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Electricity blackouts and hybrid systems of provision: users and the 'reflective practice'

Jenny Rinkinen

Abstract

Background: Interest in the role of the user has provided promising insights when considering the transition towards more decentralised forms of energy provision. There is, however, a shortage of analysis on the reflexivity and learning of 'regular' users and their understandings, competences and meanings attached to energy use practices. This paper analyses discontinuities and disruptions in domestic heating during long blackouts and whether power failures could serve as an entry point to the transition dynamics of the practice.

Methods: The study is based on six in-depth interviews on understandings, meanings, materials and competences attached to power cuts with households living in detached houses having different wood-based hybrid systems of energy provision. The interviews were conducted in a rural Finnish municipality, which faced power cuts lasting from 7 h to 6 days in January 2011.

Results: The reactions of the interviewed households to power cuts indicate that blackouts activate unused skills and resources, propose uncommon meanings for electricity and heat and revive dormant elements of practice. Resilience of practice was achieved by flexibility in terms of convenience. However, power cuts were not found to cause explicit, persistent changes in heating practices.

Conclusions: It is argued that disruptions sensitise consumers to the perception of sovereignty and that resilience building and the capability to adjust bring new perspectives to the discussions of the 'pros' and 'cons' of hybrid systems of heat provision.

Keywords: Power cuts; Resilience; Domestic heating; Decentralised production; Practice theory; Energy consumption; Reflexivity

Background

The pursuit of sustainable forms of energy provision has become more policy relevant as the threats of climate change have become more widely accepted. While the strive for political consensus continues and more investments are being made in renewable energy technologies, efficient means to reach tolerable levels of carbon emissions are still lacking. Decentralised forms of energy provision - small-scale energy production - offer new possibilities to rearrange the system of provision to overcome the challenges of the energy 'trilemma', i.e. the pursuit of sustainability, security and resilience of energy systems [1]. In Finland, the context market of this study, aging energy grids, the increasing load on supply and distribution networks, political claims for energy autonomy and in particular the threats caused by the changing climate and extreme weather have aroused doubts and concrete problems concerning the reliance on electricity production. The size, complexity, pattern and control structure of centralised, large-scale energy supply make it inherently vulnerable to large-scale failures [2-4].

Distributed systems, which are suggested to tackle the issues of centralised production, often require a shift in the role of users from passive receivers to more active users, and the conventional producer-user relationships dominating centralised forms of production are to be reassessed [3]. Furthermore, decentralised provision is seen as promising in tackling the issues of climate change and decoupling from non-renewable sources of energy. In transitions from centralised to decentralised forms of provision, a more thorough understanding of the dynamics of these transitions is important.

Correspondence: jenny.rinkinen@aalto.fi
Department of Management and International Business, Aalto University School of Business, Lapuankatu 2, Helsinki 00100, Finland

To better understand this potential and challenges in the changing dynamics of consumers and producers, recent studies have argued for new ways of thinking about energy consumption as happening *for the sake of practices* [5,6]. Practices, for example those of cooling and heating, are argued to mediate and co-produce the relationships between consumers, producers and the system of provision [6,7]. The type of knowledge needed to understand how everyday life processes might work towards sustainability could be gained by detailed analysis of practices, processes of creativity and understanding of everyday life as a productive place [8]. Such analysis could better take into account questions of why, when and how resources such as energy are consumed and thus lead to a more thorough understanding of the premises for sustainability.

An entry point for this paper is the notion that periods of disruption, failure and crisis have been suggested to bring practice dynamics 'to the front' and therefore offer a research arena where the dynamics of practice are open for scrutiny for the practitioners and for the researcher [9]. Previously, a study on the perceptions of blackouts has shown that blackouts evoke both positive and negative associations and that they have past and future temporal referents [10]. Often, power cuts disrupt the whole systemic chain of mundane actions [4]. Here, I aim to take this notion further and discuss the reflexivity provoked by a power cut in the context of hybrid systems of heat production.

This paper contributes to the discussions on the role of the user in hybrid systems of energy provision by discussing disruptions in domestic heating practices, specifically focusing on the practice of heating in domestic settings in a Finnish rural municipality. The focus is on the practice of wood heating because it is a site of active work where hybrid constellations of electricity and energy are directly used as practice-as-entity and as practice-as-performance [6]. In this way, one may research the life course of practices - how they emerge or fade when elements are linked or broken as well as their intersections and transformation over space and time. The long tradition of using wood fuel as a supporting or complementary energy source of heat provision makes Finland an interesting context to discuss the dynamics between centralised and decentralised forms of energy provision. More specifically, a focus on the hybrid constellations of wood heating is relevant for the following reasons: first, in Finland, such constellations are important examples of hybrid systems, which attract the interest of technology developers and policy actors to meet the future needs for heating and cooling. For example, heat pumps, new wood-fuelled solutions, solar thermal collections and other rarer options, such as wind collectors and PVs, are also often introduced to support the running of heating technology. Thus, understanding the dynamics of wood heating is important for the active dissemination of new, low-carbon heating technologies. Such analyses need to pay attention to the question of how new systems fit into the existing temporal organisation of everyday life and what kind of demands or work patterns they impose and are dependent upon [11].

In this study, I focus on the mundane actions surrounding the practice of heating. By domestic heating practices, I refer to the doings and sayings concerning heat provision for detached houses. Obviously, the practice of heating is carried out and managed at the intersect of multiple overlapping practices, but for conceptual clarity, this analysis is limited to the 'elements' of practice, namely materials, meanings and competence. In analysing these elements, however, it becomes clear that certain practices related to electricity, such as cooking and showering, share elements with other practices. As outlined, households with different wood heating solutions were chosen as the focus of the study because wood heating as a typical solution in the Finnish context can be taken as a significant backbone for new technologies.

Analytically, I explore continuities and ruptures in everyday life practices during multiple-day power outages. I present a qualitative study of domestic space heating practices and their interruption in the context of detached houses. This study asks how households living in detached houses with hybrid systems of heat provision are affected when they are faced with extensive power cuts of up to 5 days, both *in situ* and subsequently. Specifically, this paper addresses the question of what kind of 'reflective space' power supply disruptions offer for energy consumers to renegotiate energy use and supply.

After the motivation for studying disruptions in energy use and an introduction to the practice theoretical approach to energy use, I present the empirical data from interviews concerning blackouts as well as the method of analysis and the context of the study. Following this, the results of the analysis are discussed, leading to conclusions and implications for energy use studies, business and policymaking.

Disruptions in energy use

Disruptions and instabilities in energy supply in the everyday life context are chosen as the focus of interest for two main reasons. Firstly, it is suggested that failures could be seen as justifications for policy intervention [12,13]. Greater acceptance of transition policies could be gained if better integrated with the extensive work on system failures as justification for policy intervention: 'A tighter connection with established innovation policies and their underlying rationales may lend more legitimacy to transition policies and help integrate them into mainstream policy processes' [12]. There are examples where disruptions as such have been used as a platform for intervention. In Juneau, Alaska, an electricity supply disruption led to a persistent reduction - 8% of historic consumption - in energy demand

through a combination of new habits and technical improvements [14]. Indeed, the vulnerability of energy systems is multi-dimensional, not only including technical failure, accidents and errors, but also resource availabilities, constraints, diversity of the energy supply and political disruptions. It is an unintended side effect of centralised energy technologies [2]. Liberation from the constraints of current practices is seen as a key driver for attaining higher order learning [15], and thus, disruptions are of relevance in discussing the transition from one form of provision to another.

Secondly, disruptions and failures are seen to have a central role in reflection and change. For practice theory, the 'breaking' and 'shifting' of structure must take place in everyday crises affecting routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out a practice, is confronted in the face of a 'situation' [16]. Within the fields of innovation studies and transition literature, the processes of emergence and stabilisation are widely discussed, rather than those of disappearance, partial continuity and resurrection [17]. Whereas incoming and outgoing configurations co-exist, innovation journeys start over and remain dormant over regimes; such dynamics are often neglected in the domains of innovation studies.

In disruptive situations, the role of consumers changes from passive recipients of complex networks and systems (electricity or fuel) to co-managers of their own practices, involving the dynamics of both supply and demand [7,13]. Different social situations such as home buying, moving and aging prompt disruptions and offer 'hotspots' for interventions. Of course, it is worth noting that such disruptions differ in nature and that the variety of disruptions is extensive. Whereas aging comes as it comes, inevitably, the decision on buying a house often takes place more systematically - and a power cut may come all of a sudden.

Rather few of the contributors to the field have actually attempted to bring these ideas on disruptions into empirical considerations. Despite the growing interest in the routinised aspects of everyday life, there has still been relatively little research into how socially accepted normality and convenience are achieved and constructed. In particular, there does not seem to be enough understanding of how these dimensions of practice are disrupted and how the resilience of practice should be analytically approached. Thus, disruptions raise questions about 'normality' and provide a useful perspective to examine connections between practices, politics and socio-technical systems. Before presenting my empirical data and methods, I briefly discuss the practice theoretical framework directing the research design.

Practice theoretical framework: dynamics of heating

Conventionally, energy use behaviour has been discussed with concepts such as attitudes, values and behaviour models. These approaches have been criticised for not providing adequate means for tackling issues of sustainability and how sustainability transitions could be promoted and accelerated. Consequently, theories of social practice have recently attracted considerable interest in studies on energy consumption. In the pursuit of sustainability, the importance of identifying the practices demanding considerable resources and studying the formation of these practices as a basis for policies has been recognised [18,19]. As has been argued, consumers may be motivated to undertake various symbolic actions to demonstrate their 'green' disposition, but most valued practices are performed with little or marginal consideration for the environment [19].

Practice theory brings added value to the understanding of energy consumption habits, as it emphasises the embeddedness of energy in everyday habits. Whereas the home as a site of diverse heating practices is increasingly policy relevant and studies of adoption and domestication of novelties are increasing in number, few empirical accounts have addressed the everydayness of renewable energy technologies.

The most basic theoretical assumption is that the activities of social life have to be continuously carried out and carried through, and moreover, that this mundane performativity is organised through a multiplicity of collectively shared practices. Activities are unique, but practices are reproduced. Practices are established, delimited, reproduced and organised through social processes of practical coordination [20]. In the practice approach, the individual is seen as a carrier of practices and as a place for the intersection of a plurality of practices [5,6,20,21]. Unlike the more traditional approaches, consumption is seen as occurring for the sake of practices; thus, consumption is not itself a practice but is rather a moment in almost every practice [5].

What, then, constitutes a practice? The dynamics of practices co-evolve between meanings, competences and material, i.e. the elements that constitute a practice [6]. The practice is constituted as these elements are linked, unlinked and delinked over time and as new people are recruited to perform the practice. Meanings refer to symbolic meanings, ideas and aspirations, such as the value of focal points of heat; competence to skill, know-how and technique, such as the ability to manage radiators and other technologies for heat provision; and things refer to objects, technologies, tangible physical entities, and the stuff of which objects are made.

From a practice theoretical perspective, disruptions - temporary breakdowns in the flow of events - are important in understanding the norms, practices and technologies that construct the socially accepted definition of normality [5,6,9]: disruptions open up what is actually perceived as normal. It has been argued that when we encounter some form of significant breakdown, we start to focus on the practice as something separate and discrete: we single people and tools out from their relation with the whole and

thus change over to the epistemological subject-object relation [22].

Searching for temporary breakdowns can thus be seen as accessing - or *reflecting* on - the internal workings of the practice. At any given point in time, a practice has a set of established understandings, procedures and objectives that govern conduct within that practice, often without much reflection or conscious awareness. It has been argued that reflection and change go somewhat hand in hand [23]. Particularly in a period of disruption, it is necessary to reconsider the conditions of one's actions and possibly the historical, material and social making of one's taken-for-granted routines. Consequently, routines, practices and networks of practices are seen to provide a concrete way of tracing the social associations through which situated learning occurs [24]. Reflexivity is beyond the cognitive reflexivity on an event to solve a problem: it is a dialogical and relational activity that unsettles practices and can lead to learning through experience [23], and hence, reflexivity is closely linked to the provision of platforms for interaction. Some even argue that where knowledge is tacit and distributed in different locations, only physical co-location and/or activities and artefacts that encourage social associations are likely to provide access to deeply embedded taken-for-granted practices [25].

Methods

This study is based on interviews with households, business actors (utility service, retailer, maintenance firm) and policy actors. The interviewees were recruited from a Finnish municipality that faced extensive power cuts of up to 7 days in January 2011, followed by power cuts in the summer of 2011 and at the start of 2012. The power cuts of January 2011 were caused by heavy snow falling on trees, and the snow banks and cold weather made repair work difficult to carry out. The power cut was reported as somewhat historical because of its extent, duration and the unusual weather conditions with temperatures down to −25°C.

Altogether, 14 interviews were conducted: six in-depth interviews with households living in detached houses and eight thematic interviews with local business and governmental actors. These interviews were mostly face-to-face (in nine cases, with five phone interviews), semi-structured, and lasted from 10 min to 1.5 h. The interviews were conducted in autumn 2011 and 2012 in a rural Finnish municipality. The emphasis of the analysis is on the interviews with households, while the other interviews are used to reflect upon the broader perception of practice.

All the interviewed households were users of centralised electricity production. They were customers of the local electricity provider by law but could choose the electricity utility with whom to make the electricity contract. Regarding heating, the households had not installed air heat pumps, wind power or solar systems. However, their heating systems could be described as hybrid due to the variety of wood-burning stoves and woodchip boilers (Table 1).

In addition to households, a local home service worker, a representative of the congregation, a maintenance firm, a local retailer, the chairwoman of the local council and two representatives of the utility service company active in the area were interviewed.

The interviewed people were asked to provide a detailed description of their heating practices [26]. Acknowledging that the significance of the experimental performance prompted by disruptions can only be understood in the context of stabilised practices and social relations [27], questions concerning both the 'normal' situation and the disrupted situation were included in the interviews. In carrying out the interviews, careful attention was paid to what kinds of understandings, meanings, materials and competences were attached to power cuts, how these were reflected in the normal state of the practice and how its elements and dynamics were associated. If possible, during *in situ* interviews, the interviewees were asked to 'show us around' to gain a better understanding of their material environment and how they talked about it. Discussions with practitioners provide a sense of how competences have been defined and developed and how individual careers unfold. The interviews were transcribed and thematically coded using Atlas.ti.

Context: heating arrangements in a rural community

The municipality where the interviews were conducted is located in the south-eastern part of Finland in an area with a large number of water bodies. There are 6,400 inhabitants living permanently in the area, and up to 40% of the utility service customers are effectively summer residents. The population is widely scattered.

In the context of this study, solid wood is the traditional means of heating buildings during the cold periods of the year as well as for cooking and preparing meals. The use of wood actually increased by 20% between 1994 and 2008 and accounts for 40% of the energy content of fuels and electricity used in detached houses in Finland [28]. Significantly, however, at the national level, heating systems are changing away from wood use: whereas 30 years ago, 40% of all Finnish houses (including blocks of flats) were only heated by wood, the respective figure is now only about 10%. In more than 25% of the 1.1 million Finnish detached houses, solid wood is used as the main source of heat. Since the 1980s, every newly built house has been required to be equipped with a wood stove (typically a fireplace). There are houses built without a fireplace, but these date from the 1970s and form only a minor part of the housing stock. Nowadays, district heating is the most common heating system in Finland, efficiently providing heat in densely populated areas.

Table 1 Characteristics of the interviewed households

Household	Interviewees	Age group (years)	Other resident(s)	House type	Type of heating system
1	Couple	55-65	Older son (occasionally)	Detached house	Direct electricity and retaining oven
2	Woman	50	Sister and mother	Aged wooden house	Direct electricity and three tiled stoves
3	Man	40	-	One-storied detached house	Wood chip boiler
4	Couple	50-60	Two sons	Aged wooden house	Log wood boiler and retaining oven
5	Woman	40	Man (both only occasionally)	Detached house	Oil boiler and retaining oven
6	Man	50	Woman and two children	Detached house	Direct electricity with retaining floor (heated during the night)

Households living in detached houses as the focus of the study are particularly interesting for many reasons: in contrast to a traditional apartment building, dwellers have or have had the ability to choose the heating system and are also more autonomous regarding, for example, the temperature in the house. The energy costs are often higher compared to smaller apartments, and thus, from the perspective of rational choice theory, there should be an incentive to reduce the energy costs.

Results and discussion

Normality in heating practices and orientations to disruptions

In the following, I present two brief narratives of households with a focus on the heating arrangements before, during and after the power cut. These aim to illustrate the arrangements and configurations of the heating practice. In the narratives also, I point out rearrangements in the energy use practice prompted by the power cut. The following examples can be seen as representative of the sample as they illustrate the two main orientations to disruptions: first, an orientation to embrace disruptions by showing flexibility in heating and everyday life practices, and second, an orientation to seek continuation of the normal situation. After these narratives, more detailed results on the materials, competences and meanings attached to the power cut are presented.

Embracing disruptions

Family 1 is a retired couple living in a detached house outside the town centre, sharing the house with their eldest son. The house was originally built as a summer cottage, but in 1985, it was rebuilt and extended to suit the family with two children. The house is heated with radiators using direct electricity, and in the winter, heating of the internal space is supported with a heat-storing baking oven. The baking oven and wood-burning sauna require 12 to 15 $m^3$of wood yearly, and the house and garage (with underfloor heating) require 16,000 to 18,000 kW of electricity (previously 25,000 kW when fishing equipment was dried on the garage floor). The family obtains firewood from its own forest near the house, aiming at wood storage from 2 to 5 years. The installation of an air heat pump has been discussed but delayed because of the fear of electricity costs (of using the pump to cool the house in the summer time), uncertainty over whether it would 'fit the house' and disagreement over the aesthetics of the device. The father further explained his anxiety over the air heat pump as follows:

> *Uhh, well these heating systems come and go, so at least I have a steady view that if you come up with a system in one house, then at least I myself would stick to it, so no changing because it requires. … Some manager [in a local energy company] reckoned that electricity is good, but once pellets were so cheap that he went and bought a boiler for pellets and all the equipment, and now pellets are so expensive, much more expensive than electricity… and the more technical these things get, the more they need maintenance… and the possibility of a breakdown is higher, that… so many things… well you live according to your situation.* (Interview, household 1)

The power cut in January 2011 lasted 3 days for this family. The family coped through the power cut by intense heating of the baking oven and using water from the nearby lake (which can exceptionally also be used as a drinking water supply). In 1985, when the family moved to the house, they faced a power cut of 2 days. Then, an engine-generator was bought but later sold because it was unused for more than 10 years. The perception of the power cut had changed compared to the one in 1985 as there was considered to be no need to buy an engine-generator:

> *So now when it's [power] off for a day, two or three, that makes no difference; on the contrary, it stirs a certain kind of activity and… R2: Though evenings are bit boring, long when you can't do a thing. Actually, I knitted socks under a headlamp!* (Interview, household 1)

Seeking continuation

Family 2 lives in an old farmhouse outside the town centre. The house is occupied by Mari, who is active in local politics, her mother and sister. The house was renovated in the

1970s, when it was extended and equipped with electricity, but no major changes have been made since then. Now Mari thinks that the house needs a long-term renovation plan to suit her needs and those of her partner's once they live there by themselves at some point in the near future. As with family 1, this house is also heated with electricity and wood (a baking oven and two tiled stoves). In the winter, the wood stoves are used on a daily basis. Mari is responsible for bringing the firewood inside, while her mother assists her with lighting the fires. The firewood is obtained from their own forest with the help of Mari's partner.

Mari and her family faced a power cut of 4 days. Unlike the other interviewed families, Mari reported feeling insecure and intimidated when the power was off. She was surprised that the phone stopped working, which further increased her anxiety:

> *So it was a scary feeling, and it was the feeling that you have to manage on your own. It struck me that we are here now on our own, that what will happen. Certainly we have neighbours within half a kilometre, but you can't see them from the garden. So it was a comforting thought that the neighbours were in the same situation as we were. ... And then we really started to think that, sure, we had anticipated that it's the weather, that this looks bad. That we had run cold drinking water in advance.* (Interview, household 2)

Mari had reserved some drinking water and few pails of water to flush down the toilet. She used wood for space heating and left the indoor doors open to allow the heat to reach all the rooms. When the power cut had lasted for 1 day, her partner managed to purchase an engine-generator, which he installed and gave Mari advice on how to use it. Mari describes this as a saviour:

> *The engine-generator had the capacity for water pumps, ground floor heating, lightning, and with small arrangements we could also use the stove. That's what saved us.* (Interview, household 2)

Dormant materials and rearrangements

In the face of disruption, households reassessed the materiality related to heat provision and electricity use. The central boilers stopped working, radiators turned cold, the house became colder, lights did not turn on, cell phones became silent and electrical cooking appliances did not work. Consequently, in most cases, a variety of dormant materials held in reserve were brought into use, something that was oftentimes reported as business as usual in comparison with the alleged situation:

> *I just want to say that in Ilta-Sanomat [tabloid newspaper] there was a headline that 'Mäntyharju is in panic'. I would say that the reporter was in panic, but no one here panicked. In the countryside, we know how to... differently you know, because with old houses and everything, everything has a certain backup system.* (Interview, household 4)

These backup systems included engine-generators, wood stoves, gas boilers, garden wells, blankets and alternative forms of lighting that were used to maintain the normality of activities. One interviewee tells about a fire-burning stove that had been left unused for years:

> *The fireplace has been there, I don't even remember when we have had a fire in it. Not in 20, 15 years.* (Interview, household 3)

In most cases, these backup technologies were found inside the home, and some were bought from the local stores or provided by friends or relatives. For those people who had an urgent need to access electricity, the acquisition of a new backup device (engine-generator) became a sensible option. Some households with livestock already had an engine-generator ready to be used. Generators were also circulated within the community, amongst neighbours. Thus, many of the interviewees possessed homes having dormant elements of decentralised, hybrid energy provision. In terms of the materials of the heating practice, the purposes of certain technologies were rediscovered, as in the following case where a respondent describes how they started to heat the sauna to keep the water pipes running:

> *When you heat up the sauna - all the water systems are there - they remain unfrozen.* (Interview, household 1)

In household 6, where the power cut lasted only 7 h, the attention was directed towards other vulnerable spaces and locations - the summer cottage and relatives living in the countryside:

> *Well, we of course followed the situation, because we have a cabin in the countryside. Nothing helps there if it gets below zero; the water pipes just freeze. Luckily, this didn't happen because we went there so often, but at one point it was minus four. My parents live there in the countryside, and it calls for a certain creativity. I don't really remember how long the cut was, but days, as it was in the worst area. They have an engine-generator, but it's so small that they only use it for wood heating, as they have the water pipes, so they get the hot water running there and then turn it off.* (Interview, household 6)

Control and competence

In general, heating was relatively visible and present in the everyday life of the interviewees due to intense wood heating during the colder periods. However, the disruption invoked a set of physical, social and mental skills required during the power cut. Disruption acted as means to get to know how the house works and thus affected the competence of the dwellers. The disrupted practice required increased manual control of heat provision that was more time-consuming, but resourceful solutions were sometimes found:

> *So there where the weak part was, we started to heat it up with the generator. It's like… it's there in the yard and the lines come in, you have to have extension cables. Our Olli [son] said when I asked 'how can we make this blow' - he just replied 'let it stay there for the night; when the fuel runs out, then it will stop, you don't have to keep track of whether it's turned off or not.'* (Interview, household 3)

During the power cut, the media reported on older people who lived in unsafe conditions with very low indoor temperatures and with weak physical skills - but who refused to leave their homes, often because of pride and the willingness to tolerate lower comfort levels. However, the ones who left the house during the power cut were often older people with no physical strength to adjust to the lower temperatures, to prepare food without electricity, to manage in the darkness or to heat the house with wood. This shows the competence needed:

> *Older people living in the midst of power cuts have taken the situation positively. A taxi driver who drove around old people's homes yesterday evening tells that most of them are fine. … Yesterday none of the elderly were willing to evacuate, but the colleagues [of the taxi driver] had faced a different situation: they had evacuated a few people to the health center for heat and care.* (MTV3 news, 26 January 2011)

In household 1, the activity and resourcefulness of the husband's mother was reported as an illustration of the 'right' attitude:

> *Well, I don't know, it's a question of attitude. So if I tell you a true story, my mom lives there [in Kousanniemi] and we've had electricity since '82 in that home place. And I went to clear some snow from the roof and check because I knew that the power was off. My mom said that there's no water, but there is heat. And I thought I would go and get some water from my brother because he lives nearby, so I would get water from the well with a hand pump. It was only few minutes, I was just on the roof and mom appears and calls me for a coffee. I was, like, where did you get heat and warmth? 'Well, I lit the stove and melted some snow for water for you…' So to her it was just a natural thing that there's fire in the stove, fire in the oven, fire in the tiled stove, logs from the shed, water from the well. So that's how you live.* (Interview, household 1)

Accordingly, the households reported that elderly people proved more competent than publicly assumed. Competence was also shown through the ability to adjust indoor habits. Adjustment or loss of control meant, for example, allowing the lowering of the room temperature from normal comfort levels:

> *I feel that people didn't really consider that if they don't have electricity they can use candlelight. At some point I felt that our measures are a bit excessive. Old people there in the village have learned how to cope before.* (Interview, congregation employee)

When comfort at home was not enough, seeking comfort outside one's own property was an option for some. Respondents reported neighbours, relatives and acquaintances who had left their homes because of the blackout.

Circulated meanings

Some households reported a culture of energy conservation before the disruption by emphasising the low use of electricity around the house. These people also valued self-sufficiency in their heating and reported achieving it using wood as a source of heat. Interestingly, the power failure was consistent with their normal orientation as they reported business-as-usual feelings.

Coping in the face of the power cut evoked many meanings attached to the power cut. Whereas the electricity utilities typically strive for universal, homogenised service provision, the households embraced heterogeneity in their provision solutions and their sense of sovereignty. Feelings of insecurity, unpredictability and non-autonomy were taken as given:

> *People just say that you have to be on your own. Once we've learned that the welfare society works so this is one reminder that it doesn't. So that provision, self-sufficiency - wait a minute how do you say it… you have to prepare yourself for exceptions.* (Interview, household 2)

> *Our principle is such that the more self-sufficient you are, the better all round.* (Interview, household 3)

> *Maybe in this state of emergency you get a foretaste of what could happen, and then you realize how dependent you are, there's nothing you can do; basically, everything stagnates for a while in personal life or in working life.* (Interview, local entrepreneur)

Coping was especially highlighted in the stories concerning older people. Coping with the power cut also meant renegotiating the concepts of privacy. Interviewees reported sleeping in the same room, sleeping with the door open and showering in more inconvenient places (such as in the barn):

> *But I feel that old people here cope pretty well because they have the stove and oven and they get water as well... It's that when you have lived your whole life in the countryside, and they say that we didn't have this before, but you do remember how we have coped before and we can live like this for a while. That it doesn't do much to our lives.* (Interview, household 3)

Reflective practice

In the reactions of the households to power cuts, we can identify a resumption/revival of 'old', dormant habits. Dormancy here refers to materials, meanings and skills that had once been active but that had been unused due to new arrangements. Thus, rather than seeking change in the future, past arrangements were given value and put into effect. Past arrangements were not, however, romanticised, but they were valued for their flexibility, frugality and familiarity[a]. Furthermore, low-tech arrangements (e.g. opening doors to allow heat to move around the house) that do not require new technologies provided simple, at-hand solutions to endure the power cut.

The (dormant) practices can only be reactivated if there are flexible or hybrid material structures. Reflectivity was prompted through the carrying out of practice, i.e. 'work' and 'non-work'. Thus, the respondents did not report conscious reflection on whether they should change the material arrangements of their practice, but rather the elements of the practice started to be renegotiated, i.e. notions of autonomy, security and reliance were brought into the open. Furthermore, reflexivity was prompted both towards the home and outside it. In other words, acts of repair were expected from both decentralised and centralised systems of provision. Consequently, the web of practitioners (neighbours, community, energy companies) became more visible. One aspect of the cultural rooting of heating systems is that they enable and/or imply social relations.

In general, heating was relatively 'visible' and present due to intense wood heating during colder periods. This orientation towards wood heating requires planning and labour as well as a harvest-when-available and store-until-required mentality. In terms of convenience, the households found the development of hybrid systems important. In times of normal conditions, cheap electric heaters are often used as backup systems to enable flexibility. Some use fireplaces to provide extra heat and comfort during cold spells. In most cases, wood stoves, pellet heating systems and other small-scale production co-exist with electric heating. However, this is not to say that both of these technologies are integrated to work in tandem. Rather, when one fails and indoor temperatures begin to drop, the other is manually operated to provide the backup. Electricity as a backup also offers possibilities for extended absence. Some residents have organised their lives so that this type of backup is hardly needed and, for example, minimise travel during the heating season. For those who are engaged in livestock rearing, this 'choice' is part of their occupation, but for others, detached houses and solid wood-based heating systems belong to the non-occupational bundle of practices connected with reduced mobility. However, most users of solid wood heating systems make use of the flexibility offered by hybrid systems, and in our diary data, we encountered many respondents who are less committed to wood as a heat source but rather appreciate it as an aesthetical joy that is available when desired. When solid wood is part of such a weak or less coercive arrangement, it fits more easily with the mobile patterns of contemporary life.

Conclusions

Energy is most closely intertwined to the everyday practices it sustains. In this paper, I have discussed the flexibility of energy consumption practices, focusing on the dynamic and 'hard-to-catch' energy use practices and on understanding the processes through which forms of energy consumption change and are reproduced. Through a case of indoor heating practice and its disruption during a multiple-day power cut, I have demonstrated how the practice of heating carries dormant elements of practice that are reactivated and enacted during an instable event. As evident based on the analysis, no single solution was found for the interviewed dwellers to cope with the power cut; rather, coping was maintained through a mixture of different arrangements, adjustments and compliances. A broad set of socio-technical practices were evoked in conversations as circulating across boundaries to categorise performance.

This exploration of user practices during long power cuts has revealed that power cuts serve as spaces for reflexivity on the heating practice. This reflectivity was bodily and material, but little explicit reflection on persistent changes was observed. Little evidence was found that the disturbance in the power supply brought about reflection on energy use on a more general level. However, blackouts activate unused skills, resources and technologies that have been replaced/superseded by other elements but have remained dormant for one reason or another.

A distinctive feature in the research design was that heating was provided through embedded and localised systems of provision. These systems supply more resilient energy services than non-autonomous systems [19]. This opens up further discussions on resilience as an

argument for supporting the development of small-scale renewable energy production and, for instance, community-led energy initiatives. It is worth noting that in the case of wood-based heating, the technology is highly visible and laborious [11,29]. This implies that households have gone through negotiations concerning the practical efforts required to reach and maintain acceptable indoor temperatures. Given this, an existing know-how on the limits and possibilities of the practice and its linkages to other practices might make the adjustment to external disruptions easier and more tolerable.

Focusing on households with wood heating solutions as a backup technology can be considered somewhat excluding and a limitation of the study. Importantly, however, this study implies that the rather demanding practice of using solid wood in heating signals that convenience and ease of use are certainly not the only routes or slogans along which distributed renewable energy technologies can progress. Consequently, research and policymaking should acknowledge more openly that sustainable solutions are not only derived from above and from outside the context of users, but can also arise from the local context and from users' everyday experience.

In terms of disruptions, practice theory allows us to research the situated processes of gathering the knowledge required to accomplish practices. Through practice framing, this implies a shift from only questioning which skills and knowledge we need to examining how they are taught, how they are learned, how they travel between moments of performance and how they change and are made anew [6].

The interview study that I have presented in this paper provides an account of the domestic heating practices in the normal state and in a state of disruption. However, further mixed methods could be used for a more in-depth understanding of the life trajectory of the practice and the practice bundles that are linked to the use of hybrid forms of energy provision. The interviews were conducted only once, and people could find it difficult to reflect on their practice with a 'stranger'. Thus, a study with a longer time scale or successive in-depth interviews could be considered. Consequently, interviews during power cuts would be interesting in terms of capturing the disruption as it occurs. In addition, the interviews could be extended to cover other local actors and, for instance, the energy company. This would allow us to analyse the dynamics between the 'practitioners', understanding them in a broader sense. As practice approaches attract more interest in sustainability and energy studies, the question of how practices are learned and developed warrants further theoretical and empirical elaboration.

Endnotes

[a]It should be noted that the interviews were not conducted with young family members.

Competing interests
The author declares that she has no competing interests.

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