

Unlearning, relearning, and reactivation in times of rapid change and crisis: the case of electric utilities

Hanna Björner Brauer

Department of Social and Behavioral Studies, University West, Trollhättan, Sweden, and Department of System Transition, RISE Research Institutes of Sweden AB, Gothenburg, Sweden, and

Sara Willermark

School of Business, Economics and IT, University West, Trollhättan, Sweden

Abstract

Purpose – Society faces significant challenges, including the climate crisis, energy crisis and war in Europe, where electric utilities play a crucial role. This paper aims to explore how employees at electric utilities unlearn and relearn in response to past and future crises and times of rapid change.

Design/methodology/approach – This study is based on seven focus group interviews with electric utility companies in Sweden in 2024–2025. It includes a total of 26 employees in various roles within the organizations. The interviews explore both the energy crisis experiences in 2022–2023 and future scenarios, focusing on opportunities and challenges related to the household customer segment.

Findings – Employees identify the need for new approaches, communication and collaboration within and between organizations. They reveal the complexity of ensuring a functioning electricity system while handling issues of sustainability, security and reliability amid changing expectations and new technical prerequisites. At the same time, uncertain boundaries between different stakeholders' roles and responsibilities, lack of trust and limited analytical capacity constitute constraints for learning, complicating the ability to act.

Originality/value – Contributions include scrutinizing how socially critical actors navigate in and for an uncertain world. The authors show how employees learn in periods marked by crisis and rapid change and present four dimensions of multi-relational learning characterized by employees' interactions: intra-organizational, inter-sectoral, cross-sectoral and citizen-organizational. Furthermore, the authors introduce the concept of "reactivation" to bring theoretical nuance, highlighting how relearning may involve mobilizing dormant or forgotten practices.

Keywords Employees, Unlearning, Crises, Relearning, Energy resilience

Paper type Research paper

1. Introduction

The rapid change in the world of work and society has led employers and employees to recognize the importance of lifelong learning throughout their careers (Tynjälä, 2013, den Broeck *et al.*, 2024). Thus, facing rapid technological advancements and evolving labor market demands, the need for employees to continuously update and refine their skills has



never been more pressing (European Commission, 2019). Over the past three decades, researchers have shown a growing interest in workplace learning, i.e. learning that occurs at work, through work and for work (Billett, 2008; Fenwick, 2008; Tynjälä, 2013). In fact, it has been suggested that there is an increasing demand for learning that is transformative and innovative rather than merely reproductive, and that is social rather than individual (Tynjälä, 2013). For employees working within organizations that manage critical infrastructures and essential societal services for citizens, such as electricity provision, there is a need to adapt to several different and rapid changes simultaneously. It includes technology development, security threats, political visions and threats of massive environmental change (International Energy Agency, 2024). These disruptions, pressures and developments prompt questions of how organizations, communities and individuals can strengthen their preparedness and resilience. Resilience refers to their ability to adapt, tolerate, recover and transform in response to change (Hamborg *et al.*, 2020). Major societal challenges, such as the energy transition, war and the climate crisis, highlight the important role of energy companies in responding to these challenges while at the same time operating critical infrastructures. For example, in 2022, Europe faced a volatile electricity market with sharply rising prices and an increased risk of power cuts (International Energy Agency, 2023). The situation was triggered by diverse critical events such as Russia's invasion of Ukraine, the economic fallout from the COVID-19 pandemic, disturbances at nuclear power plants and low water levels in hydroelectric reservoirs (International Energy Agency, 2023). This led households to take various actions to reduce their electricity use and mitigate the effects of the crisis (Brauer *et al.*, 2024; Gram-Hanssen *et al.*, 2024). In this study, we shed light on the electricity supply side. More specifically, we explore Swedish electric utility companies, which are the stakeholders responsible for electricity distribution and the grid infrastructure. Electric utilities' task of providing essential services means that they carry a great societal responsibility. However, there is limited research about their role and the experiences of utility employees. Thus, we explore utility employees' perspectives on learning in response to past and future challenges through the lens of unlearning and relearning. We focus on opportunities and challenges that the suppliers identify concerning households. This paper is guided by the following research question:

RQ1. How do employees in the utility sector engage in processes of unlearning and relearning in response to energy crises and anticipated challenges within the electricity system?

2. Related work

Previous research in workplace learning has examined organizations' relearning and unlearning during times of crisis, and, for example, during technological transitions. Unlearning and relearning have gained popularity in research (Sharma and Lenka, 2019) and have become vital for organizations facing crises and periods of rapid or disruptive changes. By discarding outdated practices and adopting new knowledge, organizations strengthen their adaptive ability and sustain performance amid adversity. A recent and widespread example includes the COVID-19 pandemic, which destabilized organizational knowledge systems, necessitating organizational unlearning (Vu and Nguyen, 2022). For example, Högberg and Willermark (2024) explored how the pandemic called for new ways of interacting in the enforced digital workplace among knowledge-based workers in Sweden (Högberg and Willermark, 2024). The study illustrated how the intricate interplay between rules and norms governing interaction and work must be recognized, unlearned and relearned when the physical work environment no longer defines the context of work.

Workplace learning is a constructive approach to understanding and analyzing the energy sector that is currently going through massive changes. In Sweden, rapid technological development is transforming electricity usage, production and distribution through innovations like home batteries, electric vehicles, smart heat pumps and smart home technologies. Households, which represent a large portion of Sweden's electricity use, can now interact with the grid more actively by managing their electricity use based on market prices, user profiles and other incentives. Meanwhile, electrification, an increase in weather-dependent power and limitations in transferring capacity have led to challenges in balancing supply and demand. Additionally, climate change, security threats and digitalization can make the grid more vulnerable (Perera *et al.*, 2020; Svenska Kraftnät, 2022). Thus, employees of utilities, who are responsible for ensuring electricity supply to the population, must deal with many different types of risks in their work. However, energy companies, including utilities, have historically been considered "slow movers" when it comes to organizational change, and struggle when faced with conflicting demands and contradictory energy targets (Apajalahti *et al.*, 2015). Research on professional learning in the context of the energy sector is scarce, and not much is known about how employees in electric utilities deal with the ongoing and anticipated changes in the system. Yet, studies that investigate the energy sector suggest that employees' and organizations' knowledge and opportunities for learning have a pivotal role in how efficiently challenges are dealt with. For example, research on municipal work practices in preparation for emergency power cuts shows that contextual knowledge shortages, lack of opportunities for learning about the preparedness policy, as well as lack of knowledge transfer between employees, are some of the greatest barriers for efficient preparation for power cuts (Danielsson *et al.*, 2020).

3. Theoretical framework

In the context of workplace learning, the concepts of "unlearning" and "relearning" have gained prominence as crucial for adapting to rapid and disruptive changes (Högberg and Willermark, 2024; Kneebone and Schlegel, 2021; Semplici and Campbell, 2023). Unlearning refers to the intentional process of abandoning knowledge, behaviors and practices that have become outdated in a changing environment (Hedberg, 1981). However, unlearning is not simply about forgetting but actively identifying and letting go of established ways of thinking and acting. This process is especially crucial in industries undergoing transformative changes, such as the energy sector, where decentralization, digitalization, electrification and climate change are altering the conditions for operating the grid while simultaneously posing new threats to energy security (International Energy Agency, 2024). Relearning refers to the process of acquiring new knowledge or skills to replace those that have been unlearned, enabling individuals and organizations to stay relevant and effective (Hedberg, 1981). Still, it has been suggested that joining the two processes of unlearning and relearning in a sequence can be difficult (Sharma and Lenka, 2019). Thus, relearning does not necessarily follow this suggested ordering sequence but can occur without previous unlearning. Furthermore, the very purpose of organizational unlearning is to acquire new knowledge, i.e. relearning, which tends to lead to conceptual ambiguity in practice. However, despite this potential conceptual ambiguity, we have used both concepts and consider them as analytically connected, yet separate.

In recent research on organizational learning, two streams of "unlearning" and "relearning" can be found (Högberg and Willermark, 2024). The first stream of thought emphasizes that forgetting, letting go or unlearning primarily occurs at the individual level. This is based on the idea that organizations cannot actively forget and highlight the challenges individuals face during this process as unlearning is deeply tied to how they interpret the world (Akgün *et al.*, 2007;

Cegarra-Navarro *et al.*, 2021; Cegarra-Navarro and Wensley, 2019). The loss of deeply held conventions is particularly difficult, as these often serve as sources of certainty and security (Akgün *et al.*, 2007). The second stream focuses on organizational relearning, conceptualizing it as the transformation of organizational routines, and this process is often considered as the deconstruct or modification of deeply ingrained beliefs, norms, values and practices (Cegarra-Navarro *et al.*, 2010). Thus, changes in organizational routines or procedures make individuals reflect on and reconsider their existing knowledge and understanding of phenomena (Cegarra-Navarro *et al.*, 2010).

While unlearning is understood by some as primarily an individual process, it impacts and interacts with both group level and organizational level. For example, while the act of questioning personal beliefs and knowledge may be individual, the prerequisites for doing so at the workplace are tied to characteristics of the organization. Antecedents for unlearning can for example be the organization's exposure to external turbulences such as a crisis situation, but also prerequisites such as whether the environment offers a safe space to question and review existing knowledge and routines (Kim and Park, 2022). Furthermore, unlearning among individuals and groups in times of turbulence can lead to improved crisis preparedness in the organization, highlighting how outcomes of individual unlearning impact the organizational level. In other words, individual unlearning can be viewed as an antecedent of organizational learning. Yet, while unlearning and relearning have been widely adopted, research that examines these processes on individual and group level remains limited (Kim and Park, 2022). The research that does exist often focus on how unlearning and relearning is linked to individual differences (Kim and Park, 2022). It has been suggested that the ability for critical reflexivity in individuals and teams plays an important role for unlearning (Matsuo, 2018). It has also been suggested that the physician–patient relationship is an important factor that shapes learning processes in health contexts (Cegarra-Navarro *et al.*, 2011). However, it is unclear how such relational aspects translate into other non-health related domains. Furthermore, little is known about how unlearning and relearning at individual and group level are formed by outside events like crises and social dynamics with external actors.

In this study, we explore how employees unlearn and relearn as a response to past and future crises and disruptive change. We view unlearning and relearning as distinct, yet mutually linked aspects. They are part of the same iterative process in which employees, and by extension organizations, acquire new knowledge and adapt to a changing environment. This means, for example, that although relearning typically follows unlearning, the duration of each phase and the proximity between them are neither fixed nor in focus of this study. Rather, the emphasis is on how these processes jointly make it possible for employees to discover new ways of thinking and working.

4. Methodology

In this study, we adopt an explorative and qualitative approach. In the following sections, we describe the data collection, including recruitment and participants, focus group interviews, followed by data analysis and ethics.

4.1 Recruitment and participants

The data was collected by conducting seven semi-structured focus group interviews with a total of 26 employees in seven utility companies. In Sweden, there are about 170 utility companies, out of which 129 are owned by the municipalities (IVA, 2016). The utility companies vary greatly in organizational size, distribution area, number of households and geography, e.g. urban or rural areas. When recruiting utility companies for the study, we aimed to achieve geographical,

demographic and socio-economic variation. We invited eight companies of different sizes and from different parts of Sweden. Seven agreed to participate in the study. In the invitation, we communicated the purpose of the study, the themes we would discuss and our intended focus on the household customer segment. We invited professionals with relevant roles to participate. The aim was to include expertise in both technical infrastructure and security, as well as customer-focused areas like communication and customer service. The purpose was to encourage discussions that would involve both the social and technical dimensions of the power system. The participants represented a range of ages and varying lengths of experiences within the organization, spanning from a few years to over 30. Several participants had more than 20 years of tenure in the organization. An overview of the represented companies and the participants is presented in [Table 1](#). The participants and companies have been given fictitious names.

4.2 Focus groups

We found focus groups to be a suitable data collection method for the study. Focus groups allow colleagues to jointly explore the complex, nuanced nature of learning from crisis and preparing for future changes and challenges. Focus groups also enable participants to both reflect on changes in their roles, competencies and practices, and for the group to be able to put into words the changes they have gone through as an organization ([Cyr, 2016](#); [Tourangeau, 1984](#)). Due to the geographical distribution of the participating utility companies across Sweden, one focus group was carried out on-site, while the remaining were conducted online

Table 1. Overview of participants

Company	No. of respondents	Roles represented in focus groups
Coastline Energy	4	<i>Simon</i> , grid planning engineer <i>Emelie</i> , grid planning engineer <i>Amanda</i> , customer relations <i>Molly</i> , customer relations
Eastpoint Energy	3	<i>Rikard</i> , security manager <i>Julia</i> , customer service <i>Karoline</i> , communications officer
Clearvolt	3	<i>John</i> , senior specialist regional grids <i>Peter</i> , senior specialist local grids <i>Marcus</i> , customer relations
PowerSouth	6	<i>Kristoffer</i> , grid strategist, project manager <i>Jacob</i> , department of measuring, verification of energy meters <i>Milo</i> , representative from department of measuring, customer contact <i>Henrik</i> , product manager <i>Sandro</i> , head of grid infrastructure <i>Tanja</i> , grid strategist, project manager
Inlandis Energy	3	<i>Nils</i> , head of strategy and business development <i>Matilda</i> , security and quality assurance <i>Tommy</i> , consultant within strategical areas
Northreach	3	<i>Albin</i> , business innovation <i>Karin</i> , local grids <i>Joel</i> , local grid, measurements
GridWay Electric	4	<i>Andreas</i> , security, preparedness, total defense officer <i>Helene</i> , external analysis <i>Stefan</i> , energy market engineer <i>Daniel</i> , grid operations manager

as Microsoft Teams meetings. All conversations were recorded and transcribed. The first author led the interview with the support of a second researcher. The sessions lasted between 77 and 112 min, with an average of 99 min, excluding initial presentations and information about the study. Focus groups were carried out between November 2024 and February 2025. In the focus groups, we used the employees' experiences from the energy crisis in 2022–2023 and the concept of resilience as a starting point for discussing their perspectives and responses to the multitude of changes and threats to the power system and households. The focus groups were semi-structured and covered five themes:

- (1) knowledge about households in their respective grid;
- (2) experiences from the energy crisis in 2022–2023;
- (3) resilience;
- (4) communication to households; and
- (5) present and future challenges. See [Appendix 1](#) for a complete overview.

4.3 Data analysis

For the analysis, we combined an abductive approach with thematic analysis ([Braun and Clarke, 2006](#)). This means that the theoretical concepts of unlearning and relearning were not part of the initial research design nor integrated into the interview guide. Rather, they were identified as helpful analytic lenses after the data was collected. In our case, the abductive approach also means that our analysis was guided by theory without being completely constrained by it. As such, we were open to finding additional labels or concepts that could help make sense of the respondents' discussions. The approach resulted in an identification of "reactivation" that served as a nuance to unlearning and relearning (see Results 5.1 and Discussion 6.0).

The analysis was done in several steps. First, after each focus group, the first author documented initial reflections to start the process of identifying important similarities and variations in the data both within and between the focus groups. Next, the notes from the sessions were used to start a first scanning for relevant themes that corresponded to relearning and unlearning. This step included identifying parts of the discussions where the participants reflected on themselves, their roles, their work practices and their organization. It also included possible shifts that the participants believed were needed within their organization to tackle certain challenges. Thereafter, codes were created based on whether they were interpreted as unlearning or relearning, for example "relearning to keep up with accelerated demand for guidance and expertise," as well as whether they connected to the experience of the energy crisis, future challenges or specific roles, both within and between organizations. A table that exemplifies the coding can be found in [Appendix 2](#). Thereafter, overarching themes and sub-themes were created, where we found that the energy crisis, the preparation for future changes and roles constituted central categories.

Throughout the analysis, we scrutinized the coding and themes together. The aim of such a procedure was to provide convincing and meaningful engagements with the unlearning and relearning concepts that may be relevant also outside the electric utility context. As a starting point, we used [Högberg and Willermark \(2024\)](#) as a key reference for unlearning and relearning because the study, albeit conducted in a different workplace setting, shared an important element with our study by also being situated within a crisis context. Additionally, we received careful reading and review around consistency of concept interpretations from a third researcher. This helped us improve stringency and comprehensibility in our "storytelling." However, we recognize that unlearning and relearning may be used differently and with other

types of data. For example, our study did not include documentation of changed routines. Rather, we focused on the employees' own reflections and experiences around their work, the way practices and mindsets have changed or how they expect them to change in the future.

4.4 Ethics

Informed consent was obtained from the participants prior to the data collection. More specifically, the participants received verbal and written information about the purpose of the study and their right to withdraw their participation at any time without providing any reasons. Moreover, they were informed that their personal data would be treated with respect for their privacy and in accordance with [The Swedish Research Council \(2024\)](#).

5. Results

The employees reveal several ways in which the energy sector, and consequently, the utility companies' work, is changing. Historically, these utilities have been quite settled in their role as centralized suppliers and distributors of electricity. Employees described that to households, utilities were often backgrounded and represented a taken-for-granted infrastructure. Many households' interaction with them consisted of paying a monthly bill, and public interest in electricity and the utility's role had historically been low. Employees also described that the utility's focus had until recently revolved mainly around expanding and maintaining the grid to accommodate existing and new users. Overall, this points to a traditional view of the utility and the household as having a linear supplier–customer relationship. However, these positions are changing and become challenged in different ways. Below, we present three overarching themes that capture how employees reflect on relearning and unlearning in response to changes in the electricity system:

- experiences and lessons from the energy crisis in 2022–2023;
- preparing for future scenarios; and
- envisioning inter- and intra-collaborations and roles.

5.1 *Experiences and lessons from the energy crisis in 2022–2023*

Employees from different parts of the country experienced the energy crisis in 2022–2023 quite differently. This is due to how households in their area were affected and because of variations in their organizational and local contexts. Below, we illustrate processes of relearning and unlearning through examples related to changing societal concern for electricity and increased attention to preparedness.

5.1.1 Relearning to meet overwhelming household concerns. The energy crisis transformed utilities from overlooked suppliers to a focal point for households. Employees, particularly from utilities in southern Sweden, where prices were higher, reported that the energy crisis had resulted in an overwhelming number of incoming calls from consumers. Employees working in communication, marketing and customer service described how households were worried about rising and volatile electricity prices, the risks of power cuts and not being able to pay the bills. Households also called and asked for guidance around what energy-related investments would be beneficial for them. Julia, who worked in customer service, described the situation as “*Pretty brutal*” and stated that “*It was clear that the people of Sweden were worried. Oh my, how they have been calling and emailing us, it was a super high demand.*” Julia's colleague Karoline agreed and said that “*It was a roller coaster all through the autumn.*” In parallel, the employees also observed a big increase in demand for information, guidance and support from households. Households increasingly sought guidance on how they could reduce their electricity use to manage the rising power

prices. It included what energy technologies they should invest in, what contracts were suitable to their needs and how they should prepare for power cuts and other emergencies. Employees describe that during this period, they felt the need to take on a more advisory and supporting role than usual. At the same time, the interest and knowledge among households increased rapidly, signaling a heightened public awareness regarding the electricity system. Josefin reasoned that while it was high pressure on them to provide guidance, the upside was that it was easier to reach out to households, and that households no longer took electricity for granted. For those handling customer communication, it meant increased speed and effort to stay ahead of what households were learning about electricity, the market, the grid and home technologies. This involved coordination to answer complex questions, refer to the right person or department and being able to seek out, together with the caller, what the question really concerned. This was challenging as the electricity market constitutes a complex and difficult topic for non-energy-experts, as illustrated by Karoline: *“It was a big challenge to try to make these difficult, complex things [...] explain it simply and clearly.”*

Relearning thus meant keeping up with the latest information on the crisis itself, and at the same time, keeping up with information on technology trends, contracts, bills and advice regarding electricity use for a diverse audience. As demonstrated by Marcus, their work had suddenly become the center of attention: *“All of a sudden people started to talk about energy in a way that they’ve never talked about energy before because who would have cared?”* The employees reported a growing interest in electricity during the crisis, and it positioned the employees as key communicators, with households being more attentive than before. While adapting to the situation, employees reflected on the need for better preparedness and preventative work. Consequently, they assumed a pedagogical role, guiding households who had become more interested and informed about energy issues. In other words, they were learning how to support households’ learning. The sudden attention to electricity and electric utilities made employees question previously held assumptions that the public is not interested in electricity or what they have to say. Thus, this change process also involved unlearning. Employees saw an opportunity to take on a more advisory role, providing valuable information and making use of the attention to prevent wasteful electricity use or unfitting investments.

5.1.2 Reactivating practices of preparedness: materials, exercise and attention. While some employees saw crisis preparedness as part of the utility’s core business, some preparedness practices had not been prioritized in the years before the energy crisis, nor had they received much attention from other stakeholders such as municipalities. However, through the experience of the crisis and Russia’s invasion of Ukraine, preparedness practices had come into the foreground. Thus, adapting to a crisis requires certain relearning related to aspects of routines. These aspects include materials, exercise and attention. As for materials, employees with technical backgrounds reflected on how the energy crisis had highlighted the issue of material storage. John, Peter and Marcus discussed how both the energy crisis and the pandemic had caused prolonged delays in the delivery of materials needed for physical grid maintenance. Marcus explained that the European energy transition further strained supply chains, which struggle to keep pace. Related to this, John questioned vulnerability to the “just-in-time mindset” of wholesalers, arguing that cost-saving practices, like minimizing storage, lessen overall preparedness. Grid strategist Kristoffer echoed this view, noting that while peacetime focuses on efficiency, crises expose the need for basic materials to maintain infrastructure. These reflections shed light on an emerging unlearning process, where employees start questioning the cost-driven routine that neglects material readiness across the supply chain.

As for exercises, employees who worked with security-related routines and preparedness for power cuts or other crisis scenarios, the energy crisis heightened interest and awareness in

their work. It made them recognize the need to test and run thorough exercises on plausible scenarios. This recognition reflects a process of relearning the importance of practical exercises to strengthen preparedness. The renewed focus on exercises and power cut routines was confirmed by Daniel, who had been operating the grid at GridWay Electric for 25 years. He described that the heightened risk of power cuts that was a result of the crisis had led them to review their routines that he described as “a bit dusty” because of how low the risk had been. Hence, they had updated their routines and ran tests and exercises for the first time. The way employees describe these issues as something they “dusted off,” updated and reviewed, demonstrated a type of relearning that can be understood as *reactivation*. These practices were often not completely new. Rather they came into light and were rediscovered, reevaluated and reconfigured – in other words, reactivated. These experiences also demonstrate how this type of relearning is clearly connected to a specific scenario and situation in which emergencies no longer seemed distant and unlikely. The experiences show how relearning can reinforce itself as realizing the need for testing leads to more testing, which in turn deepens understanding of the critical role of exercises in preparedness.

The employees also reflected on the need to identify the crisis sooner. Rikard suggested that this was important to be able to set up an emergency response organization and distribute resources properly to prevent problems. He also stated that he believed this insight was the reason that their crisis organization had improved since then, indicating a relearning process. His colleagues, Karoline and Julia, agreed and added that the late realization of the crisis resulted in a situation where it was each unit to their own. They reflected upon that it would have been helpful to collaborate and unite around challenges, indicating a need to relearn attentiveness to crises.

Overall, the crisis highlighted specific work practices that were identified as especially relevant from a crisis preparedness point of view. It included having materials in reserve and unlearning just-in-time mentality, relearning the importance of proper exercises and keeping routines up to date, as well as being attentive to signs of an upcoming crisis. Notably, the unlearning and relearning described under this theme is not just about letting go of outdated routines in favor of new knowledge. It also includes being reminded of older routines, such as emergency exercises, that have been deprioritized but now appear important again. That process is here labeled *reactivation*.

5.2 Preparing for future scenarios

The employees all share a view of the energy sector in transition. They describe the energy industry at a turning point, due to rising public interest, electrification, decentralization and climate change. Therefore, this theme explores how utilities relearn and unlearn due to current and anticipated changes from social, technical and environmental perspectives.

5.2.1 Adapting to changing expectations and new communication needs. Employees discuss two key challenges in interacting with households: meeting changing expectations and managing communication across diverse household types. A crucial aspect was to better understand and differentiate between households, i.e. relearn how to communicate accordingly. Employees noted that households vary in aspects such as skills, resources, location and engagement. This diversity made one-size-fits-all communication insufficient. Targeted information was identified as essential, especially as households increasingly expected personalized guidance. Josefin reflected on the organization’s limited ability to tailor messages, as illustrated by: “[...] We’re not so good at segmenting and communicating based on target audience, and I think that is a real shame because a lot of our customers are asking for more personal guidance.” Similarly, employees stated that their knowledge of households’ user profiles “behind the meters” is limited. Yet, employees like Karin suggested

that understanding household differences in electricity use would soon be crucial, and John suggested a new system; *“To utilize this potential [target specific households and shift their electricity use] we would need to sharpen our analytical ability. To draw conclusions from all the data the grid generates, I mean it is an enormous amount.”* It reflects an idea of relearning both how to live up to the public’s expectations and a desire to be more effective in their outreach.

Moreover, tailoring information was identified as fruitful to promote energy efficiency. However, the household variations in finances, values and knowledge posed challenges. Employees testify that while a large part of the households take electricity for granted, another is increasingly “technology-savvy” and energy literate. That is, knowledgeable about contracts related to certain types of electricity practices, such as using smart charging schemas. Employees like Julia and Karoline felt that households’ learning curves necessitated them to keep their own knowledge up to date. One challenging example was how to communicate the cost of the infrastructure, i.e. explaining and motivating the cost of the grid. Learning how to explain the value of electrical infrastructures reflects a relearning of communication practices at the utility, but also a need for unlearning at the part of the household. Thus, in a country where low prices and reliable electricity have been the norm, the ongoing changes, such as electrification and security threats, require households to unlearn that the grid is “just there.” It also includes relearning that investments and adaptations need to be made to make sure that the grid will function properly.

Higher expectations around communication were also noted during disruptions like power outages. Employees noted that many households demanded faster and more specific information. Julia described how people would immediately call and complain when power was cut, showing low tolerance to disturbances. Employees reflected that while expectations have risen, adaptability declined, especially in urban areas, promoting a need to relearn how to manage growing differences between households. Communicative challenges involved balancing education on complex issues with maintaining households’ trust. For some utilities, efforts to address these challenges were already underway. For example, GridWay Electric launched a YouTube channel to educate households about electricity and the energy system.

Historically, the relationship between households and supplier has been straightforward, i.e. suppliers distribute electricity, and households use and pay for electricity. However, employees describe ongoing changes in the field of technological innovation, indicating that they are amid a significant technological transition, which has potential consequences for the operation of the grid.

Innovations like home battery systems, solar power, electric vehicles and digital control systems constitute disruptive technologies that could alter the electricity sector in fundamental ways. Other related changes revolved around emerging forms of social organization around electricity, such as energy communities, off-grid households and aggregators that could buy and sell flexibility from households to the utilities. There was uncertainty of how much of a challenge each innovation would pose in its local context, but also uncertainty around how fast each innovation would diffuse among inhabitants. Because of this, some employees felt that the company needed to be more open and humbler toward the change and uncertainty ahead. As such, this unlearning involved questioning the way the utility company has operated in the past and to what extent that type of operation would be relevant in the future. The unlearning process related to uncertainty and need for openness to change was demonstrated by Marcus: *“We will have a role to play in the future, we don’t know what it will be, but the only way to keep playing is to be on the journey there. I think that’s important, to be curious about everything. It’s impossible to go against this trend, you can sit and pout, but it won’t help.”* Other employees agreed that the technological development required them to

“be on their toes,” meaning to be attentive, curious and quick to catch up on new trends to adapt. For some utilities, this also meant competency shortages, as new technologies on the user side that would feed power back into the grid could cause problems. It required the utilities to adopt smart technologies themselves that could deal with quick changes in production. This was exemplified by Joel: *“We need more competency and more people. More man-hours and someone who has the right skills and focusses on these new technologies.”* Discussions around the relearning process, in which the employees reflect on the grid, in combination with a wide set of challenges, results in several suggested strategies for developing their work practices. It demonstrated both unlearning and relearning processes that involve viewing the future as a potential analytical space, instead of relying on analysis of historical data.

5.3 Envisioning inter- and intra-organizational collaborations

The ongoing and expected challenge of the electricity sector gave employees reasons to look outside of their organization for ideas and guidance on how to handle changes. It was argued that utility companies needed to expand their dialogue and collaborate, rather than reinvent the wheel. For example, Daniel argued that working groups across utilities will be important. His colleague Stefan agreed and mentioned how he studied experiments with power tariffs at Eastpoint Energy to gather insights for their model. A strategy for smaller utilities was to identify how larger companies evolved, as these companies often have access to more experience and new knowledge. Thus, their decisions can guide smaller utilities in how to navigate new trends and challenges, as illustrated by Karin: *“Even for us as a medium sized utility company, you sort of wait to see what the bigger dragons like Clearvolt will do, what are they saying about this, have they found a good solution?”* Being able to follow in bigger companies’ footsteps, rather than figuring it out yourself, was crucial.

These examples show how employees envision and implement collaboration strategies, focusing on relearning, to address ongoing grid changes and challenges. The collaboration encompasses formal working groups that promote intra-organizational relearning to find new solutions, informal personal exchanges between individuals for relearning tied to specific roles, but also practical help in reactivating and using skills that were lost. Employees describe relearning processes that are not only centered in social contexts but also include keeping track of what bigger companies do and learning from their experiences. It functions as a way of identifying what could have been done to improve and adapt their operations. Larger companies have more resources for specialization, while smaller ones require employees to juggle multiple roles, limiting opportunities for relearning.

5.3.1 The unsettled utility role. The way employees described their organizations’ development in response to security threats and increased interconnectedness of different energy system stakeholders revealed that the role of the utility was becoming unsettled. Yet, the idea of the utility company taking on a new role came with hesitation and concern. One such concern was to what extent supporting and guiding households meant compromising their integrity in terms of gathering, analyzing and using individual households’ electricity data. Another related concern that was emphasized by employees was the challenge of distrust in utility companies. The distrust was sometimes understood as closely connected to some households’ dissatisfaction with what they saw as high grid fees. Some employees worried that guiding and supporting households came with a risk of being perceived as having an agenda and pushing it onto households. This topic sparked discussions among employees around what stakeholders are suitable to guide households on how to use electricity efficiently. Employees like John reasoned that utilities are not considered an objective stakeholder. Thus, it might be preferable that an authority like the Swedish Energy

Market Inspectorate, municipalities or the administrative county board take on a bigger role as advisor. Another alternative mentioned was to collaborate with municipalities and authorities to, for example, reach out with campaigns regarding crisis preparedness or other important information on energy-related issues. A perceived lack of public trust in the organization can thus be seen as an obstacle to relearning how to communicate effectively to households to ensure preparedness. Even though the perception that households are generally becoming less and less prepared for power outages was widespread, employees were uncertain of what role they should have in supporting and encouraging blackout preparedness in households. This uncertainty was also related to the allocation of responsibilities between them and the municipality. While the municipality is formally responsible for the inhabitants in crisis, the utility is formally responsible for the grid infrastructure. Employees stated uncertainty about their role in preparing households for changes in power supply, stressing blurred boundaries between organizational responsibilities. While unlearning has occurred by questioning the traditional utility role, relearning is underway as employees envision a more interactive, collaborative approach. However, employees are unsure of their new role due to regulatory constraints, public mistrust and unclear boundaries with stakeholders, posing an obstacle to relearning amid the sector's shift.

5.4 Summary of results

To summarize, various examples of unlearning, relearning and reactivation, as well as obstacles to relearning, were observed. Notably, unlearning and relearning were multi-relational and social. Thus, learning was accelerated, blocked, shaped and facilitated through utility employees' interactions with each other, households, other utilities and other stakeholders. A summary of examples is provided in [Table 2](#).

6. Discussion

In this study, we have explored how Swedish electric utility employees relate to ongoing and anticipated changes in the electricity system, including their experience of the energy crisis in 2022/2023, through the analytical lens of unlearning and relearning. Our study focused specifically on changes related to the household customer segment, which represents a large share of electricity use in Sweden. The results demonstrate several different ways in which employees of electric utilities are unlearning and relearning, as well as how they are anticipating future relearning. We find that these results point to interesting insights from a learning perspective. In line with previous research, we observe that crises, or periods of rapid change, are pivotal to changing and adjusting practices and provide very important experiences through which learning can be accelerated ([Antonacopoulou and Sheaffer, 2014](#); [Högberg and Willermark, 2024](#)). Despite the fact that electricity systems constitute a critical infrastructure, studies on learning related to the energy sector and crises constitute a scarcely explored area of research. An exception is a study conducted decades ago by [Roux-Dufort and Metais \(1999\)](#) who demonstrated more broadly how crisis events fostered different learning phases in nuclear power plants. They identified technological improvements, acknowledgment of human factors and creating a culture of safety as formative learning phases. Still, research on learning processes in the electricity sector, in crisis and beyond, remains scarce.

Through our exploration, we find that periods of rapid change in society shape the utility employees' learning through various relationships between individuals and stakeholders. Based on our findings, we propose four dimensions for employees' learning during disruptive or accelerated change that is characterized by the interaction between individuals and stakeholders across professions, sectors and roles (see [Figure 1](#)). The link between social relationships

Table 2. Examples of unlearning, relearning and reactivation

Learning process	Strongly influenced by interaction with
<i>Unlearning</i>	
Questioning previously held beliefs that electricity is viewed as an uninteresting area of expertise	Households
Questioning just-in-time mentality and cost-driven routines, prioritizing material preparedness	Other stakeholders, such as actors in material supply chains
Emphasizing the grid as valuable and important rather than backgrounded and taken-for-granted	Households
Questioning the traditional role and operations of the utility, being open to new trajectories for the grid	Households and colleagues
<i>Relearning</i>	
Keeping up with latest information and technology trends	Households
Assuming a pedagogical and instructional role towards households: supporting households' learning	Households
Being attentive for emerging crisis situations as an organization	Colleagues
Analyzing and communicating effectively, adapt to different household categories, their expectations and knowledge	Households and colleagues
Communicating to households the value of infrastructure, balancing complexity and maintaining positive relationships	Households
Looking forward rather than relying on historical data: using the future as an analytical space	Colleagues
Looking to other utilities to exchange ideas and learn from their experiences	Utilities
<i>Reactivation</i>	
Rediscovering the importance of exercises and reviewing routines for crisis preparedness: mobilizing dormant practices and knowledge	Other stakeholders such as municipalities and the administrative county board
Receiving practical help from other utilities in rediscovering and using skills and practices that have been lost in the organization	Utilities
<i>Obstacles for relearning</i>	
Lack of trust in utilities	Households
Blurred boundaries between stakeholders' expertise and responsibility	Other stakeholders such as local and national authorities
Lack of transparency and communication	Colleagues

and reflexive practices associated with unlearning and relearning within organizations has frequently been highlighted in other theoretical frameworks as well. It has been suggested that “defensive” group dynamics hinder double-loop learning. This is by constraining opportunities to advocate new ways of solving problems and critically examine the assumptions and worldviews that underpin existing work practices (Argyris, 1977). Similarly, the 4I model describes how new knowledge spreads from individual to institution, again emphasizing social channels for professional practice reconfiguration (Crossan *et al.*, 1999). In this regard, our study contributes by demonstrating the importance in understanding not only intra-organizational relationships’ effects on reflexivity and learning, but also relationships with stakeholders *outside* of the organization.

Furthermore, we identify “reactivation” of dormant knowledge and practices as an important part of learning from and for imminent crises and rapid changes. Relearning and unlearning

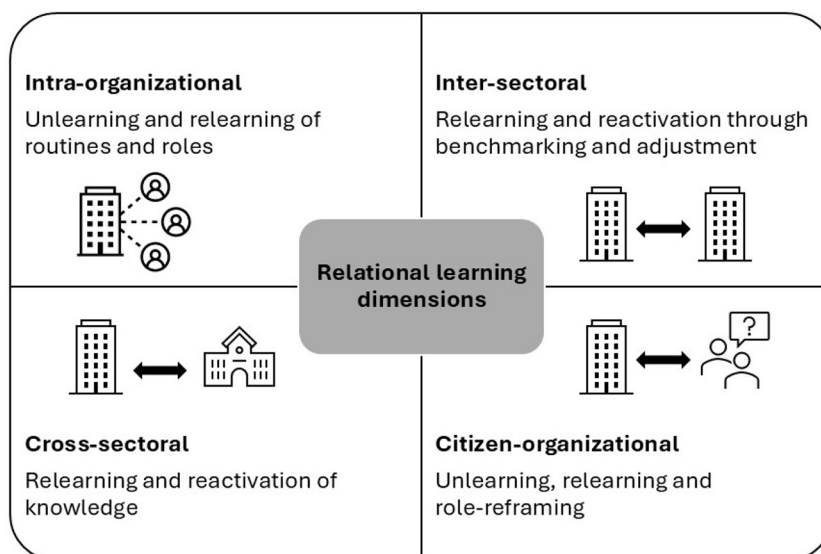


Figure 1. Four dimensions of unlearning, relearning and reactivation

typically emphasizes the need for employees to “let go” and discard outdated routines. However, we suggest that in some cases, it is also important to “hang on” to knowledge such as emergency exercises, that may be not so crucial in day-to-day operations, but all the more valuable in a crisis situation. Thus, the concept of “reactivation” can be used to provide important theoretical nuance, suggesting that some learning involves reactivating rather than replacing prior knowledge.

The first dimension concerns the *intra-organizational* and represents unlearning and relearning of routines between colleagues in the same organization. Changing routines in one part of the organization or profession can impact how others are assessing and identifying the need for new knowledge. On the contrary, we observe how a lack of transparency and information on what is going on in the organization is a barrier to making use of crises as learning opportunities. As such, for intra-organizational unlearning and relearning, it is important to consider the ways in which colleagues in different roles and with different professional knowledge can meet, share experiences and critically reflect on the organization’s practices together.

The second dimension is *inter-sectoral*, where employees of one organization look to their counterparts in the same sector, to exchange ideas, get inspired and relearn. It can also involve reactivation, as employees receive help and guidance from other organizations to mobilize skills that were forgotten or lost. Inter-sectoral learning relationships can thus reduce the perceived uncertainty on what practice reconfigurations are suitable to deal with an ongoing or anticipated challenge.

The third dimension is *cross-sectoral* and reflects how interaction between different professional stakeholders, across sectors, affect each other’s learning processes in times of crisis or accelerated change. For example, one stakeholder may signal to another that relearning and reactivation of dormant routines is needed to increase crisis preparedness. At the same time, uncertainty around boundaries to other stakeholders’ roles, responsibilities and expertise can hinder relearning and exploration of new practices.

The fourth dimension is *citizen-organizational* and points to how employees' professional unlearning and relearning is affected by their interactions with the public or lay people, here labeled as citizens. This dimension can be likened to Cegarra-Navarro *et al.* (2011), who identified physician–patient relationships as an important interaction that shapes health professionals' knowledge. Here, we abstract this interaction between professional and the lay people they service and outline it as an important social dynamic that impacts professional learning. As citizens' knowledge increase, new expectations are put on organizations that are responsible for critical infrastructures or essential societal services. Subsequently, employees need to keep up with changing demands for knowledge, support and guidance from citizens. As both professionals and lay people learn, their interactions can also lead to updated and adjusted roles. In our case, this was demonstrated through the emerging prosumer role at the household level, which created an increased demand for expertise and support from the utility. Such role reframing thus includes both unlearning and relearning: to question and unpack traditional roles as well as to create new ones. At the same time, perceived lack of trust from the public can hinder relearning as employees are careful not to negatively impact their relationship with households.

We especially want to highlight the fourth dimension, how learning is affected by interactions with citizens, as an interesting phenomenon to investigate. We suggest that it would be valuable for future research to examine how professional learning is facilitated, accelerated or affected by changes in knowledge of the public in their multifaceted roles as customers, patients, households, users and citizens. This can provide insights on how organizations effectively can manage future crises and support inhabitants, regardless of sector. From a theoretical perspective, it is interesting to further explore how professional knowledge is reshaped when workplace learning processes intersect with learning that goes beyond professional contexts. For example, it would be valuable to further investigate how citizens' learning and knowledge demands on professionals can both provide both learning opportunities and challenges for organizations to manage. Furthermore, we introduce the concept of reactivation to bring nuances to the learning that takes place within the organizations and highlight additional dimensions somewhere in between the relearning and being reminded of previous knowledge.

6.1 Implications for policy and practice

The results show both opportunities and barriers for learning in electric utilities. Limited analytical capacity, a lack of future-oriented analysis, uncertainty regarding stakeholders' roles and ambiguities in internal processes are examples of barriers that influence how employees perceive their ability to adjust and improve their work practices.

Based on our analysis, we present the following suggestions for utility management, local authorities and policymakers to make it easier for employees to learn how to adapt to rapid changes in the electricity system:

- Prioritizing analysis of existing electricity use data in electric utilities is one way of improving conditions for relearning how to know more about households and, in the longer term, tailoring communication to different household groups, thereby targeting households more effectively and precisely.
- Local collaborative efforts around communication initiatives between local authorities, such as the municipality, region and the administrative county board of the same region, could be a way of navigating uncertain role boundaries in the energy sector concerning crisis preparedness in households. These collaborations leverage stakeholders' expertise, facilitating employee learning without overstepping boundaries, thereby encouraging new forms of communication and engagement with citizens or households.

- If policymakers want households to participate in the energy transition and crisis preparedness, they should consider who is expected to support households in adapting to such parallel rapid changes. Do these stakeholders, such as utilities, have the right conditions to learn how to support households, or are they constrained by regulations or praxis on what they can and cannot do?
- Events like the energy crisis should be understood by utilities' management as pivotal moments in which practices can be changed and new ideas can be born. For example, the energy crisis has made energy come to the forefront for the general public. Not making use of the engagement by educating, learning and increasing interaction with households would be a missed opportunity.

7. Conclusions

This study explored how employees in Swedish electric utilities manage ongoing and anticipated rapid changes in the electricity system. The results demonstrate various ways in which employees unlearn and relearn as changing conditions render some of their existing work practices insufficient. While previous research has established that periods of crisis or rapid change can provide important learning opportunities, we observe that such acceleration of learning is relational and is shaped by interactions between individuals, organizations and stakeholders. We suggest four relational dimensions of how employees learn during periods of rapid change: intra-organizational, inter-sectoral, cross-sectoral and citizen-organizational. We especially highlight the importance of the final dimension as worthy of further investigation in research. Furthermore, we suggest the concept of “reactivation” as a complement to the concepts of unlearning and relearning, that highlights the value in relearning and mobilizing dormant practices, for example in crisis situations. Our results are relevant for policy and practice, as we point to the need for increased room for analytical work in utilities, collaborations between stakeholders to reduce uncertainty around role boundaries and consideration of how regulations may hinder interactions and learning between households and utilities. Finally, using periods of rapid change, such as the energy crisis, is important to not miss opportunities to strengthen the electricity system's ability to manage changes and threats in the future.

References

- Akgün, A.E., Byrne, J.C., Lynn, G.S. and Keskin, H. (2007), “Organizational unlearning as changes in beliefs and routines in organizations”, *Journal of Organizational Change Management*, Vol. 20 No. 6, pp. 794-812.
- Antonacopoulou, E.P. and Sheaffer, Z. (2014), “Learning in crisis: rethinking the relationship between organizational learning and crisis management”, *Journal of Management Inquiry*, Vol. 23 No. 1, pp. 5-21.
- Apajalahti, E.L., Lovio, R. and Heiskanen, E. (2015), “From demand side management (DSM) to energy efficiency services: a Finnish case study”, *Energy Policy*, Vol. 81, pp. 76-85.
- Argyris, C. (1977), “Double loop learning in organizations”, *Harvard Business Review*, Vol. 55 No. 5, pp. 115-125.
- Billett, S. (2008), *Emerging Perspectives on Workplace Learning*, Sense Publishers.
- Brauer, H.B., Hasselqvist, H., Håkansson, M., Willermark, S. and Hiller, C. (2024), “Re-configuring practices in times of energy crisis—a case study of Swedish households”, *Energy Research and Social Science*, Vol. 114, p. 103578.
- Braun, V. and Clarke, V. (2006), “Using thematic analysis in psychology”, *Qualitative Research in Psychology*, Vol. 3 No. 2, pp. 77-101.

- Cegarra-Navarro, J.G. and Wensley, A. (2019), "Promoting intentional unlearning through an unlearning cycle", *Journal of Organizational Change Management*, Vol. 32 No. 1, pp. 67-79.
- Cegarra-Navarro, J.-G., Cepeda-Carrion, G. and Eldridge, S. (2011), "Balancing technology and physician-patient knowledge through an unlearning context", *International Journal of Information Management*, Vol. 31 No. 5, pp. 420-427.
- Cegarra-Navarro, J.-G., Wensley, A.K. and Sánchez-Polo, M.-T. (2010), "An application of the hospital-in-the-home unlearning context", *Social Work in Health Care*, Vol. 49 No. 10, pp. 895-918.
- Cegarra-Navarro, J.-G., Wensley, A., Batistic, S., Evans, M. and Para, C.C. (2021), "Minimizing the effects of defensive routines on knowledge hiding through unlearning", *Journal of Business Research*, Vol. 137, pp. 58-68.
- Crossan, M.M., Lane, H.W. and White, R.E. (1999), "An organizational learning framework: from intuition to institution", *The Academy of Management Review*, Vol. 24 No. 3, pp. 522-537.
- Cyr, J. (2016), "The pitfalls and promise of focus groups as a data collection method", *Sociological Methods and Research*, Vol. 45 No. 2, pp. 231-259.
- Danielsson, E., Nyhlén, J. and Olausson, P.M. (2020), "Strategic planning for power shortages", *Energy Policy*, Vol. 137, p. 111186.
- European Commission (2019), *Key Competences for Lifelong Learning*, in Office, P. (Ed).
- Fenwick, T. (2008), "Workplace learning: emerging trends and new perspectives", *New Directions for Adult and Continuing Education*, Vol. 2008 No. 119, pp. 17-26.
- Gram-Hanssen, K., Hansen, A.R., Valdorff Madsen, L. and Skovgaard Nielsen, R. (2024), "The crisis that normalised Time-Shifting: energy flexibility, price awareness and care during the energy crisis", *Price Awareness and Care During the Energy Crisis*.
- Hamborg, S., Meya, J.N., Eisenack, K. and Raabe, T. (2020), "Rethinking resilience: a cross-epistemic resilience framework for interdisciplinary energy research", *Energy Research and Social Science*, Vol. 59, p. 101285.
- Hedberg, B. (1981), "How organizations learn and unlearn", in Nyström, P.C.S., W.H. (Ed.), *Handbook of Organizational Design*, Oxford University Press, New York, NY, pp. 3-27.
- Högborg, K. and Willermark, S. (2024), "Am i supposed to call them?" relearning interactions in the digital workplace", *Journal of Workplace Learning*, Vol. 36 No. 9, pp. 1-18.
- International Energy Agency (2023), "Global energy crisis".
- International Energy Agency (2024), "World energy outlook 2024".
- IVA (2016), "Sveriges framtida elnät – En delrapport".
- Kim, E.J. and Park, S. (2022), "Unlearning in the workplace: antecedents and outcomes", *Human Resource Development Quarterly*, Vol. 33 No. 3, pp. 273-296.
- Kneebone, R. and Schlegel, C. (2021), "Thinking across disciplinary boundaries in a time of crisis", *The Lancet*, Vol. 397 No. 10269, pp. 89-90.
- Matsuo, M. (2018), "Goal orientation, critical reflection, and unlearning: an individual-level study", *Human Resource Development Quarterly*, Vol. 29 No. 1, pp. 49-66.
- Perera, A.T.D., Nik, V.M., Chen, D., Scartezzini, J.-L. and Hong, T. (2020), "Quantifying the impacts of climate change and extreme climate events on energy systems", *Nature Energy*, Vol. 5 No. 2, pp. 150-159.
- Roux-Dufort, C. and Metais, E. (1999), "Building core competencies in crisis management through organizational learning: the case of the French nuclear power producer", *Technological Forecasting and Social Change*, Vol. 60 No. 2, pp. 113-127.
- Semplici, G. and Campbell, T. (2023), "The revival of the drylands: re-learning resilience to climate change from pastoral livelihoods in east Africa", *Climate and Development*, Vol. 15 No. 9, pp. 779-792.
- Sharma, S. and Lenka, U. (2019), "Exploring linkages between unlearning and relearning in organizations", *The Learning Organization*, Vol. 26 No. 5, pp. 500-517.

- Svenska Kraftnät (2022), "Systemutvecklingsplan 2022-2031".
- The Swedish Research Council (2024), "God forskningssed".
- Tourangeau, R. (1984), "Cognitive sciences and survey methods", *Cognitive Aspects of Survey Methodology: Building a Bridge between Disciplines*, Vol. 15, pp. 73-100.
- Tynjälä, P. (2013), "Toward a 3-P model of workplace learning: a literature review", *Vocations and Learning*, Vol. 6 No. 1, pp. 11-36.
- Van den Broeck, L., De Laet, T., Dujardin, R., Tuybaerts, S. and Langie, G. (2024), "Unveiling the competencies at the core of lifelong learning: a systematic literature review", *Educational Research Review*, Vol. 45, p. 100646.
- Vu, M.C. and Nguyen, L.A. (2022), "Mindful unlearning in unprecedented times: implications for management and organizations", *Management Learning*, Vol. 53 No. 5, pp. 797-817.

Appendix 1. Interview guide for focus group with electric utilities

This interview guide shows a list of questions that guided the focus group discussions, sorted under different themes. However, it should be noted that the focus group interviews were semi-structured and explorative. As such, many of the questions we did not need to ask since participants had vivid discussions and conversations, which covered many of the topics. Additionally, it was important to focus on challenges and learning processes that the participants themselves deemed important and relevant; therefore, we let their interest direct what questions got most attention. However, we always made sure to at least include all the themes in each focus group.

Introduction: Researchers introduce themselves. Information about the study and the purpose of the focus groups is given verbally. Any questions from participants are addressed. Researchers ask participants if they consent to the interview being recorded.

Introduction of professional roles: Each participant briefly describe their job and role within the company.

Theme 1. Households in your electricity network

- I would like to start by asking you to tell me a bit about the households in your electricity network. Who are they? What different types of households are there? Where do they live, in what types of housing,? etc.
- Are there any household customers that stand out more than others? How so?
- How do you communicate with households today?
- How do you work within the organization to understand the needs and conditions of households?

Theme 2. The energy crisis

- What was your situation during the energy crisis of 2022/2023? How were you affected?
- What were the biggest challenges during the energy crisis? Was there anything that was difficult?
- Did the contact with household customers change during the energy crisis? If so, how? How did you handle it?
- Is there anything you would do differently if the same situation arose again in a few years?
- What lessons have you learned from the energy crisis? Has it affected how you organize your work today?

Theme 3. Electricity limitations and resilience

- Now I thought we would talk a bit about resilience – or resistance and adaptation, preparedness. How would you describe a resilient electricity grid? (resistant, adaptable, prepared) [Note: Pause, let everyone have a say and think about resilience. Be ready with a short/simple description]
- What types of disturbances or limitations should the electricity grid be able to handle today and in the future?
- What types of disturbances or limitations do you see as the most difficult/critical?
- If we look at your household customers instead, what types of electricity-related disturbances or limitations do you think households might need to handle? Today vs in the future?
- How will households be affected by challenges such as power shortages or electricity shortages in the future?
- How important is it for households to be prepared for electricity to be, for example, limited or expensive during certain periods in the future?
- [You just told us about a resilient electricity grid and what it might mean...] How would it help your mission if households were prepared or “resilient” to limitations in electricity supply? What would it mean for you and the electricity system, do you think?
- If we imagine a situation where electricity is more expensive during certain periods, there may be power limitations, etc. What role would you say you have in that situation related to households? Do you think different households might need different support, communication or information?
- What is challenging about supporting households in this? Communicating about it?
- From your perspective: what skills are needed to support households?
- If you imagine a dream scenario where you had unlimited resources to work on this – what would it look like? What would be in place then? How would you work on this?
- What other actors are important to support and guide households to be prepared for energy crises or electricity shortages? How do you collaborate with them today?

Theme 4. Managing households' efforts during the energy crisis

- Have you in any way worked to communicate to households that their efforts during the energy crisis were valuable/important?
- How do you think such communication could look?
- How could you explain to households that their reduced electricity consumption actually helps in such situations? How could you confirm that their effort is important?
- How can you and other actors work to maintain households' engagement for the next crisis? How can you in your role help them strengthen their preparedness for such a situation? What other actors can help strengthen households' preparedness, do you think?
- What challenges might exist in such communication? Different households have different conditions, some have jacuzzis in the yard while others live in old rental apartments, etc. Can you communicate the same to everyone, or do you think there are different groups that are important to reach in different ways?
- In what way have you learned from households' responses during the energy crisis, and how have you integrated that knowledge into your work?
- What support for learning/skills development is provided within the organization to meet future challenges related to household customers and energy supply?
- Who besides utilities has an important role here?

Theme 5. Current situation and future.

-
- What are the biggest challenges you see ahead in your role, related to household customers (or otherwise)? Are there any?
 - Is there anything particularly difficult about the household segment in your industry? What and why?

Conclusion

- Now I/we have asked the questions we planned to ask, but I wonder if there is anything you would like to add before we finish? Is there anything you think we should know more about or that you want to tell us?

Thank you very much for taking the time to participate in this interview. If you have any questions afterward, you are welcome to contact us.

Table A1. Concepts and coding examples

Concept	Identification criteria	Example
Unlearning	Statements that involve respondents questioning current practices or the assumptions and understandings behind them	“... but of course there are some products that we don’t have in reserve in the amount that... because today it’s a lot of this ‘just-in-time’ mentality, and you also saw that with the hospitals all the time that orders things but then when there is a shortage, no one had nothing. I think there has been a bit of a wakeup call about that. And now as well with these crisis situations with the wars going on and insecurity, it makes you wake up and review these things” “But we became interesting, I mean out of nowhere it was...’do you work with electricity metering? [laughs] That wasn’t exactly a hit otherwise, being a power grid analyst. Yeah. Bye”
Relearning	Statements that emphasize the need for changing or adjusting outdated work practices or reactivating dormant practices anew. These updating of practices can be either carried out, ongoing or anticipated	“To utilize this potential [target specific households and shift their electricity use] we would need to sharpen our analytical ability. To draw conclusions from all the data the grid generates, I mean it is an enormous amount” “... I think that’s what makes it fun—and that’s also the challenge at the same time. This part of the energy sector has historically been quite administrative, really. It hasn’t posed any major problems—just a rock-solid electricity system, power grid—and in many ways, we still have that. The thing is, the future challenges are huge, and it’s the ability to handle them, and the uncertainty that comes with them, that’s the real challenge. And somehow preparing for that—it’s not like before, when the go-to solution was to expand the grid, reinforce it, that’s what you did. Now, the interaction with the customer is different, and there are several alternative solutions beyond just building more grid infrastructure. ...”
Reactivation	Statements that demonstrate how respondents were reminded of, or rediscovered, dormant or old routines, seeing them in a new light. Reactivation could thus involve reviewing, updating and mobilizing practices and knowledge that had either been forgotten or taken for granted	“... I’d say yes, it definitely became relevant—that first winter in 2022, people were genuinely worried about electricity shortages, as he called it, meaning there simply wouldn’t be enough electricity for everyone. So we really had to test all those emergency procedures that have always existed, like disconnecting customers and similar measures, and suddenly it was (continued)

Table A1. Continued

Concept	Identification criteria	Example
		<i>very real. Very real for our customers—regional authorities, municipalities, and so on. All those things that have always been there and tested—they were now tested for real. It was a huge deal to prepare for that winter and make sure all procedures and routines worked. They’re always tested, but this time it was extra thorough, with workshops and information meetings with the public sector—figuring out how it should work, who does what, what’s Svenska kraftnät’s role, what’s our role ...”</i> <i>“I think that’s a challenge—the fewer disruptions we have, the worse we get at ... [preparedness]... —no, but really, we become—yeah, maybe we need to learn to practice, like actual drills”</i> <i>“Drills are becoming more important”</i> <i>“Yeah, they will. Definitely”</i>

Corresponding author

Hanna Björner Brauer can be contacted at: hanna.bjorner.brauer@ri.se