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Practices, Provision and Protest: Power Outages in Rural Norwegian Households

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Introduction

Electricity plays a vital role in everyday life. However, electricity-dependent practices are often taken for granted, and the complex infrastructure enabling them tends to be invisible (Silvast, 2013; Shove & Walker, 2014)—until the power supply is disrupted. Then, consumers change from being passive recipients and become 'co-managers of their own practices, involving the dynamics of both supply and demand' (Rinkinen, 2013: 3). Drawing on qualitative interviews with Norwegian rural households, this chapter uses everyday practices as starting point for

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understanding how daily life changes during power outages and how the households themselves experience the consequences of outages.

Although lengthy power outages have been rare in high-income countries, the supply of electricity is becoming increasingly vulnerable due to the growing complexity and interconnectedness with other crucial infrastructures (Heidenstrøm & Kvarnlöf, 2018). It is impossible to imagine modern life without electricity, as outages affect systems for water, waste, food, transportation and communication (Matthewman & Byrd, 2014: 6). Security of supply is also a timely issue, as the demand for electricity services will continue to increase as energy systems become decarbonised (Ghanem et al., 2016). Furthermore, both terrorism and natural disasters induced by climate change could make outages more frequent in the future (IPCC, 2012; Matthewman & Byrd, 2014; Morrissey et al., 2018). Norway has not been particularly prone to power outages, but rougher storms and heavier snowfall in recent years have demonstrated infrastructure vulnerabilities (NVE, 2018; Agder Energi, 2018), as in other high-income countries (Ghanem et al., 2016; Silvast, 2017). The 2010 World Bank analysis of energy in 30 countries in Eastern Europe and Central Asia, titled 'Lights Out?', predicted a severe energy crunch in the region over the next decade. Similarly, the American Society of Civil Engineers anticipates large investment gaps in electric generation, transmission and distribution in the USA, leading to unreliability in electricity supply and posing a serious threat to the national economy (ASCE, 2017).

Much of the literature on power cuts and security of supply uses a techno-economic lens that expects households to *understand* the complexity of electricity systems and *calculate* the risk of power outages (Silvast, 2013). This is particularly evident in the literature on the value of lost load (VoLL), using methods that seek to establish a monetary indicator of the value of secure electricity supply (van der Welle & van der Zwaan, 2007; Schröder & Kuckshinrichs, 2015; Shivakumar et al., 2017). The methodology relies on surveys aimed at uncovering the costs and consequences of power cuts for households, often by asking directly what they would be willing to pay to avoid or accept power cuts (London Economics International, 2013; Electricity North West, 2016). Determining a monetary indicator that directly reflects how households value secure energy supply is a challenging exercise; contradictory to the

methodological intention, some studies have found that households report their direct expenses to be higher than their willingness to pay (Samdal et al., 2002). Because of the complex combinations of material and non-material costs, 'the costs arising from interruptions in the residential electricity supply market are a blackbox' (Morrissey et al., 2018: 142). Although a qualitative approach cannot reveal how households value secure electricity supply, it can shed light on why it may be difficult to translate the consequences of power cuts into monetary terms. Further, a qualitative approach enables a deeper understanding of how power outages may shape households' attitudes towards the broader system of electrical provision, which often result in protest responses in contingent valuation studies that are simply omitted from the analysis (Meyerhoff & Liebe, 2006). With a focus on daily practices, this chapter examines how households themselves reflect on the costs and consequences of outages when describing their own experiences.

Theories of practice have emerged as a powerful lens for exploring the role of energy in daily household routines (Corsini et al., 2019). As Gram-Hanssen (2014: 94) notes, 'Energy consumption is not a practice in itself, but all the different things that people do at home which consume energy, such as cooking or washing, are practices'. Theories of practice focus on 'routine over actions, flow and sequence over discrete acts, dispositions over decisions, and practical consciousness over deliberation' (Warde, 2014: 286). Using qualitative interviews with Norwegian rural households with relatively recent experience of power outages lasting at least 24 hours, I explore how the elements comprising a practice—materials (products, technologies), competences (skills, knowledge) and meanings (ideas and beliefs)—change as households cope with power outages. The aim is to shed light on how disruption influences relations between infrastructures, practices, customers and providers. The analysis further demonstrates and discusses the level of electricity dependence in rural Norwegian households.

The Norwegian Context

Heavy investments in hydropower from the 1960s onwards provided relatively cheap electricity to Norwegian consumers and contributed to increasing their dependency on electricity. Today, some 96% of electricity production in Norway is based on hydropower (Sopha et al., 2010). Norway is one of the few countries where household energy consumption is based on electricity, with a share of 75% and 79% in the period 1991–2010 (IFE, 2013). Depending on outdoor temperatures, energy for space heating and hot water use amounts to about 75–80% of the electricity use in an average household (Statistics Norway, 2014). Average electricity consumption per household has been among the highest in the world, 16,000 kWh per year in 2012 (ibid).

Customers pay a tariff to the grid company with monopoly in their specific region (136 in total), in addition to paying a utility company of their choice (free competition) for the electricity used. Electricity prices are highly volatile and may fluctuate on a daily, monthly or yearly basis, depending on the customer's contract with the electricity supplier. This variation is market-based with no social tariffs (Winther & Bouly de Lesdain, 2013). Each individual grid company determines the grid tariff to be paid, within the framework set by the national regulator (the Norwegian Water Resources and Energy Directorate, NVE). This tariff goes to finance grid operation and maintenance and to ensure security of electricity supply; the amount paid depends on where in the system the connection point is located. Distribution tariffs among companies vary; factors like difficult natural conditions and scattered settlement patterns may result in higher transmission costs (Energy Facts Norway, 2019). The tariff system as a whole is currently under discussion, partly due to the introduction of smart metres in all households during 2019, financed through this tariff (Ballo, 2015). Although Norway was among the first to deregulate the electricity market (in 1991), this has not necessarily made Norwegian consumers into economically rational market actors (Karlstrøm, 2012). Rather, consumers continue to view electricity as a common good (Winther & Bouly de Lesdain, 2013; Westskog &

Winther, 2014), with access to abundant, reliable and relatively cheap electricity as their right (Aune, 1998; Godbolt, 2014).

Security of Supply in Norway

Power outages are not common in Norway. According to NVE (2019), the delivery reliability (related to both frequency and duration of power cuts) in 2018 was as high as 99.983%, with an average duration of outage per customer of just below 2 hours (similar to European averages) (Kraftnytt, 2018). Severe weather is the greatest threat to security of supply, followed by technical failure (Fadum, 2019). In 2018, weather events such as heavy snow, wind and flooding were the major causes of unwanted events in the electricity sector, with trees too close to grid lines posing a particular risk. This means that outages are unevenly spread geographically, and rural areas with overhead grid lines through dense vegetation are more prone to outages than urban areas with underground power supply. Chappells and Shove (2004: 137) refer to rural areas as 'cold spots' in the electricity network, particularly vulnerable to breakdowns because they are 'at the end of the line', with little scope for load substitution. In winter 2017/2018, more than 200,000 outages occurred in Norway; about 20,000 end-users experienced power cuts several times, some more than five times. Southern and Eastern areas were particularly affected, especially the Agder counties (Fadum, 2019), justifying the selection of households for this study.

Grid companies are required to report the amount of energy *not* supplied through a standardised model referred to as the CENS-model (Costs of Energy Not Supplied) (NVE, 2019). This is to be 'a measure of the calculated value of lost load for the customers' (NVE, 2015). The value is thought to be captured through various survey methods, with a majority using what households report as the amounts they are willing to pay to avoid power cuts as measurement (Samdal et al., 2002; Pöyry & SINTEF, 2012; Skjeflo et al., 2017; Skeie et al., 2018). The CENS value forms part of the revenue regulations between NVE, grid companies and the transmission systems operator (Statnett): it is deducted from the grid companies' allowed revenue and is meant to ensure that

grid companies account for the delivery reliability of the grid when building, operating and maintaining the grid. Here I do not discuss the quality of these surveys, but seek to shed light on some of the difficulties involved in trying to reduce the complex consequences of power outages to monetary value. Such surveys often account for the items and technologies that stop working during a blackout—but they say very little about how households deal with the absence of electricity during an outage.

Qualitative Studies, Households and Power Outages

Most qualitative studies of households and power outages focus on preparedness: 'the process of developing a response and management capability before an emergency occurs in order to anticipate and address potential hazards so that needed resources are in place' (Diekman et al., 2007: 494). Traditionally, preparedness has been approached in terms of the ability of government agencies and emergency responders to provide assistance during emergencies, but households have emerged as an increasingly important part of national preparedness strategies. Qualitative approaches have been developed in response to the limitations of formal, normative and top–down ways of measuring household preparedness based on the quantities of emergency supplies stored for use during a disaster (Heidenstrøm & Kvarnlöf, 2018). Lists of available items reveal very little about how and why these items were stocked, or whether they are used during an emergency. By contrast, qualitative studies focus on what people actually do during power outages. This literature has been particularly useful in directing attention towards how households themselves view their own preparedness and how they act during an emergency. From Sweden, Palm (2009) has shown how the responsibilities between households, municipalities and grid companies become blurred during power outages; Guldåker (2009) has studied households as part of crisis management in the aftermath of a heavy storm. Several studies have focused on what people have done during power outages in various

European contexts (Silvast, 2013; Rinkinen, 2013; Ghanem et al., 2016; Heidenstrøm & Kvarnlöf, 2018). Generally, these studies contradict the findings from studies focused on formal, top–down definitions of preparedness, and show that households can be prepared and cope well without having formally or consciously prepared for a power outage. Building on these studies, this chapter seeks to understand how daily life changes during power cuts and how the households themselves assess the consequences. I also discuss how power outages shape attitudes towards electricity providers.

Infrastructures, Practice and Provision

During the early 2000s, *theories of practice* re-emerged in consumption studies, critiquing the highly individualistic and economistic accounts of consumption that stress rational choice, utilitarian models of sovereign consumers, and cultural approaches to consumption that emphasise cultural expressivism through style, taste and identity (Warde, 2014). The focus shifts to understanding how and why people act as they do—through routines, habits and daily life. A 'practice' can be defined as:

> a routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. (Reckwitz, 2002, 249)

Given the everyday nature of energy-dependent consumption, theories of practice have become increasingly influential in the field of energy-consumption studies (Shove, 2003; Wilhite, 2008; Gram-Hanssen, 2014). Energy consumption is understood primarily as a social phenomenon, and social life as performed through practices. Practice approaches seek to provide 'a more holistic and grounded perspective on behaviour change processes as they occur in situ' Hargreaves, 2011, 79). Electricity consumption is studied through people's electricity-dependent routines and practices. When making practice the focal point, focus shifts from measuring what

stops working during a power outage, to what people actually do to continue their daily lives without electricity.

How to link everyday practices with disruption in power supply? This requires further conceptualisation of the connections between infrastructures (such as the electricity network) and the practices to which they relate. These connections are not fixed: they are fluid and relational, with infrastructures and practices mutually influencing each other:

> rather than simply meeting pre-existing needs, infrastructures shape relations between practice, material artefacts and related concepts of service (e.g. of comfort, convenience) in time and space; reciprocally, established practices shape and sustain specific infrastructural configurations (Coutard & Shove, 2019: 11).

Central to practice theories is the idea that practices are performed through the connection of various material and social elements. There is no clear agreement among researchers on what these elements are (Wilhite, 2008, Gram-Hanssen, 2014; this analysis uses Shove et al.'s (2012) conceptualisation of *materials, competences* and *meanings*. This has become known as the 'three elements model', where the three are understood as constitutive of practices and used to understand 'what it takes to accomplish a practice in a given moment and place' (Shove et al., 2015: 278). As connections among these three are made, sustained or broken, practices may emerge, persist, shift or disappear (Shove et al., 2012). The *material* element refers to items, technologies, tools, hardware, tangible physical entities and the stuff of which objects are made. This element becomes particularly complex with electricity, as intricate infrastructures and concrete appliances are considered part of the material. Households do not use electricity per se, but items like televisions, vacuum cleaners and cookers require electricity to function. In turn, households rely on these and other items in order to perform daily routines—indeed, such appliances may even come to define or change certain practices. Here it is useful to distinguish between 'first-order' socio-technical systems, such as infrastructures, which are material configurations in the background, often taken for granted, and 'second-order' devices depending on them in a given practice (Smits, 2018, 41). Shove employs a similar distinction;

either materiality that is directly mobilised and actively manipulated, or materiality that is necessary in order to conduct a practice, but is not engaged with directly. The latter category has an 'infrastructural relation' to practice (Shove, 2017: 156).

The connections between infrastructures and practices have emerged as central topics (Shove & Trentmann, 2019). This centrality can be explained through four distinct features. First, infrastructures are connective, linking different places and sites of practices. For electricity, this connectivity moves across space and scale, connecting heat in, say, one specific living-room to the national grid. Second, infrastructures have a multiple aspect—they typically sustain a range of different practices at the same time. This is a consequence of their 'location in the background of social action' (Shove et al., 2015: 7). Hence, when infrastructures fail, they may disrupt many practices simultaneously. A third feature is the collectiveness of infrastructures: they tend to provide services for more than one user. Consequently, they are both subject to and the outcome of deliberate planning and intervention by companies and governments at different levels. This feature connects practices, infrastructures and system providers, underlining the importance of paying attention to the relation between consumers and relevant institutions and systems of provision (Coutard & Shove, 2019). Useful here is Fine and Leopold's (1993) term 'systems of provision', referring to 'the inclusive chain of activity that attaches consumption to the production that makes it possible' (Fine, 2002: 79). Infrastructures are not neutral arrangements, but the result of contests over places, resources and rights (Shove et al., 2019: 5), and between different interests (Shove et al., 2015). Those involved in planning and designing infrastructures are thus directly involved in enabling, shaping or even limiting peoples' practices (ibid). In this chapter, I use the provisioning aspect to shed light on the relations between households and grid companies. And lastly, infrastructures are obdurate: they often require major interventions in the environment, heavy investments, and 'embody and carry historically specific ideas about normal and appropriate ways of living, effectively transporting these from one generation to the next' (ibid, 7). Combined, these features make infrastructures resilient in the face of changing and disappearing practices.

The material element is central to understanding the connections between practice and infrastructure failure, but materials cannot be mobilised without knowing how, when and for what. This connects the material to the second element of practice: *competence*. Competence includes skills, know-how and technique—knowing in the sense of being able to evaluate performance, and of having the necessary skills. Skills are both shared and reproduced in the doing of a practice—immediately and in the long-term as practices evolve (Shove et al., 2015). Competence also includes embodied or tacit knowledge, where competences may lie dormant for years without being activated (Heidenstrøm & Kvarnlöf, 2018). The element of competence is used to understand the knowledge households build on (and continue to build) when practices are altered during power outages. The final element, *meaning*, refers to symbolic meanings, ideas and aspirations: 'the social and symbolic significance of participation at any one moment' (Shove et al., 2012: 23). This element is used to understand how households make sense of their practices without electricity and what ideas and meanings they attach to performing them. Together, the three elements are used to explain what happens when the linkages between them dissolve during power outages, and how households seek to continue their practices by connecting different materials, competences and meanings.

With power outages, the issue of reliability of supply becomes important. When electricity systems increase in reliability and become taken for granted, the uses of the system expand and new appliances become connected. As people's daily practices become more reliant on electric supply, dependency increases (Coutard & Shove, 2019); when an electricity system is *unreliable*, that will also have an effect on household practices. As put by Chappells and Trentmann (2019: 198), 'disruption give us short, momentary glimpses of the fabric of "normality" as it is fraying and reveal the patterns in which practices and infrastructures are woven together'. My analysis focuses on how power cuts shape the elements of practice and the connection between them, and the relations between infrastructures, practices, users and providers.

Methodology

The analysis is based on 17 qualitative interviews with rural Norwegian households which had experienced outages of more than 24 hours during winter 2017/2018 (see Table 6.1 for a summary of household characteristics). Qualitative interviewing was chosen to allow investigation of how daily practices change during power outages, and the consequences of interruptions for households, during outages and in longer-term practices of preparedness. As practices are more about doing than saying,

Table 6.1 Characteristics of interviewed households

	Household description, with ages	Informant	Years living in current house	Area
1	Couple, 56 and 53	Male	7	Agder
2	Family of four: 43, 42, children aged 10 and 15	Male	11	Agder
3	Couple, 75 and 82	Both	14	Agder
4	Family of seven: 2 adults in their 40s, children aged 17, 15, 12 and 6	Female	14	Agder
5	Woman (widow), 92	Female	>25	Agder
6	Couple, 69 and 71	Both	>25	Agder
7	Man, 35	Male	8	Nordmarka
8	Family of three: adults in their 40s, child aged 16	Male	21	Nordmarka
9	Couple, 60s, with younger relative of 18	Both	15	Nordmarka
10	Woman, 80s	Female	>25	Nordmarka
11	Family of three: adults in their 40s, child aged 15	All	1	Agder
12	Family of six: 48, 49, children aged 9, 11, 14 and 18	Female	>25	Agder
13	Family of seven: 44, 55, children aged 9–17	Female and children	18	Agder
14	Family of three: 33, 33, child aged 2	Female	10	Agder
15	Family of four: 42, 43, children aged 8 and 11	Male	8	Agder
16	Woman (widow), 70	Female	>25	Agder
17	Couple, 70s	Male	>25	Agder

observation is often seen as the ideal study method. Rather than providing accurate descriptions of how practices change during power cuts, data collected through interviews reflect how people *reconstruct* the influence of power cuts on practice and habits (Silvast, 2013). Informants may have forgotten some aspects or wish to highlight what went particularly well; however, in-depth interviews also allow for reflection and explanations about how habits were interrupted and resumed—points that might have been missed if other research methods were used. Additionally, informants may be able to place incidents during one power cut in a broader historical and cultural context.

The study-households were located in Agder district in the far south of Norway (13 households), and in the Nordmarka woodlands (four households) outside Oslo, recruited by local community chairmen, or self-recruited following an email from the grid company or through an announcement in the local newspaper. Each household received NOK 500 (approx. €51) as compensation. All households were living in detached homes in rural localities. There were eight families with children, six households of retirees, two middle-aged couples and one 35-year-old bachelor. All except one household had been living in their current home for more than 5 years—13 for more than 10 years (see Table 6.1 for further details). This gave them solid experience regarding the frequency of power outages in the area, and their influence on daily life. One household was interviewed by phone; the remaining interviews took place in the family homes. That offered a closer understanding of the geographical areas in question, with observation of the homes and the material objects used in daily life as well as during power outages. With all households except one, the lengthy power outages had affected a larger geographical area. Table 6.2 (below) summarises alternative materials and technologies for selected practices in the households interviewed.

Interviews were semi-structured, and included questions about background information such as household composition and employment, the extent to which daily routines involved electricity, available alternatives to electricity, and experiences with outages. Main themes were the socio-material aspects of how practices change during lengthy power outages and the specific consequences. The interview guide included open questions and specific ones covering daily practices to reveal what

Table 6.2 Alternative materials and available technologies

Heating	Cooking	Lighting	Toilet and hygiene	Generator
Households				
1 Wood stove	Have: charcoal grill, campfire pan Used: wood stove	Candles, hand-torches, LED -lights	Traditional outdoor toilet	No (under consideration)
2 Wood stove	Wood stove	Have: hand-torches Used: candles, kerosene lamp	Waste water from the well	Yes (not used)
3 Wood stove, gas-driven stove	Wood stove	Hand torches	Used stored water, fetched water from nearby stream	No
4 No, but slowness in the system (central heating system driven by wood and electricity)	Gas grill (portable)	Used: head torched, candles	Used stored water	Yes (not used)
5[a] Wood stove	Wood stove	Chargeable battery-driven	Kept water access	No
6 Wood stove	Have: Gas grill Used: Wood stove	Candles, hand-torches	Waste water on tap in basement	No (under consideration)
7 Wood stove	Used: primus, bought prepared food	Candles, hand-torches	Used stored water, melted snow	No (under consideration)
8 Wood stove and fireplace	Gas flare	Some driven by generator, head-torches, candles	Generator-driven, chargeable dishwasher	Yes
9 Wood stove	Have: Wood stove, primus Used: only cold food	Head-torches, candles	Used stored water	Yes (not used)

(*continued*)

Table 6.2 (continued)

Heating	Cooking	Lighting	Toilet and hygiene	Generator
10 Wood stove	Campfire pan and wood stove	Head-torches, candles	Traditional outdoor toilet	No
11 Wood stove	Hotplate with propane and wood stove	Candles, hand-torches, battery lighting bought during blackout	Bought water, melted snow	Yes (but broke down first evening)
12 Have: Gas oven Used: Wood stove	Primus	LED-lights, hand-torches, candles	Connected directly to well	Yes (used only for TV one day)
13 Wood stove	Wood stove	Hand-torches, candles	Melted snow, used muck cellar in stable as toilet	No
14 Wood stove	Did not cook warm meals	Hand-torches, candles, battery-driven lamps	Waste water from the well	No
15 Generator-driven heating	Gas flare	Hand-torches, candles	Kept water access, heater driven by generator	Yes
16 Wood stove	Camping stove	Hand-torches	Kept water access	Yes (not used)
17 Wood stove and fireplace	Gas flare	LED-lamps, hand-torches	Kept water access	No

[a]Stayed at a nursing home during the outage

households had actually done during the outage. Informants were also asked directly about translating the consequences of power cuts into economic terms. The latter is not the main focus of the analysis, but is discussed briefly and reflected upon in the conclusion. The interviews were recorded, transcribed and later coded in Nvivo. All quotes have been translated from Norwegian to English by the author.

Coping with the Consequences of Outages: Restructuring the Elements of Practice

During a power cut, our dependence on electricity is foregrounded and the vulnerability of everyday practices revealed. Lights go out, as does the background sound of electric appliances in use. On a winter afternoon in rural Norway, this means total darkness and silence, except perhaps from cell phones in use. Electric heating, electric cookers, water heaters—all stop working. As noted, Norwegian households are particularly dependent on electricity for most daily practices (Winther & Bell, 2018). As put by one informant (household 6, man 35):

> All your routines are changed. Normally, you're 100% dependent on electricity all the time, nearly everything you do and touch involves electricity, so you have no routines anymore.

The centrality of infrastructures to practice becomes evident during a blackout: electrical infrastructure serves as the 'backbone' to most devices used daily, and to our understanding of what it means to live a modern, normal life in a high-income country.

What then happens during a power outage? What becomes the major focus of households during disruption? While the moment of disruption brought the dissolution of previous routines for the study-households (some described this as 'a state of emergency'), they still managed to adapt quite quickly. As one informant put it, 'it's about getting into a rhythm…it's not a problem, it just means more work' (13, family of seven). They focused on keeping the wheels turning by trying to maintain daily routines and practices—which illustrates the

centrality of practices in seeking to understand social life. As Ghanem et al. (2016: 173) note:

> The power outage presents a situation where the linkages between the elements of the practice are broken, albeit temporarily. However, for normal everyday life to continue, existing practices need to be modified, new linkages need to be made incorporating new technologies and artefacts, and would require knowledge and competence for the practice to be performed in a power outage situation.

Maintaining daily practices entails re-organising the elements that normally shape them. In the following, I present and discuss how household practices change during power cuts: using different materials, invoking other competencies, attaching new meanings to practices.

The Material Matter(s)

As noted, the material element involves 'first-order' or 'background' materiality, such as infrastructures, and 'second-order' devices that are directly used by households during power cuts (Smits, 2018). A power outage severely affects the background materiality, as electric infrastructure often intersects with other complex infrastructures. For many of the rural households interviewed here, this meant the water system and communications. For 8 of the 17 households, water supply stopped immediately after the power disappeared, and this became the chief consequence for those households. In 2017, about 85% of the Norwegian population was connected to municipal water supplies (Statistics Norway, 2018). Those supplies were not affected by power outages—households without water supply during power outages were thus among the unconnected 15%. Their normal water supply comes from wells, conducted into the house by means of electric pumps. As the estimated daily consumption of water per person in Norway is 179 litres (Statistics Norway, 2018), a full stop in water supply means a considerable disruption of everyday routines. The households found various ways of keeping their water-dependent practices going. Several had foreseen the consequences, and

had filled buckets, bottles and bathtubs with water in advance. For others, this involved the lengthy process of melting snow/ice on the (wood) stove (household 1), fetching water from the nearest stream (household 3), or driving to buy water (household 2 and 11). Regardless, losing the water supply entailed a major shift in the workload connected with daily practices of cooking and hygiene—cumbersome and time-consuming. During two 38-hour power outages, one elderly couple fetched all the water they needed from a small stream about 30 metres from the house, using a bucket. And a family with five children had to use the muck cellar in the stables as a toilet for almost four days.

Regarding the communications system, the battery backup on base stations for households' mobile technology lasted only for some hours. Nine of the 17 households interviewed soon had no way of communicating with the outside world for the remainder of the outage. This was considered risky, especially in combination with the harsh winter weather with heavy snowfall and fallen trees blocking the roads. One household reported that a neighbour had died of a heart attack during the power outage, as his wife had no way of contacting the ambulance services. That episode became a major talking point in the community. The lack of communications represents materiality that is not easily compensated, especially since telephone landline use has decreased steadily in recent decades: from 2009 to 2018, the number of landline subscriptions fell, from 1.8 million to about 563,000 (Ekomstatistikken, n.d.). This also poses a major danger to more general emergency preparedness—without a communications network, households cannot call for help:

> We had to keep our hopes up, but of course we were all thinking 'what if something happen when all the systems are down'. No trains, nothing, and the roads blocked by snow. You might as well be locked in a bunker, waiting for someone to come and get you out. You don't know anything – and that is not a good feeling. (household 1, middle-aged couple)

As to second-order devices, households had to mobilise materials in new ways in order to maintain daily practices.[1] For some, this meant obtaining new materials, but for most, it meant using available materials in new ways, drawing on an existing backup system of dormant materials

(Rinkinen, 2013). Because material arrangements 'simply exist' (Shove and Walker, 2014), various materials can be included in numerous different practices (Gram-Hanssen et al., 2017). Hence, how a practice is performed is influenced by both the availability of things and whether and how households make use of them.

Although electricity is the main source of heating for the majority of Norwegian households, all but one household had alternative technology in the form of wood-burning stoves. In fact, 86% of detached houses in Norway have wood-burning alternatives (Statistics Norway, n.d). Wood has remained central in heating systems in Scandinavia (Rinkinen, 2019), and several households interviewed here saw their wood-burning stove as the main heating source. The one household without a wood-burning stove normally used a central heating system powered by wood and electricity. Inertia in the system meant that the house kept some of the heat during the 48-hour blackout. Households reported utilising other types of 'materials' to keep warm, such as wearing thermal underwear indoors (household 4, family of seven), in addition to various types of outerwear and blankets:

> The fact that it got really cold was uncomfortable, but then we had warm bed-sheets, and extra duvets, and these woollen blankets, you know the kind you keep in the house and never throw away but never really use either. (household 13, family of seven)

From a provisioning perspective, using wood for heating makes sense considering the instability in the electricity infrastructure and the fact that many of the households had easy access to wood locally; some owned forest themselves. While keeping warm was seldom mentioned as the most challenging aspect of the outage, heating with wood required substantially more work, as well as different daily rhythms with fetching wood and keeping the house warm (Rinkinen, 2019).

For practices like cooking, materials were removed from their predetermined role and relation to other materials—often referred to as the 'script' of a technology (Akrich, 1992)—and used in new and innovative ways. The garden BBQ grill, the campfire pan, a camping stove or woodstoves became main materials involved in cooking dinner:

> We had a gas grill, in the kitchen. I'm glad that I'd bought it – had never used it before, but it came in handy now. … Actually, it was meant for holiday trips; it was such a small one that we could just put it on the table. (household 4, family of seven)

The quote above shows how the material used had not necessarily been acquired for use during an outage. Otherwise, the snowdrifts outside were used to store food from the refrigerator; pots of snow were used as cooling elements inside the refrigerator. Candles and pocket torches, normally used for outside trips in the dark, became the main lighting source indoors; head-torches allowed the continuation of certain activities, like reading (household 12 and 14), eating dinner (household 9) or doing handicrafts (household 10).

Several households were innovative in their use of existing materials, but uncertainty about the duration of the power cut became a key factor regarding what materials were employed. This is again connected to the failure of the communications system, demonstrating the interlinkages between infrastructures and appliances. Without any contact with the grid companies to learn about the scope of the outage and repair schedule, planning became difficult. As also Palm (2009) found, not knowing when the power supply will return can have a paralysing effect on households, as they are unable to decide what efforts to undertake:

> … you have no idea whether it [the power] will return tonight or tomorrow. You begin to think, should I start melting snow, which will take at least an hour, if the power will be back tonight? (household 13, family of seven)
>
> My main frustration was about information, and being able to plan. Being in the dark – literally speaking – and not knowing… that is extremely frustrating. (household 17, middle-aged couple)

Without information about the probable duration, people kept hoping for the power to return and refrained from mobilising materials that could be useful but would require considerable effort. For example, four households had generators, but chose not to use them, weighing the amount of work required against the possibility of the electricity returning.

Although the household economy is an integral element in material arrangements (Westskog et al., 2011), financial issues were not brought up as central aspects. When asked specifically about direct costs in relation to the power outage, informants downplayed this aspect:

> I really don't want to focus much on costs, they aren't the sort of thing I think about in relation to outages. (household 7, man 35)

Most households had incurred direct expenses from the outages, but very little was considered monetary loss. The use of pre-existing stockpiles of wood, batteries or candles was not considered an extra expense, but an integral element in household practices. For most households in this study, outages were not about economic costs, but about the difficulty of leading a normal life without a steady supply of electricity.

Building Competence

According to Rinkinen (2013: 7), 'disruption invoke[es] a set of physical, social and mental skills required during the power cut'. These different skill sets can be linked to the element of competence (Shove et al., 2012). While available materials are crucial, these cannot be mobilised without knowing what to mobilise and how—which demonstrates the interlinkage between competence and materials. For many households, these competences were connected to previous experiences with power outages, constantly building and informing new practices. Heidenstrøm and Kvarnlöf (2018) found that previous experiences with blackouts became a tacit form of knowledge embodied in peoples' daily lives that became activated before or during disruptions. Such embodiment results from two forms of social learning: either by being exposed to others' performances in the same socio-cultural context, or through 'purposive training', as when learning sports or a craft (Wilhite, 2012: 89). Some household members had grown up learning such coping mechanisms from family and community:

> (..) when we hear the weather forecast and know there will be snow, we assume that the power will be cut. I've have been taught that ever since I was a little kid. (household 2, family of four)

Others had achieved this competence through repeated experiences of power cuts. For some, that year's hard winter became an important learning arena:

> But people learned, I heard that from the other kids' parents; they'd filled buckets of water, 10 to 20 litres, to have on hand, expecting more outages. With the first power cut, you're pretty helpless, but with the next one, you've realised that there are things you can do yourself. (household 12, family of six)

Discussing the effect of different types of disruptions, Chappells and Trentmann (2019) found that people continuously build competence and shape practices through various experiences with disruptions. Disruption and normality feed into each other and contribute to shaping the flexibility of infrastructures and practices. This was evident in the households' descriptions of how they prepared, particularly linked to competence in reading the weather signs that instinctively triggered a set of activities:

> When such weather sets in, we always start filling buckets (…) water for cooking, and then we need to think about the toilet as well. (household 3, elderly couple)
>
> Well, we knew that there'd be heavy snowfall, so I finished preparing dinner and baked a cake for the next day, because I thought that I wouldn't be able to do that later. (household 4, family of seven).

Other types of competences were activated during the outages. For nearly all the households, knowing the storage life of food in the freezer was talked about in a common-sensical matter:

> The freezer, you just keep the lid closed, and then things will last for several days at least. (household 12, family of six)

> You just don't open the freezer, and things will stay cold for days. (household 9, middle-aged couple).

Experiences with outages, and the building of specific competence related to this, also meant that the households had created routine for dealing with future outages. This included storing water, having food that could be prepared easily, having a supply of candles, batteries and firewood, and pre-arranged places for pocket torches and matches:

> We always have them [pocket torches] ready just in case, and we always have batteries, that's something I always make sure of. (household 1, middle-aged couple)
>
> Actually, we have water out there now. I always keep a little bit, for sometimes things happen so fast that we don't even have time to turn around… (household 3, elderly couple)

Several informants also mentioned how they were reluctant to upgrade or modernise some appliances, because this would make them less prepared for power cuts. For instance, one informant (household 2, family of four) explained how it was necessary to keep the old pots and pans, because the modern ones, like those used for induction cookers, were no good on a woodstove. And people kept woodstoves centrally placed, knowing how essential they could become:

> There are very few here who, for example, discard their old woodstoves. People normally keep one or two just in case, even if they otherwise heat with heat pumps or something similar. (household 12, family of six)

Such findings are in line with the research of Ghanem et al. (2016) on how previous experience with outages can inform household choices. For instance, several households had opted to keep their traditional outdoor toilet for use as backup during outages (households 1, 10, 11), or their telephone landline in case the cell-net disappeared (households 10, 17). This shows how competence and materiality are intrinsically interlinked.

However, unfamiliarity with using available materials could become a barrier. As mentioned, several households chose not to use their generator

during the long outage, not least because getting it started was such a hassle. One household had considered getting the water pump connected to the generator, but had put off doing this because it would require outside assistance. Another informant simply said that it had always been the responsibility of her late husband—she herself did not know how to use it.

Making Sense of Practice During Power Outages

Experiences with power disruptions, on a regular basis for some households, also involved meaning-making—the third element of practice (Shove et al., 2012). This centred on the sense of achievement connected to being able to cope with the power outages, and became part of identity-building processes for the households involved. Several informants pointed out that they themselves had chosen to live relatively isolated, and therefore could not expect the same security of supply available to city-dwellers. When talking about what a good life meant to them, nearly all informants linked that to living in rural areas, removed from the stresses of urban life. This choice was thus used in explaining that they were more prone to power cuts than elsewhere, and the feeling of their not being first priority:

> We realise that we live in an area where there may be power outages a couple of times a year, and if we lose power one, two, three, four hours, that's no crisis for us – it's just annoying. That's how it is, we can't expect to have the same service as the city, where the power system runs underground. (household 1, middle-aged couple)
>
> …[the grid companies] of course prioritise where there are most people living – that goes without saying; when you live out here in the woods you just have to understand that. (household 2, family of four)

Such an understanding of their own rural location and the effect on security of supply seemed to invoke a particular identity constructed around being able to cope with power outages, often as opposed to 'city-people':

> I think people out here are more flexible, better at adapting when something happens. We're more used to it, and generally speaking we're pretty

> independent of many things that people in the cities have come to rely on. (household 13, family of seven)
>
> I get really annoyed by those people who get so paralysed by power outages. It doesn't have to be long, but they're completely unable to act: they don't go to work, don't send their kids to kindergarten, they just sit at home and wait. I am truly shocked that people are so helpless. (household 12, family of six)

Similarly, Silvast (2013) found that Finnish households explained how capable people can manage without electricity, by being responsible and prepared for outages. Several of my informants were keen to show me their firewood stockpiles, or stressed the flexibility of their daily routines also during outages:

> Yes, we kept things easy, we had tacos for instance. It's easy to cook the minced meat on the camping stove, and that was it. And we probably wouldn't have had tacos on a regular weekday if it wasn't for the outage, so no wonder they [the kids] were happy. (household 12, family of six)
>
> We didn't heat up the whole house for it to be as comfortable as always. We didn't put in a major effort for everyone to be able to sit in their own rooms. We kept to a minimum – this is good enough – and we'll survive very well with that. (household 13, family of seven)

Widespread electric heating has made it possible to heat up entire houses, thus also contributing to changing what is considered to be comfortable and normal home conditions (Shove, 2003). Wood heating is different, as a fire is lit only when and where heat is needed (Rinkinen, 2019). During the power cuts, afternoon activities would centre around the heat, bringing an extra sense of togetherness during the power outage; families spent more time together. This was deepened by the lack of mobile communication, with a stronger felt need to keep the family together, and the lack of working electronics that otherwise facilitated separate leisure activities.

While the above demonstrates the interlinkages between materiality and meanings, others illustrated the connections between competence and meanings. For several households, managing to cope with the power

outages gave a sense of autonomy, proving that they could be self-sufficient:

> I do feel in a way that we're a little like an old-fashioned homestead here (…) a bit by ourselves out here, we simply have to manage on our own – that's what we've chosen. (household 15, family of four)

This was often extended to the community level. One household explained how the neighbours came to borrow their toilet as one of the few with water access; another mentioned letting the neighbours charge their phones from his generator. Several described a community feeling where everyone would help out, especially in making sure that the elderly had what they needed. Other studies have also shown how disruption can intensify social cooperation and bonding (Trentmann 2009). However, stories about those who did not manage so well during the power outages demonstrated how my informants expected responsible households to take the necessary precautions and not simply lean on the community:

> Then they came and asked nicely if they could borrow some [wood] ... or buy some from me. Good Lord [laughing], here I was, seventy years old, splitting wood all summer long, splitting away, while they went off with their picnic baskets and butterfly nets. And then they come to me and ask for wood. I felt embarrassed for them. (household 16, elderly woman).
>
> It would have been so embarrassing if we ran out of firewood, we couldn't have told any of the neighbours… so I don't think we'd have heard about it if someone had been stupid enough to run out of wood. (household 13, family of seven)

Provision and Protest When Infrastructures Fail

Although social learning through outages shapes future expectations of service and response capacities (Chappells & Trentmann, 2019), this does not mean that my informants accepted the failure in service provision as such. While the households felt that they managed quite well in terms of routines and keeping the wheels of daily life turning, it also

became evident that repeated power outages strongly affected the relation between customers (the households) and providers (grid companies).

While part of the competence involved in coping with outages concerned understanding weather signs, the responsibility and explanation for recurrent outages was still placed on the grid companies, as the main actors that customers deal with in connection with power outages. The relationship between customers and providers is shaped by direct and indirect interactions, which in turn shape customers' views and concerns (Winther 2012). Discussions about the grid companies often evoked emotions of anger, bitterness and frustration. The households did not feel like the grid companies had their interests at heart, but rather that they-were distanced and staffed by city-people ignorant of realities in the countryside. This led to inadequate electricity line clearance, contributing to the severity and length of power cuts:

> All the trees that fell over this time – they were too close to the electricity lines. The grid companies have to spend more [money], that's their responsibility … With better maintenance, I think much of the trouble could have been avoided. (household 11, family of three).
>
> For us who are used to being out in the woods and fields, and able to use our heads a bit […] we see that this doesn't work ... they trim and fell trees in a way that is completely idiotic; it doesn't help to clear the line three meters on each side when there is a 15-meter tree on the one, right? The old line-clearers knew this, but they've all been replaced now… (household 2, family of four)

Other studies also note the importance of trust in the grid companies and their understanding of the local context. Palm's study in Sweden found that 'if the household thought the company lacked such local awareness trust in it quickly evaporated. […] a certain bitterness that the company did not regard rural customers as equally important as urban customers' (Palm, 2009: 59). A similar feeling was evident in several of the households interviewed. This bitterness was exacerbated by the general feeling that the grid companies focused not on security of supply, but on keeping costs down, deliberately misleading their customers in the never-ending search for profit. Informants saw power outages as an effect of the privatisation and liberalisation of the electricity market:

> It's provocative to read about their [the grid companies'] surplus of NOK 1.2 billion, and then be told that if upgrades are to be made, if they are to do something about the electricity line, that will cost each household NOK 20–30,000 kroner a year… that *we* should foot the bill for the greed culture that's developed in those companies. (household 1, middle-aged couple)
>
> The reason why they don't upgrade into *[area name]* is that they won't recoup that investment. But when they take over something from the state and become privatised and get the opportunity to make money, then they should also have to spend some money, they can't just make profits everywhere. (household 8, family of three)

Here, the households seem not to criticise electric provision as a large and complex infrastructure that occasionally fails, but as a profit-seeking actor that places its own concerns before those of the customers (Silvast, 2013). According to Winther and Ericson (2013: 382), 'people pre-assess the information contextually with respect to who the sender is and what its underlying motives are presumed to be'. Several households used the fact that they themselves had to record the duration of the outages and fill out forms in order to receive compensation after lengthy power cuts as an example of this profit-seeking mentality—the grid companies obviously had this information already.

Generally, the households had low confidence in, and negative attitudes towards, the grid companies. This could be linked to a 'Norwegian energy culture', where electricity is seen as a common good, not a tradable commodity (Godbolt, 2014). As mentioned, Norwegian consumers seem to expect a steady supply of electricity and feel entitled to access it at reasonably low prices. This is at odds with how the Norwegian electricity market expects households to be economically conscious actors who apply market logic (Karlstrøm, 2012). Consequently, customer outlooks and expectations are not met, and distrust towards the system may develop (Karlstrøm & Ryghaug, 2012; Godbolt, 2014; Aune et al., 2016). While the households acknowledged that they lived in vulnerable locations in terms of service provisioning, several highlighted that they already paid substantial amounts in grid tariffs that should have secured a steady supply of electricity.

Conclusions: Between Dependency and Flexibility

Drawing on qualitative interviews with Norwegian rural households, this chapter has analysed how the households themselves experience the consequences of power outages when their practices are disrupted and they have to continue without electricity. The analysis has shown that, although outages represent a major interference in daily routines, rural Norwegian households appear well-prepared for power outages. They tend to have alternative heating sources and can find alternative means of lighting, cooking and storing food. Although most households interviewed had some direct costs in relation to the power cut (unusable food or devices, expenses for batteries, candles, firewood, food), these were not thought of as important consequences. The major challenges concerned the lack of broader infrastructures, such as water supply and communications network. The latter was considered particularly serious, since it could not easily be substituted by other technologies or appliances. Informants stressed that they managed quite well during extended outages, they found ways of adapting, especially in comparison to urban areas. However, they still considered power cuts a major disturbance in everyday life and felt unjustly under-prioritised by the grid companies.

This study of power failure reveals the ways in which practices and infrastructures are intertwined in shaping the daily life. Infrastructures enable many practices at the same time and have come to define many of our habits and routines. Thus, when they fail, much of what we consider daily life has to be reorganised. Placing the three elements—the material, competences, and meanings—at the centre of the analysis allows us to explain how power failure temporarily breaks the linkages between elements in electricity-dependent practices, and to understand the ways in which households go about forging linkages between other things and technologies, embodied knowledge and competences, and new meanings, in order to continue everyday life. This reassembling of elements in practices reveals the complexity of consequences of power cuts and explains how rural Norwegian households can cope relatively well with lengthy power outages.

The analysis illustrates the many layers of materiality involved in performing daily practices, often taken for granted in a functioning system of electricity provision—for instance, how electricity intersects with water supply and communication networks. The findings also shed light on how infrastructures and practices co-shape each other: how experiences with unreliable power supply lead people to take necessary precautions, in turn enabling them to cope better during a power outage. As put by Chappells and Trentmann (2019: 198), 'disruptions over time shape expectations of a "normal life"'. Electricity, water and communication infrastructures have become crucial for the performance of many daily practices. However, as this interview material has shown, previous experiences with recurrent failure in supply contribute to shaping households' future practices, creating shadow-practices involving a different set of elements. Households kept stocks of wood, batteries, and water and chose to keep outdated or traditional materials for use during power cuts. That did not mean they necessarily accepted their position in the 'cold spots' of electricity networks, as expressed in how they related to the electricity providers. The grid companies were expected to deliver electricity in every location, even in challenging weather conditions. Their inability to do so resulted in low customer confidence in the grid companies' abilities and intentions. Households tended to see the grid companies as profit-seeking actors that placed their own concerns above those of their customers. As noted, Norwegian consumers still tend to consider electricity a common good.

The analysis has also shown how economic aspects play a marginal role when households must cope with lengthy outages—which could be one of the reasons why it is difficult to transform the consequences of power outages into quantifiable monetary values. While commonly used methods for estimating the value of secure electricity supply seem to assume that those who experience power cuts calculate the consequences into quantifiable costs, these findings indicate that this is not necessarily the case for the rural Norwegian households in this study. They focus on maintaining the routines of daily life—by mobilising alternative materials, evoking dormant competences, and attaching new ideas and meanings to modified practices. Although their ability to adapt and change their electricity-dependent practices during outages demonstrates a

relatively high level of preparedness, this does not mean that these households do not value secure power supplies. Their daily practices are heavily dependent on electricity, but also flexible enough to respond to recurrent failures in the electricity provisioning system.

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Note

1. See also Table 6.2 for a summary of alternative materials and technologies for selected practices.

References

Agder Energi. (2018). Accessed February 19, 2019, from Strømbruddene på Agder https://www.aenett.no/presse-og-aktuelt/strombrudd-pa-grunn-av-uvar/

Akrich, M. (1992). The description of technical objects. In W. E. Bijker & J. Law (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 205–224). MIT Press.

American Society of Civil Engineers (ASCE). (2017). *Infrastructure report card. Energy*. Accessed from https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Energy-Final.pdf.

Aune, M. (1998). *Nøktern Eller Nytende: Energiforbruk Og Hverdagsliv i Norske Husholdninger* (p. 34). NTNU.

Aune, M., Godbolt, Å. L., & Sørensen, K. H. (2016). Mismatch or misunderstanding? Calculation and qualculation among economists and consumers in their framings of the electricity market. *Acta Sociologica, 59*(4), 347–361.

Ballo, I. F. (2015). Imagining energy futures: Sociotechnical imaginaries of the future smart grid in Norway. *Energy Research & Social Science, 9*, 9–20.

Chappells, H., & Shove, E. (2004). Infrastructures, crises and the orchestration of demand. In C. Southerton & V. Vliet (Eds.), *Sustainable consumption: The implications of changing infrastructures on provision*. Edward Elgar.

Chappells, H., & Trentmann, F. (2019). Disruption in and across time. In E. Shove & F. Trentmann (Eds.), *Infrastructures in practice: The dynamics of demand in networked societies* (pp. 197–209). Routledge.

Corsini, F., Laurenti, R., Meinherz, F., Appio, F. P., & Mora, L. (2019). The advent of practice theories in research on sustainable consumption: Past, current and future directions of the field. *Sustainability, 11*(2), 341.

Coutard, O., & Shove, E. (2019). Infrastructures, practices and the dynamics of demand. In E. Shove & F. Trentmann (Eds.), *Infrastructures in practice: The dynamics of demand in networked societies* (pp. 10–22). Routledge.

Diekman, S. T., Kearney, S. P., O'Neil, M. E., & Mack, K. A. (2007). Qualitative study of homeowners' emergency preparedness: Experiences, perceptions, and practices. *Prehospital Disaster Medicine, 22*(6), 494–501.

Ekomstatistikken 'Fasttelefoni'. (n.d.). Accessed August 9, 2019, from https://ekomstatistikken.nkom.no/#/statistics/service?servicearea=Fasttelefoni

Electricity North West. (2016). *The value of lost load (VoLL). Methodology Statement Addendum. A literature review*. Accessed from https://www.enwl.co.uk/globalassets/innovation/enwl010-voll/voll-methodology/voll-methodology-statement-addendum-a-literature-review.pdf

Energy facts Norway. (2019). *Regulation of grid operations*. Accessed September 30, 2019, from https://energifaktanorge.no/en/regulation-of-the-energy-sector/regulering-av-nettvirksomhet/

Fadum, H. S. (2019). *Oppsummering av uønskede hendelser 2018 i kraftforsyningen, Fakta, 4/2019*. NVE.

Fine, B. (2002). *The world of consumption: The material and cultural revisited*. Routledge.

Fine, B., & Leopold, E. (1993). *The world of consumption*. Routledge.

Ghanem, D. A., Mander, S., & Gough, C. (2016). "I think we need to get a better generator": Household resilience to disruption to power supply during storm events. *Energy Policy, 92*, 171–180.

Godbolt, Å. L. (2014). *Market, money and morals: The ambiguous shaping of energy consumption in Norwegian households*. Ph.D. dissertation. NTNU-trykk.

Gram-Hanssen, K. (2014). New needs for better understanding of household's energy consumption – Behaviour, lifestyle or practices? *Architectural Engineering Design Management, 10*(1–2), 91–107.

Gram-Hanssen, K., Heidenstrøm, N., Vittersø, G., Madsen, L. V., & Jacobsen, M. H. (2017). Selling and installing heat pumps: Influencing household practices. *Building Research Information, 45*(4), 359–370.

Guldåker, N. (2009). *Krishantering, hushåll och stormen Gudrun. Att analysera hushålls krishanteringsförmåga och sårbarheter*. Ph.D., Institutionen för kulturgeografi och ekonomisk geografi, Lund University.

Hargreaves, T. (2011). Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture, 11*(1), 79–99.

Heidenstrøm, N., & Kvarnlöf, L. (2018). Coping with blackouts: A practice theory approach to household preparedness. *Journal of Contingencies and Crisis Management, 26*(2), 272–282.

IFE. (2013). *Future energy demand – A Norwegian overview, IFE/KR/E-2013/003*. Institute for Energy Technology.

IPCC. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation. Special Report of the Intergovernmental Panel on Climate Change*. Accessed from https://www.ipcc.ch/site/assets/uploads/2018/03/SREX_Full_Report-1.pdf

Karlstrøm, H. (2012). *Empowering markets? The construction and maintenance of a deregulated market for Electricity in Norway, NTNU*. Faculty of Humanities, Department of Interdisciplinary Studies of Culture, Trondheim, Norway, Ph.D. dissertation

Karlstrøm, H., & Ryghaug, M. (2012). From user to consumer? How households use of electricity is affected by market deregulation and environmental concern. *Empowering Markets*, 99–124.

Kraftnytt.no. (2018). *Strømbrudd i Norge på nivå med det europeisk gjennomsnittet*. Accessed August 9, 2019, from https://kraftnytt.no/2018/09/21/strombrudd-i-norge-pa-niva-med-det-europeisk-gjennomsnittet/

London Economics International. (2013). *Estimating the value of lost load*. Briefing paper prepared for the electric reliability Council of Texas, Inc. Accessed from https://hepg.hks.harvard.edu/files/hepg/files/06_18_13_ercot_voll_literature_review_and_macroeconomic_analysis_0613.pdf

Matthewman, S. D., & Byrd, H. (2014). Blackouts: A sociology of electrical power failure. *Social Space*, 1–25.

Meyerhoff, J., & Liebe, U. (2006). Protest beliefs in contingent valuation: Explaining their motivation. *Ecological Economics, 57*(4), 583–594.

Morrissey, K., Plater, A., & Dean, M. (2018). The cost of electric power outages in the residential sector: A willingness to pay approach. *Applied Energy, 212*, 141–150.

NVE. (2015). *Economic regulation*. Accessed August 9, 2019, from https://www.nve.no/energy-market-and-regulation/economic-regulation/

NVE. (2018). *Uværet fører til strømbrudd*. Accessed February 19, 2019, from https://www.nve.no/nytt-fra-nve/nyheter-sikkerhet-og-energiforsyningsberedskap/uvaeret-forer-til-strombrudd/

NVE. (2019). *Avbrotsstatistikk 2018, Rapport 29/2019*. Oslo.

Palm, J. (2009). Emergency management in the Swedish electricity grid from a household perspective. *Journal of Contingencies and Crisis Management, 17*(1), 55–63.

Pöyry & SINTEF. (2012). Samfunnsøkonomiske kostnader ved avbrudd og spenningsforstyrrelser – husholdninger. *Energi Norge Publikasjon, 2012*, 348–2012.

Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory, 5*(2), 243–263.

Rinkinen, J. (2013). Electricity blackouts and hybrid systems of provision: Users and the 'reflective practice'. *Energy, Sustainability and Society, 3*(1), 25.

Rinkinen, J. (2019). Chopping, stacking and burning wood. In E. Shove & F. Trentmann (Eds.), *Infrastructures in practice. The dynamics of demand in networked societies* (pp. 48–57). Routledge.

Samdal, K., Kjølle, G., Kvitastein, O. & Singh, B. (2002). *Anbefaling til nye KILEsatser*. SINTEF Energiforskning og Samfunns- og næringlivsforskning (SNF).

Schröder, T., & Kuckshinrichs, W. (2015). Value of lost load: An efficient economic indicator for power supply security? A literature review. *Frontiers in Energy Research, 3*(55), 1–12.

Shivakumar, A., Welsch, M., Taliotis, C., Jakšić, D., Baričević, T., Howells, M., & Rogner, H. (2017). Valuing blackouts and lost leisure: Estimating electricity interruption costs for households across the European Union. *Energy Research & Social Science, 34*, 39–48.

Shove, E. (2003). Users, technologies and expectations of comfort, cleanliness and convenience. *Innovation: The European Journal of Social Science Research, 16*(2), 193–206.

Shove, E. (2017). Matters of practice. In A. Hui, T. Schatzki, & E. Shove (Eds.), *The nexus of practices: Connections, constellations, practitioners* (pp. 155–168). Routledge.

Shove, E., & Trentmann, F. (2019). *Infrastructures in practice: The dynamics of demand in networked societies*. Routledge.

Shove, E., & Walker, G. (2014). What is energy for? Social practice and energy demand. *Theory, Culture and Society, 31*(5), 41–58.

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes*. Sage.

Shove, E., Watson, M., & Spurling, N. (2015). Conceptualizing connections: Energy demand, infrastructures and social practices. *European Journal of Social Theory, 18*(3), 274–287.

Shove, E., Trentmann, F., & Watson, M. (2019). Introduction – Infrastructures in practice: The evolution of demand in networked societies. In E. Shove & F. Trentmann (Eds.), *Infrastructures in practice: The dynamics of demand in networked societies*. Routledge.

Silvast, A. (2013). *Anticipating interruptions: Security and risk in a liberalized electricity infrastructure*. Ph.D, Department of Social Research, University of Helsinki.

Silvast, A. (2017). Everyday habits as a risk response. In A. Silvast (Ed.), *Making electricity resilient* (pp. 127–145). Routledge.

Skeie, M., Tennbakk, B., & Vennemo, H. (2018). *KILE-funksjoner for husholdninger bygget på erfaringer med lange avbrudd. Rapport 05/2018. Vista Analyse AS*.

Skjeflo, S., Magnussen, K., Navrud, S., Tennbakk, B., & Vennemo, H. (2017). *Nye KILE-funksjoner for husholdninger. Rapport 2017/32. Vista Analyse AS.*

Smits, M. (2018). Situating electrification: Examples of infrastructure-practice dynamics from Thailand and Laos. In E. Shove & F. Trentmann (Eds.), *Infrastructures in practice* (pp. 38–47). The dynamics of demand in networked societies.

Sopha, B. M., Klöckner, C. A., Skjevrak, G., & Hertwich, E. G. (2010). Norwegian households' perception of wood pellet stove compared to air-to-air heat pump and electric heating. *Energy Policy, 38*(7), 3744–3754.

Statistics Norway. (2014). *Energibruk i husholdningene*. Accessed January 29, 2019, from https://www.ssb.no/energi-og-industri/statistikker/husenergi/hvert-3-aar/2014-07-14

Statistics Norway. (2018). *Kommunal vannforsyning*. Accessed Januaru 7, 2019, from https://www.ssb.no/natur-og-miljo/statistikker/vann_kostra

Statistics Norway. (n.d.). *Statistikkbanken 'Energibruk i husholdningene'*. Accessed August 9, 2019, from https://www.ssb.no/statbank/table/10568/tableViewLayout1/

Trentmann, F. (2009). Disruption is normal: Blackouts, breakdowns and the elasticity of everyday life. In E. Shove, F. Trentmann, & R. Wilk (Eds.), *Time, consumption and everyday life: Practice, materiality and culture* (pp. 67–84). Berg.

van der Welle, A., & van der Zwaan, B. (2007). *An overview of selected studies on the value of lost load (VOLL). Working paper*. Policy Studies Department, Energy research Centre of the Netherlands (ECN).

Warde, A. (2014). After taste: Culture, consumption and theories of practice. *Journal of Consumer Culture, 14*(3), 279–303.

Westskog, H., & Winther, T. (2014). Electricity consumption: Should there be a limit? Implications of People's attitudes for the forming of sustainable energy policies. *Consilience, 11*(1), 97–114.

Westskog, H., Winther, T., & Strumse, E. (2011). Addressing fields of rationality: A policy for reducing household energy consumption? In G. Ibon, M. González-Eguino, & A. Markandya (Eds.), *Handbook of sustainable energy* (pp. 452–469). Edward Elgar.

Wilhite, H. (2008). New thinking on the agentive relationship between end-use technologies and energy-using practices. *Energy Efficiency, 1*(2), 121–130.

Wilhite, H. (2012). Towards a better accounting of the roles of body, things and habits in consumption. In A. Warde & D. Southerton (Eds.), *The habits of consumption*. Collegium.

Winther, T. (2012). Electricity theft as a relational issue: A comparative look at Zanzibar, Tanzania, and the Sunderban Islands, India. *Energy for Sustainable Development, 16*(1), 111–119.

Winther, T., & Bell, S. (2018). Domesticating in home displays in selected British and Norwegian households. *Science & Technology Studies, 31*(2), 19–38.

Winther, T., & Bouly de Lesdain, S. (2013). Electricity, uncertainty and the good life: A comparison of French and Norwegian household responses to policy appeals for sustainable energy. *Energy Environment Research, 3*(1), 71–84.

Winther, T., & Ericson, T. (2013). Matching policy and people? Household responses to the promotion of renewable electricity. *Energy Efficiency, 6*(2), 369–385.

World Bank. (2010). *Lights out?* The outlook for energy in Eastern Europe and Central Asia.