

Societal barriers and drivers for V2G: a case study

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Foreword

This thesis marks the end of my 5 years as a student at the Department of Media and Social Sciences at UiS. These years have been great, and I am thankful to all my professors and student colleagues through these years! I finish with so much knowledge, so many experiences and a great education.

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1. Introduction

The future is electric, and most sectors in society is working on electrifying their work. This leads to a higher demand of electricity and efficiency. There are several local projects testing new technology, implementing local grids, and renewable energy to supply their energy mix (see i.e.; Alilou et al., 2020; Åsegg Hagen, 2019; Elnett21, 2022). To secure energy supply some local actors have bought big batteries in containers to both store and utilize solar power to become more independent and reduce the electricity cost. These solutions are integrated into their buildings and energy supply on local level and smaller scale compared to the power grid. As the electrification of different business sectors need periodically high energy supply, a battery can supply the users of the grid when demand and load is high, and decrease the effect taken from the grid, both saving the grid from needed updates and outbuilding and giving lower electricity bills. However, the battery container only has a limited lifetime and use. Utilization of batteries and material is not fulfilling for all in this way.

As Norway has one of the highest penetrations of Battery Electric Vehicles (BEVs) there are many lower effect and capacity batteries not used when the vehicles are parked, and batteries not in use. When the technology of V2G chargers and BEVs is assumingly compatible, the need for big containers of batteries, used only to supply power when load demand is high could be reduced. The BEVs could offer an added value and use, by utilizing the batteries for more than just travel and freight. For more sustainable and efficient material usage, the potential of distributed battery storage could be combined within the use and cost of vehicles. In addition, the high penetration of BEVs in Norway is of concern as it increases grid load when charging the vehicles in a non-smart way (Skotland et al., 2016).

There are studies around the technology V2G, most show that the technology will be important for grid stability and an asset for users of EVs in the future (Garcia-Villalobos et al., 2015; Lamedica et al., 2015; Vadi et al., 2019). The technology is still considered young. However, the societal opinions, drivers, and barriers towards utilization of EV batteries for V2G are not illustrated. Therefore, the research question for this paper is “What are societal drivers and barriers for V2G within the Elnett21 project?”.

From a sustainable perspective, the use of BEVs in the energy mix is an additional value and could contribute to lower material use, if charged smart and utilizing distributed storage capacity. In addition, the need of updating and building on the grid would possibly decrease, if

the flexibility market is normalized within the electricity/power grid supply (*NORFLEX*, 2020). Lastly there could also be economic incentives for the vehicle owner by utilizing the BEV as a battery in addition to the initial function (Valle, 2021). This could be a natural development of vehicles, as battery technology evolves and society moves towards circular economy, where all resources are utilized as much as possible.

Elnett21 is a project that aim to become more electricity sufficient (Elnett21, 2022, 2022). Considering implementation of V2G on the airport parking or at other high electricity consuming areas, the technology proposes a solution to the grid load during high demand periods. However, it is unclear to the project whether the potential users of the V2G chargers are willing to connect to this technology. Elnett21 is additionally testing and making different potential business models for flexible electricity market, including how such a market would affect the actors in the project. This far in the project, it has shown to be a problem for the electricity supplier and grid owner. As the Norwegian law states (Forskrift om leveringskvalitet i kraftsystemet (Olje- og energidepartementet, 2004)) that the grid supplier is held accountable for the social responsibility of the important task of delivering the demanded electricity at all times. The only supply company allowing flexibility market is Statnett, which have a high efficiency needed to be sold/bought (*NORFLEX*, 2020).

The Elnett21 project is researching whether to implement V2G as a part of their electrification project. However, there has previously been barriers stopping this from being enrolled in the project, as the technology was not sufficiently effective and commercial. Looking at the potential of V2G in present time, there are questions of whether such technology would be used by either the participants or other end-users of the local community in Elnett21. As the Elnett21 project is looking into the technological and economical aspects of the technology, there are still questions to survey the societal aspects of implementation of such technology, as the technological transition is dependent on social factors to understand the sociotechnical change. This is covered different theoretical theories like the multi-level perspective (Geels, 2002).

This case study is done independently from the Elnett21 project, and is not a paper produces for them, or as task given by them. It does however take standpoint from the project, as field work was possible, and the case study was made more conceptual by doing so.

Thereby, questions that will be asked in this paper include “What are possible societal barriers to utilization of V2G within the Elnett21 project?”, “What are end-user drivers and concerns/barriers to V2G technology?” and “How do actors included in the Elnett21 project comprehend V2G?”

When looking into the green shift, both nationally and internationally, many actors are positive towards renewable energy. However, the term “Not in my backyard” has taken a big space in the public discussion (Geels, 2014; Ryghaug & Toftaker, 2016). The attitude of society at large is usually positive towards renewable energy, for a sustainable future. The downside has become, the new technology is unknown and take up space that makes the affected local population, or at times society, negative and reluctant towards such implementation of new and less familiar technology. This also gives an idea that smart technology implementation, V2G, can give fear of surveillance culture from end-users, as an additional barrier for new technology.

2. Literature review

In this chapter aims to give a short description of the state of knowledge on the topic of V2G and BEVs in Norway (Blaikie & Priest, 2019). In order to situate the case study, it is important to understand the surrounding context. A literature review thus will support the understanding of both informants and the field.

2.1. BEVS in Norway and V2G

Data from NVE about the future with higher rates of BEVs concerns Brevik Wangsness and Harkjerr Halse (2021; amongst others see e.g., Habib et al., 2015) in their empirical study for evidence of electric vehicles impact on local grids. Although V2G make others positive, with regards to climate change and increased consumption of electricity (see e.g., Guille & Gross, 2009; Habib et al., 2015; Kester et al., 2018; Vadi et al., 2019). There is altogether a big market for flexible electricity in the future, as electrification goes on. There are both projects and solutions for flexible electricity usage, where the aim is to develop a stable electricity grid for the future, that is forecasted to be flexible in regards to demand and use (*NORFLEX*, 2020). V2G could support the electricity grid by reducing local demand during peak hours where

demand is high. Or it could supply the grid with output/effect from the vehicle battery (Garcia-Villalobos et al., 2015).

Distributed storage capacity of Vehicle-to-grid (V2G) or Vehicle-to-home/house/building (V2H/V2B) is a good supplement to the delivery network and can shave of load during peak-hours (Vadi et al., 2019). In addition, distributed storage, like V2G, can help implementation of renewable energy (Alilou et al., 2020). Renewable energy is generally intermittent, which gives unreliable power to the electricity grid. Distributed storage opportunities like V2G gives reliable storage and delivery to the local grid it is connected to, by utilizing the battery of the BEV (Vadi et al., 2019).

For the V2H or V2G technology being efficient, a smart grid is required (Guille & Gross, 2009). The vehicle-owner also rely on the battery of the vehicle to be charged enough to drive when needed. These requirements demand both smart grid and smart system. To ensure optimization of the technology, smart systems monitor the behavior and use of the vehicle and electricity (Kester et al., 2018). This could also include flexibility markets, that stabilize the grid, or it could be used for peak-shaving, pushing back the need for upgrading the grid. However, the biggest argument for V2G (or V2X) is the full utilization of energy sources, to promote efficient use of materials and energy/electricity.

This paper will not go into technical details of the V2G technology, nor on battery technology it is however important to note that the high penetration of BEVs in Norway has led to a lower improvement of the technologies compared if the high numbers were generalizable in the world or even just in the Western World (Horne et al., 2019). V2G give some concern to the vehicle owner, as the battery ages by every cycle in addition to the regular calendar aging (Garcia-Villalobos et al., 2015). In addition, there is energy loss in the electricity conversion of discharging the battery through the charger. These technological issues are viewed as barriers to implement the technology however improvements are made with both batteries and V2G chargers. This is often a result of projects from governments and local actors wanting to test future technological solutions, similar to Elnett21 that are considering testing it, and a big project in Utrecht (Hampel, 2022). These test projects help the technological development, as it expensive to develop as a private actor on their own, in addition to use feedback being important for full uptake of technology in society (Kester et al., 2018).

	Petrol	Diesel	Electricity	Hybrid (chargeable)	Hybrid (non-chargeable)	Other fuel
Private cars	893437	1215484	460734	184503	139370	459
Vans	20480	471131	15133	321	346	500
Lorries	2217	66908	98	2	8	698
Buses	169	13224	546	59	106	779
Tractors	72731	233921	132	0	0	85
Special purpose vehicles	2040	4161	17	0	0	1
Mopeds	147907	2707	3488	0	0	0
Light motorcycles	31508	2	154	0	0	1
Heavy motorcycles	181593	57	2018	0	0	6
Snow scooters	96012	2	8	0	0	2

Table 1. “Registered vehicles by type of fuel” taken from Statistics Norway (2022) .

Table 1 is taken from Statistics of Norway, to visualize the different fuel types in vehicles on Norwegian roads. It is clear that ICE vehicles have a higher representation on the road compared to BEVs, even including hybrids. Although the data is important, as articles usually state how high penetration of BEVs Norway has, the most common form for fuel is still diesel and petrol (see figure 1).

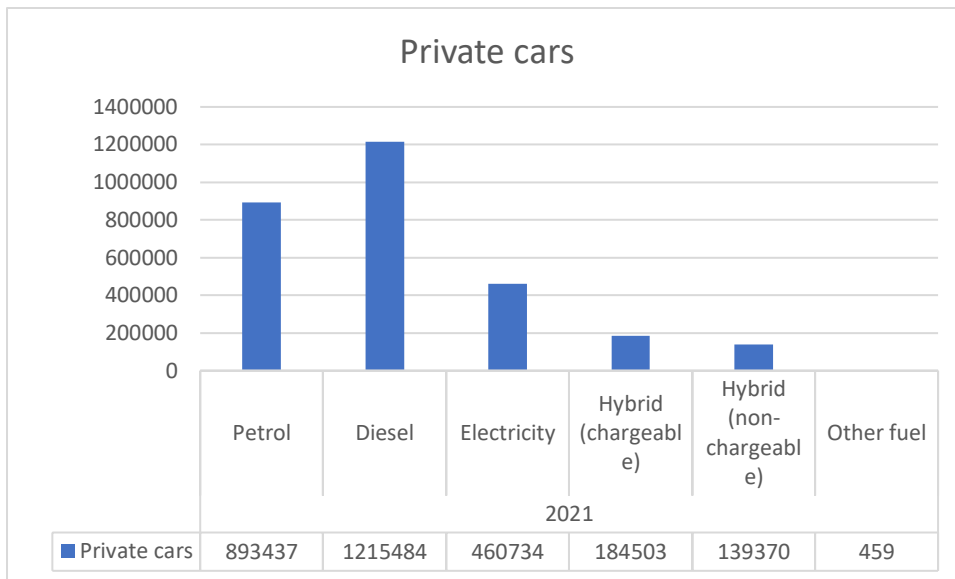


Figure 1. “Private cars in 2021 by fuel type” based on table 1.

Further, it is interesting to look at the change in BEVs from 2020 to 2021, shown in figure 2 below. The increase of registered electricity fueled private cars is higher than the fall in petrol and diesel fueled cars.

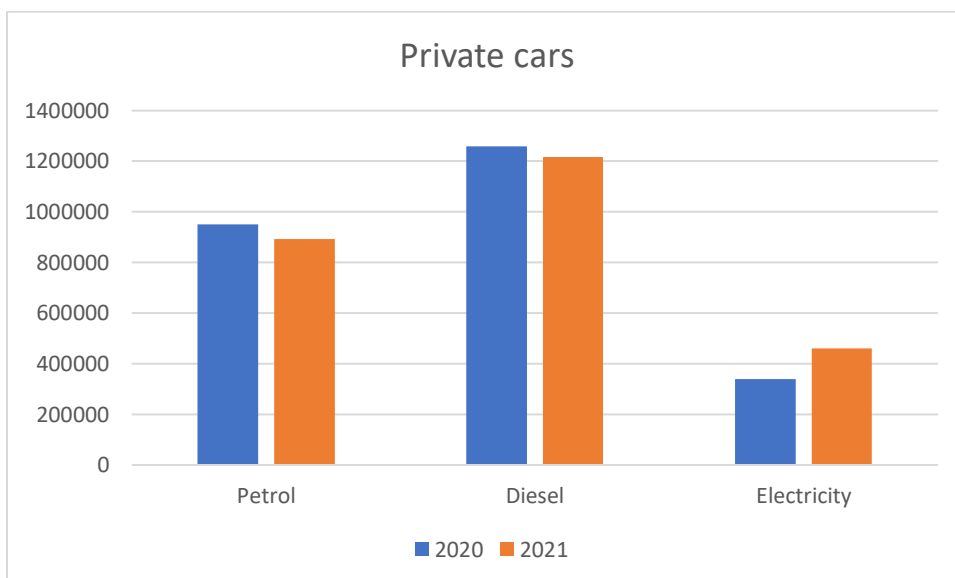


Figure 2. “Change from 2020 to 2021” Data from Statistics Norway (2022).

While the amount of ICE private cars goes down, the electric personal cars continue to rise. In addition, the change in new private cars is more significant. According to Norwegian Road Federation the year 2021 holds records for shares of electric vehicle sales (OFV, 2022). Not only has the share of new ICE vehicles gone down, but the increase is significant in sales of new fully electric vehicles, as shown on figure 3 below.

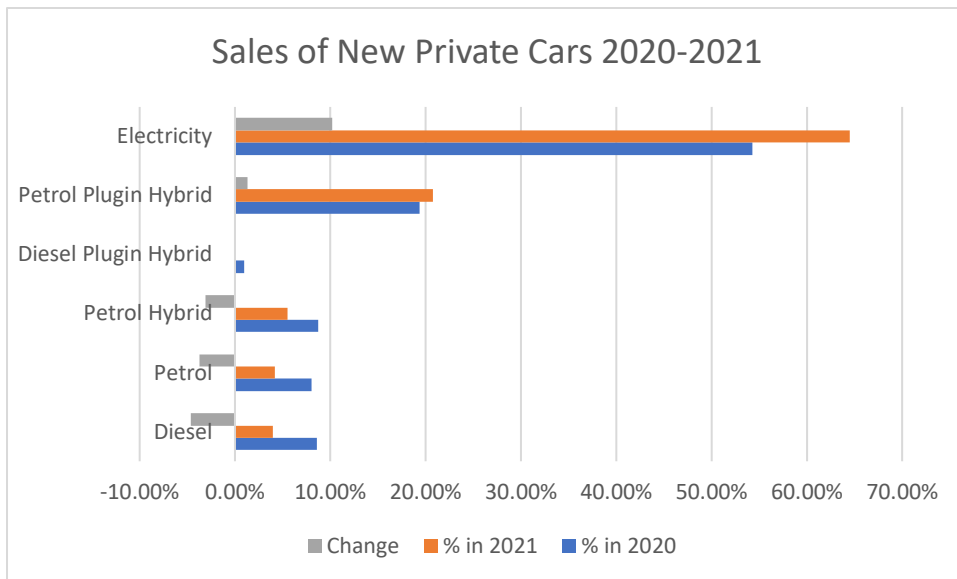


Figure 3. “Sales of New Private Cars 2020- 2021” Data taken from Norwegian Road Federation (OFV, 2022)

In addition to the high penetration of BEVs in Norway, the SDG and the Paris Agreement has made the Norwegian Government set the year 2025 as the year when no more new ICE cars will be sold or imported to the country as personal cars, similar goals are set by the EU for 2035 (Samferdselsdepartementet, 2021; Steitz & Carey, 2021). This shift will give a large fleet of batteries on parking lots, giving an opportunity for the owner of the vehicle to utilize it for more than just transport, and giving the electricity grid and community/society a flexible opportunity for efficiency and full utilization of resources (Kester et al., 2018).

3. Theory

A traditional framework for sociotechnical theory is the Multi-Level Perspective (MLP). The framework describes on different levels how technological development and social aspects come together, which is relevant for newer technology and technological innovation and social acceptance (Geels, 2011). This framework will be described, in addition to the sociology of expectations, surveillance culture and surveillance capitalism and lastly theory of technology acceptance and adoption.

3.1. MLP

The multi-level perspective consists of three analytical levels: technological niches, sociotechnical regimes, and sociotechnical landscape (Meadowcroft et al., 2019). In the niche level is called the locus of radical innovations, within it there are different rules, technologies,

and actor groups. The locus of niches are not considered stable or big, however it is described as the incubation room for radical novelties, that protect and shield the novel innovations from the adverse market and other selections of pressure however, these spaces do interact with established regimes on macro-landscape level (Geels, 2014; Geels & Kemp, 2007; Meadowcroft et al., 2019).

The next analytical level in the MLP theory is the socio-technical regimes (Meadowcroft et al., 2019). Socio-technical regimes consisting of rules, routines and practices used by different actors and institutions create and recreate, in this process the technological system is sustained. The socio-technical regimes longstanding development trajectories reproduction gives stability to the systems, which is why it is called a regime, associated with vested interest and dominance or power.

Lastly the socio-technical landscape is referred to as part of the exogenous environment beyond direct influence from actors (Meadowcroft et al., 2019). Within the landscape the exogenous factors are present, which include factors like rapid external shocks and long-term changes as trend patterns, price fluctuations, crisis like wars or demographic changes.

The three analytical levels are however not fully separate, as they can influence each other in many different ways (Geels, 2014). A change on the socio-technical landscape, i.e., not satisfaction from current solutions, there can become a pressure on the regime level. This pressure can destabilize the regime level, giving a window of opportunity for innovation at the niche level. To give an example; “green” or sustainability innovations can struggle with the already existing regime on many levels, either economic, technical, political, cultural, or infrastructural, as the mainstream regime is more rigorous and resistant due to the recreation of practices, and trajectories within the existing regime, if compared to the “green” or sustainable development.

The V2G technology is implemented in a variety of projects and scales (Utrecht & Invade (Hampel, 2022; Invade, n.d.; Manthey, 2021)) showing that it is a potential battery storage, however it has not fully evolved from the niche level, as there are few cars compatible with bidirectional chargers, and the chargers are big, expensive, and not very efficient. The multi-level perspective applied to the Elnett21 project and their aim towards enrollment of V2G, can give an understanding to whether the technology transition is likely to happen, and at which

level the window of opportunity opens for V2G as a result of Elnett21 putting pressure on the technology and the socio-technical regime.

From the socio-technical regime of MLP: The charger-manufacturer and the vehicle manufacturer, as they produce the car, and “remember by doing” they can innovate a commercial bidirectional charger, leading to a technological trajectory (Geels, 2002). Embedded in institutions and infrastructures, are already the commercial vehicle chargers used today. The technological transition to different chargers for private cars has given an infrastructure that is a part of the sociotechnical landscape and is no longer a niche in Norway. The Elnett21 allows for a window of opportunity, as the project test the technology, it allows the technology to not be fully developed but protected in a socio-technical regime while tested in the landscape, as the project is open to be used by all.

It is generally agreed upon that for a sustainable transition to happen, like the electrification of the transport sector, one cannot rely on the individuals initiative (Fridstrøm et al., 2018; Ryghaug & Toftaker, 2016). To promote the transition to BEV in Norway, economic incentives where a key driver, and this is generally a driver for transition from established technologies to newer, more sustainable technology, as the sustainability aspect is not fulfilling to change individual behavior or choice (Bjerkan et al., 2021). The potential incentive of V2G is naturally payment or reduction of cost in charging by discharging the battery.

Geels conceptualize the MLP stating that “[u]ser practices and mobility patterns emerge from the daily use of cars by user groups” (Geels, 2002, p.1259). The enrollment of V2G is thereby dependent on user practices and patterns, as the user must accept the utilization of their battery and connect the vehicle to the charger, whether they are going to charge the vehicle or not. User practices of BEVs today would typically be that the charger is only connected when need of battery charging. This behavior would have to change for V2G utilization of batteries. This would be the next step after the choice of implementing V2G in Elnett21 project.

3.2. The sociology of expectation

Sovacool et al. (2019) used sociology of expectation as a conceptual lens in a similar paper, exploring with experts within the electric mobility of the Nordic region, with V2G as theme. This approach suits this paper as well, as it focuses on the social and gives a sociological approach to a newer technology that has not been thoroughly studied in this way. The definition

of technological expectations is taken from “real-time representations of future technological situations and capabilities. [...] [I]t is a combination of expected progress of the technology at stake, its future markets, and its societal context” Bakker et al. (2011, p. 156). These expectations can be both collective or individual and be in the form of stories, images, terms, or exist in different groups in society or other organizations. The concepts of the sociology of expectations want to reveal the narrative infrastructure or the structure of stories about technology.

There are various concepts grounding the approach of how expectations originate and circulate (Sovacool et al., 2019). The first of four Sovacool et al. (2019) present is rhetorical vision describes it as advocates of particular technology often hold some shared expectations and narratives about it. Here the actors have characteristic and share a mutual positioning in a story of the technology in the future. Actively sharing information, often through politics, the argumentation surrounding the technology can lead to a collective scheme representing the future objectives, and how these visions can be realized. If visions are publicly accepted and become a part of the collective repertoire in large stakeholder groups, the vision turns into the social reality. These ways of narrating and envisioning the future of a technology are only expectations and not a promise, as there are many processes the technology must accomplish to be realized and accepted as the social reality, in society, which is not a given (Sovacool et al., 2019). The sociology of expectations consists of the manifestations of the actors’ visions and narratives of the technology.

Ideograph is a powerful collective vision/narrative of meta-vision or super-promise cutting across visions and recurs, as it intertwines ideology, power, social control, and language (Sovacool et al., 2019). It forms a baseline of political and public commentary related to rhetorical tropes. Sovacool et al. states the most prominent ideograph in the past, connected to technology is continual progress, that dates to the Enlightenment. Continual progress is also connected to sociotechnical systems as electricity and information and communication technology amongst other.

As in sociology, the concept of cycles can be expectations. The third concept in Sovacool et al. (2019) is the notion of a “promise – requirement” cycle. These develop politically from a promise of solving a problem and with the promise of profit. When the problem politically uptakes it leads to a requirement and the innovation/technology is protected to ensure

development. Technological innovations that promise to solve problems typically get this protection because it gives a mandate to the engineers (or other actors) to develop their technology, making it a requirement, thus the cycle is in form, and the promise to combine the development to societal obligations becomes a nested phenomenon.

The final concept from Sovacool et al. (2019) describes brokering expectations, where the two types of actors' enactors and selectors are involved. There are rarely simple technological solutions to a pressing social problem, thereby different stakeholder groups are involved in different technologies. The enactor stresses the criteria favoring their variation, holding on to their preferred attributes and performance aspects. On the other hand, is the selector, that acts more balanced, dynamic, and fluid when competing criteria of technology arises. The enactor thereafter focuses on promoting and maintaining expectations, while the selector focusses on picking expectations. These two groups of actors will compete for resources and support in the different areas of expectations that gives strength in a trial process of selection and variation.

The sociology of expectations presented offer semiotic and symbolic understanding of technology development, and thus have similarities to the sociotechnical imaginaries (Sovacool et al., 2019). The main difference between the two is how sociotechnical imaginaries concern the mass public or the collective and assessing the moral of innovation. Both terms are relevant for the case study, however the scope of this paper is too small to include a group that could be viewed as a collective in the way sociotechnical imaginaries require.

3.3. Surveillance culture and capitalism

There is little to no literature concerning surveillance of users of V2G, in the respect of their privacy and data collection. There are several mentions of the threat of cyber-attacks on smart systems like V2G (see e.g., Mihet-Popa & Saponara, 2018; Vadi et al., 2019). This can be a part of the concern for the vehicle owners when considering the use of V2G chargers.

Articles published by Zuboff are very well describing of the surveillance capitalism and surveillance culture, however they are on the topic of internet and social media (2015 & 2019). Companies like Google and Amazon make profits by tracking big data form their users, by selling them to advertising companies and providing advertainments personalizes for users, which isn't what is expected or studied in this paper. However, the theory of surveillance culture and capitalism is highly relevant, and can be applied to other studies, where big data is produced

by using smart systems or devices. This is because of big data and surveillance, and its aim to optimize user experience, and adaption for the user, and their behavior (Zuboff, 2015, 2019).

Lyon (2017) argues that surveillance culture needs to be studied more, and illustrated the practice of sharing, in relation to visibility and exposure of oneself. Following the tendency of surveillance culture being a part of the digital citizenship, but also bringing up the discussion of ethics in this new digital society. The discussion of ethics is important, as we today share a lot of our world on social media, and through different technologies and with different technology companies, especially as people at the same time have a tendency of resistance towards surveillance. Stressing how contextual integrity must be uphold, privacy is subjective and differ according to the situation and the context of surveillance.

The choice of term surveillance culture is due to the surveillance “becoming part of a whole way of life” (Lyon, 2017, p. 825). Surveillance has become a part of the culture, it has been internalized in our lives (Lyon, 2017). The everyday citizen complies with either willingly or wittingly, engage with or resist in novel ways can initiate and desire, surveillance. Surveillance culture has grown fast during the 21st century, led by new technologies that are both fast and powerful, incorporating the everyday life through information infrastructures. This development has also given an increasing dependence on digital materialistic relationships.

As a short description of why surveillance capitalism is included in the theory a key point include “[t]he competition for surveillance revenues bears down to our bodies, our automobiles, our homes and our cities” (Zuboff, 2019, p. 11). Zuboff stresses how surveillance capitalism no longer can be viewed as something that is “out there” in the factories and offices” but it aims at and is affecting society and individuals to a degree where it has become a part of us (Zuboff, 2019, p. 11). Zuboff describes the economic orientation of digital technologies as the puppet master, where surveillance capitalism binds the elements and direct the “puppy” into action (2019). Thus, surveillance capitalism is an important subject to debate in the democratic society, as it is an economic creation. The technology can often be presented as the trojan horse, with the capitalistic ideal inside.

“It is no longer enough to automate information flows about us; the goal is to automate us” (Zuboff, 2019, p. 19). “Such a self-authorizing power has no grounding in democratic legitimacy, usurping decision rights, and eroding the processes of individual autonomy that are essential to the function of a democratic society” (Zuboff, 2019, p. 19). This however mainly

concerns the commercials on social media and smart devices and systems used on a daily basis to automatize the human behavior and every day habits. The extent of automatized feed on smart devices are the concern Zuboff raises, and it can not directly transfer to the business model that is to be implemented with V2G. Further on this will be elaborated in the discussions of the paper.

Dated back from 2008 several studies have been conducted around the world, where the practices and premises of surveillance capitalism have been rejected by the majorities (Zuboff, 2015, 2019). However, the trend of smart systems utilizing surveillance capitalism has grown and dominated with success. This is due to the change of position, the collective has become a user, and is no longer a customer of the host that uses surveillance capitalism. If a user wants a product that is smart, they have to agree to the terms and conditions. Zuboff claims the reciprocities are no longer employed (2019). However, smart technology needs big data and “surveillance data” to optimally function for the user.

The perception of surveillance can be described using “surveillance social imaginaries” (surveillance imaginaries) where the shared understanding of certain aspects of surveillance culture is key (Lyon, 2017; Taylor, 2004, 2007). Imaginaries provide context to act, engage in, and a way of legitimating surveillance practices. Moreover, surveillance practices help carry surveillance imaginaries and contribute to their reproduction, in this way it is a part of modern everyday life, lived under surveillance. The imaginaries can additionally include popular media, providing growing awareness of surveillance in society and as a part of the social culture. However, surveillance practices can include activities relating to being surveilled, in a responsive matter, as well as different modes of engagement with surveillance, initiating the practice in different ways.

Lastly, Lyon (2017) emphasizes how the term surveillance culture is an umbrella term, that is not meant to signify a unified or all-embracing situation but relates to phenomena, relating points of a whole way of life in reality can in positive and negative ways be surveilled.

3.4. Technology Acceptance and Adoption

The framework Technology Acceptance Model (TAM) by Davis (1989) has been used and developed to comprehend/research individuals intention to use new technology, by looking at the perceived ease of use and perceived usefulness (Tekler et al., 2022). The further developed framework includes the perspective that lack of awareness or perceived risk will discourage

technology adaptation. Tekler, Low and Blessing (2022) modifies the model with additionally “considering, image, perceived voluntariness, [...] environmental worldview, and goal internalization[.]”. These aspects give further understanding for the user’s intention with adopting technology.

The model also includes the aspects that can discourage user acceptance. Concerns are generally regarding privacy violations, cost, lack of control and intrusion of the daily routines (Tekler et al., 2022). Previous studies have given reason to include user requirements in the developing phases to ensure higher technology adaption. Findings within the framework include giving flexibility to customize to individual needs. Personalization of smart technology has reduced perception of alienation and security concerns.

Tekler et al. (2022) found in that giving user’s agency by engaging them and in the development of the smart system technology, the adoption and long-term engagement of the users increased. In this framework the concerns raised include aspects covered by Zuboff, presented higher in this chapter. The approach of user engaged development is also found in Robinson et al. (2022) using the Technology Implementation Model of Energy (TIME).

TIME is an appropriate model for the case study, due to V2G not only being a smart system, but also an energy technology. In Robinson et al. (2022) as in Tekler et al. the focus is changed from trying to implement a finished technology in society, to develop, listen to and engage the users, when initiating implementation of the technology, giving the technology higher chances of user adoption. TIME gives focus to the end-user reality and stakeholder involvement.

As TIME mainly is used to solve SDG goal 7, the focus in Robinson et al. (2022) is put on energy poverty solutions and is different from this case study. Although the area and situation of the model is different, the model is still appropriate as there have been other theories also addressing the problem of long-term user adoption of smart and energy technology systems. The addressing of end-user perspective, needs and wishes are crucial for the full implementation and optimal use of new technology. Not just for the individual as the end user, but also as larger scale, the local community and society. If the goal is to reach the SDGs, the different organizations, societies, and individuals across the world must try to use their recourses effectively and optimally. Barriers of energy technologies needs to be addressed and solved, often with the end user, as addressed with TAM and TIME.

The different terminology, methods and frameworks mentioned in this chapter will be used to try to solve the research questions and problem statement of the paper. The choice of several different theory terms is deliberate, as the aim is to answer research question with the most fitting and explaining terminology from literature available, including newer articles. Choosing different articles as the theory base of the paper is additionally to give answer to the timely and futuristic explorative case at hand.

3.5. GDPR

As a theme in this paper regards personal and big data, both personal data flow and processing, it is important to mention the somewhat new European regulation of personal data. This is also relevant in Norway, as the change in regulations in Europe, also affected and changed the laws in Norway. Further there will follow a short overview of what the GDPR aim to regulate and how it can protect the natural person.

The European General Data Protection Regulation was applied from 25th of May in 2018, and is a regulation for all personal data and concerns all the member states privacy laws (gdpr.info.eu, n.d.). In short, this regulation protects the free flow of personal data and processing these types of data. The goal with GDPR is to protect but not prohibit or restrict the flow or process of free personal data, but to give the natural person the chance to protect their own privacy and personal data flow. This law has also been adopted to the Norwegian laws, and is called “personopplysningsloven” (Kommunal- og distriktsdepartementet, 2019). The law was passed and entered into force in June and July, respectively, the same year as the European Union member states GDPR laws.

4. Research design and methods

In this chapter the research design will be described, including the methods used for data collection, data analysis and data reduction. Reflections of methodological limitations, reliability and validity will also be given within this chapter.

By a way of introducing research design and research methods, it is important to state that the methods used within social research are tools, to plan the path to the goal, which is social science research (Blaikie & Priest, 2019). Consequently, this chapter includes the planning and

execution of the research of the paper, aiming at giving an understanding of the work done to produce the research presented in this paper. The research design was made prior to the research done for this paper. The research process started with producing the research design with a description of what was going to be studied and why it will be conducted in a specific way.

The start of the research design was producing a research problem and continuing with the research questions. Starting with the research problem, an intellectual puzzle, is intentional to start the research design, before deciding what the research questions will be (Blaikie & Priest, 2019). Looking into existing literature, both academic and non-academic about the V2G technology was the first step. The research done prior to choosing a research question, included getting an understanding of the technology and looking at different problems from a social science perspective. This resulted in a literature review, to contextualize the research problem.

In the process of clarifying the research questions, meeting with a contact in the Elnett21 was crucial to making the research possible, as there was interest within the local society for V2G. However, the local project had previously considered the technology too young to include and explore. With the input from the contact, the research problem became clearer, and the research design was further narrowed and specified. After developing the research design, the research question became:

“What are societal drivers and barriers for V2G within the Elnett21 project?”

The supporting research questions are the following:

- (1) What are opportunities for implementation of V2G in parking lots?
- (2) How do end-users perceive V2G smart technology?

The logic of anticipation, including how one plans to conduct research, can hardly ever be followed entirely (Blaikie & Priest, 2019). Because changes usually are required to answer the research question intended, making it a process of adaptation of methods, as the research goes on and understanding of the phenomenon increases. This is why the research design was further developed and set after the meeting with a contact. This made the research into a case study, however not as a research given by the Elnett21 project.

The method used in this study is a qualitative case study (Yin, 2018). The study is explorative, which is why the research design could be developed and adapted as the understanding of the

societal conditions increased. The case study design is used to examine one specific subject in the associate contextual conditions, in this case a project of V2G (Sovacool et al., 2018).

Case study also opens for the use of different data collection methods (Blaikie & Priest, 2019). Doing a case study is a linear but iterative process where plan and design is linear and the process between design, preparation, collection, and analysis is iterative (Yin, 2018). At the beginning of the research design process ethnographic field observation was conducted. Doing field work at the beginning made it possible to narrow down to the research questions, as a result of getting information of what was happening in the Elnett21 project. Understanding the local project, the scale and scope of it was useful, as it gives context to how this paper can be helpful not only as a thesis within social studies, but also relevant for the local society. This data collection endured for just over 4 months, however there were not too many interactions during this period. Field observation was done on a weekly basis of one day, where the schedule varied from a full day to only participating in lunches.

As described in Blaikie and Priest (2019, p. 39) this research required a more exploratory method to establish an adequate background for choices to be made. Examining statistical data, doing some field work, to develop the research design for a case study on a theme where existing literature is not adequate for the research problem. The case study design was chosen because of the factors at hand. This includes time limitation, location, global pandemic, economic factors (no funding) and other practical matters. The choices made at one stage of the research design influenced the choices and opportunities/boundaries in the following stages, they were interdependent. Lastly, the methods chosen are results of choice of research problem after contact with Elnett21.

4.1. Logic of inquiry

Social sciences research is based on four different logics of inquiry that are used to answer research questions (Blaikie & Priest, 2019). Logics of inquiry are used in context of a paradigm, including the ontological and epistemological assumptions of the paradigm. The four logics of inquiry will be shortly described in the following paragraph. The paradigms can be divided into four classical and six contemporaries, however Blaikie and Priest (2019) reduce them into the following research paradigms; Neo-Positive, Interpretive and Critical Realist.

Inductive and abductive logic answers “what” questions that are exploratory and descriptive (Blaikie & Priest, 2019; Sovacool et al., 2018). However, these logics give different methods and outcomes when used. Deductive and retroductive logic on the other hand are used to answer “why” questions and are used when the purpose is to explain, these logics answer the questions based on different assumptions. In addition to “what” questions, abductive logic can also answer “why” questions if used with constructionistic retroductive logic if the purpose is understanding.

Abductive and retroductive logic used together can purpose “what” and “why” questions with the purpose of understanding (Blaikie & Priest, 2019). Retroductive logic of inquiry is used to discover causal mechanisms and structures, in particular context can explain observed regularities (Sovacool et al., 2018). Examining the characteristics of the context, in this research the case study, after the use of abductive logic, which gives an understanding and provides causes (Blaikie & Priest, 2019). Abductive logic of inquiry concerns theories from social actors’ meaning and accounts in the everyday activity context. In this logic the meaning, intentions and motives used in the everyday life is of importance. Abductive logic produces understanding and not explanation by giving reasons and not causes to “why” research questions. By describing this the researcher form a basis of understanding to the problem at hand, also called plausible interpretation by Dey (2004).

Inductive logic aims to “establish limited generalization about the distribution of, and patterns of association amongst, observed or measured characteristics of individuals and social phenomena” (Blaikie & Priest, 2019, p. 92). Inductive logic of inquiry requires a set of chosen characteristics and collecting data related to them, then drawing generalization from this. Inductive logic thus requires the researcher to define concepts that they will use to observe or measure the social world with. This logic will be used in the case study.

Further, abductive logic will be used in this case study as it is of explorative and interpretive basis. It allows for re-description of science, in line with grounded theory (Yin, 2018). Earlier it was believed that objective descriptions could be accomplished if the observer did not choose what was to be observed, but philosophers now agree that pure descriptions are impossible to carry out (Blaikie & Priest, 2019). Thus, answers to “what” questions will differ as a result of the choices a researcher makes when choosing what characteristics to focus their research on.

This is typical for social science research and qualitative research on smaller scale, this will be further addressed in the limitations section of this chapter.

4.2. Data collection

As mentioned above, some field work was conducted (Blaikie & Priest, 2019). This included conversations with a team in the Elnett21 project. Additionally, observation in two working meetings with the same group. The field work did not go on for a long time, as the research question was produced, and the understanding of the situation and phenomena, and technological situation increased for the thesis writer. The field work was moreover important to find a more realistic research question that was possible to answer specifically with the time limitation for conducting the research presented.

Field work as a part of the case study methods was thereby important but will not give the main answer to the research question. This is due to interest found during the field work, where the population is themselves interested in V2G, giving a biased answer as a result of their work in the local project. Thus, it is viewed valuable for the methods and case study, by giving understanding and context in the local society. This will be further elaborated in the findings and discussion of the paper. The data collected from field work include contextual information and some expert statements, taken from observation and not interviews or conversations (Dey, 2004).

To collect data, the population had to be selected. Selecting the population is an important part of the research methods, as it will give the data used to answer the research question (Yin, 2018). With case studies, the population is in ways given, however because of limitations in time and practicality, the population was selected so that the sample could be as representative as possible. Thus, getting a representative sample is difficult with such short time and with smaller research as this paper is based on. However, choosing informants from both locations give a better understanding of the potential the V2G technology has in the local project.

The stakeholders and the effected users in the Elnett21 project are a natural choice of informants, as they are a part of the project (Sovacool et al., 2018). It is due to this being an undeveloped technology and not common situation the case study method is used, as random sampling is hard with the low implementation of V2G (Flyvbjerg, 2004). Furthermore, the

travelers at the airport are anonymous, making it hard to get in touch beforehand to schedule the interview. Making the time of interviews different, as some of the informants had to leave earlier than others. However, the length of the interviews would differ due to the semi-structure of the interview guide, and qualitative characteristics of the method (Seale, 2004).

A sample of 10 interview informants were randomly approached and volunteered to be a part of the sample, divided in the two locations of the Elnett21 project for this study. This is not representative thus it gives a good understanding of how the end-users of the local parking lots comprehend and find concerning with the implementation of V2G. The locations are different, where one is concerning a parking lot for an office building, the other is for travelers by airplane. The interview guide was the same for both locations, as the reason for their parking was not as important as other aspects with the parking locations. This includes, how long they will be parked, what their way of transportation to the location was and what their thoughts on smart systems, in this case the V2G, were.

The sample consist of people at an office building, where they spend most their work hours. This sample is relevant as it will include mostly individuals that are located at one place for a longer time, and most likely drive their car and park it there for a longer period. The population was chosen because it is more likely for a population to utilize V2G if parked for a longer time, in opposition to a population that park for a shorter period of time. At parking lots for shorter parking period, charging would be the main reason of connecting to the vehicle charger. The problem with parking for a shorter period would include the need of charging the vehicle and then driving, in contrast with longer parking. Longer parking time period opens for the possibility of battery charging and discharging. These locations were chosen as they are common types of parking spaces, and it is relatable for many car owners. The time aspect is naturally related to the person owning the cars however, it is not likely that one would connect the car to a supermarket charger when going grocery shopping, and allow discharging, due to the short parking period.

The logic of anticipation and the research design with case studies are as mentioned iterative, including the process of interviewing informants (Yin, 2018). As the first interview was conducted, some changes were needed. The interview guide was changed after starting with one interview, and the open structure of semi-structured interview makes each interview different. This way of interviewing is limiting because it makes the data collected different.

However, the structure of semi-structured interviews opens for the informants thought process and was used to get as much out of the interviews as possible (Dey, 2004). This falls under the abductive reasoning, where there is a dialogue between theory and empirical data, giving the opportunity to find aspects not covered in the existing literature.

Interviews in this study have been anonymous and consent was given verbally, with anonymous evaluation from the Norwegian Center for Research Data (NSD). This is done to ensure as qualitative and honest answers as possible. By not collecting personal information or information that can identify the informants, there is less concern from their side to not answering fully honest. Although being interviewed by the thesis author there are no connections with the informants that can influence them other than the conversation led during the interviews.

Problems when approaching the population, the sample must be based on voluntary participation (NSD; Blaikie & Priest, 2019). As the sample consist of people working at a specific building, that is a part of the local project, there are conflicts with the work they are conducting in the building. As people are at work where the sample was collected, their where many potential informants that could not set aside time to do an interview. Similar problems were present at the airport, as travelers were stressed about making it to their flight on time, making many non-approachable. This will be further discussed in the limitations of this chapter.

4.3. Data analysis

Data analysis is crucial for the research, as the way one analyze data will give differing weighing of the data collected (Sovacool et al., 2018). It is also what gives the data a connection to the theory, and how one connects the two. Empirical data on its own is without meaning, it must be analyzed to give answers to the research questions. This is done by identifying, analyzing and reporting the patterns found when going over the data collection.

Yin (2018) claim data analysis of case studies to be the least developed aspect. This can lead to researchers not analyzing their data for months, as the data collection is done before having a plan for how to later analyze the empirical data. Yin (2018) suggests this could be due to the flexibility of the case study design, in comparison to statistical or quantitative data having data sets and formulas for how to analyze the data at hand. The data analysis is dependent on the

researchers own empirical thinking and efforts to sufficiently present evidence and consideration of possible interpretations.

To start the analysis, an analytical strategy was made. The analytical strategy included reading over the data and the research questions, to familiarize with the data and look for patterns, concepts and insights that seemed promising. The interview data was sorted in a table, making the main focus points from the interviews clear, and easy to compare. This is mainly done to remember the different informants' key opinions, experience, and comprehension of V2G and BEVs. Further the data is discussed and conceptualized with the use of previously presented theory from the theory chapter, with start point from grounded theory strategy (Yin, 2018). The data from field work is also discussed and conceptualized with the perspectives given by theory presented in the chapter above. However, data from the field work is difficult to find patterns in, thereby the memo of conceptualizing this data is different from the interview data.

The field work turned into more of a background for the study, but also positions the different actors when using the MLP framework. This has made the choice of theoretical terms and frameworks easier. According to Yin (2018) one could call it a ground up way of working, where the field work was the starting point, and later on using theoretical propositions for the interview data analysis. This builds on the grounded theory strategy, as well as the exploratory inductive strategy used in case study. It is however important to say that these strategies are usually more used by experienced researchers with thorough understanding of the field they are studying. Experienced researchers are likely to have relevant concepts in mind and memory as a result of their understanding, making these strategies appreciated, however more difficult to conduct and utilize by an unexperienced researcher, as the author of this paper.

The five analytic techniques by Yin (2014) will be presented and discussed as a tool for data analysis. Mentioned the logic of pattern matching has been used to analyze the data and is known as a method that can strengthen the internal validity of the case study. The patterns found are based on making perceptions, opinions and thoughts from interviews into a table with variables that form a pattern from the different answers received that are repetitive.

As the questions asked were open, and the structure of the interviews only semi-structured, the precision is higher than what is used in the second analytic technique by Yin (2014), explanation building. As the case study does not aim to develop ideas for further research, it has not been

used as an analytical technique. Finding causal links in the data, such as the link between knowledge about GDPR and smart technology however is conducted. The possible pitfall of explanation building is moving away from the initial topic of interest. It is therefore important to continuously check with the original research design, to avoid this pitfall.

Third, the time-series analysis is not of interest for this case study, as it changes over time are not researched or of interest, due to the timeframe of the work conducted (Yin, 2014). It would thus be interesting to collect and analyze data in this way when V2G technology is better known by the common person, then compare or find patterns with this case study. This applies for the fifth technique, the cross-case synthesis. The mentioned techniques will not be explained further, as they are not fitting nor helpful tool for data analysis in this case study.

The fourth analytic technique, logic models has shown to be increasingly useful in case study evaluations (Yin, 2014). It operationalizes complex chain of occurrences and can be used with events over a longer period of time. For this case study it has been used to match empirical data with theoretical expectations or predictions. It is similar to pattern matching, only it takes more into account events and observable data. This analytic technique has been used to situate Both V2G technology and BEV in Norway, additionally it has been necessary to understand data from field work. This analytical technique is useful and in ways coherent to MLP theory, as it is developed collaboratively often looking into a sequence of events and their “repeated cause-effect-cause-effect patterns” (Yin, 2014, p. 155).

4.4. Methodological reflections

The following part will consist of the authors reflections on the research conducted. Starting with the limitations and the research process, following with reflections of the validity and reliability of the paper. To begin it is important to note that the researcher-defined and chosen characteristics, are chosen in the process of research design. As one may come across other characteristics in the research process, such as the interviews in the data collection, this are already limited and specific as a result of the research design being done (Blaikie & Priest, 2019). This makes the research influenced by the researchers’ background in academia and within the time and space it is conducted. This paper is thus influenced by the sociologic discipline in addition to the master’s degree it is enrolled in.

4.4.1. Limitations

Informants were easier to come in contact with at the airport, due to people being bored and therefore easily engaged in conversation. Additionally, it seemed they viewed it as more meaningful and less like a waste of their time, as in the office building. This made the interviews at the airport easier to conduct, as the random sampling was possible at the initial enterprise/connection with the potential informants. As the informants also viewed the task presented as valuable, helping a student conduct research, they also seemed more positive in the whole situation. Compared to the potential population sampling at the office building, where the informants struggled to see how they were helpful and understand the task presented. This was due to their relation to the building, they were at work, and did not find time to engage with the thesis writer. This might be an inconvenience occurrence from initial contact not seeming interesting enough. The presentation of the interviews and their meaning could be the reason why more informants decided not to participate; however it is also understandable that workers cannot set off time to participate in the research.

During field work and observation, this was set up by a contact, and it was also valuable to the participants as it is a part of their research before deciding whether to implement V2G in their project. The field work, with both observation and participatory observation was moreover more engaging to the participants compared to the interviews, as it was a part of their everyday work.

Other limitations and problems with the population sampling that influence the study include fear of personal information being revealed, not having time to do physical interviews with paper author, and the biggest problem experienced when collecting data was not having engaged informants or population. These problems limit the sample, and the sample was therefore reduced to voluntary and understanding workers at the office building and airport gates.

The issues of not having engaged population could have been eased with better time to get in touch with the population before having to conduct the interviews. This could have given better and more indebt interviews of various viewpoints/perceptions, in addition to a bigger sample. However, as time is limited less informants and better focus on the data collected give better data to analyze, than many and shorter interviews with less time to analyze the data collected.

4.4.2. The eight criteria for qualitative research

To end the methodology chapter some reflections of the quality of the thesis will be given. Within research the quality of the research work is usually measured by looking at the reliability, validity, and relevance. Researchers have however critiqued these terms, and state that they do not show for the quality of the research conducted in regards to the qualitative methods, but are relevant for quantitative methods of inquiry (Guba, 1981; Tracy, 2010; Walby & Luscombe, 2017). This is due to quantitative research being easier to test and calculate, as it is based on higher quantities and lower set of qualitative characteristics that qualitative methods make hard to measure the validity and reliability. Thereby, to make it easier to check the quality of a qualitative method, several suggestions for other measurements have been made, i.e., trustworthiness, generalizability and verification (Guba, 1981). These suggestions share the same goal, to show the quality of the research conducted. This reflections chapter is based on the eight criteria for qualitative research by Tracy (2010).

- (1) Worthy topic, based on the relevance of the topic, taking into concern the relevance, and how significant and interesting the chosen topic is at the time the research is conducted (Tracy, 2010). As this topic is under consideration in a local business project by several partners in the local area, it can be considered all these things. The topic is not researched a lot beforehand, and is still under testing in many countries, however it is also relevant as it is considered enrolled by local actors. This is viewed as interesting by Tracy, however the significance of the research can be more discussed (2010). As the local actors are looking into the future electricity market and more sustainable alternatives for the high electricity consumption in the future, the significance of V2G is not the highest. It is on the other hand important, as all the topics discussed and terms from theory give it a timely manner, as many smart systems are and have been discussed after the GDPR. Lastly, the local actors in Elnett21 are questioning the end-user perspective and what can be the expected reception. Thereby the topic can in fact be considered worthy.
- (2) Rich rigor, looking at the theoretical constructs, empirical data and time in the field, including the sample, context and methods for data collection and analysis (Tracy, 2010). It is achieved if the use of these key points is sufficient, appropriate, and complex according to the study. As the sample size in this paper is not that big, it can be discussed whether the sample is in any way generalizable to the population studied. This is a result of limited time in the field, however as this thesis has to be done over only one semester,

the use of time is more relevant. To achieve the richness at limited time the sample has to be smaller, and the data and results of the study are thereby also limited by this. In addition, the limitations on recruiting informants for interviews was difficult at the locations giving a smaller sample to interview. The other methodological tools used in the study are otherwise described in the chapters above and taken from well-known sources and researchers.

- (3) Sincerity, achieved by transparency, honesty, self-reflexivity, data auditing and vulnerability (Tracy, 2010). During the research notes were made to trace all the steps taken in the research process, from start to finish. This was done to ensure full transparency and honesty while writing the thesis and give arguments for why certain choices were made, to ensure sincerity in the paper and research.
- (4) Credibility, related to the trustworthiness and plausibility of the research findings, as an alternative to reliability used in quantitative research methods (Tracy, 2010). This can be achieved by using thick descriptions, something Geertz introduced many years ago (1973, in Tracy, 2010). The term thick descriptions in short means that in depth descriptions of the situated meaning is presented in combination with the interpretations of the meaning behind the circumstances in a bigger context. By first presenting the topic of the thesis, then presenting a theoretical framework that followingly gives the said topic a bigger coherence, in turn gives the paper a thick description. The framework is used to look into different interpretations, definitions and meanings for the data collection, with the aim of analyzing the data and the topic in a bigger context.
- (5) Resonance is referred to the researcher's ability to affect an audience in a meaningful way by appealing to the emotions of the audience (Tracy, 2010). This is achieved by promoting empathy, identification and resonance by the readers how themselves have no directly experience to the topic. This paper is referring to the future, either that being close or far away, the social society can in some ways identify with aspects of the electrification and especially the transition from ICE vehicles to BEVs and the grid load that is expected from this transition. As the problem will be present in not only where the case study is conducted, it can appeal to other citizens as well, that are dependent on electricity or a personal vehicle.
- (6) Significant contribution is expected from the research, and it can be assessed in differing ways, including new knowledge production, improvement of praxis, morally, methodologically, or heuristically providing improvements of the topic (Tracy, 2010). This paper has contributed to the social aspects around V2G, something that is not

researched to a high degree, which can inspire further research on the topic with similar theoretical and social science approach. In turn this could lead to technology implementation, cost reduction and especially technological improvement for the end-user.

- (7) Ethics, with the main focus on ethics considering the interviews and data storage and anonymity (Tracy, 2010). For this paper, no personal or sensitive information has been asked for or stored, as it is not of importance to the research questions. In addition, all information and interviews have been anonymized, apart from the name of the local project. The interviews have been conducted within ethical guidelines to be followed while writing a master thesis, with authenticity of research ethic of providing all sources used when presenting or using other researchers work in the paper.
- (8) Meaningful coherence, achieved by finding the answers to the research questions and the aim of the research conducted (Tracy, 2010). This is done by using appropriate methods to the scientific theory in addition to aligning the theoretical framework of the philosophy of science, methods, and findings. It is of importance to interconnect all these to achieve a common thread throughout the paper and research. These aspects have in parts been accounted for above, as the methodological choices have been made to find the best way to answer the research questions. The logic of inquiry has additionally been accounted for above, where hermeneutics are purposefully chosen to give an understanding of the research question and is contextually meaningfully cohesive to the other methods chosen in the research. The terms taken from theory chapter is relevant to the research question and the answers given by informants and is thereby needed to give meaning to the empirical data. The data will thereafter be discussed, and findings will be presented to fully cohere the research and the choices made in the research design process from start to the finished paper.

With the eight criteria for qualitative research, given by Tracy (2010) the validity and reliability of the paper is discussed. Summing up, the explorative design and qualitative methods give room to explore a less researched topic, as chosen for this paper. The flexibility the design and methods give are however under the circumstances of the research process not exploited to its ideal, as the timeframe is limiting. The limitations must be taken into consideration with the results from the research.

5. Findings

This chapter will present the most important findings from the data analysis. The findings are based on the data analysis techniques described in the chapter above. All the empirical data was collected and produced with Norwegian speakers as a result of this all data has been translated by the author to English. The translations have been done with as much accuracy as possible, to keep the opinion and statements of the informant as close to original as possible. The structure in the chapter is given by the different categories found interesting in the data analysis. Categories are based on similarities found in data and theoretical concepts. Findings will be discussed further with theory and research questions in the following chapter.

5.1. Overview of answers

During the interviews, some basic questions were asked. To start of most of the travelers at the airport were going to be away for at least 5 days, or more. Only two out of the seven informants were going away for less, two days and one was going way for just the day. Most of them were traveling for work as well and chose to drive to the airport themselves. Here the exemption is two different informants, one traveled by public transport and the other used a taxi. The informant using the taxi said, “When it is an option, I always choose the hybrid car”. This finding is interesting and will be discussed further later. The public transport user on the other hand said the commute to the airport was too expensive to drive, because she lived quite a drive away. This made the commute shorter and cheaper by public transport.

At the office building the statement of “my regular car works fine still, so I won’t pay for a new electric one just yet” or similar, was reoccurring. One man explained that he was working with sustainable development but did not have the money yet to get an electric personal car. Many informants suspected to be questioned about their choices in regard to sustainable development early on in the conversation. The intention was not to gather information based on this. It was however surprising to hear that all except the youngest informant, had many reflections of sustainability and the choice of their vehicles. This came as a surprise because the field work done with the car dealer shop fronted the high sales of BEVs as a choice of economic value, and not that most of the buyers considered sustainability or the fact that BEVs are mostly viewed as a zero-emissions vehicle.

The most interesting finding from the interviews was that one of the interview objects responded completely differently from the rest of the sample. This informant was late middle-

aged male. He drove a diesel car to the airport, and when BEV was mentioned his tone and body language changes immediately. This informant responded “I’m not getting an electric car. I won’t have it!” and did not want to elaborate in any ways, other than staring to talk about very irrelevant politics about powerlines. As far as the response was very off topic from the asked question, it is a very interesting finding. The statement he made was that “the power generated in Norway belongs to the Norwegian people, it is not the states to control, or sell”. His main complaint was with the high electricity prices, dated back to 2021 and the interview was done in the first quarter of 2022, the news have been full of complaints of high electricity prices in Norway (see NTB, 2022; Olje- og energidepartementet, 2022; Solli, 2022).

The respondents during interviews were found somewhat repetitive, at both locations. None were familiar with V2G except for the contact and one informant in the office building, called informant B. The only one to respond that they had a BEV was this office building informant B. Otherwise, all the informants in both locations wanted to change their ICE car with a BEV, as soon as their currently working personal car was no longer economically smart to keep, in regard to flaws that had to be fixed. The only two that were negative to BEVs were the young woman, mentioned previously, and the middle-aged man that refused to talk about BEVs.

Informant B was familiar with V2G because of the contact for this thesis, they had previously had conversations of this. However, informant B was not very interested in the technology. Moving forward, informant B was the only informant with “ownership” of a battery, that could be connected to V2G. Making it an important informant for perceptions of V2G implementation. Thus, informant B was familiar with the researcher’s position, and might have given biased answers, although all informants at all stages were encouraged to answer and speak as honest as possible, and informed that all answers would be anonymous.

5.2. Interest in V2G

The first and foremost finding during this research was the interest within the business market, at local level. The interest shown in the Enova supported project can be seen as an interest in the technology, and the project is based on energy efficiency and security for the business partners in the region, especially the stakeholders in the project (Elnett21, 2022). The interest in V2G as a part of the business model development for future electricity market, is shown also in projects by Statnett, Agder Energi and NODES (Åsegg Hagen, 2019).

Findings during field work proved the fact that many do not have any knowledge of V2G, resulting in no interest for it. The contact from Elnett21 had investigated the technology to a high degree, and came with many journal articles, online articles, and different YouTube videos. These sources have not been used in the paper, as they are considered to not be a safe and secure source for research. This might also be the reason to why Elnett21 has struggled to find a way of implementing V2G as a part of their project. The information found and the projects of interest by the contact have been heavily sponsored, and many ended up being more costly than expected.

The struggle with interest in V2G has also found the reason being it not being an investment that would grow with time. Over time, the contact would like to consider V2G charges being a good investment, it has however not been viewed likewise by other stakeholders when presented to them. The solutions presented with the smart systems that has to follow V2G, like flexible electricity market and pushing off the development of the local power grid has also all been declined. This is due to the power grid having a societal responsibility in Norway, securing electricity under all circumstances. Investments for the future more effect intensive electricity consumption, is only estimated, but it is still viewed as more important to the stakeholders. This finding is more based on how the stakeholders easily overlook new technology, as a response to their societal responsibility, they do not find these innovations of interest.

“The grid company is always the hardest to convince” was said many times, as other stakeholders were considering V2G, they did not believe that the grid delivery would go along with a project including V2G.

While doing field work, a car dealer shop was visited. As the data collection was more based on observation than interviews at this part of the field work and data collection, the informants were informed that the student was writing a thesis, however the participation was low. Out of respect to the contact, the conversations were focused on what their questions were, and not directly related to the research question for this paper. Moreover, findings during the visit show that people buying new cars have a high interest in BEVs, but non ask questions about V2G or similar technology. The car dealers themselves were not aware of what V2G was.

“Only specifically interested people, like you, ask about V2G. I can’t think of any costumers having asked” was said by a car dealer. It later was found that workers at this shop were not aware of a new car soon being released would be V2G compatible.

These data show that only a few people have an interest in V2G, and it was only found in the field work. No interest was found during the interviews, in regard to former knowledge and interest before the interviews were conducted. The data findings will be characterized and presented in the most fitting category following below.

5.3. Knowledge of V2G and BEVs

The knowledge level in field work and during interviews were mostly at a very low level, the norm was that none were familiar with the technology, nor that some vehicles have been compatible with this way of battery and charging technology. This was to the extent that the car dealer shop was not aware they would release a car shortly after, that was V2G compatible. The informants at the shop were asked about the current battery technology, and said no one asked for V2G, but they were asking about the range and charging capacity.

Findings in the interviews show that many are not aware of the range BEVs have today. “I can’t be afraid of driving more than 1 hour, and not have enough range to make it to a charger” said a young woman at the airport. In addition, she said, “Everything needs to be charged these days, I just want to fuel up my car and move on” and laughed. The conversation from here included some information of how new her car was, and what the range of BEVs typically is. The general statement during interviews included “Don’t BEVs have short range? I don’t have one, so I’m inexperienced and remember all the complaints on batteries from the first ones. They had such a short range”.

This shows how little information and knowledge many have about the batteries and range capacity newer BEVs. As one informant said “I thought BEVs had really short range, however I recently had to borrow one, on a trip to Kristiansand, from Stavanger. And the range was actually perfect for this trip, even with the high speeds and rolling hills”. This informant said she had not driven a BEV in a few years, and do not have her own car. This is a good example of how non-BEV-users view BEV range before and after driving one.

Another informant said “My son has a BEV, and he is really happy with it. I was surprised when he told me how far the range had gotten, as last when I considered getting one, I thought the range was too short for my use and needs”. This man added that he had bought an ICE car a few years ago, and was more content with the investment, as the range was too short just a

few years ago. “But if I were to buy a new car now, I would definitely choose an electric car. Mostly because of the incentives I get, it would be a lot cheaper in the long run, than a fossil fuel car bought today”.

Most of the informants were aware that in 2025 the government of Norway does not want to import any new ICE vehicles, at least that Europe is facing out the ICE personal cars by 2035. However, the young woman that recently bought her car, was not aware of either the range of BEVs, the 2025 goal or any smart charging technology. Plainly she admitted “I’m not very up to date on cars, I just want one that gets me from A to B, that I can trust and have for a long time. That’s why I chose a diesel car, it’s what I know how to use and am familiar with”. This finding is interesting, as it is a young adult, that also stated that she does not like to follow the news every day. Keeping up with the news with personal cars, most likely is not something many do on their spare time nor in their job. Although it is interesting to see how little knowledge some still have about BEVs as they have evolved and have such a high penetration in Norwegian roads.

The most informed informants with regards to both V2G and BEVs were the ones at the office building. Two of them drove BEVs and one stated that as soon as their current ICE vehicle is “used up or too expensive to fix I am buying an electric car”. At the airport, a woman argued the same “I want an electric car, hydrogen mostly, but the technology is not the best yet, and my petroleum car works fine for now” ending the statement with “I have to use the products I currently have, before I replace them”. This signals that even though they know their ICE cars are worse than a BEV, they prefer using the resources at hand till their end of life, rather than throw it away.

5.4. The future energy demands

During interviews, the informants were asked about their views on energy demand for the future. As literature finds this concerning, the electrification, and the focus on optimizing and making most things more efficient, to utilize most resources as best possible. The field work found the grid and power companies worried as their societal responsibility is at stake, they want to be prepared for the next up to 50 years at least when building or fixing the grid and supply chain for electricity and power. The finding here was no surprise, as this also was stated in the literature.

The informants were therefore asked how they saw the power usage today and for the future. This was specifically interesting in regards to the airport, as there might come more electric airplanes in the future that need high effect and will load the power grid (Avinor, 2019). Reflections that came did not seem forced nor biased at the airport, making it a good finding. The general response was “I’m worried, I don’t see how it is going to be fixed, as the maintenance of the grid is already so expensive” this came from both genders and all age groups. Finding that all the informants had thought about this was interesting, especially as none had any idea of what would happen. The informant against BEVs exclaimed “I am worried that we will sell all our sustainably produced power and pay foolishly high prices”.

“Where will we get electricity from in the future if we sell all the hydropower? How will we get enough power for the future? Using battery technology will most likely be important to support and take off load from the grid, and it is not long till we have to find these small but very needed solutions for more efficiently using our electric power”

The quote above was a reflection done during conversation about electricity use. The reflection was made as a part of a conversation, and not as result of the questions from the interview guide, as with the other informants’ thoughts on the topic. Findings like this is interesting and informative in the sense of population concerns. As mentioned, all informants had concerns or were directly worried about the electricity demand and supply within few years. “How will we increase production and keep the electricity supply stable without oil and gas? I do not like the looks of windmills, and we can’t destroy our beautiful nature any more than it already has been.” Mentioning the looks of windmills was common with negative associations to the way it both looks and impacts wildlife and nature.

The young woman at the airport had an interesting way of describing her view on electricity use “We charge everything, and every day I find new things I have to stick a charger into, or just have connected to electricity. My electricity demand only increases more and more”.

Findings about the energy demand today and what informants think of the future showing all had worries or concerns, to some degree they had all thought about it. However, none thought there was an easy solution, nor did they think of a solution that on its own would work, not even for Norway. “In Norway, we are lucky. We have a high percentage of clean energy production

and are not dependent on power from other countries” was a statement made of today’s situation, but the informant also showed concern with their body language, insinuating that they did not feel as secure for the near future. Generally, there were statements about the high electricity prices and negative comments about the cables going out of the country. These findings will not be discussed much further, nor elaborated.

In field work there were findings of the battery containers at one location, this in order to make the building self-sufficient in seasons with high solar power production, resulting in a local micro grid. This is a part of why some informants from field work wanted to consider V2G, as it could give a more flexible electricity supply, and reduce their costs from building out the grid for their expected energy demand. As this location was energy intensive already, and would become more so as the electrification and efficiency increases in their business.

5.5. Range- and charge-anxiety

To ensure BEVs are available to use V2G chargers, the car owner and driver must feel safe to use the new charging technology. During field work at the car dealer shop, it was found that all BEV drivers are comfortable with their range within short time after changing their ICE car to BEV. “But many go from range-anxiety to charge-anxiety” “[..]worrying about when they will find their next charger” is called the new BEV anxiety, the danger of not finding a charger “when their range-anxiety has decreased”. This was explained as the new phenomena, as questions were asked about what the most common questions from customers were, when considering what car to buy.

“Most of our sales are BEVs [..] we only sell non-electric vans to companies that load heavily and drive long distances during a day. The BEVs are more than good enough for the average customer, both companies and private users”. This finding supports the statistics from literature review. It is also relevant for the ban of ICE personal cars from 2025. Lastly it is a good finding, as the majority of the informants from interviews did not own BEVs or have much experience with them.

An informant stated “I recently borrowed a family members electric car, and it was only a few years old. With this car, I could travel way farther than I expected, as I bowered it for a longer trip.” This shows how many non-BEV drivers might perceive range and charging infrastructure, before and after using a BEV. The other informants seemed to have the same experience, as the

BEV owner was comfortable with the range, but the ones without experience perceived it as “range-anxiety” and hassle to find chargers in their everyday travels.

5.6. Incentives for using V2G

To figure out whether the technology would be used, it is important to understand what an end-user wants in return. The question “What would you want in return, if you connected to a V2G charger?” also gave more similar responses than expected. During field work, the main incentive fronted was “secured best parking slots” and “getting paid for the extracted electricity, or even charging for free”. These were indeed the responses from both the office building and the airport. The majority wanted to be secured a good parking and would easily connect their vehicle to a smart charger if that was the requirement for a parking, they found good. “If the front row of the parking lot was all V2G I would put the charger in, just to get that parking spot” and surprisingly the informants mainly did not need or want anything else in return for the use of their battery. “As long as I have enough range to get home, I don’t care” was stated by many. The field work revealed that V2G would either give free parking, good parking, free charging, cheaper charging, payment for discharging or a combination of some of these. This field work also made the concept of how V2G would work much easier, as not much information can be found about how the charging system looks for the end-user. Thus, making it important for the thesis and the case study.

Naturally, the BEV negative informant was not able to answer questions around incentives for V2G, as he refused the vehicle type. Aside from this there seemed to be general consensus of what is wanted in return for connecting to V2G. Further, concerns were raised about the “battery degradation, as more charging cycles mean more use, and probably shorter life”, said by an informant at the office building. This was also general consensus, that “if I get my battery back in the same state as when I parked it, its OK. But I don’t want it to be damaged or degraded by anything other than my use”.

5.7. Perceptions of smart technology

As field work went on, the theme of surveillance culture and surveillance capitalism occurred. When considering V2G there was found some reluctance and suspected concerns related to these concepts. However, the contact felt safe that if end-users were familiar with the GDPR, they “will understand that there is no surveillance done of the private person” [..]”the technology and the law is so standardized it is no threat of surveillance or privacy”. “There

must be some kind of app that allows for the end-user to control the charging and discharging, setting boundaries for how low the discharging can go, and how high the battery percentage must be when the owner wants”. This is the image of how V2G would work, found during field work.

The informants were reluctant towards new smart technology, as it would impact their vehicle. On one side, they all seemed concerned of the unknown, as there were few experiences with BEV charging overall. On the other side, six of 10 informants responded with showing or pointing to their smart phones, when asked about smart technology. “That train has already gone” or “That’s already too late to worry about” were comments on privacy or thoughts on effects of smart technology in their everyday life.

Again, the BEV negative informant stood out, he said he was not comfortable with smart technology. However, he did have a smart phone by his side, and received a phone call as the interview ended, and seemed to be scrolling on it when initially approached. It is interesting to find someone openly saying “smart technology feels too similar to surveillance. I’m not afraid to use it, but I use it as little as possible, to keep my privacy.” This finding will be discussed further in the following chapter, and is weighted more than other statements, as it is different from the other informants’ utterances.

“I am not scared that anyone will harm me or my privacy, however hacking does happen sometimes...” was stated with reluctance from an elder lady at the airport. The body language was not clear, and the statement seemed like a reflection. Majority of the informants took a break to think about smart technology and what they think of it. Some did seem reluctant and unaware of the laws, but at the same time they in differing ways stated that society today is depending on smart systems, and that it is helpful at the same time as it is unknown.

In this chapter the different findings have been presented from the empirical data. They have been categorized in different topics, and statements have been given from both informants and from field work. These findings will be further discussed in the following chapter, with the use of theory presented previously.

6. Discussion:

The discussions of this paper aim at discussing the findings and theory together, with the end goal of shedding light on the research questions. This will be done as described in the data analysis from the Research design and methods chapter previously presented in the paper and finishing with a discussion to answer the research questions.

6.1. MLP

The placement of V2G in the MLP framework has partly been done, as it has been discussed and evaluated previously for the local project and was determined “too young” it can be viewed at niche level. On the other hand, as V2G has been implemented in other projects around the world, it has already made it through its window of opportunity and made it to both the socio-technical regime level. V2G would be considered to be placed in the regime level, if it were to be implemented in the local project, as it has funding and is protected in some ways by a regime and with stakeholders’ special interest in the technological development.

Further, if V2G was implemented by the local project, it would enter the socio-technical landscape as a result of the project not being private, but public to the local citizens. This is because the stakeholders are companies with grants from the government, and the project not being a part of a governmental scheme that would give more protection and resemble a regime more than a landscape. However, this would also depend on where the chargers were localized. If the location of the chargers were only private parking lots demanding approval for accessing, it would be protected from the landscape, and kept within regime resembling level. However, data from field work found this to not be the goal, thereby also making it important to speak to the general public at the chosen locations for interviews for this case study.

Findings from interviews made it clear that V2G is not something the sample was familiar with. This shows for the technology to be a part of the socio-technical regime. As the contact from the local project, was very interested in the technology this also accounts for the technology to be located in a regime, and not still being in the niche level. The window of opportunity for the technology might thus be the need for flexible electricity or effect in the market, this being the office building or the airport. Depending on the need and the perceived profit of V2G, this might give pressure from the landscape, opening for V2G to become a part of the socio-technical landscape at local level. Moreover, the technology cannot at this point be seen as a part of a general socio-technical landscape at national level even if the project decides to

implement and test V2G. As a consequence of the project being local and funded, V2G implementation would not be commercial or natural in the landscape outside this project. As stated previously, the technology must be used by the end-users and fit into or change their behavior. This perspective on V2G cannot be given at this time because there are no V2G chargers in the project yet. Therefore, this paper only looks at possibilities for the technology, also considering possible barriers.

6.2. The sociology of expectation

Moving forward, the sociology of expectation is about the expected, and therefore gives a more accurate discussion of the current state. The future technological situation and capabilities are not covered fully in this paper, as this is dependent on the technical aspects with V2G and battery technology in vehicles. This in turn makes the discussion given weaker, however the concept will be discussed because of the expectations from field work and literature research and background, finding it possible to assume that these technical aspects will improve and develop as a result of the EU 2035 goal of phasing out ICE, in addition to the Norwegian timeline being shorter (Samferdselsdepartementet, 2021; Steitz & Carey, 2021).

The future markets and societal context for the technology is found to exist, if viewed from the perspective of the contact in Elnett21. As literature review found, there is already a flexibility market for electricity and effect. In addition, there are business models being developed for these technologies and for markets expected, as found in the field work. The societal context is a bigger discussion, as there might be business markets developed, however there are no guarantees for the societal context and acceptance. As the grid suppliers decline the possibility of depending on such markets, this weights against the other field work. Because the grid suppliers are the owners as well, they have the power to accept or decline these markets before they can make their way into the socio-technical landscape.

The local society and citizens of the region could be given agency at a lower level, to push for flexibility markets, and solutions like V2G, or vehicle to home. At lower scale it was said to be higher chances for approval of use from the grid company, as it would not affect their infrastructure as much, compared to a higher scale of electricity or effect grid that is additional to the one they operate, control and own.

The sociological expectations, can as mentioned, be both individual and collective. For instance, the expectations of the contact were positive and promoting the implementation of V2G within a short period of time. On the other side, the expectations of the collective of Elnett21 was more negative, as they have previously declined to test V2G in the project. These expectations can be compared to the niche, socio-technical regime, and socio-technical landscape in the MLP framework. The interest and investment in a technology or technological development is often expected to be more positive respectively with the interest and investment. This is clearly found with the contact when compared to the “bigger scale”, being the grid company or the project group at landscape and regime level.

The narrative about the technology is important for the sociological expectations, this can also come from both a collective and an individual. The rhetorical vision is based on the advocates of the technology being told as a story to envision it as a social reality in the future. This can not be found as the case for V2G in the data of this research. It however has become a social reality in Utrecht, as mentioned previously. As the contact narrates and envisions V2G possibilities, he is not a part of a collective that shares his own vision or story, however he shares it by telling others about the technology and narrates his visions and expectations in the same way as described by Sovacool et al. (2019) about the concept of brokering expectations between enactors and selectors. Where the contact is the enactor.

The other concepts within sociology of expectations are hard to find within the data, as there are no others to promote or narrate V2G, other than the contact. However, if Elnett21 were to test the technology, they could act as a powerful collective narrating the vision as an ideograph. Additionally, as V2G is still under development and improvement, this project could give a requirement and the developer would serve a promise for improving the technology to solve the problem of no existing flexibility market. As the cycle of promise and requirement could possibly continue V2G could become a part of the social reality and become realized as a technology in the landscape.

6.3. Surveillance and smart technology

The data presented found that many informants seemed to have just accepted how smart systems and smart technology works. As they had smart phones and stated that the train has already left the station, is still interesting. Because such a phrase indicates that they might have concerns or not feel good about it, however there is nothing they can do about it anymore.

Surveillance capitalism is based on the fact that companies profit from the user behavior. The GDPR protects the private persons information, but it also allows for the company to demand all information, as long as the user agrees to the terms and conditions stating this. The aim of V2G in this case study is to provide a more efficient use of resources available, and therefore the contact wants an app for the end user to control the chargers and the state of their battery. The idea of V2G is in this way not based on capitalism, as the data collected for the chargers will only have the purpose of utilizing the BEV battery and giving the end user the control of how much.

The responses to what end users want in return if they were to use V2G, was surprisingly not based on economics either. Smart system does still depend on some sort of surveillance because it adapts to the behavior of the end user or at times changes it with the aim of optimizing user experience. Attaching to a smart charger would mean allowing the technology to form data of your behavior, and the behavior of others in order to find where the electricity or effect from BEVs battery is needed. In how far this is based on surveillance capitalism will depend on the business plan of the V2G company and applications that come with it. Therefore, it is hard to discuss at this point where the chargers are only being considered and are not implemented.

It still is interesting to see how literature review promotes V2G as a technology that can give BEV owners money back, in addition this was the narrative of the contact, as mentioned in the discussion of sociology of expectations. The privacy of the end user can also be discussed with this in mind, as the experience of surveillance is subjective and will be perceived differently according to context. The findings from interviews hardly found any mentioning of the feeling of being surveilled or losing privacy if connected to a V2G charger. It however was more found that the concerns were related to the battery state of the vehicle, if it was due to the charging cycles or if one needed the vehicle prior to the time one usually does. This is an aspect of smart systems that can be perceived as negative or challenging, as the system tries to learn your behavior it also optimizes to this user pattern, and if the pattern is suddenly broken, the system might have challenges to adapt quickly. This is based on Lyon (2017) surveillance culture.

The surveillance is adapted and adopted to the user behavior and has become a part of society in many ways, as smart systems have evolved. The example of sudden changes in pattern is a

good way of explaining how it becomes a part of whole way of life. One might have to wait for the charger to charge the battery of the vehicle before moving on with the day. Explained by Lyon, this is how technology infrastructure in surveillance culture affects society (2017).

The BEV negative informant gave stronger statements towards smart systems compared the sample at large. The perception of smart systems was in general much more negative and reluctant, and as he stated, his use has not evolved with the development in society, as the sample otherwise has. This social imaginary tells against the acceptance and reproduction of surveillance capitalism and surveillance culture. This imaginary might be a result of more awareness, or as the contact stated, it might be because he is not informed and know whether or not the GDPR will keep his private information safe.

The imaginary given with the saying “the train has already left the station” supports the surveys mentioned in Zuboff (2015, 2019) as the majority rejects surveillance capitalism, and the data collected for smart systems. At the same time as the majority does not fully accept the development, they all together accept it in reality when using the technologies. In this way, their social surveillance imaginaries are not complete. The imaginaries they carry are conflicted, due to their personal perception of surveillance, they feel negative. The conflict is showed when the informants choose to use smart systems, or smart technology, because in these actions the behavior around the technology is reproduced. The reproduction of behavior will reconfirm the technology as a part of the culture and contribute to the success of the technology they might personally have negative thoughts about.

These conflicts can not be confirmed or denied for V2G, as the behavior is not present without the chargers, and therefore no data has been collected. It is an argument for conflicting imaginaries as found with other smart technologies that the informants use, that can be argued to be transefered to V2G. As the responses towards V2G was in general positive, and the findings only had remarks on technical barriers (battery degradation) and no findings of concerns of surveillance or privacy. These imaginaries also lay ground for the practices one can expect with V2G, similar to smart phones, the users might perceive it as something they wish they could control but it is too late.

6.4. Technology acceptance and adoption

The perceived usefulness and need of V2G from the perspective of the interview informants was varying. As none except for one informant, informant B, owned a BEV, making it less realistic to the informants to answer the questions about V2G. The findings from data were overall positive, with the requirement of longer parking period, as found in literature review and field work. The perceived ease of use would increase if the chargers were placed at good parking spaces, as found in the data. The perceived usefulness with this is again a question one can not answer, but according to the few informants with BEV experiences, chargers are viewed as easy to use and useful. The usefulness could also be angled to the economic benefits, but this was not highly found in the data.

Some informants spoke in ways that insinuate sustainability being important to them. As with the informant taking a taxi to the airport stated that “I always choose a hybrid car when available”. This shows how some try to find more sustainable choices in their everyday life. This can be a positive driver for using V2G, both as it gives the owner more use of their car, and as they can lower the need for other energy sources if completed on a large scale. This is in line with the additions by Tekler, Low and Blessing (2022).

The environmental worldview of several of the informants made them reflect and consider V2G more than for instance the BEV negative informant. It can be discussed that to them sustainability is an internal goal to work towards. This is also supported by the finding of how many wanted to change their car for a BEV when the ICE car is no longer adequate. On the other hand, the discouraging aspects of alienation or security concerns might weigh against the use of V2G for most of the informants. This seemed to be a reoccurring during interviews, the technology was too unfamiliar to fully make up a good perception of the technology. And even though the contact suspected a good personalization of V2G in their project, the barrier of starting to use such smart technology can be larger than the individual imaginaries and values to change their familiar routines.

As the field work started, it was under consideration whether this paper should be written for the project. In such a case, a possible app for the end users might have been showed and developed with informants to increase chances of adaption to the new chargers. However, the timeframe for this research project is much lower than for the possible V2G project. This could give the possible users a chance of developing the system for V2G and test the Technology

Acceptance Model even better. However, it seems like the informants were interviewed they got more engaged about the technology, and the possibilities it had for both them and society.

With the framework of TIME by Robinson et al. (2022) the main focus is energy poverty and SDG 7. The focus of Robinson et al. is to include the end user needs in development of energy systems. This is why it is important to hear what the informants view as good incentives for adapting to V2G and using it long term. As found at both the airport, the office building and in literature review, the most promoting factor was placement. For a good parking, the informants said they would easily pay the same price as for a normal parking, even when connecting to a V2G charger. This indicates that the focus should not only be economic, when finding a way to initiate implementation.

6.5. Ending discussion

As the main theoretical concepts and framework has been discussed separately the final discussion will make efforts to tie it all together before ending with a conclusion. Answers to the research questions will here be discussed. Starting with “What are end-user drivers and barriers to V2G technology?”.

The drivers found for V2G include the imaginaries and narratives from both interviews and field work, where the main story of smart system technologies is generally accepted, with few exceptions. The exceptions have been given previously but should always be kept in mind as there might be a bigger group opposing than what has been found in this study, as found in surveys showed Zuboff (2018). These groups will also oppose a threat to new technology as it enters the socio-technical landscape. The majority however was found to be positive and had imaginaries that might make them support energy and/or resource effective technology. As the imaginaries implied there might be some dissonance between the perceived risk of personal data collection of smart systems, and the actions of the end-user.

Surveillance culture is found as a reasonable possibility for imaginaries being conflicted, as there might exist a barrier, however the culture in society takes this barrier away for many users. The surveillance capitalism provides reasoning for smart systems to collect personal or behavioral data. It was not found to be visibly present in the business model of V2G, as literature mostly narrate it as economically profiting the end user. This comes with a barrier of technical nature. As the BEV undergo charging cycles there is perceived risk of battery degradation,

which informants were found in varying degree negative against. As most informants trusted the battery technology to be sufficiently good if V2G compatible, this suggest it is not a high risk or barrier if other benefits existed.

The value of the BEV is found important to all informants. Gaining a value by using V2G, however some reluctance to the degradation with use. This is not covered in this study, as this would need technical competence, making it a possible barrier V2G has to tackle, in order to make the end-users acceptance and adaption of the technology positive. According to field work data, such information would be given the end user if V2G was implemented. End-user awareness is proven to be important, as alienation is possible a barrier that can be solved by knowledge.

7. Conclusion

The most interesting findings included the high interest in V2G at the beginning of the research process, the concerns of surveillance of smart technology and the informant that was fully rejecting the possibility of owning a BEV in the future. As this study has an explorative nature, the field work was important to grasp the background of the research question. The interviews were highly positive in majority, and the imaginaries of some informants were interestingly based on sustainability. This led to a conversation based on the semi structured interview guide, where the informants could reflect over their answers and provide qualitative data to the study. There are several limitations to the research conducted, that has been discussed in chapter 4.

As this study has not included technical barriers or drivers it is not possible to state whether implementation of V2G in Elnett21 would be successful or not, however it is possible to state that there are few barriers in how the sample perceive V2G as a smart technology, that can not be broken if given information or reassurance of their concerns. This must be given in the business model and with technical remarks, as the societal barriers mainly can be found as a result of surveillance culture, where imaginaries or narratives provide sufficient ground for use, to many informants. The main barrier found is no knowledge of V2G, however a project like Elnett21 might reduce this barrier, and the incentive good parking was the highest rated driver. Concerns were fewer at the airport, this might be a result of boredom or alienation V2G propose, as the data is based on scenario it can not be used as a direct answer to how V2G would be received or perceived in reality.

Lastly the barriers are found to be of bigger number than drivers, which is found natural as the research is based on future possibilities and not taken from user behavior or experience. Knowledge and familiarity are drivers for technology implementation and acceptance; thus, it will be a barrier new technology has to overcome. The findings overall do not give a clear answer to whether V2G implementation in Elnett21 would be a success, though it would be a possible window of opportunity in areas for longer parking and high penetration of BEVs. The drivers and barriers from the social science perspective have been discussed in efforts of answering the research question. Further research could include a practical case study of end-users testing V2G, in addition the technology should be improved by technological development to promote the utilization of recourse. Lastly, it would be interesting to investigate whether V2G could be helpful in countries with weaker power grids than Norway, as it might serve a bigger problem than what is presented in this case study.

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