Recharging the Technology Transition Framework: A Theoretical and Practical Examination of the Norwegian Electric Vehicle Transition

by

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Introduction: The Electric Vehicle Transition in Norway

Norway has been hailed by many as the paragon of blending environmental progress with a modern and thriving economy. One area in which it seems that success cannot be disputed is the transportation sector. Norway is a world leader in many areas of sustainability, including the share of renewable energy in the electricity grid (hydropower generation accounts for about 92% of all electricity production, wind powered generation accounts for roughly 7% of electricity production) (Statista Research Department 2021). The penetration of renewable energy sources in Norwegian electricity is indicative that Norway can sustain a shift toward a transportation market that relies more heavily on proportional sales of new electric vehicles (EVs) over internal combustion engine (ICE) vehicles. The aim of this thesis is to understand the differing influences and motivations behind what has been recognized as the world's most successful electric vehicle transition to date (NEVA 2023) (Norwegian Road Federation 2022). To do this, I will examine sociological frameworks of sustainability transitions generally, how those frameworks apply to the Norwegian example, and the technological and infrastructural support for the growing Norwegian EV system.

The Norwegian regime in the personal vehicle market is unusual compared to other western countries such as those in Europe or North America. Norway does not have a domestic personal vehicle manufacturing market to speak of, so the entrenched interests regarding ICE sales over EV sales are quite limited. This is one of the factors that makes Norway unique among its peers, and one of the important reasons that corporatism and the influence of overall economic interests on sustainability initiatives has played such a large part in the history of this transition.

Generating change within deeply entrenched socio-technical systems requires an understanding of all facets of the problem. Only such an understanding will allow for the creation

of policy that effectively and, importantly, efficiently, engages a national polity in nurturing change. The modern transportation and mobility sector has been firmly entrenched in a history of reliance on high-carbon technologies since the advent of the automobile. And, although the transportation sector does not account for all harmful Greenhouse Gas (GHG) emissions, it makes up 37% of all global end-use GHG emissions ("Transport – Topics" 2022). Thus, creating policy that incentivizes a transition toward a carbon neutral vehicle fleet is a point of emphasis in all major climate accord initiatives, especially those in the European Union (EU). Although Norway is not a member of the European Union, it is a member of the European Economic Zone, and takes pride in trying to surpass climate initiatives set out within the EU. Some of these standards are a net-zero emissions cap by 2050, reducing emissions 55% by 2030, and an economy that is decoupled from non-renewable resource use. Each of these targets is an area where Norway has made large strides (the Norwegian electricity grid is 98% renewable energy, mostly derived from hydropower (Statista Research Department 2021)), or has set more ambitious goals (where typical phase-out targets for ICEVs are set in the late 2030s onwards, Norway's target is 2025 by the latest), or both.

An interesting aspect of the Norwegian EV transition, which has contributed to its success, is the combination of both front-end (positive) incentives to encourage the consumption of Electric Vehicles, and back-end (negative) incentives to encourage the consumer to shift away from Internal Combustion Engine vehicles (a high-carbon transportation option). Ultimately, the combination of these incentives should lead to an uptick in the consumption of plug-in hybrid, battery electric, hydrogen fuel cell, or other zero emissions vehicles (low-carbon transportation options). Positive incentives are introduced into the market by government financial programs and policies; however, they often have their origins with non-government organizations, pushing for

increased use of EVs within Norwegian society. Negative incentives are a slightly narrower group, and are more aptly characterized as exnovative policies, or policies aimed at suppressing certain established technologies. Both positive and negative incentives, however, are structured to work within a capitalist, or more accurately a corporatist, system. Norway is an example of such a system. In literature on corporate systems in countries, scholars focus on the interplay between interest groups and the government, the ability of committees to generate policy, and the supremacy of economic sturdiness over sustainability initiatives. In the section of this thesis discussing incentives, I will show how policy promoted by interest groups through governmentally appointed committees is critical for driving the phase-out of internal combustion engine vehicles and promoting electric vehicle adoption.

Multilevel Perspective Theory

Multilevel Perspective (MLP) theory was refined as a framework for examining sustainable technological transitions by Frank Geels, in 2002. In his work, he compares two views of technological transitions, one as driven by a process of variation, selection, and retention, and the other as a process of unfolding and reconfiguration (Geels 2002). His "multi-level perspective" is a combination of these two evolutionary trends. Multilevel Perspective (MLP) theory is the framework which best reveals the Norwegian propensity toward corporatism as one of the dominant forces in the EV transition. MLP theory asks the viewer to look at the interactions among three analytical constructs: niches, socio-technical regimes, and a socio-technical landscape. These three areas are simply differently sized versions of similar concepts. Where a niche may refer to a newly created market force, a regime evokes ideas of establishment, significant market influence, and prestige. Above the other two, a landscape makes up the global background within which the transition under examination is taking place. The landscape is the status quo within which change

is occurring. In (Figenbaum 2017), an additional layer of national governance is inserted between regimes and landscape. I argue that the national governance layer created by Figenbaum reflects aspects of Dryzek's corporatism, but I do not believe that Figenbaum pushes the connection as far as it should go. I will show that national governance should be conceptualized as the operation of corporatism, not as a level between the regime and the landscape, but as a base layer supporting niche development of new technology. This thesis will discuss the important connection between the multilevel perspective approach to framing technological transitions, and the effect of situating a sustainable technological transition within a corporatist society.

An understanding of the negative externalities generated by the current transportation sector, viewed within the frame of contemporary environmental issues, reveals the need for current reliance on fossil fuel and high-carbon transportation to be phased out. However, it would be foolish to ignore the desire of entrenched socio-technical powers to maintain their hold on market dominance. MLP theory shows that actors within each of the three levels hold different degrees of influence over the policy making process. Niche regimes typically hold less power than established regimes. For example, domestic car manufacturing (a fossil fuel transportation regime) exerts influence within the United States Federal Government through lobbying and a desire to sustain their large contributions to national GDP. The landscape holds the most power, as it contains the entrenched global socioeconomic pressures of the time, such as oil price, international climate agreement targets, and general technological development. Pressures for change rise from the niche level upwards, while they are resisted from the top down. Because of the power of regimes, niches require support to protect their immature technologies within a hostile market. In the Norwegian case, this protection stems historically from the efforts of non-government

organizations and interest groups, as well as more recent government ministries such as ENOVA (Environment 2018).

Actor Network Theory

One critique of the MLP that has been made is that the framework takes too broad a view of transitions and does not account for the coproduction that occurs between people and technology within a transition. Coproduction is certainly useful for understanding how a transition changes once it is underway but it narrows the scope of analysis too much to explain the origins of new technology. It focuses on the interaction of human and technology once that technology has entered the market but does not explain how it reaches the market. Although this is useful for looking at the part of a transition that encompasses the shift from niche to regime, it does not account for the initiating phases. Instead of ANT, I will use an understanding of corporatism that permeates the MLP, but mostly forms a foundation upon which the niche level is supported, which will allow me to better explain the holistic transition through the concept of a tailored framework.

CORPORATISM

This thesis seeks to review comprehensively what has made the EV transition within Norway possible. Because a transition this complex extends out of the private lives of individuals and into the realm of national governance, it is important to understand the interplay among non-government, government, and the economy. Corporatism, as defined by Dryzek, indicates the efforts of the executive branch of government to make agreements with business and labor federations to create policy that will benefit both sides of the exchange. Industries will benefit by way of government support, so they will have incentive to uphold the policy, and the government will benefit because of the policy's implementation, so it will be incentivized to support industry in return. These agreements come about in the form of *quid pro quo*, as labor federations agree to

discipline their members in return for a privileged seat at the policy making table. Norway operates on a committee-based form of corporatism, where elected officials authorize the formation of committees (comprised of representatives of various non-government groups), to conduct research and write reports, which will then be rubber-stamped into legislation. The history of this exchange benefitting the environmental movement in Norway extends back to the early 1930s, when the Ministry of Church and Education lent support to the Conservation Society (Dryzek et al. 2003). The government's provision of financial aid to interest groups is one of the main avenues leading those interest groups toward membership in the Norwegian committee system.

The committee system is one of the more unusual aspects of Norwegian governance, with Norway oft referred to as the "land of a thousand committees" (Klausen and Opedal 1999). These committees are commissioned by cabinet and are used to generate proposals that will then be debated and voted upon by the Storting, the highest level of the Norwegian legislature. Committees, either permanent or temporary, wield a vast amount of power within the Norwegian legislative process, as they in large part control the content of proposals seen by the legislature. This creates ties between government funding and sustainability initiatives dictated by policy across the country, showing that control of the policy making process rests nearly entirely with the government.

The fact that the government has the power to decide what funding to allot to which groups forces groups advocating for increased sustainability measures within Norwegian society to make concessions to the government just to be heard. Those concessions, a function of the conditional funding, often generate far more moderate proposals than might be most beneficial for Norwegian sustainability. Notably, approved proposals are almost always aligned with Norwegian economic interests. This raises the question – to what extent does the committee system, within the

Norwegian corporatist state, limit Norwegian actors in making radical sustainability policy in favor of more moderate, economically conservative policy.

EXNOVATION

Most technology transition literature emphasizes the importance of innovation as the driver pushing out old technology. Once new technology has matured sufficiently to serve as a replacement for the old, because it is better in some way, it will be adopted by the consumer. However, this understanding does not account for the pushback that will inevitably come from actors in the market with existing interests (firms that produce the products that are in danger of getting replaced). As I will explain in Chapter 1, once a technology has created a regime in the local market, a system of insurances will be in place to protect that regime. This may look like public familiarity and preference for that good, or lobbying efforts of powerful firms to ensure that their products are not the subject of harmful legislation. The only way to ensure that the newly innovated technology is phased in is to suppress the old technology in such a way that it allows for adoption of the new. This suppression is called exnovation.

Exnovation is an idea that finds its origins in the German sustainability debate (Antes, Eisenack, and Fichter 2012; Arnold et al. 2015; Geels 2002; Kivimaa and Kern 2016; Szarka 2012). It is a term that defines the set of policy instruments concerned with breaking the incumbent resistance from entrenched technology regimes, and opening gaps in the market into which new technology may enter. The range of what exnovation might apply to can vary (Heyen 2017), from a certain product to an entire set of technology or even a sector. However, what does not change is the aim of exnovative policy toward the destructive and exclusionary. Exnovative policy,

importantly, does not prescribe replacing technologies, it leaves the choice of what might follow the old technology either to policy, or to the market.

In Chapter 3, I will describe how the system of incentives and policy devised by Norway serves to model the potential benefits of exnovation as a necessary complement to innovation in technology transitions. I will also explain how exnovation can be seen as a necessary final step in the completion of such a transition and is useful only once the preceding steps have been properly executed.

Brief Timeline of National Incentives Programs

The time between 1989 and 1998 can best be described as an experimental period of EV incentives in Norway. Jump-started by a small but fierce group of electric vehicle enthusiasts, the first incentive was put in place – a registration tax suspension for EVs. This was soon followed by more social incentives such as eliminating fees on toll roads and free parking in city centers for those driving EVs. Such incentives were not only financially beneficial tools but served to raise the perceived status of EVs within Norwegian culture. The Norwegian ICE regime was small, and saw no threat from the EV biased policies, so it put up no initial media resistance (Figenbaum 2017).

The second and third periods in Norwegian incentives programs (1999-2002 and 2003-2009) are characterized by a failure to initiate domestic EV manufacturing and a successful expansion of EV promotional policies, respectively. A foreign automotive manufacturer's acquisition of a Norwegian EV company ended poorly and in nearly immediate resale. However, BEVs began to be seen as a large part of addressing climate policy targets, both within city centers and in rural and coastal areas. The incentives programs, initiated during this third stage, would

provide tangible evidence to back the six million euro funding package to establish charging stations during the fourth period (Fridstrøm 2021) (Interview 1).

These periods do not show a smooth progression of EVs from an upstart technology with little grounding in the Norwegian market to potent forces with the ability to sway policy. The timeline of EV incentives is plagued with setbacks and pushback, from what little existed of an ICE regime in Norway, to simple technological shortcomings. The development of lithium-ion batteries, for example, was only sufficiently far advanced to support meaningful function in 2009. ICE regime pushback was seen, but was largely ignored by the government (Figenbaum 2017).

The fourth period, as accounted for in (Figenbaum 2017), ends in 2014, and provides an excellent jumping off point from which to examine the last 9 years of national incentives, which will be expanded in Chapter 3.

METHODS

The research for this thesis was conducted through an analysis of primary archival materials, a comprehensive review of secondary literature, and via video-interview with officials involved in Norwegian EV policy. The first chapter of this thesis uses a review and analysis of technology transition literature and sociological theory to formulate a framework that I then specifically apply to the Norwegian Electric Vehicle transition. The second chapter introduces a brief history of Norwegian Environmentalism, as well as the Norwegian governance model as it relates to policy creation. I take advantage of accounts of environmentalist history, secondary policy literature, and interviews with a project leader for electric mobility in the city of Oslo and a Research Director at the University of Transport Economics. The third chapter applies an analysis of primary policy documents and tax codes to the framework of transport sociology and

national governance that I have constructed to draw conclusions about the origins and nature of the transition in Norway. I conclude with an analysis and explanation of potential contradictions within the Norwegian system, as well as general lessons that can be learned from the multi-decade effort that the EV transition has been.

Chapter 1 – Transition Frameworks in the Norwegian EV Context

Conceptually, the Norwegian EV transition would appear to be limited to a changeover between two technologies – from the internal combustion engine, running on fossil fuels, to battery powered electric, zero-emissions vehicles. It is a simple logical leap to assume that this transition is motivated by a difference in technology, that the newer, electric vehicles have an advantage over older fossil fueled cars, either technical, financial, or both. It may even make sense that the proven negative externalities associated with fossil fueled vehicles, and technology in general, have persuaded consumers to reject them in favor of more environmentally sustainable EVs. However, neither of these simple explanations satisfactorily addresses the intricate nuances of such a drastic change within as large and established a market as the automotive industry. Radically new technologies, such as electrically powered automotive vehicles, have difficulty finding traction in established markets due to existing infrastructure, regulations, and user preferences, which are entrenched in previous technologies. Causing such a large disturbance within the automotive sector, even in a country that does not possess a domestic ICEV manufacturing regime, requires the input of social, governance, and industrial actors. To frame my discussion of this transition, I will elaborate on the Multilevel Perspective Theory as a socio-technical framework. This framework will help me show what relationships are most essential to understanding the

Norwegian EV transition, which actors have the largest impact, and how smaller actors create the space for themselves to change the socio-technical landscape. To address these questions, I will look at how a broad socio-technical framework maps onto the Norwegian example. I will also address a critique of the model.

A Sociological Framework of the Technological Transition

Geels first describes technological regimes generally as the contemporary industrial institution: the coordination between manufacture, perception, and governance of a technology within a society. More simply, technological regimes are the status quo for a technology's fixation in a society. It is important to understand that the regime indicates that the technology is accepted by the society, and the systems that hold it in place often do so at the behest of other technologies. As technical regimes advance along "technical trajectories," driven by the incremental improvements of engineers, they further entrench themselves within the technological landscape (Geels 2002). The technological landscape is made up of a patchwork of these technical trajectories. However, the slow speed of improvement within trajectories and the fixation pressures of regimes do not allow the development of radical innovations. These come from protected niches, which are isolated from the landscape, and so allow newer technologies to emerge.

The Multilevel Perspective Theory can be used to describe socio-technical transitions generally and presumes that hierarchical power differences favor the existing technology. The three overarching levels, by growing degrees of relative power and influence, are niche actors, regimes, and landscapes. Each level controls an abstract amount of practical and social resources. Practical resources could refer to capital, technology, and/or production systems, whereas social resources refer to things like corporate influence over government resulting from lobbying efforts,

pressure on legislators stemming from public sentiment, and mandates handed down from executives in government who rely on public mandate as the basis for creating their political agenda. Each different level with Multilevel Perspective Theory controls a different combination of practical and social resources. I will first detail the role of niches within the broader multilevel network by providing an example within the Norwegian context.

The Niche

Niches are the smallest and least powerful of the three levels. Niches are isolated from the market in most meaningful ways, and are even referred to as "incubation rooms," or areas in which novel technology can develop and evolve away from the negative pressures of the regime-controlled market (Schot 1998). In his book, *The Lever of Riches*, Mokyr offers an explanation of how technological innovation drives economic growth, stating that the niche often produces a "hopeful monstrosity," or a novel technology so cumbersome and inefficient that it would not survive without the active support and protection of the niche (Mokyr 1992). The niche creates a location for learning processes and allows "radical technology" to push through its growing pains. Norway offers an example that illustrates this point.

In the mid-1990s, a small car manufacturing company PIVCO, an offshoot of a large thermoplastics manufacturing corporation, Bakelittfabriken, developed a line of electric vehicle prototypes called the THINK. The car was designed to meet urban personal vehicular needs, being small, lightweight, with limited range, and a unique manufacturing process that lowered investment costs in manufacturing plants. The project was financed through a system of sponsorships. PIVCO would partner with a company like Statoil so that Statoil's petrol stations might also be used as recharging points, thereby incorporating PIVCO and electric vehicles into the existing infrastructure. Statoil, in return, would be able to use the partnership to demonstrate

its receptiveness to new technology and the growing social trend of environmentalism within Norway (Hoogma et al. 2002). The largest stakeholder in the PICVO vehicle, however, was the Statens Näringsdistrikts Kreditbank (National Fund for Regional Development and Industry), an institution that provided funding to technological development projects in Norway. These two types of partnership, one industrial and the other financial, began to create the niche within which EVs could grow in Norway. Incorporation of electric vehicles into the existing infrastructure of Norway would protect the burgeoning electric vehicle market from a need to compete with larger, far more established actors for land and materials. There would be no need to waste monetary resources on establishing a charging network from scratch. Government subsidies for the construction of charging points would establish themselves as a niche protectorate, and now, due to high market penetration of EVs in Norway, there is no longer a need for even these subsidies, as charging stations have become a viable business risk (Interview 2). Similar to the industrial cooperation between PIVCO and Statoil, and, the national government's charging station subsidy schemes that followed it, the financial backing of an established public institution like the Statens Näringsdistrikts Kreditbank further cemented the niche being pioneered by PIVCO. Other precedents set by PIVCO, and the efforts of early EV interest groups, were exemptions from import taxes, purchase taxes, and toll road payments. These, along with other shielding actions, allowed actors like PIVCO to develop their nascent technologies in the Norwegian Niche. Ultimately, PIVCO and the THINK failed, but the electric vehicle niche that they helped to create allowed for the protection of EV technology within Norway, letting it grow to the point where many of the incentives that were so vehemently held in place by interest groups to protect them, are now no longer needed (Interview 2).

As I will describe in Chapter 3, the structure of incentives programs in Norway extends over a long period of time (several decades) and was not necessarily mapped out in advance. Rather, these incentives were placed additively (Interview 2). I will show that they allowed for ease of access to EVs, and were one of the most important reasons for the rapid growth in EV sales that has been seen – 79% of new car sales in 2022 ("Norwegian EV policy" 2023). However, these policies, which have garnered such success, are beginning to be phased out by the government. The reasons for the phase-out are multiple (share of EVs on the road and being bought has reduced toll and registration tax revenues to the government; the ongoing attempt to address the disproportionate income effects of EV exemptions; etc.). An important takeaway is that the incentives are being rolled back without a real impact on the sales of EVs. In March, 2023 86.8% of new car registrations in Norway were EVs (Norwegian Road Traffic Information Council 2023). Traditional ICEVs made up only 2.7% of new registrations. Because of these recent trends, I argue that we are currently witnessing the crossover from niche to regime, as electric vehicles increasingly become the norm in Norway.

The Regime

The example of PIVCO also demonstrates one of the more important nuances about the Norwegian automotive industry – the lack of a domestic automobile manufacturing regime. As outlined by Geels, Rip, and Kemp, the regime is characterized by a stable platform for technological development (Rip and Kemp 1998) (Geels 2002). In the context of an automotive transition, this would be a domestic manufacturing presence, which is actively engaged in the local and national economy. Such a presence could take several forms. A Norwegian vehicle company, headquartered in Norway but outsourcing its manufacturing would likely influence the market similarly to a domestic company with domestic manufacturing. Even a foreign company with

domestic manufacturing would still have an interest in maintaining their *status quo* of dominance over the automotive space as would the previous two examples. All this is to say that established technology within a system propagates and improves itself. This is the nature of technology within a capitalist system – there is incentive for improvement of the current technology, both to generate profits for the manufacturer and to satisfy the demands of the consumer. The profit motive also encourages those firms to protect their market share, through political lobbying efforts (Kerr, Lincoln, and Mishra 2014). However, what the PIVCO example highlights is the lack of lobbying pushback. This indicates a lack of a cohesive automotive regime, or at least an internal combustion engine personal vehicle manufacturing regime, meaning that there was no countervailing force opposing the growth of new EV technology. This lack of ICE manufacturing regime is something that has been noted by many scholars looking to explain the expansion of the Norwegian EV niche and is persuasive evidence for why many of the government policies ("Norwegian EV policy" 2023), which are overtly favorable to EVs over ICEVs, were never challenged (Figenbaum 2017).

It is also significant that those companies that sold ICEVs within Norway (Volkswagen, Volvo, Porsche, BMW, Mercedes-Benz, Audi, and others) incorporated EVs into their inventories rapidly, and targeted the Norwegian market, showing a lack of pushback on incentives from these companies, and even complicity, in the crossover to an EV regime, that I outlined above.

The Landscape

As Geels refers to the "nested character of these levels", the third, and therefore all-encompassing level is the landscape (Geels 2002). Whereas niches, producers of radical technological innovations, are nested within regimes, so must regimes, the existing technology, and the coproduction within society, be nested within landscapes. Landscapes represent the interplay among regimes, social and technological, within a defined context. Within the Norwegian

context, then, landscape is a blend of industry and environment, which makes a very hospitable atmosphere for EV proliferation. As is discussed in the following chapter, Norwegian environmental sentiment has always been strong and relatively pervasive economically and governmentally, throughout the latter half of the 20th and start of the 21st centuries. Due to the widespread acceptance of policy like the Brundtland Report[1] and the visible establishment of renewable energy making up 98% of the electricity mix (Statista Research Department 2021), I would argue that environmentalism may be considered as much a part of the Norwegian landscape as the fishing or offshore oil and gas extraction industry. This makes the success of electric vehicle adoption in Norway far more understandable. Although EVs are a novel, radical technology, the landscape supported the proliferation of environmentalism, further protecting the niche and allowing for a smoother transition from niche to regime.

Windows of Opportunity

The concept of a "window of opportunity" is not intrinsic to MLP theory. Neither Rip and Kemp nor Geels mentions it in their conceptualizations of sociotechnical transitions. However, I believe that it is a critical component of the Norwegian EV transition. A window of opportunity, in this context, is the alignment of new technology with an opening, or weak point, in a regime. Windows of opportunity are perhaps best described through example. In 1990, the elimination of registration taxes for the importation of the very first EVs were achieved via petition to the government from EV interest groups who were fascinated by early EV races in the Sahara desert and wanted to perform experiments themselves (Dryzek et al. 2003). This exception set a precedent

[1] Discussed further in Chapter 2, this report was generated and published by the United Nations, in large part due to Gro Harlem Brundtland's role as Chair of the World Commission on Environment and Development. Brundtland is a former Prime Minister of Norway, and her report's urgent push for global acceptance of ideas of sustainable development reflected Norwegian proclivities in the same ideological direction.

for EV tax exemption, which was increased, by pressure on the government from interest groups, through the 1990s until the government eliminated the standard 25% VAT for all Norwegian EV imports, as well as the purchase and import taxes. These exemptions stood until 2022, when they began to be rolled back as EVs started to dominate the personal vehicle market space. The window was opened by the first EV interest groups, and policy was driven through that window to make EVs financially competitive, helping them to achieve market stability.

Actor-Network Theory: A Criticism of Multilevel Perspective Theory

Martin Anfinsen, in his paper on tensions in the Norwegian Mobility system, argues for a flat ontology of the associations between actors and technology, without the hierarchical structure of Multilevel Perspective (Anfinsen 2021). There are certainly merits to evaluating the transition through this lens. For instance, it allows for a more accurate conceptualization of the long timescale a transition of this magnitude takes. Anfinsen stresses the need for showing how the development of the EV within a society may be better understood by examining the networks constructed around the vehicle-driver nexus. Through this individualistic approach, broader trends can be extrapolated about how change in EV markets is affected by the interplay between users and technology. This allows for an interesting examination of the expansion of markets but does not capture the formation of markets through their maturity as well as does the Multilevel Perspective analysis. Using MLP, we can trace a technology from its origins all the way to its market dominance, when it becomes accepted as a regime and is integrated into the landscape. ANT allows us to look at the interactions between humans and technology once the technology is in the market as a close-to-viable product. It does not allow us to see the whole picture, and although it is useful for understanding the evolution of newer technology through coproduction, it provides too granular a view for the purposes of this thesis.

As I will show in my discussion of incentives, and the efforts of non-government groups in Chapter 3, the intentional efforts of NGOs and niche protections from the government facilitated the Norway EV transition through the addition of a support system below the niche layer. The platform of the corporate system, discussed in Chapter 2, that defines Norwegian Governance, actively and intentionally supported the EV niche.

Section Conclusion

The Multilevel Perspective theory enables a structured view of the evolution of electric vehicles in Norway, along with the mechanisms that encouraged and protected them. The niche that developed and was protected through government intervention in the form of financial and behavioral incentives allowed consumers to purchase EVs cheaply relative to conventional vehicles (Kvalø 2020). I believe that I have shown that the niche is well on its way to becoming a national regime, if it is not already. The formation of a niche in Norway for electric vehicles begins to show why their adoption in the country has been so effective, but it does not give a complete picture of the social effects at work. Three levels of actor may be a useful way to frame the main drivers of transition, but they do not allow for the nuance that is involved in kickstarting an industry and a consumption trend as large as this. To remedy this, I propose here, and continue to refine throughout this thesis, an idea of a more targeted framework that incorporates corporatism as the support structure that allows niche actors to facilitate this transition. Although corporatism is specific to Norway, the idea of tailoring transition frameworks to the situations of different countries will allow policy makers to address shortcomings within their governance system to expedite their own niche protections and regime changes.

Finally, achieving 30% total market penetration in less than 20 years in the personal vehicle sector takes more than the development of a niche (Norwegian Road Federation 2022). It requires both the social and government acceptance of a shift toward this new mode of personal transportation. More importantly, it necessitates taking advantage of opportunities to push more radical policy than could normally be enacted, during windows of opportunity. Policy can be enacted during windows of opportunity when interest groups have influence over the governing process, which is most effective in a system that promotes a close relationship between non-government and government actors, like Norwegian Corporatism.

Chapter 2 – Political Structures within Norway: Corporatism gives rise to the Committee System

A General Understanding of the Relationship Between The Norwegian Government and Environmentalism

To understand how a technological transition is legislatively supported, I will first provide a brief overview of Norway's rather unusual form of government. Its basic structure is by no means unusual, it is a constitutional monarchy, although its main legislative body arose in the 1880s. Its constitution, penned in 1814, now vests legislative authority in the Storting, the Parliamentary body that is democratically elected by the Norwegian people. The Storting, consisting of 169 members, is responsible for passing, amending, and repealing legislation, considering, and adopting the national budget, and authorizing plans and guidelines for the activities of the State ("The Storting" 2022). There is also a strong history of local governance in Norway, with each of the 435 municipalities electing their own local council (Vabo 2005). The local council is responsible for selecting an executive committee, which then returns a multi-year finance plan, as

well as coordinating and overseeing policy and property within the district. The local committee system holds a large amount of power and is functionally a reflection of the voting tendencies of the electorate. However, it has been held that the local committee structure tends to encourage a rather narrow focus on services and revenue generating sectors at the expense of the community at large (Vabo 2005). This is something that I believe is reflected in the national committee system as well, specifically regarding environmental sustainability, and the ongoing EV transition.

Because a technological transformation involves the interaction between government and the economy, mediated in part by non-government actors, this section will look at the main way in which legislation is created and passed into law. In the Norwegian system of government, policy making is delegated to committees, which draw on experts from a multitude of different sectors. Because of the unequal distribution of power that we see across the landscape of actors in Norway, it is necessary to question whether the most knowledgeable individuals, who are closest to issues of transportation transitions, are included in that policy making process. Power is vested most heavily in the hands of those who are at the helm of industries such as oil and gas extraction, fisheries management, and national electrical grid construction and maintenance. These industries, especially the first two, make up a large proportion of Norwegian economic interest, so they are granted greater access to policy creation. Given this, it is important to question the terms on which Norwegian environmentalists have historically been included in the policy making process.

Norway is often cited as a world leader in state supported environmentalism, for good reason. The cause of sustainable development has a long history of public and state support, beginning in force with the issuing of the Brundtland Report, which propelled Norway to the fore on the international stage (Brundtland 1987). The Report, published in 1987, outlined a stance on sustainable development as conceived by the then prime minister of Norway, Gro Brundtland. This

report expressly tied the future security of the global environment to the ways in which people of the current day consumed necessary products and generated power. The report lays problems both current and future at the feet of endemic poverty in the global South and unsustainable patterns of consumption in the global North. Although this was a document that generated guiding principles rather than applicable policy, it incentivized the contemporary model of sustainable development (ARE 1987). The report was a product of the United Nations and was published through the World Commission on Environment and Development, but it also had a distinct impact on Norway. The fact that the document was published in recognition of Brundtland's leadership as chair of the World Commission on Environment and Development gave the concept of linking industrial consumerism and environmental sustainability state sponsored legitimacy. Using this legitimacy as a base, niche environmental groups within Norway could begin to voice their concerns with tangible leverage.

It should be noted, however, that this report was not the singular origin of positive Norwegian government recognition of environmental issues. The long history of organized environmentalism within Norway traces its roots to the Norwegian Mountain Touring Association, founded in 1868, which led to the establishment of the Norwegian Society for the Conservation of Nature in 1914 (originally named the National Association for Nature Preservation) ("Transport – Topics" 2022). Financial ties between the Norwegian government and environmental groups are more recent, but reach as far back as the 1930s, when the Ministry of Church and Education gave support to the Conservation Society (Dryzek et al. 2003). Financial support within the committee system is where unequal distribution of power, as outlined by Multilevel Perspective theory, begins to take meaningful effect regarding the creation and implementation of policy. Regimes, like the oil and gas extraction industry, the hydropower industry, and the fisheries industry all hold

abundant power within the system. This creates a preference for policy that protects those economic interests, and begins to skew the distribution of national funding toward committees that generate policy in line with moderate, economically safe ideas.

Corporatism in the Norwegian System

In an Oxford Academic Socio-Economic Review, Norway was listed among the top 5 most corporatized countries in the world. Corporatism indicates the level to which a country's policy making process is controlled, in large part, by the interests of organizations. However, as shown by the structure of policy making mechanisms in Norway, the model of corporatism that it holds has been, in the recent past, indirectly controlled by general short-term economic interests. Interest groups, such as the Norwegian Society for the Conservation of Nature, are recognized as producers of services, and so are seen as appropriate recipients of government grants. By 2000, 19 groups were receiving operating and project grants administered by the Ministry of the Environment (though the grants predate the establishment of the Ministry in 1972) (Dryzek et al. 2003). The grants for these groups are distributed based on application, meaning that groups will compete for funding. Importantly, however, groups need to tailor their objectives to fit the government's needs and expectations.

Because project grants are distributed according to government priorities, and the grant specifies what must be done with the money, groups can tailor their grant applications toward what is usually a more moderate policy solution. The distribution of support to groups who are awarded grants strengthens their hand, as groups prepared to cooperate with the government, and weakens groups critical of government policy. In the environmental context, this means that as relationships between group and state become entrenched, the government can exercise more control over the

environmental policy making process. With time, the grant system expanded to cover many groups, which the Environment Ministry justified by suggesting it sustains a broad movement of democratic organizations. But the "consequences for democracy may be precisely the opposite of those intended." Because the government only finances groups that support the policies it wishes to promote, other groups, which may be in opposition to the proposed policies of the government, have very little space or weight to oppose them. In Norway, the system of operating and project grants encourages group moderation, engaging larger, more moderate environmental organizations, while sidelining smaller, niche radical organizations pushing for more extreme action. These more radical groups might be animal rights groups, which is an issue that is not as close to the heart of the government's priorities (Dryzek et al. 2003). During the late 1990s and early 2000s, project grants for sustainable consumption, a key component of government policy (Bondevik 2004), were allocated liberally.

Norway has traditionally embraced environmentalism, and actively incorporated it into its governance structures (Dryzek et al. 2003), to the point where environmentalism is seen to be institutionalized at both the political and administrative levels (Sverdrup 1997). There is one aspect of the Norwegian economy that has resisted this incorporation; the hydropower complex has denied environmental groups influence, making it the exception to the "consultative and co-operative rule" that Dryzek outlines as the norm for industry in the country. This denial is best exemplified by the Alta Dam incident, and dam construction in the 1970s in Norway more generally. In the 1970s, Norway began experiencing protests in connection with hydropower dam construction (the only substantive environmental protests that Norway has ever experienced). The protest that has gained the most notoriety relates to the Alta Dam, which was approved in 1978, despite resistance from both civilian protestors and the Ministry of the Environment. There was

legal pushback, but ultimately, "it was state economic imperatives that prevailed on the energy issue, with both environmental groups and the Ministry of the Environment excluded from the core of state decision making." (Dryzek et al. 2003). Although this episode does not directly correlate with the EV transition, I will reflect on it in my conclusion, as it will allow me to show why the specific framework, I illustrate for the Norwegian transition is useful for understanding the current success of EVs.

The Committee System

In a corporate society such as Norway's, there must be a link among government, non-government interests, and industry/the economy. It can also be assumed, with what is understood about the broad structures of MLP theory, that this nexus is unfairly controlled by the government and industry, in tension with non-government environmental interests. This assumption even holds up when eschewing the MLP's broad approach in favor of the flatter, more interpersonal analytical approach suggested by Anfinsen. Even when closely looking at the interplay between actor and technology there still exists an imbalance of power in favor of entrenched forces – regimes and socioeconomic landscapes – that will exert self-serving bias in policy creation (Anfinsen 2021) (Figenbaum 2017). However, what is known for certain is the well-established democratic proclivity toward cooperation within Norway. This leaves the door open to a system of policy creation that at least claims to provide an opportunity for all voices to be heard. Norway, being the "country of a thousand committees" (Klausen and Opedal 1999), passively encourages environmental groups to focus their efforts on influence over cabinet-appointed committees, which traditionally hold a tremendous amount of influence over policy (Farstad 2014). It is worth examining whether that committee system fairly incorporates its disparate group membership.

The committee system is broken into two components, each designed to provide a service to the Storting. The first kind of committee is a permanent committee, which is often used as a governing body for an institution, such as the Management Board for Norwegian fisheries. This board, and the Norwegian Seafood Council that it governs, act as advisors to the Ministry of Trade, Industry, and Fisheries ("Board and Management" 2017). As its name suggests, the committee is a permanent installation of the government, meant to regulate fishing practices in Norway year after year. The second type of committee is temporary, oftentimes lasting less than a year. These committees are given a particular task, and asked to produce a report, which will then be adapted to public policy. Such committees are task oriented, formed for a specific purpose and disbanded once that purpose has been fulfilled. Structurally, it would appear that each of these committee types is liable to abuse in the context of environmental sustainability.

Permanent committees do not fall prey to the pressures that act on temporary committees – after all, they are well established and usually are not producing project reports with one eye on contingent funding (something that will come up later). However, a relatively small number of committees under the Ministry of the Environment, only four permanent and temporary councils in 1997-1998, indicates an historic lack of motivation by the government to engage meaningfully with environmental advocacy (Dryzek et al. 2003). This is not to say that environmentalism is not represented in the committee system. Quite the opposite, as many environmental groups fought for representation on committees in other policy sectors. In the late 1980s, the Norwegian Society for Conservation of Nature pushed for representation on the Norwegian Management Board for fisheries, mentioned above (Hernes and Mikalsen 1999). The argument was that the Brundtland report ordained that conservation and sustainability must be a part of natural resource decisions (Brundtland 1987). The seat was granted to ensure a check on the short-term interest of industry

by injecting "resource conservation… into decision making parameters" (Hernes and Mikalsen 1999). This appointment did not go unquestioned, and it was in fact an appointment for an observer, who had no voting power. The observer was also totally excluded when important negotiations between Norway and Russia over total allowable catch quantities were brought up, calling into question the sincerity of the appointment. This episode echoes the Alta Dam situation described above, where the core economic activity of the state took precedence over environmental concerns.

The committee system certainly has its faults, and the fisheries episode shows that there is a definite ability for the state to hold back environmental groups from meaningful contribution to policy creation. Nevertheless, the committee system still does exhibit some merit. Temporary committees, as described above, are formed with a specific purpose or policy creation objective. One such group, a Green Tax Committee, was charged with making recommendations on a green tax system. The report that was generated showed the deep divisions between environmental interests and government financial interests. A representative of the Ministry of Finance even went so far as to attempt to delay the release of the report so that it would come out only after a government decision on gas-fueled power plants, as the report recommended taxation of natural gas emissions. Ultimately, a coalition of representatives from research institutions and the Nature Conservation Society was able to push the report through. The report pointed to the ability of green taxes to "reconcile economic and environmental values" (Dryzek et al. 2003), clearly alluding to the Brundtland Report as precedent. The application of government intent from niche interest groups through the committee system into public policy is clear support for the hypothesis that niche actors, within an MLP framework, can exploit *windows of opportunity* to effect change. Although it is clear that the committee system, like the broader landscape of environmentalism,

does not engage each interest group equally, it does, to a degree, engage them equitably. It can be stated that the committee system can be used for pro-environmental work.

Section Conclusion

The committee structure is a symptom of corporatism and can be seen, on the one hand, as the reason for the progressive attitude Norway has taken toward aligning its policy with pro-sustainability initiatives. On the other hand, it is the limiting factor for why environmentalism within Norway will always have boundaries it cannot push past.

The version of corporatism present in Norway is unusual in that despite the high level of involvement from non-government organizations, the government still holds a large degree of influence over the policy making process. This manifests as a moderating effect that has the potential to suppress environmental interest groups' more radical efforts and initiatives. The prime example of this is the episode in the 1970s and 80s with the Alta Dam, which was a decision made against the clear protestations of the environmental community, and with only minimal evidence that it might result in economic benefit. However, this is not to say that the committee system is failing. The fisheries episode shows that environmental interest groups are at least being granted a seat at the table. Many recent policy decisions, including, but not limited to, the Norwegian Green Recovery from the COVID-19 pandemic, as well as the various net-zero initiatives and international climate change policy alignments, show the pro-environmental intent with which Norway as a country regulates its industry, energy, and transport sectors (*Norway's Green Recovery from COVID-19*, 2020). Most pointedly, the Norwegian EV association has been advocating for EV friendly policy and legislation for 25 years. As a non-government organization

that receives national funding, it is the perfect example of working within the structure of Norwegian corporatism to achieve the desired transition.

I ended Chapter 1 and the above section on committees by briefly mentioning the phrase *windows of opportunity*. This is a concept, brought up by Figenbaum, in which he hypothesizes that the development of EVs in Norway is the result of "windows of opportunity" being taken advantage of by niche actors – such as the window opened when registration taxes were eliminated for EVs. He understands "windows of opportunity" as a series of fortunate events leading to a favorable situation for the interests of whatever group is under examination. However, I would argue that Figenbaum's concept of the "window of opportunity" is too static. Instead, I understand the window as something that can be opened through the actions of individuals. To support this claim, I would simply present the committee system and network of interest groups that I detailed above. The group which first argued for the abolition of registration taxes for electric vehicles was Bellona Europa, a section of the Bellona Foundation, and an electric vehicle interest group that brought the first EV to Norway in 1989 and began lobbying for the EV tax exemption immediately thereafter (Serafimova 2015). The committee system, and interest groups like Bellona, have the power to affect policy – instead of limiting our understanding of interest groups to opportunism, we must understand that interest groups can open their own windows of opportunity by exploiting what leverage they might have within a society.

Intentionally leveraging influence through the committee system to create and widen windows of opportunity is the next step that Norway can take to improve its EV adoption programs, and its overall sustainability objectives. However, for countries that do not rank among the five most corporatized states in the world, other solutions will need to be found (Jahn 2016). The direct reason for the high volume of sales of EVs in Norway is the lower relative cost of EVs

compared to traditional ICEVs. This cost disparity is only possible because of the incentives that were implemented through the committee system. For countries like the United States, who's corporatism ranking is 42nd (last out of all industrialized countries considered in the index), niche protections cannot rely so heavily on the direct influence of interest groups on public policy through corporatism. It is then the project of these non-corporatized countries to identify mechanisms that are best for creating those protections.

Chapter 3 – Policy Driving the Transition, and the Incentives Encouraging Technology Substitution

Explaining the sociological factors driving a technological transition may allow us to visualize the social impetus for changing between preferred technologies. However, to understand the EV transition in Norway on its deepest level, this chapter will detail the actual policy and incentives motivating the shift. There are two main forms of incentive that have been shown to encourage EV adoption within Norway, each type approaching the problem from the opposite side. Most of these incentives are of the first form, and focus on innovation. As we have seen, niche creation and sustenance within Norway has led to a rapid expansion in recent years of EV purchases. It can even be argued that the niche creation encouraged through the late 1990s and well into the 2010s was both driven by, and drove, the corporatist mechanisms within Norway to promote the adoption of improved EV technologies through foreign importation (of cars) and domestic production (of charging stations). Subsidies and financial incentives were first called for by interest groups (Serafimova 2015) with no real influence over the governance process, and these same interest groups have formed lobbying forces and now argue for the continued use of these incentives to maintain the high proportional sales of EVs.

These incentives, which have been a staple of automobile policy in Norway since their inception, and which I will enumerate later in this chapter, opened the door to innovation, both foreign and domestic. Innovation, the creation of novel technology, is critical for any technological transition, as an old technology cannot be supplanted without something to replace it. However, focusing on innovation alone, which can be politically convenient as well as fruitful, also tends to limit the effectiveness of transitions (Heyen, Hermwille, and Wehnert 2017). It can be easy to procure funding for novel technologies that have the promise to solve broadly recognized problems such as polluting transport. This can be conceptualized as a predisposition on the part of the government to pass policy that encourages innovation, where the production of new technologies does not severely affect the existing technological order, while appearing to improve the society through new, sustainable technology. But, when considering the oversaturating effect of producing new technologies without discarding the old, innovation alone fails. Flooding a market with many alternatives to a staple product that everyone is used to (in this case traditional ICEVs) it is difficult to expect much changeover from the old method to the new, especially at any kind of rapid pace. New products may seem unsafe and untested, or regimes may push back, protecting their market share. The multitude of different options may split the consumer base into factions, further entrenching fossil fuel technology within society. There are many reasons why innovation alone might fail to execute a sufficiently rapid EV phase-in. So, it should be balanced by a force that actively suppresses and serves to phase-out old technology, such that space is created in the market for new technology. Here, I can introduce the concept of exnovation.

EXNOVATION

Exnovation is the opposite of innovation. Where innovation encourages the invention and refinement of new technology, exnovation and exnovative policy encourages the phasing out of

old, potentially harmful technology. Most often, this comes in the form of a legislated removal of that technology from the market. Exnovative policy, especially in the context of sustainability transitions, focuses on mitigating the effects of fossil fuels by controlling the use of technologies that use those fuels. This opens gaps in the technological markets, into which sufficiently mature new technologies, which are not hampered by exnovative policy restrictions, can expand. This chapter uses the concept of an exnovation-innovation balance to explain how the Norwegian policies have had the demonstrable transition effects that have increased the market share of EVs in Norway from 2% to 25% within the last 10 years.

Existing literature on the impetus for technical transitions often refers to the importance of "creative destruction" as a mechanism of transition (David 2017). Creative destruction is the idea that a policy emphasis on innovation will generate new technology, the appeals of which will drive the consumer in the market away from old technology to the new. David critiques this approach by analyzing Joseph Schumpeter's ideas about the nature of capitalism. Schumpeter writes that "…capitalism, then, is by nature a form or method of economic change and not only never is but never can be stationary" (Schumpeter 1942). David interprets this to mean that the process of creative destruction is inherently unpredictable, which contradicts the idea of managing a niche to protect and foster growing technology, something I explained the merit of in Chapter 2. This contradiction is worth noting because it sets up the significance of both the corporate system in protecting niches, and the importance of exnovation in limiting the potentially negative effects of unchecked capitalist style technological development. David further explains that new technologies can "coexist in markets with unsustainable, status quo technologies'" (David 2017), leading into a discussion of the importance of combining innovative with exnovative policy.

Building from David's assessment of Schumpeter's observation, exnovation also acts as the counterweight to what could be an endlessly expanding innovation balloon. Because pure capitalism "never is and never can be stationary" the initial innovation that begins and drives any given transition, will not be the end-result. So, even if the desired transition comes about, there will almost certainly be innovation after-the-fact, which may negate the achievements of the transition. For the sake of an amusing example (using an extreme transportation transition hypothetical) affordable, practical teleportation is invented after a successful global transition to electric vehicle transport. However, the process is extraordinarily polluting, and is even worse for the environment than was fossil fuel transport. Under a policy system that encourages innovation but does not discourage the emission of greenhouse gasses as a function of transportation, the new system of teleportation would take over the market and would probably (because of its clear efficiency advantage) dominate the transportation market. With exnovative policy in place to eliminate old polluting technology and guard against other technology with similar negative environmental externalities, innovation can be allowed to flourish knowing there will be safeguards against unintended harms. Thus, within the context of a transition, exnovation should be used as a tool to restrain the negative impacts of a capitalist drive toward innovation. It should not be used to stifle it, but rather to direct it in a more sustainable direction. This may protect both the technical and social advancements that are made (perhaps in this case we will achieve sustainable teleportation).

David's analysis of the effect that a capitalist system has on technology transitions can be further refined. Schumpeter states that, because capitalism is an uncertain endeavor, and in its pure form is dictated by the will of the consumer, its outcome cannot be predicted (Schumpeter 1942). By placing faith in innovation to drive a transition away from a firmly entrenched technology

regime, two assumptions are made. The first assumption is that the resulting innovation will be a successful technology and can sustain itself in the marketplace. The second assumption is that there will be a shift away from the old technology toward the new technology. The first assumption certainly has merit and is logically sound, but the second is not. The effects of corporate lobbying in places like the United States show the manipulability of the market by concerned forces. There will, often, be resistance from the established technology regimes. So, there must be a countervailing force that opens the door to those innovations. The exnovation that David and others have written about, must be paired with, and balanced against the innovating policies. As I will be able to show in the timeline of transition policy in Norway in the following section, not only is the "innovation-exnovation nexus" (David 2017) important to study and attempt to replicate, an innovation-exnovation balance will allow for a better understanding of the success of the Norway transition because of proper policy timing. The balance comes about not only in the power with which the policies affect the marketplace, but the chronology in which they are implemented.

As discussed in Chapter 1, both environmentalism and the history of promoting sustainable industrial practices have a long history within Norway. The system of non-government interest groups like the Norwegian Society for the Conservation of Nature made official what seem to be pro-environmentalist tendencies in Norwegian culture. These tendencies further manifested themselves in the Brundtland Report (Brundtland 1987), which encouraged Norway, through governance, to live up to the example outlined by the prime minister in that document. It is in this mix of environmental interest, combined with the corporatist structure of Norwegian governance, that the social backing for an EV transition can be found. However, a transition such as this still needs a spark. That spark, according to several experts associated with the transition, came in the form of the oil crisis of the 1970s. Research and development programs, directly funded by the

national government, were created after 1973 to address the sharply increasing energy prices associated with personal transportation ("The Rise of Electric Vehicles in Norway" 2020). However, these programs were minimal in nature, and fell toward obscurity once the oil crisis receded. It was not until the late 1980s and early 1990s, when decarbonizing transportation became a higher priority for the Norwegian government that these programs, as well as other incentives, began to make a resurgence. This reinvigoration did not occur in a vacuum, however, as a desire for overall industrial decarbonization led Norway to push for increased hydroelectricity capacity, which would increase the availability of cheap electricity, thereby assisting the EV transition.

Importantly, Norway is not a member of the European Union, although it is a member of the European Economic Area, and as such, aligns many of its climate policies with those of the EU. Some of those policies include the EU Emissions Trading System (ETS), the Effort Sharing Regulation, and EU Regulation 2019/631, which sets limit values for new passenger cars and light duty vehicles. However, the combination of profit seeking behavior displayed by the Norwegian corporatist system government aligning with the overall culture of environmentalism has encouraged Norway to reach beyond EU targets to set its own, more stringent, efficiency targets. Since 2012, Norway has imposed stricter internal regulations on vehicle emissions than has the EU (Danish Technological Institute et al. 2018), and has even suggested to the European Union that they update their policy in Regulation 2019/631 to match the 2030 100% emissions phase-out date for new personal vehicle sales set by Norway (Hedum 2021) (Norway's phase-out date has since changed to 2025 ("Norwegian EV policy" 2023)).

A Breakdown of Important EV Incentives in Norway

Financial Incentives

In 1990, the environmental group Bellona, lobbied the national government for the abolition of registration taxes for electric vehicles. This was the first retraction of regulatory personal vehicle policy and paved the way for the numerous other tax repeals to follow – import taxes on EVs were lifted shortly thereafter. Annual road and registration taxes were lifted in 1996. In 2001, the largest financial incentive was introduced by the government – a reduction of the Value Added Tax (VAT) on imported EVs to 0% (Norwegian Tax Administration 2022). Traditionally, VAT for automobiles in Norway was 25%. This new tax break, more than any other single measure, allowed EVs to be priced competitively with ICEVs (Zeniewski 2017). The goal of providing affordable EVs to Norwegians has encouraged the Norwegian government to leave the VAT exemption in place far longer than initially planned. A preliminary phase-out date of 2012 was pushed all the way back to 2022, and it will still be in effect for many EVs in perpetuity. In 2022, the government transitioned the exemption to a stepped model, where vehicles over NOK 500,000 (Norwegian Kroner, approx. USD 48,000), no longer qualify for the exemption (Misch 2023).

Financial incentives have continued to grow and began incorporating infrastructure projects as well. In 2009, Transnova (now ENOVA) launched a charging point construction project, which generated nearly 2000 charging stations in its first two years and was on track for 25,000 after a decade. Increasing the availability of chargers would make the use of EVs easier on the consumer by greatly extending the range of their potential travel. It would also begin to make the construction and maintenance of these stations easier, as economies of scale developed.

Table 3.1: Price Comparison between Volkswagen Golf and e-Golf

	Volkswagen Golf	Volkswagen e-Golf
Import Price	22,510	33,730
Carbon Tax (113 g/km)	4,440	--
NOx Tax	210	--
Weight Tax	1715	--
Scrapping Fee	249	249
25% VAT	5512	--
Retail Price	34,076	33,286

Source: NEVA 2020 (Kvalø 2020)

Behavioral Incentives

1999 brought about the introduction of specialized "EV" labeled registration plates, to make EVs easier to identify as they took advantage of the free public parking benefit introduced concurrently. It is interesting to note the social skew of this incentive. Free parking, along with being less financially burdensome than paying for parking along the street, affords the user a certain degree of status within the community. This perceived pedigree is an example of one of the behavioral incentives implemented by the Norwegian government, along with exemptions from ferry charges (2009-2017) and toll road fees (1997-2017).

Free parking, toll road exemptions, and free ferry rides afforded EV users a more convenient personal vehicle experience. This was improved upon through allowances for EVs to use bus lanes, first as a trial in and around Oslo in 2003, and then nationwide in 2005. Kristensen

claimed that this policy had a noticeable impact on the demand for EVs by reducing commuting times of EV drivers (Danish Technological Institute et al. 2018).

These behavioral policies were targeted at creating strong, non-fiscal incentives for individual EV adoption (Mersky et al. 2016). Enacted near the beginning of the EV transition period in Norway, these incentives played into niche management and protection, helping to counter the inconveniences of a yet underdeveloped technology system. Shorter commute times and increased ease of travel made up for the relatively shorter ranges and longer charging breaks of EVs of the time, when compared to contemporary ICEVs and later model EVs.

EXNOVATIVE INCENTIVES

Financial Exnovation

In 1991, Norway introduced a carbon tax, specifically targeting petrol and diesel sales. These carbon taxes have gradually increased over time, and are currently sitting at NOK 771/tCO_2e (USD 73.5) for diesel and NOK 777/tCO_2e (USD 74) for gasoline (Norwegian Tax Administration 2022). Additionally, the Climate Action Plan of Norway, from 2021 to 2030, announced that the total carbon price in Norway (the combined European Union ETS price and the domestic carbon price) would gradually triple by 2030 to approximately NOK 2000/tCO_2e (USD 190) (Ministry of Climate and Environment 2021). Lastly, the excise taxes levied on both gasoline and diesel fuel are higher still, costing NOK 1323/tCO_2e (USD 126) and NOK 2162/tCO_2e (USD 206) respectively (Norwegian Tax Administration 2022).

Table 3.2: Carbon and Excise taxes on Diesel Fuel in Norway 2018-2022

Year	Carbon tax (NOK/l)	Carbon tax (NOK/tCO2e)	Excise tax (NOK/l)	Excise tax (NOK/tCO2e)	Combined tax (NOK/l)	Combined equivalent carbon tax (NOK/tCO2e)
2018	1.33	500	3.75	1410	5.08	1910
2019	1.35	508	3.81	1432	5.16	1940
2020	1.45	545	3.62	1361	5.07	1906
2021	1.58	594	3.58	1346	5.16	1940
2022	2.05	771	3.52	1323	5.57	2094

Source: Government of Norway (2022) (Norwegian Tax Administration 2022)

Table 3.3: Carbon and Excise taxes on Gasoline Fuel in Norway 2018-2022

Year	Carbon tax (NOK/l)	Carbon tax (NOK/tCO2e)	Excise tax (NOK/l)	Excise tax (NOK/tCO2e)	Combined tax (NOK/l)	Combined equivalent carbon tax (NOK/tCO2e)
2018	1.16	507	5.17	2258	6.33	2764
2019	1.18	515	5.25	2293	6.43	2808
2020	1.26	550	4.91	2144	6.17	2694
2021	1.37	598	5.01	2188	6.38	2786
2022	1.78	777	4.95	2162	6.73	2939

Source: Government of Norway (2022) (Norwegian Tax Administration 2022)

Separate from the fiscal and behavioral incentives above, financial exnovative incentives are not meant to encourage the purchase of electric vehicles. They are, in fact, not meant to encourage anything. They are meant as deterrents, as a discouraging economic force, driving the price of an unwanted and harmful technology up. The high up-front costs of investing in an electric vehicle, including the non-necessary but useful costs of installing a home charging point raise the barrier to entry over that of an ICEV. However, the running costs of EVs are, in the long run, lower. Various taxes make up more than half of the fuel costs for ICEVs, with VAT, carbon taxes, and excise taxes on diesel and gasoline at 58% and 59%, respectively, resulting in running costs for ICEVs more than four times higher than EVs.

The above discussion of purchase/set-up costs versus running costs indicates that the fiscal incentive structure may be interpreted (and justifiably so) as benefiting the wealthier classes of society, who can afford to purchase EVs as secondary vehicles and charge them from home. The higher up-front costs of EV set up in the home are not an issue for those individuals who can afford it. The lower running costs then benefit those people, creating a disproportionate advantage for wealthier individuals. However, the new tax structure in effect in 2023, placing a price cap on VAT exemptions for "luxury" EVs, has been well received by the Norwegian public and should help dampen the potential price-discrimination effect.

In addition to carbon and excise taxes on fossil fuels, Norway took advantage of the existing tax structure for imported vehicles and enhanced it to have an even greater effect on the equitable suppression of sales of ICEVs. What might not be clear from looking at Figure 3.1 above is that the weight tax, NO_x tax, and CO_2 tax are all calculated based on the weight and emissions profile of the vehicle (Norwegian Ministry of Climate and Environment 2021). The advantage of a progressive tax structure such as this means that larger ICEVs with higher emissions profiles are

taxed at a higher rate than smaller, lighter, and lower emissions vehicles. Taxing new and relatively larger ICEVs likely will target wealthier consumers over lower-income households.

Section Conclusion

It is nowhere stated in Norwegian legal code or policy documents that internal combustion engine cars must not, under penalty of law, be sold after a certain date in Norway. Instead, targets are set, such as those in the 2021-2030 Climate Action Plan document, which details 2025 as the date set to achieve 100% sales of zero-emissions personal and light duty vehicles, and 100% of new local buses should be zero-emission or should run on biogas (Norwegian Ministry of Climate and Environment 2021). 2030 is set as the zero-emissions target date for 100% of all heavy vans, 75% of new long-distance buses, and 50% of new trucks, as well as emissions free goods distribution. However, none of these targets is enforceable by code or law. Rather they are all supported through the combination of innovation and exnovation incentives detailed above (I have only detailed incentives pertaining to personal vehicles, but similar incentives exist for the other vehicle types listed above). The lack of codified laws in combination with a plethora of progressively increasing policy instruments constitutes an implicit ban on ICEVs, in favor of electric vehicles.

The objective of the implicit ban must be inferred by the consumer (although the stated targets of the Norwegian Storting listed above certainly help narrow the field). The consumer infers what the government intends by following the policy that the government implements. As the Norwegian government steadily raises CO_2 and NO_2 taxes, and taxes emissions progressively, the consumer will infer that they are being intentionally priced out of emitting GHG. Then, when import, registration, and purchase taxes are eliminated for a different technology, which has the

potential to fill the space left by the suppressed old technology, the consumer infers that this is what they are supposed to use as the substitute technology. Overall, the effect of the economic incentives is to make EVs more appealing relative to ICEVs, such that they are purchased. This is beginning to work. In a survey conducted in 2017, 41% of respondents said that their primary reason for buying an EV was "to save money" (Lorentzen et al. 2017). It can be assumed that cost was also a strong factor for many other respondents. The importance of financial incentives must be noted by other countries attempting to encourage similar traditions, especially if those other countries do not benefit from the breadth of advantages that Norway holds in encouraging environmental activity.

Finally, as I will detail further in the conclusion section, these incentives only work once the replacement technology has matured enough to become a viable alternative to the old, harmful technology. The desire to protect nascent technology can be deduced from the Norwegian Climate Action Plan for 2021-2030, in its discussion of the rationale for different policy instruments. Emissions taxes are explained by the phenomenon that the "pricing of emissions is particularly effective when zero- and low-emissions solutions have reached the market, or are nearing market introduction" (Norwegian Ministry of Climate and Environment, 2021).

Conclusion: The Importance of Corporatism in the EV Transition

Summary

I have used this thesis to construct a framework to show how the electric vehicle transition in Norway is not the result of simple market or social forces. It was not the Norwegian pro-environmentalist sentiment alone, nor the economic incentives which allowed for a transition of

this scale and success to occur. In Chapter 1, I showed that while the MLP broadly describes the Norwegian transition, it is insufficient to explain the nuance that allows for a novel technology to develop so rapidly within a country that has such powerful non-environmental industrial regimes. In Chapter 2, I explained the structure of Norwegian governance, and showed how the interaction between interest groups and the government produces public policy. I then extrapolated this interaction to show how it supports the development of niche technologies. In Chapter 3 I detailed the economic and behavioral incentives encouraging EV adoption, explained the effects of exnovative policy, and tied them together by showing that the innovation-exnovation nexus is critical for creating a complete technology transition.

Discussion

Something that has been relatively absent from this thesis is a discussion of other aspects of Norwegian Industry, including oil and gas extraction, the fishing industry, and the hydropower complex. This has not been by accident; the scope of these issues is far too large to tackle in this thesis. However, they are worth addressing here in the concluding remarks in answer to the questions that might arise – is the high electric vehicle adoption rate in Norway the result of great national wealth? Is it caused exclusively by traditionally high environmentalist sentiment? How did it occur at all with two seemingly diametrically opposed interests vying for prominence? Norway, a country that relies so heavily on non-sustainable material exports for much of its wealth, would seem to have firmly entrenched economic interests in denying sustainable discourse entry to policy making spaces. Apart from the hydropower complex, however, this does not seem to be the case. As I have shown, environmentalism has both a long history in Norway, and is fully "institutionalized" in the legislative process. So how then do we rationalize the discrepancy

between the methods by which wealth is generated in Norway, and the strong social proclivity toward environmentalism?

One of the answers to this question is that Norwegian corporatism allows interest groups to sit at the same policy making table despite ideological conflicts (remember the fisheries episode). The system of input from non-government interest groups in Norway functions as a focal point for the high social value of environmental thought. The corporatist system allows non-government groups, like the Norwegian EV Association, to advocate for policy that is favorable toward their interests. But, because the corporate system is not limited to environmentalists, all interest groups, including proponents of oil and gas extraction and hydropower, can and do have input within the system. So, the advancement of EV transition legislation can, in this way, coexist with oil and gas extraction interests, despite the high level of national environmental sentiment.

If it is corporatism that allows for interest groups to enact policy, then by extension, it is corporatism that supports innovation. The actions of the Bellona Foundation and the Norwegian EV association are what initiated and supported the incentives that allowed EVs to flourish within Norway. If innovation stems from corporatism, where does the license for exnovation come from? Exnovation, being the intentional suppression of technology through legislation and policy, would have to come from politicians, supported by a broad consensus in the public that the exnovation is beneficial. Two pieces of evidence that I have already identified explain this. The first is the Brundtland report – a document from the then prime minister that reflected national environmental sentiment and its acceptance at even the highest levels of government. The second is the idea that corporatism through the committee system is simply the reflection of the broader will of the people, meaning that exnovation stems from the environmental sentiment that is the entrenched social value system that corporatism structurally represents.

Returning to Multilevel Perspective Theory, I would like to refine the framework that can be used to view the Norwegian EV transition. The three general levels are the *niche*, the *regime*, and the *landscape*, with (Figenbaum 2017) advocating for the addition of a level of national governance between the regime and the landscape. I argue that instead of national governance as an additional level above that of the *regime*, there should be added corporatism beneath the *niche*. Because innovation stems from corporatism, then corporatism must support that innovation. It must also support the *niche* in which the innovation takes place. In that way, corporatism, and Norwegian national governance as a whole, is not a mid-level component of MLP, but rather the foundation upon which it is built, in the Norwegian context specifically. A section of the Norwegian Climate Plan for 2021-2030 represents this idea well:

> *During the development of a technology, when solutions are not yet mature and costs are still high, it is important to improve the technology and drive down costs. The most important policy instrument at this stage is support for research, development and innovation on zero- and low-emission solutions. Norway is dependent on technological advances to achieve its targets. Without public support, there will be too little investment in these activities.* (Norwegian Ministry of Climate and Environment 2021)

This section shows that the national government understands the need for niche protection of novel technologies, and the role that the government plays in legislating these protections. It also shows an understanding of the importance of public support in the success of niche technologies and technology transitions.

Finally, to round out this framework of the Norwegian transition, I close with exnovation. Without exnovation, innovation has only an additive character, and serves only to supplement global production and widespread consumerism and does nothing to assuage the aggravation of ecological problems. Where the corporate system proactively supports niche protection, and, therefore, positively expands the innovation potential of a given system to foster a technology

transition, exnovation is a retroactive support. Corporatism and exnovation are mirrors of each other, each relying on differently expressed public support, to allow innovation to flourish in a productive direction. To summarize the framework that encompasses this transition, the corporate system supports the protection of niches, in which novel technology can develop to the point of market viability, after which exnovative policy allows that technology to take a prominent place in the market, forming a new technological regime.

Where to Go from Here?

The difficulty with attempting to apply lessons from the Norwegian example onto other countries and transitions is that Norway was able to take advantage of a unique set of circumstances. The strong public environmental sentiment in Norway is reflected in few other places. The ability for nearly 100% of all electricity needs within a country to be met by a renewable and clean energy source is almost equally rare. As the fifth most corporatized country in the world, there are few other places where the ideas and desires of the public can be as easily translated into policy as in Norway. But despite all of these hurdles, there are still important things to be learned.

The first is the importance of relative cost. The success of EV sales in Norway hinges almost entirely on the tax exemptions and lower relative cost of purchase when compared to ICEVs, especially among lower income households. Behavioral incentives such as free parking and toll reductions are policies that would likely find little pushback no matter how strongly an ICE regime lobbied against them. Finding ways to lower the relative cost of EVs is a critical component of supporting the transition. Whether or not the target country has tax structures that can be taken advantage of, as in Norway, there should always be ways to lower costs, such as subsidy programs. The difficulty is in identifying what those levers are. This is where

understanding how to create a targeted MLP framework for a particular country, as I have discussed, becomes important.

The second lesson is the importance of supporting innovation both proactively and retroactively. Proactive support is the function of the corporate system in Norway, and retroactive support is the manifestation of exnovation. Although the mandate for exnovation will be different from country to country, it is still necessary, as exnovation acts as the check on potential unwanted consequences of a technology transition.

The third and final lesson to be learned is the importance of time. Something that I have not stated explicitly but has been implicit throughout this report is the lengthy period of time over which this transition took place. Whether the origin of the EV transition is the effort of the Bellona Foundation lifting registration taxes, or even the Brundtland Report in 1987, kicking off an era of sustainability, both events happened decades before the first substantial progress was seen in transitioning the personal vehicle market toward EVs. This should signal strongly to other countries that policy to enable an EV transition must be implemented sooner rather than later.

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