once is dependent on the size of the water boiler [16]. In this study, social practice theory is used as an analytical lens to understand how household practices were affected during and after the energy crisis in Sweden, with a particular focus on energy practices involving electricity use.

2.2. The effects of disruptions and crises on household practices

Although there is extensive research on households' energy practices in response to different types of pricing mechanisms, incentives, and technologies, studies on the impact of energy crises on households in affluent countries are comparatively limited. This is of interest because of the specific circumstances that emerge during periods of time of electricity shortage and volatile prices, which are deviations from what is considered normal in affluent countries. One exception is Lutzenhizer et al. [31] who investigated how households' behaviours changed in response to the increasing prices and media attention following the Californian energy supply crisis in 2001. They found that households took several different actions to reduce electricity use, guided by common sense and past experiences. Notably, Lutzenhizer et al. found that householders were not only motivated by costs but reported that their concern for society and the environment were important motivating factors as well. Furthermore, households still engaged in conservation measures a year later, although the amount of electricity saved had been reduced. The experience of the energy crisis had also accelerated certain investments to reduce electricity use in the longer term [31]. In addition, households were still concerned about how the energy situation would develop. The Californian energy crisis of 2001 has similarities to the situation in Sweden in 2022/2023, especially regarding the significant reduction of electricity use by households. While Lutzenhizer et al. focus on quantifying changes, we aim to qualitatively examine, with a social practice perspective, how households changed their energy practices in response to the crisis.

Another type of energy crisis, that has been investigated previously, is disruptions such as blackouts and power cuts [32–35]. Studies of practice change during longer blackouts show that dormant technologies and know-how become activated and that resilience of for example heating practices can be achieved by compromising convenience [35].

However, as also shown, this re-configuration of practices was temporary and did not last when the power returned, which also limited the impacted households' reflections on energy use in general [35].

The link between practices, crises, and demand for natural resources has been investigated in contexts beyond electricity. Taylor et al. [15] describe how growing demand for water in the UK through an expanding individualism and consumer entitlement is linked to systems of provision ensuring reliable and unlimited water supply. They also find that the growing water demand is reinforced by an emerging management principle to encourage responsible water consumption on a voluntary basis rather than using tougher policy instruments to avoid overconsumption. With this background, Taylor et al. argue that crises such as droughts, at least in the UK context, serve as reminders of our environmental and planetary boundaries and can be seen as a catalyst for creating more sustainable water practices and reducing waste [15]. Furthermore, experiences of scarcity can shape consumption practices of households as well as overall demand for resources such as water and electricity [14]. Experiencing droughts or power shortages affects the configuration of practices, some of which can persist beyond a period of crisis. Past practices, that were developed in times of resource scarcity, can persist in new life situations of perceived abundance or be resurrected if needed, as shown in research on different generations of migrants [14,36]. In contrast, a power system that is perceived as reliable, abundant, unlimited, and immaterial encourages increased and perpetuated consumption and makes the configuration of frugal practices unlikely [14,37,38]. Older, more sustainable practices can also disappear in infrastructure contexts that do not require their survival [14]. From a practice perspective, perceived shortages, disruptions and limitations in power supply can thus help materialise electricity for households [14].

Other types of crises also affect practices, one recent example is the Covid-19 pandemic which completely disrupted and relocated many household practices [39,40]. Although many practices bounced back as the pandemic diminished, some practice changes seem to have persisted and new skills and ways of carrying out daily activities among householders had been established, for example related to working remotely or shopping online [39–41].

Different types of disruptions in infrastructure are part of everyday life, and although some disruptions have severe consequences, there is an adaptability in human routines and activities that is evident when observing how people deal with these disruptions [34]. Furthermore, disruptions in infrastructures are important events in the sense that they expose people to the rhythms of nature and can make people reflect on growing demand, dependency, and scarcity [32]. Disruptions in infrastructures such as power supply can thus unlock human innovation and creativity in re-configuration of routines [15,29,34,38,42]. Disruptions can also revive practice memories and skills that have been unused for a long time such as fire-making [35,36]. However, as observed in the above-mentioned studies, different types of disruptions and crises in systems of provision, such as blackouts or droughts, have potentially different effects on households in terms of how practices change and if the disruption leads to reflection on consumption or not.

Power disruptions or energy crises can lead to a range of consequences or measures, from blackouts or short power cuts to restrictions on electricity use, encouragement to reduce electricity voluntarily, as well as measures at grid level in terms of utilizing power reserves [43]. In the present study, the energy crisis in Sweden resulted in aggressively increasing and volatile electricity prices, and strong encouragement from authorities to reduce electricity use for households and organizations. Although there were warnings of possible power cuts, no power cuts actually happened [44].

3. Methods

A qualitative approach was used to explore how households adapt to a changing power system. Interviews with households were conducted in December 2022, when media and politicians increasingly reported high electricity prices and predicted a tough winter ahead. At the same time, reports of significant reductions in electricity use in the residential sector of southern Sweden were coming in. In line with Parag et al. [2], we found this situation to be of particular interest for energy research, especially in a country like Sweden where electricity prices have been low and energy supply abundant for a long time. This necessitated a swift response to gather distinctive data during this extraordinary period, ensuring prompt recruitment and scheduling of interviews in the following months. Follow-up interviews were later carried out in June 2023, when the energy situation was less strained and electricity prices were back at normal levels.

We were primarily interested in households living in single-family houses, because they generally own, and thus have more control over, the material aspects of the home that impact electricity consumption the most, such as heating and hot water systems, insulation, large appliances, and electric cars. Furthermore, we focused our investigation on the middle and southern parts of Sweden, which were most affected by high prices and transmission bottlenecks as explained more in detail below.

3.1. Empirical context

Sweden's electricity production is dominated by hydropower and nuclear power, along with a growing share of solar and wind [45]. Although natural gas only represents 2 % of Sweden's total energy use [46], the power price in Sweden is still affected by the price increase of natural gas abroad. This is because Sweden is part of the European electricity market, where power is bought from cheapest to most expensive, and the most expensive power on the market needed to satisfy demand will dictate the overall price [47,48]. As a consequence, shortages in natural gas in Europe in 2022 created higher prices on the electricity market, which also impacted Swedish consumers [48]. Sweden is divided into four separate bidding areas, meaning that the price in each area differs depending on power production and the balance between supply and demand in each area, as well as transferring capacity between the areas [49]. Today most power is produced in the north, while most consumption happens in the middle and south due to industries and large population. Transmission bottlenecks to the south as well as regional bottlenecks create challenges for balancing demand and supply and differences in prices between the bidding areas. In 2022, the prices increased in a way that is unusual for the Swedish electricity market. Due to the differences between bidding areas and Sweden's part in the European electricity market, Sweden's southern bidding areas (3 and 4) tend to be more affected by what happens in Europe [49] compared to the northern bidding areas (1 and 2). During the crisis, prices therefore accelerated faster and were generally higher in the southern parts of the country compared to in the north [46].

Single-family houses represent about 44 % of Swedish households, of which 54 % are heated with electricity including heat pumps [50–52]. In general, detached houses are most common among families with children and couples aged 40–80, while younger adults and single women more often live in multi-family dwellings [51]. In Sweden, most single-family homes are owned by the occupants, who thus oversee the energy system of the house as well as the choice of electricity contracts. Although there are disparities between different households regarding the burden of electricity costs, there has been no comparable nationwide energy crisis like the year 2022/2023 since the oil crisis in the 1970s [53]. The Swedish electricity system has been described as “cheap and clean”, and in the last 25 years, most Swedish households have become used to a relatively affordable and reliable electricity supply [53], although network fees and taxes put Sweden close to the EU average for 2023 [54]. This is reflected in the fact that Sweden's electricity consumption per capita is among the highest in the world [55]. Such contextual factors are important since research shows that expectations and experiences of electricity supply affect how households

consume electricity [42,56]. During 2022, the share of households' disposable income spent on electricity increased from 3,8 % (2021) to around 6,3 % (2022) [57].

3.2. Recruitment of households

The study focused on households in the middle and south of Sweden (bidding areas 3 and 4). Participants were recruited through a survey that included information about income level, house type, age, gender, household members, and electricity contract, i.e., parameters that may affect the households' energy practices [2]. Since we were specifically interested in households that *had* responded to the electricity situation with some form of action, we encouraged participants to report if they had made any changes or wished to make any changes in response to the energy crisis.

Because recruiting households was time-critical, we utilized our network within the RISE Research Institutes of Sweden to spread the link to the survey. RISE Research Institutes of Sweden consists of >3300 employees distributed across Sweden. Using an internal online platform, we shared the link with all employees, encouraging them to forward it to households that could be interested in participating or post the call for participants in relevant local forums on social media. Importantly, as we did not want any employees to participate, we excluded any colleagues who had signed up.

Despite the rapid recruitment process, we were still able to recruit quite a heterogeneous group of households in terms of living arrangements, electricity contracts, and technologies at home. We interviewed nine households, and one participant from each household participated in both the December 2022 and June 2023 interviews. Most of the households consisted of two persons and the interviewees were all above the age of 45 (see Table 1 for an overview).

3.3. Semi-structured interviews

We conducted the interviews online via Microsoft Teams. In the first round of interviews (December 2022) two researchers participated, where one took notes, and one led the interview. The second round of interviews (June 2023) was conducted by one researcher. All interviews were recorded, with the participants' consent, and transcribed. The first round of interviews ranged between 30 and 70 min, while the second round of interviews ranged between 15 and 40 min. The first round of interviews aimed to investigate how households adapted electricity related practices to the energy crisis. The respondents were initially asked about their perception of the current energy situation in Sweden and Europe, and their electricity use at home, including their electricity costs and contract. They were then asked to describe any changes to electricity consumption that they had made, motivating how and why they decided to make those changes and what this had involved in terms of technical and social aspects. The final section of the interview focused on expectations and concerns for the future.

After the first round of interviews, we used the interview notes to identify reoccurring themes and compare quotes and perspectives across different interviews. This analysis informed the development of the interview guide for the second round of interviews. The second interview guide focused on what had persisted and what had changed since the first interview. Respondents were asked to describe their experience of the winter and what they had decided to continue doing, stop doing, or start doing in terms of practices connected to electricity use. They were also once again asked to reflect on the future.

3.4. Analysis

In short, the process of analyzing qualitative data can be summarized into five fundamental steps: compiling, disassembling, reassembling, interpreting, and concluding [58]. We used a thematic analysis, which has been described as a method for identifying, analyzing, and reporting patterns [59], to analyze transcripts and notes from both interview rounds. As the focus of the study was the re-configuration of domestic energy practices, the interview data was coded into sub-themes corresponding to different practices and different elements of practices. These sub-themes were then re-organized based on the domains of practices to which they belong, according to our understanding.

4. Results and analysis

In the presentation of the results below, we first introduce two domains of practices, hygiene and heating, that were significantly re-configured during the winter of 2022. For each domain, we describe the re-configurations that were brought up in the first round of interviews as an immediate response to the energy crisis. In the second section, we draw on the follow-up interviews to revisit these domains and describe practices that were consolidated or had returned to their pre-energy crisis state. An overview of all re-configurations identified through the analysis can be found in Appendix 1.

4.1. Re-configured practices

Our results suggest that certain domains of household practices were significantly altered or affected by the energy crisis, while others were not. For clarity, we encouraged respondents to talk primarily about

Table 1
Overview of participating households. All names have been replaced.

Respondent	Household members	Age	Gender	Electricity contract	Occupation status	Household income (after tax)[1]
Anders	2	55–64	Male	Monthly Variable[2]	Work	>53,100 EUR
Stina	2	65–74	Female	Fixed/Monthly Variable[3]	Retired	17,700–26,500 EUR
Joar	2	65–74	Male	Fixed[4]	Retired	35,400–44,300 EUR
Gustaf	3	45–54	Male	Hourly rate[5]	Work	>53,100 EUR
Jasmine	2	45–54	Female	Hourly rate	Work	>53,100 EUR
Lise	2	55–64	Female	Wind power cooperative[6]	Part-time work	>53,100 EUR
Monica	2	45–54	Female	Fixed	Work	35,400–44,300 EUR
Mats	4	45–54	Male	Fund[7]	Work	8850–17,700 EUR
Robert	2	+75	Male	Hourly rate	Retired	44,300–53,100 EUR

[1] Exchange rate 1 EUR = 11.30 Swedish Krona (SEK).
[2] Monthly Variable contract means that the household is charged according to the average electricity price during a period of time, typically a month.
[3] Fixed/Variable (mixed) means a combination where a share of the price is based on a fixed rate and the rest is variable. How big each share is differs from different contracts.
[4] Fixed price means that households pay the same price each month for the length of the contract regardless of variability in power prices.
[5] Hourly rate means that the household is charged by the hour according to spot prices.
[6] Owning shares in a wind power plant, and through the cooperative getting an electricity contract based on either fixed or variable price from the wind power.
[7] The households buy into a fund, where electricity is bought by specialists to get as low price as possible, and the household is then charged the average price per month.

practices that *had been* affected or changed in their homes. This resulted in two identified domains of practices that were significantly affected by the strained electricity situation in Sweden: *heating* and *hygiene,* which we will present below (Fig. 1). Additionally, we observed that practice elements seem to have changed, which determined in what way the practices they are part of became re-configured. Other common practices in the home, for example, related to cooking and entertainment [22], were not at all or only briefly discussed by the respondents in our study and we therefore interpret them as less affected by the energy crisis.

4.2. Heating

The accelerating prices made the households review their heating practices and indoor temperature settings. This domain of electricity use, typically overlooked or assumed in affluent contexts like Sweden, involves mundane practices integrated into daily activities [60–62]. However, during the energy crisis, activities of heating and maintaining warmth became more visible, especially in houses heated directly with electricity.

During the expensive winter, respondents made detailed adjustments in thermal comfort practices, including reducing indoor temperatures. These changes reflected renewed meanings of sufficiency, frugality and solidarity, as respondents argued that they both wanted to reduce their own costs but also contribute to mitigating the effects of the crisis for everyone's sake. Altered heating practices involved actions like adjusting temperatures on a day-to-day basis, decreasing floor heating, increasing reliance on heat pumps, reducing direct electric radiator usage, delaying the start of the heating season, and adjusting settings based on outdoor temperatures. These adaptations demonstrated increased interaction with the heating system compared to pre-crisis times. Other measures included closing off rooms that were not used, lowering temperatures in garage and storage areas, and using additional heating sources such as fireplaces. To compensate for lower or shifting indoor temperatures, Monica, Robert, Anders and Stina described wearing more clothes, as illustrated by: *"We have decreased the temperature by one degree in all rooms. It's okay, you wear a sweater instead"* – Stina, 1st interview.

Changing heating routines also involved negotiation and shared decision-making between family members in some households. Lise, who lived away from her partner and adult daughter, turned up the heating every time they came to visit, only to reduce it when they left. Joar considered turning off the floor heating entirely but had to compromise since his partner disliked cold floors.

Changes in heating routines and practices were closely linked to material preconditions and resources in each house, as well as climate conditions. For households with fire stoves, making fires became a bigger part of the heating practice during the expensive winter months, allowing for lower temperature settings on heat pumps and radiators. For example, Monica described how she started a fire each day after work and kept it going for three to four hours to get the house warm, which was a large increase in the use of the fireplace compared to before the crisis.

Heating practices were not only affected by existing material conditions but also by changes made to these houses in response to the crisis. The energy crisis reinforced values associated with electricity-related investments to change electricity driven practices in the long-term through new technologies or improvements to the house. Respondents mentioned examples of material changes that gained momentum in anticipation of the costly winter, including upgrading to more efficient heating systems, exploring solar panel deals, investigating home insulation options, evaluating home batteries, and planning window replacements.

However, as many investments that would affect the energy performance of a house are expensive and might require a loan, the respondents expressed an urgency to understand what choices would make the most difference. The increasing electricity prices and an uncertainty about future winters made considerations about cost-effective investments both more relevant and complex. For example, in the context of the strained electricity situation, Monica explained that they were considering several different options: *"We have been thinking about the heating, can we find alternatives for heating? Maybe find a fan that can move around the heat differently, circulating the air. Should we insulate, change windows, things like that? But it does cost a lot"* – Monica, 1st interview. Deciding on investments also involved talking to others and doing research, as illustrated by Joar: *"I'm very interested in a ground source heating, and I have to read up on it before I can start calculating what it will give. My neighbor is very satisfied (…). You could save a lot of*

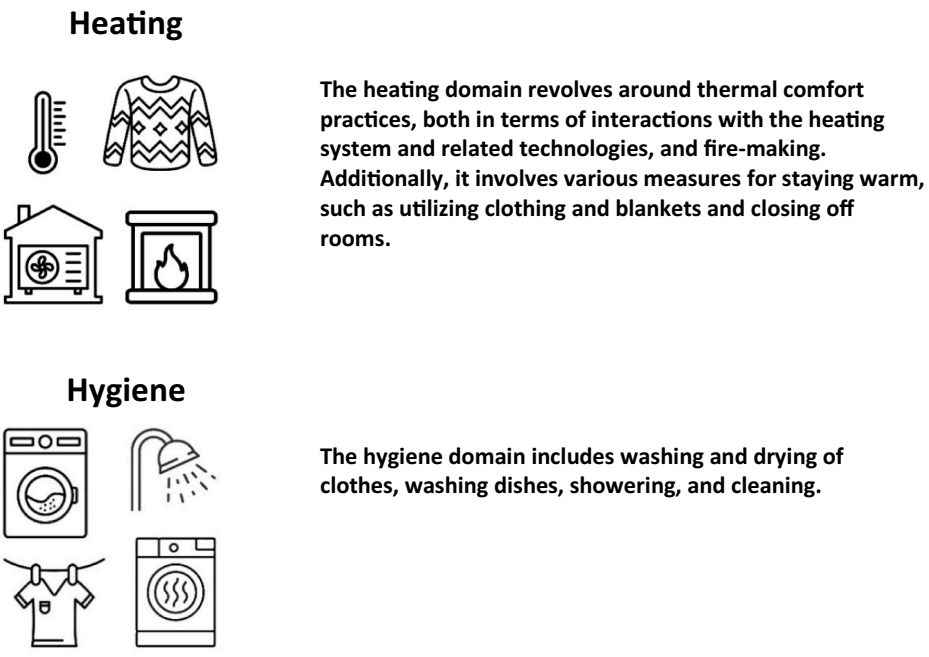

Fig. 1. Domains of practices affected by the energy crisis.

electricity if you remove the direct electric heating. I'm attentive to what is happening on the market. I read about everything, batteries, storage, wave power…"– Joar, 1st interview.

Another element involved in heating practices that was affected by the crisis was households' knowledge about price and electricity consumption. Accelerated by the energy crisis, actively monitoring electricity consumption, pricing, and scouting for favourable electricity contracts was emphasized in the interviews. Beyond individuals with expertise in energy and technology, responsibility for overseeing and tracking costs became a shared task among participating household members during the expensive winter season. This collaborative effort extended to negotiations about prioritizing activities, and conversations about electricity were shared with neighbours and friends as well. In the heating domain, monitoring was especially relevant in terms of understanding how much electricity heating represented and what types of heating systems, such as floor heating, and rooms, could be adjusted to avoid wasting electricity.

Furthermore, the respondents highlighted electricity contracts as an important context for what they chose to do in response to the crisis, including heating. The electricity contract dictates what possibility households have to affect their electricity bill, and thus represented both an important meaning and knowledge element in the re-configuration of energy practices. It was clear that the choice of electricity contract had become more relevant for the interviewed households, and the energy crisis motivated them to review contracts that no longer seemed beneficial. Respondents sought additional information by comparing contracts with others, consulting independent energy advisors, comparing with friends, and conducting internet research to make informed decisions. Respondents considered factors such as the house's physical attributes, type of heating system, individual commitment to changing routines, and levels of knowledge and skills. For Gustaf, his interest in technology and previous experience with smart home appliances made him feel confident to choose an hourly price contract. In contrast, Mats, who had direct electric heating, was not interested in an hourly price contract because he felt that it was challenging to steer the heating in a smart way which otherwise could get very expensive. Other respondents anchored their choice of contract in other meanings. Joar for example, was content with a fixed but high price because he wanted a sense of control and reliability.

In summary, changes in heating practices, influenced by heightened meanings of frugality, sufficiency and solidarity, were dependent on each household's material conditions, including the heating system, insulation, additional heating sources, and house layout. The crisis also accelerated changes to these material conditions in the form of investments, which in some households were prioritized because of the crisis. Social negotiations and compromises among household members were also important to adapt changed heating practices so that they were satisfactory or sufficient for everyone in the household.

4.3. Hygiene

Other practices that were changed during the winter were related to hygiene, a domain which in this study included showering, laundry, and dishwashing. Laundry and dishwashing were performed when the price was low, especially in households with hourly price contracts. For respondents like Gustaf, Jasmine, and Robert this meant running washing machines and dishwashers during night-time or other off-peak hours, which required more effort, planning, and communication between family members. Gustaf and Robert even mentioned hanging laundry or running a machine in the middle of the night: "*When there was a big price difference, we ran the dishwasher during the night, but now it is not so important. When you are up during the night, which you are at our age, then you might* as *well turn it on*" – Robert, 1st interview. Notably, even some respondents without hourly prices, like Mats and Monica, shifted the timing of their laundry. Thus reducing and time-shifting was not only about reducing your own bill, but also contributing to keeping prices lower for everyone out of solidarity. However, other respondents were unwilling to run appliances during the night or when away, as they were concerned about the risk of leakage or fire hazard. For instance, Stina, decided against running the washing machine overnight and instead ran it in the evening, potentially coinciding with power peaks depending on the day. This illustrates that households were not always aware of, or ignored, the occurrence of power peaks.

Time-shifting was not the only change to these practices. Households also reported being more careful with the amount of washing. They described reducing the use of tumble and towel dryers, as well as making sure to fill up washing machines and dishwashers. Some respondents like Monica and Gustaf temporarily avoided the tumble dryer completely, and Gustaf explained that they dried the laundry by the fireplace instead. Adjusting laundry routines sometimes required collaboration within the household, particularly when one household member monitored electricity prices while the other managed the laundry. This could lead to one person instructing the other when to do laundry, which was not always appreciated. For instance, Mats mentioned that his wife was not entirely pleased with their goal to align laundry with cheaper hours.

Respondents also mentioned reducing time spent in the shower and encouraging others in the family to do the same. These measures seemed to be associated with a stronger sense of frugality than before, as respondents argued that it is not okay to shower just because it feels good. Others like Anders and Monica mentioned that they tried to shower while at the gym to reduce the bill at home. There were also examples of changing timing of showering. Stina explained that she and her husband had started synchronizing their showers, meaning that they showered right after one another, to "*not waste the hot water already in the pipes*". Overall, changing shower routines seemed to require a lot of social negotiation between household members. Gustaf had a talk with his teenage son about not showering too long, and Monica stated she had a minor conflict with her husband when he suggested putting a timer in the shower: "*We have discussed having a timer in the shower (…) but then I threatened to divorce! It was mostly a joke, but it feels a bit exaggerated*" – 1st interview, Monica.

The time-shifting described above was connected to the strengthened knowledge elements associated with monitoring electricity price changes and electricity use. Respondents tried to understand their appliances and consumption by mapping home electricity usage to varying extents. They tracked usage through various apps, bills, and supplier information to identify major power consumers. For example, Mats noted a consumption dip when the washing machine and dishwasher were idle, while Jasmine observed peaks during stove, oven, and shower use. Others investigated electricity use by inspecting the performance of appliances or checking energy labels. The incentives for monitoring and understanding electricity use were rooted in different perspectives. Mats, Lise, Stina, and Monica voiced apprehension about the electricity cost and the unpredictability of price fluctuations while Gustaf was motivated by the goal of optimization and achieving maximum efficiency.

For the respondents with hourly price contracts, monitoring the electricity price became a pervasive part of everyday life during the winter, determining when it became appropriate to do activities such as laundry or dishwashing. Gustaf, for example, had developed his own database and analysis of price developments and comparisons between contracts. However, it was not only households with hourly contracts that monitored electricity prices. Monica, who had limited prior knowledge of the electricity market, explained that she now tried to keep track of the electricity price to become "energy smart", even though she was temporarily stuck with a fixed price contract, as illustrated by: "*We have a fixed price now but we're following it closely, because we want to know the day we change to variable. We have begun a habit of becoming energy smart*".

Existing and changing material conditions also affected the hygiene domain. While these households did not explicitly invest or consider

investing in things that were directly related to the domain of hygiene practices, they discussed possible investments that could still affect this domain. For example, a more efficient heating system and well insulated house could reduce the bill in such a way that other electricity saving efforts would be viewed as unnecessary. Having solar panels, for example, affected Jasmine in her choice when to do laundry. Having a fire-stove enabled household such as Gustaf's to both reduce electrical heating and dry the clothes by the fire.

In summary, hygiene practices underwent re-configuration through the adjustment of activity timing and electricity reduction. Shifts in hygiene practices resulted from intentional efforts, including a shift in meaning towards frugality, sufficiency and solidarity, informed by monitoring of price for households with hourly price although households with other electricity contracts also made efforts to reduce and time-shift. These efforts also required negotiations and communication among household members. As revealed below, some of these changes became routines over time.

5. Consolidated practices

During the spring of 2023, the electricity prices dropped significantly and by early summer they were more or less back to normal. In the second round of interviews, it was clear that some practices had shifted back to their pre-energy crisis state, while others seemed to have changed more profoundly, which we turn to next.

5.1. Heating

Changes in thermal comfort practices did not go back to their pre-crisis state as swiftly as other re-configured practices that demanded more engagement from household members. Despite the follow-up interviews being conducted in early summer, with higher outdoor temperatures and thus lower heating demands, almost all respondents expressed the likelihood of maintaining heating routines established during the past winter in upcoming winters. Having lower temperatures in general or in certain rooms, using the fireplace more frequently, wearing more clothes, and reducing the floor heating were routines that most householders expected to continue doing. Respondents like Jasmine, Lise, Joar, and Gustaf indicated that there was no reason to actively adjust the settings of for example floor heating back to the previous higher temperature as long as their thermal comfort was acceptable. Adjusted heating practices seemed to be a new normal after the winter, both on a daily and yearly basis, and the increased awareness of cost and power consumption from heating motivated these adjusted practices to continue. For example, Stina, Joar and Monica describe how these changes have now become the new normal as illustrated by: "*No, we are happy with the indoor climate, and I don't think we will increase the floor heating again. I will turn them on again sometime during the autumn so the floors are not freezing, but they will not be at the level they were before. (…) We've learned a lot about saving [energy], and we will continue saving as it doesn't require any work from us. We're happy with it*" – Joar, follow-up interview.

Because the changes in thermal comfort did not disrupt other routines, these households mostly envisioned keeping the reduced temperature. Furthermore, meanings associated with the adjusted or re-configured practices were altered by the experience of the energy crisis. Awareness of electricity consumption and the value of frugality and not wasting electricity became more important than in previous years when prices were low and power seemed abundant. These meanings were in turn both connected to the interest in saving money and solidarity and concern for society. For some respondents like Gustaf and Lise, the technical interest in optimizing their respective home's energy performance was a strong motivator as well.

Interestingly, frugality appeared to remain important. Despite declining prices and a temporary resolution to immediate electricity shortage issues, respondents continued to emphasize the importance of frugality and the senselessness of wasteful electricity consumption. Gustaf reflected deeply on how the energy crisis made him recognize his past unnecessary electricity waste and how he had become much more conscientious: *"An insight I bring with me is how easily you can lower costs a lot without really having to reduce living standards. (…) Previously I had towel dryers on 24-7 - why? The floor heating in the bathroom was on 24-7 at the same temperature, why? (…) The tumble dyer which we sometimes ran two, three times a day – why? (…) I just did not think about it before."* – Gustaf, 2nd interview. Although most respondents seemed satisfied with the new normal of their heating practices, Robert expressed that the incentives for reducing electricity use were now lower and that they would probably go back to what they did before. However, overall, the alterations made to heating practices seem to be quite easy to sustain.

The experience of the winter also affected the households' decisions around their homes which would affect the heating domain further. Some households delayed significant investments like solar panels or insulation measures for the house, treating the winter experience as a test to assess its severity and evaluate possible investments after the winter. For instance, Gustaf mentioned they decided to "*ride it out [the strained period]*" and explore how well they could manage without substantial investments. Similarly, Monica had considered changing the entire heating system but was putting it on hold. This decision-making reflects a kind of stress apparent in discussions about current and future investments, with households being uncertain about the future, the severity of the winter, and whether it represented a new normal. This uncertainty was sometimes managed by putting effort into other practices such as adjusting settings and routines. Households who successfully reduced their electricity consumption and bills by adjusting settings and routines felt they have the situation under control, and it made them feel comfortable with delaying larger investments. The uncertainty regarding future winters was also impacted by media. Some households were critical about the headlines in 2022 about how serious the winter could be and referred to them as "war headlines" or "propaganda", indicating that they felt it was easy to make the wrong decisions because of stress or fear for the coming winter.

Households were further unsure of how to spend their money wisely and what would be worth it in the long run, given that resources were limited. For example, Gustaf wondered if it would be better to get new windows, solar panels, or insulate the attic. Households compared themselves to friends, neighbours, and people they heard about in the media, to benchmark whether they were making the right decisions or not. As such, some of these investments were either accelerated or abandoned by a deeper knowledge of what seemed to be the best choice for a specific home from an energy performance perspective. Others were still in consideration as households were continuously thinking about what a sound investment would be, moving forward. However, regardless of knowledge, the households expressed uncertainty about future winters.

Monitoring electricity price, use, and evaluating contracts as a part of the knowledge element in both the heating and hygiene practice domain, remained somewhat relevant also in the follow-up interviews, but in a different way. While the immediate need for keeping track of price was not as strong anymore, monitoring had now transformed into a more reflective phase where householders reviewed and evaluated the winter and their decisions, for example around electricity contracts. Importantly, the financial consequences for these households differed, depending on their different contracts, houses, consumption, efforts, and income levels. However, the households had anticipated continuously high electricity bills, and thus some households like Robert, Mats, Monica and Gustaf were surprised that the situation did not become as bad as they had feared. In fact, related to this, some respondents felt that in hindsight they had chosen a suboptimal contract. What was seen as suboptimal also differed between households. Some changed from hourly price to monthly variable price because they felt the effort of shifting electricity use by the hour was not worth the savings in the end. Others were happy with their hourly price contract.

This decision-making process around electricity contracts involved both material configurations and investments in the home, technical interest, and the ability to control appliances, as well as meanings like feeling secure and predictability for upcoming winters. Mats, who recently purchased a new heat pump with the capability to adjust to market spot prices, also opted to switch from a fund contract to an hourly rate. Here, the material configuration (a smart heat pump) affected the choice of electricity contract. Other respondents expressed that the decision-making around electricity contracts was difficult. Stina, for instance, had a mixed contract with both variable and fixed pricing. In the follow-up interview, she expressed dissatisfaction, stating that a contract with only variable price would have been much cheaper. Unhappy with her choice, she planned to switch to a variable contract later in the summer. She argued that the reason for the original choice of contract last summer was because of the "media scare" before the winter: *"Because then [last August] there was a lot of scaremongering about the electricity prices and that they would skyrocket and things like that, so that it was best to get a fixed price"* – Stina, 2nd interview. This reflects that both experience of the winter and knowledge about the system and different contracts affect the choice of contract.

Monitoring price, use and contracts to become informed interacts with both heating and hygiene domains, but the focus had shifted with the season and become less about watching price and consumption in the moment, and more about evaluating the experience of the winter, what had been done and what could be done in the future. Through this process, some respondents decided to change electricity contracts and thus conditions, whereas others felt confident that they would be able to manage a similar situation again.

In summary, awareness around electricity consumption and strengthened meanings of frugality and avoiding electricity waste had persisted beyond the crisis months. Most respondents seemed to have found a "new normal" regarding what heating settings they felt were sufficient for them.

5.2. Hygiene

In the summer of 2023, the observation of prices and planning of activities, e.g. when to do washing, had become less frequent. The respondents now ran washing machines and dishwashers during the daytime without checking the electricity price beforehand. This was also true for households, like Gustaf's, who had put a lot of effort into changing the timing, but no longer paid much attention to the price. As the prices went down, some households also returned to using the tumble dryer. For example, Monica described that while it seemed almost "taboo" to use the tumble dryer in the winter, she now felt that she was comfortable using it for some items again, such as towels. According to social practice theory, time-shifting practices is difficult unless they can be configured into new routines that align well with the overall rhythm of everyday life [16–18,22]. Our results indicate that time-shifting laundry, dishwashers, and showering requires effort, and these families were able to do it for a short amount of time. During the most expensive and price-volatile months of the winter, householders needed to monitor electricity prices to know when to do said practice, which made these activities more difficult to form into a standard routine. However, as financial incentives weakened, the effort to sustain the altered practices was considered too high, especially as lower prices also signal that the effort is less crucial.

For some, however, the new behaviour of changing the timing of certain activities remained. Stina stated that she and her husband still synchronised showers to not waste hot water and argued that this was now part of their routine. One possible explanation for this household's continued flexibility with timing is that they are both retired; a flexibility that households with members working full-time do not have in the same way.

As shown above, the intensity with which some households had engaged in closely monitoring their electricity price and use had decreased since the first round of interviews. Most respondents stated that they were more "relaxed" about their monitoring. However, some kept an eye on the price every now and then, like Monica, who stated that the crisis became a "before and after" when she became aware of power use and when to do power-intense activities such as laundry.

While monitoring had decreased overall, some respondents anticipated having to become more engaged in electricity prices and use again if a similar situation of high and volatile prices would occur in the future. For example, as Jasmine reasoned, choosing when to do dishwashing and washing could be actualized to some extent again: "*We can manage the electricity bill financially, so we can choose if and when to time-shift. But it feels like you've learned to reflect on it, for environmental reasons, and I will continue to do that.*"– Jasmine, 2nd interview.

Material changes in the form of investments also affect the incentive to specifically change the timing of doing activities such as laundry. Although investments typically are decided over longer time horizons than the time span of this study, some investments had already been made in the participating households. For some, earlier investments had finally arrived, while others had changed their minds about investments they had considered at the time of the first interview. Mats, for example, had received a new heat pump, resulting in higher energy efficiency for the house overall, leading to reduced bills, which in turn led to less pressure to reduce electricity costs in other ways: "*Now because the electricity prices are completely different, we run things more on daytime for sure. During the winter we ran almost everything during the night all the time. But then we changed our heat pump and it will be exciting to see, I haven't seen any data on it yet, but I hope it will reduce the power consumption.*" – Mats, 2nd interview. For Lise, the solar panels she had ordered a long time ago had now been installed. She explained that the solar panels have already impacted how she thinks about her own electricity consumption because she is now interested in optimizing it, including selling electricity when she gets a higher price. The PV system gave her renewed incentives to wash dishes and clothes around noon when the power production from the solar panels was high. Furthermore, material differences between the households affected in what way households continued to relate to electricity price: householders with solar panels such as Lise and Jasmine adopted a more sensory logic [63], for example, routinizing laundry practices when the sun was shining to utilize their own electricity production and minimize costs.

While efforts to modify timing and reduce consumption related to hygiene practices seem to have eased, these practices do not appear to have fully returned to their pre-altered state. The meticulousness and frugality adopted during the winter to avoid wasting electricity, such as filling up washing machines and dishwashers, limiting tumble dryer use, and shortening shower durations, were still in place in some households. Gustaf acknowledged that while it required more planning and foresight, they would continue to implement it as much as possible. This ongoing frugality was also expressed by respondents like Joar, Anders, Robert, Monica, and Mats, all suggesting that the winter served as a wake-up call regarding unnecessary electricity consumption and heightened awareness of vulnerability in terms of electricity supply.

6. Discussion

The aim of this study was to understand how households respond to rapid changes in the energy system with volatile electricity prices, using the lens of social practice theory. While social practice theory has been widely adopted to understand domestic energy use in everyday life [22–24], its application to research on crisis situations has not been as widespread, although there are instances where it has been used to examine households' preparedness for storms or power-outs [35,64,65]. Specifically, we wanted to investigate what re-configuration of domestic energy practices occurred during the energy crisis in 2022–2023, and which of these changes remained once the electricity prices and the sense of urgency had dropped.

Previous research has outlined the extensibility and robustness of

various types of practices [23,24], demonstrating that not all practices can be easily adjusted or re-configured, as certain practices are constrained by material factors or rhythm of daily life. Our findings indicate that households rapidly adjusted to the rising electricity prices. Particularly practices in two domains, heating and hygiene, were significantly affected in our participating households (see overview in Appendix 1). Short- and long-term changes in these practice domains will be discussed below. In addition, we observed that particular changes to elements in these domains of practices seem to be important. Acceleration of investments influenced the material elements of particularly heating practices, increased monitoring added new knowledge elements, and strengthening of frugality, sufficiency and solidarity as meaning elements seem to have re-configured practices significantly. These elements interact with each other and with the practices they are part of, for example data on electricity price and use affects when and how other practices are done, and changes how future investments are considered. Whether investments are made will in turn be partly determined by the results of changed practices. For example, a satisfying set of thermal comfort practices that could adapt to the volatile electricity prices may decrease the perceived need to update the heating system. In turn, investments can affect how other practices are performed and if they are re-configured or not – for example, acquiring a highly efficient heat pump may reduce the need to change thermal comfort practices in response to price changes.

6.1. Short-term changes to energy practices

In the shorter term, households engaged in actively monitoring the price and time-shifting of activities, especially practices related to the domain of hygiene such as laundry and dishwashing. Households also changed settings on their heating system while increasing the use of additional heating sources and clothing. Changing material conditions was actualized as some households made or considered investments in new technologies. This re-configuration of energy practices was made based on householders' personal meanings, knowledge, material resources and convenience and rhythm of their daily lives. Interestingly, our findings align with prior non-crisis research on domestic energy practices, where hygiene and heating habits were more adaptable and easier to time-shift, while practices related to food and entertainment appeared more robust because they are more sequenced and synchronised, meaning that they are bound to other practices and fixed in daily life rhythm [22–24]. In our interviews, short-term changes to electricity practices were driven by solidarity and households' concerns about their financial situation, as well as the economic situation in society at large, resembling findings from the 2001 energy crisis in California [31].

Previous qualitative research on disruptions in electricity supply and energy crisis has largely been focused on blackouts and power cuts [34,35,66]. These studies find that people adapt to blackouts by reviving older, dormant practices using different technologies and activating skills [35], and that these types of disruptions unlock a creative and innovative ability in humans to adapt their everyday life [34], although differences in vulnerability and context affect what consequences people must deal with as a result of the disruption. In contrast, our study investigates a crisis that in hindsight primarily involved highly volatile prices and concern for risks of power cuts and power shortages. However, as it turned out, power cuts were avoided, in part because of Swedish households' efforts to reduce electricity use. Our households thus reported a more diverse set of responses to the 2022–2023 energy crisis, including both adoption of older practices such as using fireplaces, hanging clothes to dry, wearing more layers and shutting doors, and newer ways of adapting to variable electricity supply such as time-shifting electricity use and investing in smart technologies.

6.2. Long-term changes to energy practices

When prices went down, some energy practices went back to their pre-crisis state, especially in the hygiene domain. For example, some households started using the tumble dryer again, and were more relaxed about the use and timing of hot water and appliances. This supports previous non-crisis research showing that while time-shifting of electricity use certainly is possible, it sometimes requires too much effort to sustain, especially if financial or other incentives are weak [19,21]. However, mirroring insights from the Californian energy crisis in 2001 [31], households in our study did not return to all their pre-crisis practices even though prices decreased and the immediate threat of power shortage was gone in the spring of 2023. Renewed meanings of frugality and sufficiency seem to motivate households to reduce unnecessary washing, tumble drying, and heating, especially when such efforts could be easily routinized. For some households, even certain time-shifting remained even though the impact on electricity bills was marginal.

While previous studies such as Rinkinen [35] found that disruptions in the form of longer blackouts caused re-configuration and revival of practices, these disruptions led to limited reflection on energy use in general. In our case, households stated that the expensive and strained winter had made them reflect on their electricity use and in particular unconsciously wasteful use. Our results thus suggest that the crisis stimulated reflection on sufficient versus wasteful electricity use in these households, because of the adjusted settings, increased monitoring and overall strengthened focus on electricity in everyday life. Furthermore, in line with previous research, we observe how specific technologies and material arrangements affect and at the same time obscure certain electricity use [16,30,67], making electricity use immaterial to residents [14]. An illustrative example was the respondents' reflections on floor heating and towel dryers as passive, hidden electricity consumers. It was not until the respondents reviewed their electricity consumption in response to the energy crisis that some of them discovered that these applications were using more than sufficient electricity. These observations can be connected to different experiences of systems of provision, where the way electricity materialises in everyday life will shape the relationship between households, supply and demand, not only in the way practices are formed but also the way households view electricity as a resource [14]. The material configurations of heating systems such as floor heating make the electricity consumption easy to forget. In fact, the way the respondents talked about how they had not noticed or thought about these appliances before indicates that the very system is hidden and “backgrounded” [19]. This also illustrates how practices such as keeping warm, material artefacts such as floor heating systems and infrastructures such as the grid affect each other [30]. It seems that a system that is designed to stay on will stay on, and by extension these systems will affect electricity demand and domestic energy practices [16]. The upside is that they, once adjusted in response to the energy crisis, may stay permanently on a lower setting.

Disruptions in electricity supply in the form of blackouts expose people to weather cycles and rhythms of infrastructures, and it has been argued that although it is convenient to have provision systems that create an illusion that there are no such cycles [32], rhythmicity helps people to organize everyday life and increase the awareness of ecological boundaries [14,15,32]. As the energy crisis of 2022/2023 in Sweden resulted in very high and variable prices and warnings from authorities, suppliers and media, but led to no blackouts, it can be more likened to droughts and water shortage, where households are encouraged to reduce water consumption but are not completely cut off from supply [15]. Despite not leading to any blackouts, we argue that the energy crisis in Sweden still exposed households to rhythmicity: both that of weather and high electricity demand caused by low temperatures, possibly that of climate change in the form of low hydro reservoirs, that of infrastructure maintenance in the form of malfunctioning nuclear power plants, and, not least, geopolitical conflicts. The price peaks and threats of power cuts occurred when all these rhythms and events culminated, materialising the electricity system for households more than before [14]. In this study, the seasonal rhythmicity of infrastructure

was perhaps most visible in the follow-up interviews when prices had gone down and there was an abundance of electricity in Sweden due to lower heating demand and more power production, causing households to no longer have to time-shift or reduce their electricity use as carefully.

6.3. Recognizing households' efforts during an energy crisis

It is an important insight that households were able to act in a time of crisis and make a significant difference through reducing and time-shifting electricity consumption, which helped significantly to control the Swedish electricity price and mitigate power cuts [8]. However, for households to act again in future crises, we believe it is important to consider how stakeholders communicate the impact of re-configured practices. Our results show that households in hindsight perceived that the media attention to the energy crisis was exaggerated and intended to scare, especially since they felt the situation did not turn out as serious as portrayed in the media [8]. While some disruptions at the infrastructure level cannot be solved solely by households' efforts, power cuts caused by power peaks can be prevented and price peaks can be mitigated, as evidenced by this crisis. The energy crisis of 2022/2023 is thus in that sense more dynamic than for example a week-long power-out, as it affects, and is simultaneously affected by, households' activities. The crisis is in that way similar to the Covid-19 pandemic, in which households were asked to help hindering the transmission of the virus, motivating their practice change by care for themselves and others as well as restrictions [41]. Yet, similarly to the pandemic, households cannot be expected to know how much they contributed to avoiding power cuts or how their efforts mitigated price peaks. We argue that there is a need for clearer communication from authorities and grid operators towards households regarding in what way their efforts to "flatten the curve" [5] during the energy crisis mattered for the energy system. Lacking this feedback, there is a risk that households may perceive the situation as exaggerated and dramatized, rather than recognizing that their efforts could have been instrumental in preventing the situation from escalating to its full severity. The interviews showed that the way respondents understood the situation and whether they felt confident that their efforts mattered seem to play an important part in knowledge and meaning elements interwoven in changing energy practices. Authorities, media, and grid operators thus need to be careful with households' engagement and not take the legitimacy of crisis-like situations for granted. We believe that not communicating with households is a missed opportunity to make valuable use of this crisis experience.

6.4. Limitations of doing energy research in a hurry

Making use of a crisis for research purposes means acting fast to collect relevant data [2]. However, performing data collection both quickly and with a minimum of funding leads to limitations. One limitation of this study concerns the diversity of participating households. We were not able to reach low-income households or other vulnerable groups, and hence cannot draw any conclusions about how such households were affected by the energy crisis and increased electricity prices. This was reflected in interviews where the respondents reported relatively little concern about their immediate financial situation, with several participants indicating they had enough financial resources to consider investments in energy efficiency. Likewise, our sample lacked representation from households with young children, which can affect the results since this group often faces challenges in time-shifting activities [22]. Considering the circumstances of the study, the number of households we could recruit and interview within the limited timeframe was restricted. Nonetheless, we received different answers as well as similarities across the dataset, indicating that saturation was achieved. Despite the limitations above, we believe that our study has resulted in valuable insights about an extraordinary event in recent Swedish energy history. Future research could focus on vulnerable households, including those with small children, to delve deeper into the ramifications of the energy crisis through the lens of energy justice.

7. Conclusions

While national statistics on residential electricity consumption highlight households' efforts to reduce and adjust their electricity usage, this interview study explains the specific ways in which these changes were implemented within a group of Swedish households. The study contributes to both research and practice. Contribution to energy research is made by demonstrating how practices evolved during times of crisis. The findings suggest significant involvement and changes in diverse interrelated social practices within households during an energy crisis. This includes adjustments in practices in the domains of heating and hygiene such as keeping warm and clean, washing and drying clothes and dishes. The adjustments were affected by changes in practice elements related to monitoring price and usage, changing material conditions through investments and strengthened meanings of frugality, sufficiency and solidarity. Some efforts seem to have been routinized and remained at a lower level of electricity consumption in these households even when prices went back to normal, reinforced by meanings of frugality and sufficiency. Thus, the crisis and high price seemed to have made electricity use visible for these households and motivated them to review it. However, certain efforts like active time-shifting, accelerated by high prices and emergency communications from media and authorities, reverted to previous patterns after the crisis abated in Sweden. Relating our study to previous research on disruptions in infrastructures and practice change, we suggest that the energy crisis of 2022/2023 at least in the Swedish context has more in common with past studies on droughts than blackouts, given that the energy supply was strained but never cut off.

Furthermore, this study contributes to practice, by identifying specific challenges and opportunities derived from our findings, which have implications for energy technologies, policy initiatives, and the work of practitioners within the electricity system. Firstly, our findings highlight the significance of providing households with feedback on their efforts following a crisis. In the absence of clear communication about how changes in domestic electricity usage contributed to mitigating strained situations in the power system during the crisis, motivating continued efforts in the future becomes challenging, with a potential risk of households misinterpreting what is happening in the electricity system and the severity of the situation. We suggest that the practitioners within the electricity system, and Swedish authorities managing the national grid, as well as media and politicians need to take on the responsibility for communicating more clearly to households. Secondly, we believe that there is potential for improvements in certain domestic energy technologies and how they "communicate" with users. Specifically, systems such as floor heating, towel dryers, and similar installations can inadvertently constrain users to a fixed electricity usage that is ultimately unnecessary. We propose that implementing more active control mechanisms for such systems or increasing the need for user interaction could enhance the visibility of electricity consumption. As shown in this paper, active participation from households as a response to an energy crisis is not only possible but may be one effective way to mitigate the effects on society, but to do so again, households will need support from the electricity system's stakeholders.

CRediT authorship contribution statement

Hanna Björner Brauer: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hanna Hasselqvist:** Writing – original draft, Project administration, Methodology, Funding acquisition, Data curation. **Maria Håkansson:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Data curation, Conceptualization. **Sara Willermark:** Writing – review &

editing, Writing – original draft, Supervision, Conceptualization. **Carolina Hiller:** Writing – review & editing, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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Appendix 1

Overview of practices by the domains heating and hygiene, showing how some activities or re-configurations within the domains are related to investments, especially in the heating domain. It is also indicated which of the practice re-configurations that were temporary (lasted for a shorter period during the winter) and which ones were longer-lasting (lasted until June 2023).

	Heating	Hygiene
Investments	Buying new heat pump	Buying a monitor for electricity price
	Buying additional heat pumps	
	Buying smart radiators	
	Considering, researching and comparing new investments such as solar panels, insulation, replacement of windows, new heating systems.	
Temporarily re-configured practices	Using fireplace more often	Showering at the gym
	Using electric fans to circulate heating	Doing laundry and dishwashers during cheaper hours and at night
	Using (electric) blankets, heating pillows	Hanging laundry at night
	Adjusting temperatures based on who is at home	Hanging clothes to dry by the fire
		Following price in apps
		Analyzing prices
Longer-lasting re-configured practices	Reducing indoor temperature	Taking shorter showers
	Reducing temperature in garage and storage areas	Synchronizing showering
	Closing rooms with colder temperatures	Filling up washing machine and dishwasher
	Turning off floor heating	Stopping/reducing use of tumble-dryer
	Adjusting temperature in response to weather	Turning off towel-dryers
	Reducing share of direct electric heating, increasing use of heat pump	Mapping and inventorying electricity use at home
	Wearing more clothes	
	Mapping and inventorying electricity use at home	

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