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Home heating cultures in transition: exploring material participation, norms and practices in Swedish households

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Abstract

Background The transition to sustainable energy systems requires a deeper understanding of how households experience and negotiate heating practices over time. In Sweden, where residential heating remains a major source of energy use, heating systems are embedded in daily routines, shaped by evolving technologies, social norms, and material contexts. This study draws on the Energy Cultures Framework and oral history interviews to examine how Swedish households recall and reflect on their "heating careers", tracing changes in infrastructures, behaviours, and meanings across the life course.

Results The findings disclose a transition from manual, labour-intensive systems to automated and centralised heating solutions, alongside shifts in comfort expectations and user engagement. Narratives highlight how certain practices have persisted, been abandoned, or re-emerged, particularly during moments of disruption such as the 2022 energy crisis. While automated systems offer convenience, they can also reduce energy awareness and user agency. Financial constraints, warm rent arrangements, and housing conditions further shape how households engage with heating transitions, revealing inequalities in the capacity to act.

Conclusions Understanding home heating as a socio-technical and emotionally embedded practice is crucial for designing inclusive energy transitions. This study shows how identity, habit, memory, and structural conditions shape household heating cultures over time. Oral histories offer valuable insight into how people adapt to and resist change, emphasising the need for policies that acknowledge diverse experiences, promote energy literacy, and address the socio-material inequalities that influence participation in heating transitions.

Keywords Home heating, Energy culture, Heating practices, Household engagement, Oral history, Sustainable energy transitions, Sweden

Background

The global imperative to mitigate climate change has placed the transition to a fossil-free society at the centre of energy policy and planning. While national strategies vary in scope and ambition, many countries have committed to long-term decarbonisation goals in line with the Paris Agreement. Heating systems are particularly relevant in the context of energy transitions due to their significant contribution to residential energy consumption and carbon emissions [1]. Space and water heating constitute nearly half of global energy use in buildings,

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making home heating a crucial climate issue. These energy services, providing warmth in winter and hot water for sanitation, are essential. Globally, around 40% of households require space heating at some point during the year, which accounts for a significant share of residential energy consumption, especially in colder regions [1].

Despite the central role heating has for the home and people's everyday lives, the low-carbon heating transitions are frequently framed in technological terms, emphasising goals such as increased efficiency and reduced carbon emissions [2] and neglecting the human dimensions of these transitions, particularly the everyday experiences and practices of individuals and households [3, 4]. However, such transformations are far from solely technical; they also reconfigure social practices, institutional arrangements, and the ways in which people interact with and use energy in their daily lives [5]. Understanding the social dimensions of energy transitions is thus essential for addressing the broader implications of moving towards a fossil-free future. Rather than passively adapting to infrastructural shifts, households actively contribute to and influence the direction of sustainability transitions [6].

This paper will analyse how households in Sweden interact and reflect upon the heating system and how they consume heating at home. By employing oral history as a methodological approach, it seeks to uncover the personal, social, and cultural dimensions of domestic heating practices.

Oral histories are used as a way to engage households and encourage them to talk about home heating through stories of everyday life [7]. These narratives reveal how they carry out daily activities, including how they interact with heating systems. Heating systems serve as a means for households to carry out activities that create a comfortable indoor environment and achieve a temperature they perceive as pleasant [8]. When studying home heating, it is essential to examine these activities, practices, and routines in order to understand how heating systems are used and interacted with.

As an analytical framework, the Energy Cultures Framework (ECF) developed by Stephenson et al. [9] will be applied. The ECF offers a comprehensive approach to understanding how heating practices emerge from the interplay between societal norms, material conditions, and social practices. It encompasses a broad range of factors, including economic considerations, values, household activities, acquired technologies, and everyday routines. A more detailed explanation of the ECF is provided in the following section.

To capture the diversity of energy cultures across different contexts, we begin with people's own narratives about their heating experiences throughout their lives, or at least as far back as they can recall. The aim of this paper is to analyse how heating cultures are reflected in the oral history interviews, which illustrate various approaches to how and why people use and interact with their home heating system. These different narratives offer a household perspective on the everyday interaction with domestic heating in Sweden over the past 70 years. From these stories, we have derived key energy culture themes that we identify as important to consider in a broader energy transformation. To guide this analysis, the paper addresses the following research questions:

- How do individuals in Sweden recall and narrate their everyday experiences of domestic heating across the life course?
- How do these personal narratives illustrate changes in material infrastructures, social norms, and household practices related to home heating?
- What forms of continuity and change in domestic heating cultures emerge over time, and how can these insights support socially attuned energy transitions?

The paper is organised as follows: first comes a discussion of earlier research on home heating and the theoretical framework used in this study. This is followed by a description of our methodology and key findings from the oral history interviews. The results are analysed in terms of material culture, norms, and practices, and the paper concludes with policy implications and recommendations for future research.

Understanding heating transitions: the role of lived experience in shaping energy cultures

The global imperative to decarbonise energy systems has brought increasing attention to domestic heating, which remains a major source of fossil fuel consumption and greenhouse gas emissions. Despite significant policy and technological efforts to drive heating transitions through electrification, heat pumps, or district energy systems, research continues to show that such transitions cannot be fully understood or effectively implemented without considering the social, emotional, and cultural dimensions of household energy use [10, 11].

While policies typically target efficiency and carbon reduction, they often overlook how households experience, interpret, and negotiate heating transitions in everyday life [12]. This is shown by, for example, Johnson [13] who explores control and user experience in a mid-century UK scheme designed to reduce domestic labour. While residents generally accepted the system's performance, some expressed frustration over limited control

and lack of transparency, highlighting how centrally managed systems can create detachment and passive energy use. Several strands of literature underscore the value of focusing on households' everyday experiences. An expanding literature on 'energy biographies' [11, 14–16] underscores the importance of closely examining how individuals experience and navigate energy transitions over time. Shirani et al. [17] for example use energy biographies to understand how heating practices are shaped by biographical, emotional, and social contexts. Kerr et al. [18] and Küpers et al. [19] further expand this by showing how emotions, routines, and spatial attachments inform people's responses to heating transitions. They argue for a broader conceptualisation of "thermal infrastructures" that includes not only technical systems but also emotional and symbolic dimensions. Similarly, Middlemiss et al. [20] demonstrate how transitions can create anxiety and resistance, particularly when they challenge established meanings of care and domestic security.

Darby [4] shows how personal narratives of domestic energy use foreground the relational, place-based, and affective aspects of transitions. Her work reveals how local housing conditions, life-course changes, and municipal actors shape heating practices over time. This resonates with Arapostathis et al. [21] and von Platten et al. [3] who discuss intergenerational energy knowledge and everyday negotiations within households, highlighting the entanglements between technology, gendered labour, and infrastructural change. Previous research also shows how households express attachments to specific forms of warmth, such as the glow of a fireplace [22, 23], which are not easily replaced by abstract notions of efficiency. Heating is not simply about temperature regulation, but about maintaining comfort, identity, and emotional well-being [24] and, as shown in rural Australia, also about tradition, social cohesion, and a strong sense of place [25].

Affective dimensions are increasingly recognised as central to energy transitions. Martiskainen and Sovacool [26] argue for the need to incorporate emotions into policy design, documenting a wide spectrum of emotional responses to energy technologies, from pride and nostalgia to confusion and grief. Similarly, Ransan-Cooper et al. [27] find mixed emotional responses to solar battery systems in Australia, highlighting the importance of early involvement of users in technology design and decision-making.

Beyond emotion, domestic transitions are shaped by broader socio-material structures and imaginaries. Phillips and Dickie [28] examine how rural imaginaries influence responses to low-carbon transitions. Based on interviews in English villages, they found that many residents viewed rural life as the antithesis of change, expressing reluctance to alter established ways of living. Even when change was accepted, it was often seen as inevitable rather than personally actionable. Their findings highlight how spatial identity and attachment can constrain the imagination of sustainable futures, particularly in rural contexts. Kuijer and Watson [29], using oral histories in UK council housing, show how changing housing designs and domestic routines co-evolved with rising heat demand. They trace the spatial and temporal expansion of heating from singular rooms to whole homes, driven by shifts in appliance use, privacy norms, and conceptions of comfort.

This body of literature underscores the need to move beyond narrow techno-economic framings of heating transitions. A valuable conceptual tool in this regard is the Energy Cultures Framework (ECF), which understands energy behaviour as the result of dynamic interactions between material culture, social norms, and everyday practices. By embedding energy use within broader socio-technical and cultural contexts, the framework provides an integrated lens for analysing how everyday life and societal structures co-produce and are in turn shaped by energy transitions [9].

By applying the ECF, we can explore how households engage with heating systems through the interwoven cultural, material, and practical dimensions of energy use. The ECF provides a multidimensional lens for analysing everyday interaction with energy infrastructure, including home heating [9, 30]. Rather than through formal participation, household involvement in energy transitions often unfolds through mundane routines and habitual engagement with technologies, which can foster a sense of agency and connection to broader energy transitions [31]. Figure 1 presents the ECF as outlined by Stephenson et al. [9], illustrating how these elements interact to influence household energy culture.

The concept of an energy culture represents the combination of a household's material culture, norms, and practices in shaping energy use and interaction.

Material culture refers to the physical artefacts and infrastructure present within a household, such as the building itself and its technological components, including energy-related devices [32]. The interaction with these materials, referred to as material participation, links closely to this material culture. Ryghaug et al. [31] introduce the concept of material participation as an "object-oriented" or "device-centred" approach, highlighting the role that technologies and material objects can play in facilitating everyday political participation. Rather than assuming that such participation is already occurring, they suggest that the adoption and use of technologies such as electric vehicles, smart meters, and rooftop photovoltaic systems may create opportunities for individuals to engage with energy transition in socially

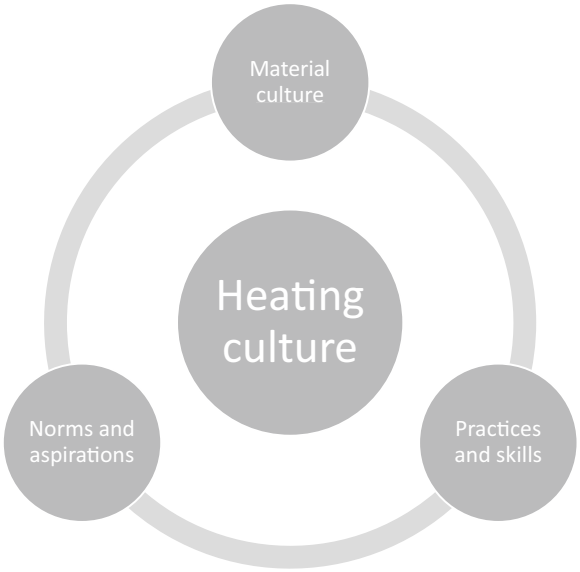

Fig. 1 The Energy Cultures Framework [9]

transformative ways. In this view, material engagement becomes a possible entry point into broader political awareness and action, though not a guaranteed outcome. Participation through such means is often associated with a heightened sense of responsibility and awareness of the need for active involvement in sustainability efforts [33], while recent research has also emphasised the importance of recognising and valuing diverse forms of participation beyond technologically mediated engagement [34–36]. In our study, we have conducted oral histories with households without any unique or special interest in heating and from different socio-economic groups (see "Methodology" section), which provides us with the opportunity to analyse different versions of energy cultures in homes.

In Fig. 1, *norms* represent the expectations and societal standards surrounding energy use, while *aspirations* reflect individuals' visions for the future, shaped by cultural meanings attached to energy-related behaviours [32]. Norms influence household decision-making, for example in the adoption of energy-efficient technologies or the prioritisation of comfort over conservation. Aspirations, on the other hand, often motivate transformative actions, such as transitioning to renewable heating systems. The meanings and images associated with heating systems play an essential role in shaping norms and aspirations. For example, a household's desire to adopt a geothermal heating system might stem from its association with environmental responsibility and modernity. Understanding these normative and aspirational drivers is critical for designing policies and interventions that align with household values and motivations.

Practices refer to the habitual and routine actions carried out by households, such as setting the thermostat, using wood stoves, or insulating windows during winter [30]. These practices are shaped by societal norms, material culture, and individual competencies [9]. The inclusion of *skills* in this dimension emphasises the importance of knowledge and abilities that enable households to adapt to new heating technologies and systems [32]. For instance, a household's ability to program a smart thermostat or maintain a pellet stove reflects both technical competence and cultural acceptance of the technology. Expanding the concept of practices to include skills recognises that energy behaviours are not solely dictated by available technologies or societal norms but also depend on individuals' capacity to interact effectively with these systems [32].

While much of the existing literature on domestic energy transitions focuses on behavioural models, technical innovations, or snapshot-style qualitative methods, relatively little attention has been paid to the role of memory, life-course experience, and long-term sociomaterial change. This article addresses that gap by drawing on biographical and oral history methods to examine how individuals in Sweden reflect on their heating practices across different homes and life stages. In doing so, we build on and contribute to an emerging body of scholarship on energy biographies [e.g. 4, 11, 37] and biographical inquiry in energy research [38], while also seeking to extend this work by applying an oral history approach grounded in the ECF. Our research design, therefore, connects theoretical interest in temporality and lived experience with a qualitative methodology capable of tracing patterns of continuity and change in domestic heating over time. The ECF provides a conceptual lens, helping to identify interconnections between material culture, norms, and practices in shaping energy behaviours.

We consider the ECF particularly well-suited to this study for two reasons. First, the framework offers a structured way to conceptualise the dynamic interplay between everyday routines, material arrangements, and social expectations—an interplay that emerges clearly in life-course narratives of heating. Second, the ECF accommodates the temporal layering of practices, allowing us to trace how changes in heating technologies, domestic norms, and individual competencies evolve over time. In this way, it complements the oral history method by offering a flexible but coherent structure for thematic interpretation while remaining open to the complexity and situatedness of lived experience. Our aim is not to apply the ECF deductively but to use it as an interpretive scaffold that helps us identify patterns across diverse biographical accounts.

Methodology

The oral histories used in this paper were collected within the project 'JustHeat: Looking back to move forward—a social and cultural history of home heating'. JustHeat is an international, interdisciplinary initiative funded by CHANSE, which investigates historical heating transitions to inform future policymaking for sustainable and just home heating. The project is grounded in oral history methods and has compiled oral history interviews across four national contexts: Finland, Sweden, the UK, and Romania [39]. In this article, we focus solely on the Swedish material and analyse it through the lens of the ECF, acknowledging that other dimensions of the empirical material will be addressed in future publications from the JustHeat project.

Sweden constitutes a particularly compelling case for examining domestic heating transitions, given its cold climate and correspondingly high number of heating-degree days, among the highest in the EU. Despite the relatively energy-efficient housing stock, the demand for heating remains substantial. District heating plays a dominant role in meeting this demand, accounting for approximately 50% of the national heat market, in stark contrast to the EU average of 12% [40]. Other common heating methods include electric systems, such as heat pumps, and wood-based heating [41].

To fully understand how these diverse heating systems are experienced, negotiated, and embedded in everyday life, it is essential to engage with the perspectives of those who live with them, an aim well served by oral history methods. Oral histories enable the inclusion of a wider range of voices beyond those that typically dominate public and policy debates. By incorporating the everyday experiences of individuals, they broaden discussions on energy and heating transitions, shedding light on the complexity and contextual nature of domestic heating transitions [2, 7, 42]. To examine the lived experience of heating transitions in Sweden, 44 oral history interviews were conducted between 2023 and 2024. Half of the interviews took place in rural or semi-rural areas in 2023, and the remaining half in urban areas in 2024. The sample reflects a broad diversity in terms of housing type and tenure, age, gender, income level, occupation, and both historical and current heating arrangements. Participants ranged in age from their early 20s to over 90, with a significant number born before or during the mid-twentieth century. This wide age range enables a longitudinal perspective on domestic heating practices. Approximately 20 participants were aged 70 or older, the majority of whom lived in rural areas and thus had first-hand experience of a range of heating technologies over the course of their lives, including wood-burning stoves, oil heaters, electric radiators, and more recently, district heating or heat pumps. In contrast, the youngest cohort, those in their 20s and early 30s, comprising seven participants, had little to no personal memory of pre-modern heating systems. Most resided in urban settings where district heating is prevalent. This generational diversity provides a valuable basis for examining both individual transitions in heating practices and intergenerational differences in expectations, routines, and experiences related to domestic warmth.

Each interview began with an open prompt inviting participants to recall their earliest memory of keeping warm at home [39]. This initiated a chronological account that traced heating practices through different homes and life periods. The housing pathways approach [42] guided participants to describe systems, behaviours, and changes in their heating experience over time. In line with oral history methodology, participants determined the flow and content of the conversation, while the interviewer encouraged elaboration or clarification and helped maintain a chronological structure. Interviews lasted between 1 and 2 h and were audio recorded and transcribed in full.

The analysis followed a hermeneutic circle approach [7], which interprets data at two levels. The first level treats each account as an individual life story, analysed through inductive, open coding to identify recurring patterns and divergences. The second level moves beyond the individual to draw out broader socio-material and cultural dynamics, using thematic narrative interpretation [43]. This two-tiered analysis allows us to trace how personal stories reflect and refract wider socio-technical changes. The ECF provided a conceptual lens, helping to identify interconnections between material culture, norms, and practices in shaping energy behaviours.

Oral history has increasingly been recognised in energy studies as a method that can capture the long-term, situated, and affective dimensions of energy use. Darby [4] argues that personal stories are not peripheral but central to understanding energy transitions. We build on this by emphasising the importance of stories that attend to temporality, revealing how expectations, preferences, and routines are shaped by lived experience across the life course [2]. Several studies demonstrate how early experiences of heating leave lasting impressions. Goodchild et al. [7] and Butler et al. [37] show that practices such as layering clothes in bed, rationing heating regardless of income, or preferring open fires often stem from childhood experience. These findings challenge the assumption that energy behaviour is easily changed through incentives or technology and instead suggest a deeper cultural and historical embeddedness [44]. Oral histories provide a way to listen for messiness, contingency, and unintended consequences, elements that are crucial

for developing more equitable and grounded approaches to energy transitions [42]. This aligns with Greene and Royston's [38] reflection on biographic inquiry, where participants are shown to articulate past practices in nuanced and reflective ways. Their concept of discursive co-development captures the collaborative nature of the interview process, where meaning emerges through the interaction between researcher and participant. Like oral history, this approach reveals how embodied, routinised practices such as domestic heating can be meaningfully narrated and situated within broader life trajectories.

Results: home heating cultures in Sweden

The findings from the oral histories are presented according to the three dimensions of the ECF: material culture, norms and aspirations, and practices and skills. These dimensions are not treated as isolated analytical categories, but as overlapping and co-evolving elements that help trace the dynamics of heating transitions in everyday life. Through the biographical narratives, participants reflected on their lived experiences of domestic heating across different life stages, housing contexts, and technological regimes.

Material culture

Material culture refers to the physical infrastructures, technologies, and systems that shape how energy is used within households. In the Swedish interviews, participants' accounts illustrate shifting material arrangements over time, from wood-burning stoves and oil heaters to electric radiators, district heating, and heat pumps. These changes shaped not only thermal comfort but also the degree of user engagement and technical competence required.

In childhood memories, wood-burning stoves stood out as the dominant and most evocative technology. Even when multiple fuel types had been used, such as wood, coal, or oil, it was wood that was most often remembered. These stoves required frequent tending, manual fuelling, and a bodily awareness of fire and temperature. Some also recalled more improvisational uses of available materials for fuel, such as burning household waste in shared boilers:

> *They set fire to rubbish and such in those days, too. It wasn't environmentally friendly that way, but it was a good way to get rid of garbage. (Majvor)*

Such recollections highlight the embeddedness of heating in broader material systems both infrastructural and ecological [7, 9]. They also reflect a different cultural orientation to heat as something produced through effort, skill, and proximity [11].

Material shifts were often tied to changes in housing policy and building design. Participants who moved into homes constructed during the Million Homes Programme in the 1950s–1960s recalled the introduction of central heating and indoor plumbing as transformative. During this era, the share of households with central heating increased from 59 to 82% and the share of households with access to a WC increased from 52 to 82% [45]. This was a change connected with both memories and a feeling of entering heaven:

> *It was heaven because there was central heating and hot water and a bathroom and toilet and stuff like that indoors. (Majvor)*

These shifts illustrate how state-driven housing policy reconfigured not just material conditions but also symbolic understandings of modernity, cleanliness, and domestic dignity [8]. Central heating was experienced as clean and convenient. In the 1980s, many went from oil to an electric boiler, which was also described as a convenient heating system that did not need much attention. The oil phase was experienced as an improvement because oil was cleaner and more convenient than coal and wood, and gave more even heating over the day. Direct electricity radiators had also been used by many and were generally appreciated, as they were considered even more convenient than oil heating. They eliminated the need for fuel deliveries, storage, and regular maintenance of burners or tanks. However, in most cases direct electricity radiators had meanwhile been abandoned totally or replaced with a heat pump.

District heating systems were otherwise the system most of our informants had experience of. District heating is common in urban areas and is valued for its efficiency, low environmental impact, and ease of use. It had, however, the effect that it detached the households from direct involvement in heating. Many interviewees noted that district heating required minimal interaction, reducing the need to understand or engage with the heating system. The interaction was limited to adjusting the temperature on the radiators and it was priced for being a fantastic system thanks to its ease of use. However, most people did not have any stories to share around district heating, because the system had just been running without any need for interaction:

> *But I think that is a result of the fact that there has been district heating everywhere I have lived. It's very positive in the way that you don't have to think about it. (Hampus)*

This increasing automation meant that many users no longer understood how their heating systems functioned or where the energy came from:

No, it was water … it wasn't electricity, it was water heated by oil, I think it was. I should know that, really. (Harald)

For most people, the main link to the district heating system was through their thermostats. Those who had lived through many different heating systems remembered the appreciation of the thermostats on the radiators:

It felt super modern to have thermostats that could control the heat. There was not only a scale on the radiator but they had to maintain the right temperature. I think that was a bit special. (Helena)

However, many of the tenants lacked incentives to control the district heating system. In Sweden it is common to have the heat included in the rent, so-called 'warm rent', as opposed to a cold rent where every apartment pays for their actual energy use [45]. The heating system is also often weather dependent, and the heat is turned on and off at specific dates or in relation to the outdoor temperature. That the radiators turned on and off by themselves did not encourage the tenants to adjust them:

Interviewer—But you have the possibility to adjust the temperature in the apartment?
Respondent—Yes, I have. But it's not always that … Because it's weather dependent, it's not necessary to adjust the system. (Alexandra)

The district heating system is also slow to respond, making it unclear what effect user interaction has. Combined with the fact that the system is largely self-regulated, this makes it rational for users to disengage rather than attempt to adjust the settings.

I think, I have the attitude that the element is always on, at max. I know that the elements shut themselves off. There is no need to go and adjust them. (Hampus)

Such experiences show how material arrangements can lead to passive energy subjects [31], where technological infrastructure obscures the workings of energy systems and limits opportunities for conscious engagement.

Even when new technologies such as heat pumps or underfloor heating were adopted, these introduced new challenges. One participant described recurring technical problems and difficulties in understanding how her heat pump worked:

With the heat pump, I had a harder time understanding how it works technically. So, there was a bit of trouble with it sometimes. Sometimes it didn't heat the water or the house. (Lotta)

This underscores how new material cultures can create both empowerment and alienation, depending on users' familiarity with the systems and the quality of support they receive.

Other participants reflected on the built environment's role in shaping heating outcomes. In rented apartments, where tenants had little control over building maintenance or heating technologies, frustration was common:

They probably didn't have moulding around the windows, had single-pane glass, and were very draughty. … So, it was very cold, even though everything was set to the maximum, so to speak. It was quite sad. (Carolina)

Here, poor building quality undermined the effectiveness of even the most advanced heating systems, highlighting the co-dependence of energy infrastructure and housing stock [4, 7].

Finally, more recent experiences with underfloor heating demonstrated how technological innovations shape sensory perceptions and bodily routines:

We have underfloor heating in both bathrooms, and I think it's so nice in the morning. You come in with cold feet, step onto the warm floor, and just have to brush your teeth before heading to work. I think it's wonderful that the bathroom is warm—especially the floor. (Mårten)

At the same time, challenges in retrofitting and managing such systems, particularly in older condominiums, reminded participants of the infrastructural complexity and fragility underpinning modern comfort:

It's hard to know where the pipes are, and the heat isn't even. It's been difficult to maintain. (Alexandra)

These reflections emphasise that heating transitions are not just about switching technologies, but about how those technologies are situated in material contexts that affect both thermal outcomes and user agency.

Norms and aspirations

Norms and aspirations refer to the shared expectations, cultural values, and subjective standards that shape household perceptions of heating needs and experiences. The feeling of being warm or cold is an individual feeling, but it is also related to expectations. When talking with elderly people who have experienced really cold winters, poorly insulated houses, and lack of sufficient heating, they very seldom remembered that they froze when they were young. A typical response was:

No, I don't remember being cold, except for when outdoors. (Solveig)

However, on further discussion, it was clear that it had been cold:

> *I also remember that it was always cold at my grandmother's house. … But you just walked around and froze. It was cold in the house. (Carolina)*

These accounts suggest that being cold was normalised in earlier decades, embedded in cultural norms about what was acceptable or tolerable. In contrast, younger participants tended to express a baseline expectation of thermal comfort indoors:

> *It feels like it's something you've always just taken for granted. It is warm indoors and cold outside. (Hampus)*

Such statements illustrate how heating expectations have shifted alongside increasing material standards. These findings echo earlier studies [e.g. 4, 37] arguing that evolving norms of comfort are central to understanding domestic energy transitions.

Heating also served as a status marker. One interviewee recalled the stigma of smelling like kerosene, which was interpreted as a sign of poverty. Others drew parallels between energy crises past and present, noting the reappearance of wood smoke smells during the 2022 energy crisis, signalling renewed reliance on cheaper fuels.

Norms of comfort were also shaped by cross-cultural experiences. Indoor temperatures in Sweden are comparatively high, typically averaging between 21 and 22 °C, although higher temperatures are also common. Several respondents who had lived abroad or migrated to Sweden highlighted mismatches in heating expectations. One participant who worked as an au pair in the UK described struggling with cold conditions, while a recent immigrant described their first Swedish winter as deeply unsettling. Some came to Sweden as immigrants and had never experienced a winter and described their first winter as tough, with difficulties to keep warm:

> *I had put on all the clothes that I owned, socks, everything, but it wasn't enough. I almost cried. (Samya)*

These accounts reveal how heating norms are culturally and climatically situated. As Grove et al. [14] also point out, expectations are not just shaped by physical conditions but by cultural understandings of what is appropriate or 'normal'.

Effort and obligation were also central to how people described their relationships with heating systems. Wood-based heating was recalled with ambivalence; although physically demanding, it was also associated with control, familiarity, and sensory satisfaction.

> *I don't usually chop the wood, I don't like it. It feels like a lot of work, and I'm terrified I'll hurt myself. My mother once got it in her foot, and ever since, I've kind of had PTSD about it. I'm really scared of doing it myself. But I love the fireplace at my mother's—it's so cosy, and of course that's where everyone wants to be, gathering around and hanging out. (Carolina)*

Despite such appreciation, many participants viewed the transition to automated systems, such as electric radiators or district heating, as a luxury. These systems offered comfort without physical labour, reflecting a normative shift towards convenience. This parallels earlier research [31], highlighting how technological automation reconfigures user roles, moving from active management to passive consumption.

Another theme concerned detachment from the heating infrastructure. Many interviewees could not recall what fuel their heating system used, especially in multi-dwelling buildings with district heating. This lack of knowledge was often framed as irrelevant because "the heat just worked". However, the absence of direct payment, due to the prevalence of "warm rent" (where heating is included in rent), contributed to this detachment:

> *I can never get cheaper heat. Because it is included in the rent. It is not me who decides it. (Magdalena)*

Although warm rent protects vulnerable tenants from fluctuating prices, it also discourages awareness and control, as noted by Ambrose et al. [44]. Only when people paid directly for heat did they reflect on usage and costs:

> *When we paid for the heat ourselves, my husband and I have been quite frugal … rarely above 20 degrees at home. (Lotta)*

In rental housing, issues of indoor temperature were also shaped by trust and power relations with landlords. Several tenants described cold or poorly insulated apartments, but few formally complained. Reasons ranged from lack of knowledge about rights, language barriers, and fear of retaliation, to feelings of loyalty when landlords had previously offered support:

> *I didn't want to cause any trouble … they had let me stay even when I couldn't pay the rent. (Amanda)*
> *If I hadn't [trusted the company], I might have been more sceptical. (Janina)*

These examples demonstrate how norms around heating comfort are relational and socially embedded, involving institutional trust, economic vulnerability, and cultural knowledge.

Finally, heating was sometimes associated with psychological states, particularly feelings of safety and care:

Security and warmth. It is clear that it is connected … The colder your apartment is, the less you feel safe in it. (Janina)

This reinforces the argument that heating is not merely a technical or economic issue, but a deeply symbolic and affective one. Understanding domestic energy use requires attention to how heating intersects with emotional well-being and identity [3].

Practices and skills

Practices and skills refer to the routine ways in which energy is used in daily life and the competencies people develop to engage with technologies and achieve comfort. Drawing on participants' oral histories, this section explores the persistence, transformation, and re-emergence of heating practices across different socio-technical configurations and historical moments in Sweden.

The interviews contained detailed and personal memories of home heating, revealing practices shaped by necessity, adaptation, and social norms. These practices span decades and are embedded in material conditions, life-stage circumstances, and changing expectations. Among the older participants, memories from the wood and coal era feature prominently. Some describe practices now largely abandoned, such as children sharing beds for warmth or peeing in the kitchen sink to avoid cold outhouses. These practices illustrate how warmth was achieved through creative, embodied strategies often shaped by scarcity:

It was so cold in the winter that our mother had to put all three children in the same bed to keep warm. My father was a sailor, so he was not always at home. It was also hard times, so it was not always possible to buy coke. (Majvor)

Other abandoned practices included insulating shoes with newspaper or using soaked and dried newspaper as makeshift fuel (see Table 1). These examples reflect both the development of adaptive skills and the material limitations of the time.

Some practices, however, have endured across generations. Techniques such as layering clothing, using wool blankets, and consuming hot drinks remain common. Contemporary practices such as using electric heaters to supplement inadequate heating in rental apartments signal both a continuity and an adaptation to current technical and institutional conditions. The persistent desire to maintain agency in managing indoor comfort is reflected in the use of electric heaters, despite tenancy rules:

And I know that many people have bought electric heaters. You are not allowed to do that, but quite honestly, if it is so cold that we … well, that we're suffering in our homes, well, then we have no choice but to do it. (Emil)

A common practice was to take a warm shower or bath. Both making food and eating and drinking were other heating practices. Some heated the oven or left it open after they had used it to heat up the kitchen. These accounts underscore how practices serve as a bridge between material cultures and social norms, where expectations about warmth persist, even as the technical infrastructure changes (see Table 2).

A third set of practices had been largely abandoned but has resurfaced in response to the energy price spikes following the 2022 energy crisis. Participants recounted closing off rooms, concentrating activities in single heated spaces, and relying more heavily on wood stoves.

The price for both electricity and heat increased in 2022 and has continued to do so, mainly as a consequence of the Russian invasion of Ukraine. Heating costs for households in detached houses were heavily affected by the rise in electricity prices. While many households have replaced direct electric heating and electric boilers with heat pumps for improved efficiency, there is still a significant share of houses being heated with direct electric heating and electric boilers, particularly among lower income households. When it comes to heating practices, some have been re-introduced in these households. Some households told us that they had closed off some of the

Table 1 Summary of practices mentioned as common in the past but now abandoned

Practice/skill	Description
Sharing a bed	Sharing beds with family members to stay warm in cold environments
Peeing in the kitchen sink	A practice used to avoid going outside to cold toilets during winter
Heat water for bathing and washing	Heating water manually for baths and laundry when hot water was not available, especially during winter
Newspaper in shoes	Inserting newspapers into shoes as insulation against the cold, a practice used in times of scarcity or when shoes were bought large to last longer
Soaking newspapers	Rolling and soaking newspapers in water, drying them, and then using them as slow-burning fuel for fires
Intermediate glass windows in winter	Installing additional glass panes in windows during winter for insulation, with decorative elements placed between the panes

Table 2 Summary of practices mentioned that seemed to be persistent over time

Practice/skill	Description
Clothes	Wearing extra layers such as socks, gloves, indoor shoes, and lined trousers to stay warm. Some people wear specific items like turbans or cardigans
Quilt usage	Using heavy blankets, often made of wool or other materials, to stay warm in bed, particularly in cold bedrooms
Knitting	Knitting warm items like socks, scarves, and blankets for personal use or for guests
Electric heaters as additional heat sources	Many tenants invest in electric heaters to supplement district heating and maintain control over indoor temperatures
Cold bedrooms	Many prefer sleeping in cold rooms and have learned to manage this over time
Warming up on elements	Sitting close to radiators or heaters, sometimes even moving furniture to ensure maximum heat exposure
Slippers	Wearing slippers indoors to keep feet warm; not all individuals use them, with some preferring thick socks instead
Carpet usage	Placing carpets on cold floors to insulate against the cold, although they can be difficult to clean
Using pets as heat sources	Having pets, such as dogs, sleep in the bed to provide additional warmth
Movement	Staying active to generate body heat and keep warm
Tight windows	Sealing windows with tape, batting, or other materials to prevent drafts and maintain heat
Remove trapped air in radiators	Bleeding radiators to remove trapped air and improve heating efficiency
Open oven	Leaving the oven door open after cooking to release heat into the kitchen, a practice reminiscent of older heating methods
Hot showers	Using hot showers as a quick way to warm up
Using candles	Utilising heat candles for warmth and ambiance
Measuring temperature	Buying thermometers to monitor indoor temperature and adjusting heating strategies accordingly
Hot drinks	Consuming hot beverages like tea or warm water to stay warm inside
Eating food	Eating food to generate body heat, especially when feeling cold due to low energy levels
Furniture placement for heating	Arranging furniture to maximise the effectiveness of radiators, ensuring nothing blocks the heat flow

rooms or decided to keep some rooms warmer and others colder to compensate for the increased prices. Those who had used wood stoves more for cosiness before the crisis had now started to use them as their primary heat source since wood was relatively cheap compared with, for example, electricity:

> *We had used the fireplace for cosiness, but now it has become the main heat source again. (Kjell)*

These 'revived' practices illustrate the dynamic interplay between cost pressures and habitual knowledge, often informed by earlier life experiences (Table 3). The reintroduction of such behaviours aligns with findings in earlier research that highlight how past heating experiences shape current energy strategies [7, 37]. Practices and skills related to home heating are not static but evolve with social, economic, and material contexts. They reveal a complex web of experiential knowledge and normative adaptation, critical for understanding how households navigate heating transitions.

Discussion

The oral histories collected in this study reveal how Swedish households' heating practices are shaped by a dynamic interplay of historically learned behaviours, technological change, and evolving social norms. These patterns resonate with the ECF as illustrated in Fig. 2, which maps shifts across material culture, practices, and

Table 3 'Forgotten' practices returning with the energy crises

Practice/skill	Description
Closing off rooms	Closing off unused rooms to conserve heat in the main living areas
Heating individual rooms	Focusing heating efforts on specific rooms, often the kitchen and living room, while keeping other areas colder
Firewood and starting fires	Collecting firewood and learning to start fires in wood stoves or tiled stoves, a skill often passed down through generations
Gathering in one room	Staying in a single room with other family members during cold periods to conserve heat

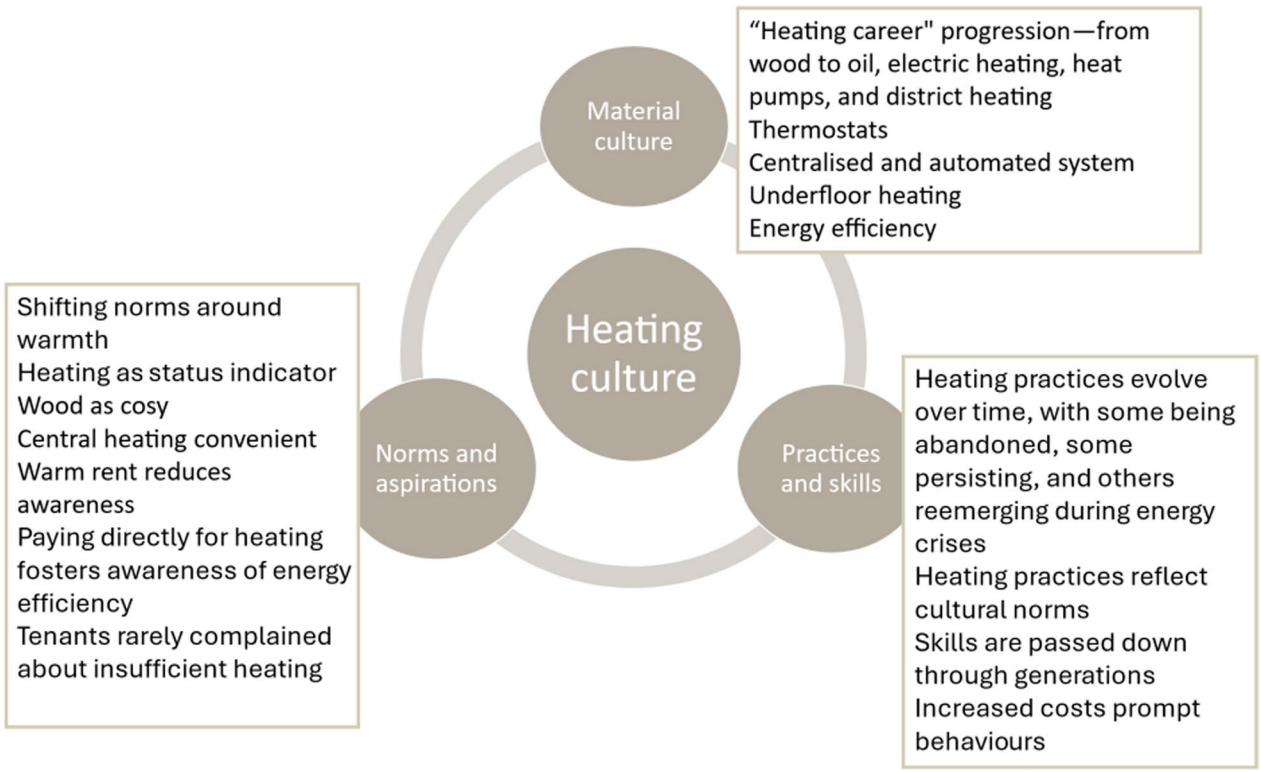

Fig. 2 The main findings in relation to the Energy Cultures Framework

norms over time. In terms of material culture, the trajectory from wood and oil to electric heating, district heating, and heat pumps reflects long-term socio-technical transitions that mirror those documented by, for example, Kuijer and Watson [29] in the UK. Their analysis of domestic heating demand through oral histories similarly identified a spread of heating, both spatially and temporally, enabled by infrastructural and lifestyle changes.

The findings contribute to the ECF by illustrating how heating practices can be abandoned, persist, or be reintroduced. Figure 2 presents the practices accordingly; for example, the use of newspapers as insulation has been largely abandoned, layering clothes and using blankets have persisted, while closing off rooms and relying on wood stoves were reactivated during the 2022 energy crisis. This supports the argument that energy behaviours are not linear but contextually adaptive [18]. The crisis also demonstrated, consistent with Groves et al. [11], how households draw on past practices in response to present constraints, underscoring the importance of energy-related memory and resilience.

The transition from manual heating systems, such as wood stoves, to centralised and automated district heating illustrates a broader societal trend towards convenience and efficiency. However, this convenience often comes at the cost of user engagement and understanding. Bickerstaff et al. [46] found that automation may reduce energy agency, with households expressing frustration over reduced control. In our study, many participants similarly noted a sense of detachment from their heating systems, echoing earlier findings and confirming that automation can create a passive energy culture. While district heating is praised for its efficiency [13], users may not fully understand the system or have influence over its operation. Importantly, our study adds a new dimension by linking this passivity to the absence of energy literacy, suggesting that enhancing user knowledge could mitigate some of the disempowering effects of automation.

Expectations around indoor comfort have also changed. Older generations often tolerated colder environments and viewed heating as a labour-intensive task, whereas contemporary norms reflect expectations of stable, whole-home warmth. This shift is confirmed in earlier research [47, 48] that argues that modern comfort norms are increasingly demanding and often decoupled from the effort once needed to achieve warmth. Our participants valued warmth as a taken-for-granted aspect of domestic life, which reinforces the trend towards convenience and minimal engagement documented in earlier studies.

While centralised systems provide comfort, they can render energy use invisible, diminishing awareness of

environmental impacts [12]. Earlier studies have shown that invisibility reduces energy literacy and weakens the feedback between behaviour and consequences [26, 30]. Participants in our study often lacked knowledge about how their heating worked or how to influence it, which could present vulnerabilities in times of system failure. In contrast, households using biomass or hybrid systems in rural areas demonstrated a higher level of engagement and understanding. This aligns with Phillips and Dickie [28], who highlight how rural residents often maintain more autonomous, albeit conservative, energy practices.

Warm rent policies, where heating costs are included in rent, further complicate the picture. While such arrangements can support thermal equity in times of financial strain (as seen during the 2022 crisis), they may also reduce incentives for energy-saving behaviours and limit user control. Our findings highlight the dual nature of warm rent systems: while they can shield vulnerable households from fuel poverty, they also risk reinforcing passive energy use [45, 49]. This adds a new layer to earlier discussions, offering a more complex understanding of how affordability and agency intersect in domestic energy use [50].

The narratives also reveal how heating practices intersect with identity and status. As Hards [10] and Reeve et al. [25] note, certain systems, such as wood-burning stoves, are associated with comfort, nostalgia, and even social distinction. Our participants confirmed this; some viewed underfloor heating or newly installed heat pumps as modern and desirable, while others prised traditional fireplaces for their sensorial and emotional significance. These findings are consistent with earlier studies demonstrating the emotional and symbolic value of visible heat sources [22, 23].

Household responses to the 2022 energy crisis also varied by income and housing status. Wealthier participants were more able to invest in energy-saving technologies, such as heat pumps, while lower income households often returned to labour-intensive practices. This confirms observations by, for example, Shirani [17], who notes that transitions are unevenly experienced and shaped by structural constraints. Moreover, the crisis highlighted how practices considered obsolete can quickly regain relevance under new conditions, extending the insight that embodied habits and learned responses shape energy use across the life course [30].

Notably, our study contributes several important extensions and nuances to the existing literature. First, by tracing "heating careers" through oral histories, we deepen the life-course perspective [4, 17] revealing how transitions unfold not only across time but in response to crises, place, and generational memory. Second, we highlight how the 2022 energy crisis reawakened historical practices, extending the adaptability theme in energy cultures and underscoring the cyclical nature of domestic strategies. Third, our analysis of warm rent as both an enabler and constraint of energy agency adds complexity to understandings of affordability and control. Fourth, while earlier studies [e.g. 13, 51] present district heating as largely beneficial, our findings suggest a contrasting reality of detachment and confusion, pointing to cultural or infrastructural differences that warrant further investigation.

While this study offers valuable insights into heating transitions through household narratives, several limitations should be acknowledged. The sample is limited to the Swedish context and, although diverse in age, geography, and housing type, it cannot capture the full heterogeneity of heating cultures in other national settings. The use of oral history as a retrospective method also means that accounts are shaped by memory and narrative construction, potentially foregrounding certain experiences over others. However, rather than viewing this as a flaw, we consider it a strength in understanding how people make sense of heating transitions over time. The study also primarily includes individuals who were willing to reflect in depth on domestic life, which may bias the sample towards those more comfortable discussing household routines.

Finally, by drawing on oral histories, this study confirms calls by Darby [4], Kerr et al. [18], and Küpers et al. [19] to centre lived experience, emotional geographies, and biographical narratives in understanding heating transitions. Our method captures diverse trajectories across class, gender, and geography, offering a more inclusive picture of how households experience and navigate change. The heating careers traced in this study suggest that energy transitions are not linear but entangled with memory, care, habit, and resilience. Integrating the ECF with such narratives helps illuminate how personal, material, and institutional factors co-produce household heating cultures.

Future research should continue to explore how heating transitions unfold in place-based, life-course terms and how emotional, economic, and infrastructural conditions converge to shape the everyday realities of domestic energy use.

Conclusions

This article has explored how individuals in Sweden recall and narrate their experiences of home heating across the life course. The oral histories reveal both personal and structural dimensions of change, highlighting how material infrastructures, social norms, and household practices have evolved together. Participants' narratives illustrate a gradual shift from manual, spatially

confined, and effortful heating practices to automated, invisible, and standardised systems, though not without loss of control, knowledge, and emotional connection.

Despite these changes, many older practices persist or re-emerge, especially during crises, pointing to the adaptability and embeddedness of heating cultures. The findings underscore the value of attending to continuity as well as change, and of recognising how identity, memory, and socio-economic position shape transitions.

By foregrounding lived experience, this study contributes to a deeper understanding of heating transitions as social and cultural processes. These insights can inform more socially attuned energy policies that engage with people's everyday realities and diverse heating careers.

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Author contributions
JP did the initial idea formulation and developed the theoretical foundation for the paper. JvP conducted the interviews and collected the data. JP did the analysis and wrote the first draft. JvP reviewed the draft. Both authors read and approved the final manuscript.

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Data availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study did not need ethical approval in Sweden since it did not: involve the processing of sensitive personal data or personal data relating to criminal offences; and/or involve physical intervention, whether on a living or deceased person; involve a method intended to produce physical or psychological effects on a human being or involve a clear risk of harm to the research subject; nor was it carried out on biological material from a living or deceased human being that is traceable. The research participants have been informed of the aims of this research and consented to the use of interview data for publication. All data have been anonymised. We manage data in accordance with GDPR regulations.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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