

CLEAN ECONOMY WORKING PAPER SERIES

NOVEMBER 2020 / WP 20-11

THE STORIES THAT BIND US: ELECTROMOBILITY TRANSITION STORYLINES IN QUÉBEC, ONTARIO, AND ALBERTA

Nathan Lemphers

Post-Doctoral Fellow Institute of the Environment University of Ottawa

This research project was supported by Smart Prosperity Institute's Economics and Environmental Policy Research Network (EEPRN) and the Greening Growth Partnership Ce projet a été réalisé avec l'appui financier de : This project was undertaken with the financial support of:

Changement climatique Canada

Environment and Climate Change Canada

SSHRC **=** CRSH



The Clean Economy Working Paper Series disseminates findings of ongoing work conducted by environmental economic and policy researchers. These working papers are meant to make results of relevant scholarly work available in a preliminary form, as a way to generate discussion of research findings and provide suggestions for revision before formal publication in peer-reviewed journals.

The stories that bind us: electromobility transition storylines in Québec, Ontario, and Alberta

Nathan Lemphers*

Electrification is a crucial step in decarbonizing the transportation sector. As global momentum builds for electromobility, regional adoption of this new form of propulsion and implementation of supportive public policies remains highly varied, even within a single country. In part, this variation is a function of how powerful incumbent regional industries have engaged this potentially disruptive technology. This paper employs the multi-dimensional discursive approach to storyline formation, which considers how actors, context, and content shape storylines, and importantly, assesses the implications of these storylines for sustainability pathways. Using discourse analysis of regional sectoral trade publications from 2014 to 2020, this analysis identifies dominant electromobility storylines in three sectors in three Canadian provinces: Ontario's auto sector, Québec's electricity sector, and Alberta's oil sector. It provides insights on how actors can engage incumbent industries to harness powerful pre-existing and regionally-specific narratives that can accelerate regional electromobility efforts.

KEYWORDS: Transitions, Discourse, Multi-dimensional discursive approach, Electric vehicles, Incumbent industries, Pathways

JEL CODES: L10, Q55, R1, R48

ACKNOWLEDGEMENTS: This project has been supported in part through the Smart Prosperity Institute Research Network and its Greening Growth Partnership, which is supported by a Social Sciences and Humanities Research Council of Canada Partnership Grant (no. 895-2017-1018), as well as by Environment and Climate Change Canada's Economics and Environmental Policy Research Network (EEPRN). The author would also like to thank David Wolfe, Daniel Rosenbloom, Cameron Roberts, Kim Smet, and Alice Irene Whittaker, participants in the 2020 International Sustainability Transitions Conference, and two anonymous reviewers for their insightful comments.

^{*} Post-Doctoral Fellow, Institute of the Environment, University of Ottawa. nlempher@uottawa.ca

1.0 INTRODUCTION

As electromobility rapidly moves from an expensive niche experiment to an increasingly viable transportation option, the adoption rate of this new technology has varied widely across different regions. This regional variation, set against a common international context, shapes and reflects the preparedness of governments and powerful incumbent industries to harness this potentially disruptive technology, spur economic development, and accelerate decarbonization. What makes some regions enthusiastic adopters of electricity-powered transportation and others confident in the continued demand for gasoline and diesel? A comparative analysis of three Canadian provinces offers insights into this timely question. These three regions provide analytically useful variation in both preparedness for electromobility and industrial makeup. Hydropower-dominated Québec has created a flourishing environment for electromobility, while Ontario and Alberta continue to struggle. Ontario boasts a major automotive manufacturing industry, which should position it to embrace the competitive advantage that comes with technological innovation, but the province currently produces only one electric vehicle model. Alberta, a wealthy oil-producing province, has not bankrolled expensive electromobility policies, unlike its fossil fuelproducing peer, Norway. The unique political economy of these three regions of Canada has clearly played a strong role in shaping current electromobility policies.

Broadly, this paper examines how different industries in different regions have depicted electromobility and how these narratives are used to promote or inhibit the transition towards this new technology. At the heart of these narratives are storylines, which intentionally distill depictions of complex problems into simplified accounts (Hajer 2006). These mid-level accounts aggregate individual texts but are more specific than broader cultural tropes or repertoires (Swidler 1986). Crucially, storylines can unite coalitions and give groups political power. Some political actors use causal stories to deliberately grow support for their side (Stone 1989), while others use stories to delegitimize and marginalize the efforts of other groups. Storylines shape not only material interests but also policy outcomes (Kern 2012). In short, different storylines can catalyze different types of discourse coalitions and shape the imagination of policymakers.

Of course, electromobility is not a sustainability panacea. While it can substantially

reduce greenhouse gas emissions and allow for societies to reallocate money that would otherwise be spent on fossil fuels, it can also extend societal dependence on personal vehicles at the expense of other modes of transport. Electric vehicles (EVs) do not necessarily disrupt land use patterns or traffic congestion, and in some cases may worsen urban sprawl and commute times (Mattioli et al. 2020). The uncertain effects of EVs are exacerbated when they are combined with autonomous driving technology and new business models such mobility-as-a-service (Pangbourne, Stead, and Mladenović 2018; Sperling 2018). That said, with foresight, policymakers can better manage some of the downside risks of personal EVs, while maximizing the economic, social, and environmental benefits. The puzzle for policymakers and sustainability transition researchers is how to govern the adoption of electromobility in regions with powerful incumbent industries that have historically resisted electromobility policies.

This paper employs Rosenbloom et al.'s (2018) multi-dimensional discursive approach to storyline formation, which considers how actors, context, and content shape storylines, and importantly, assesses the implications of these storylines for sustainability pathways. It examines how three powerful incumbent economic sectors frame electromobility and, in doing so, shape how three regions resist or embrace this new technology.

This study makes four contributions to transition literature. First, it applies the multi-dimensional discursive approach in a new comparative context. This recent theoretical addition to the transitions literature has not yet been employed to juxtapose economic sectors and jurisdictions (Rosenbloom, Berton, and Meadowcroft 2016; Rosenbloom 2018). Moreover, existing studies of socio-technical storylines have examined a single sector in a single geography (Rosenbloom 2018; Roberts and Geels 2018; Smith and Kern 2009; Bosman et al. 2014). Second, this study compares three subnational regions. Most discursive analysis of sustainability transitions take place at the national level (Isoaho and Karhunmaa 2019; Kern 2012). Third, the analysis examines sectoral trade association publications, rather than mainstream media publications, which are a typical data source for discourse analysis (Barry, Ellis, and Robinson 2008; Stauffacher et al. 2015). As a result, the storylines documented in this study are those expressed by and for sectoral members. This narrower scope enables the analyst to better understand the dominant views within a given sector towards electromobility. Fourth, this paper reflects on the role of agency and political struggle within transitions

research. It applies and extends the multi-regime interaction typology developed by Raven and Verbong (2007) on the historical and potential future dynamics regarding electromobility among Alberta's oil industry, Ontario's auto industry, and Québec's electricity industry. This is particularly germane for policymakers and those wanting to build coalitions among powerful incumbent industries that can hasten sustainability transitions. This study demonstrates the need for political actors to link the stories they use with powerful pre-existing and regionally-specific stories to deepen the discursive resonance of pro-electromobility storylines. In the case of Canada, a highlydecentralized federation, with distinct and sometimes divisive regional identities, certain electromobility storylines could also be used to unite different regions.

2.0 APPROACH

The multi-dimensional discursive approach is a recent development in the sociotechnical transitions literature that hybridizes discourse theory and methods with the multi-level perspective and adapts them for the study of sustainability transition storylines (Rosenbloom 2018). The discursive approach has arisen over the last decade as a valuable methodological tool to demystify the politics of sustainability transitions (Isoaho and Karhunmaa 2019). Within this largely qualitative and interpretive approach there are three main methodologies — discourse analysis, frame analysis, and narrative analysis — which are based upon a variety of theoretical approaches (e.g., Hajer 1995; Schmidt 2008; Goffman 1974; Roe 1994). The multi-dimensional discursive approach employs qualitative discourse analysis (Hajer 1995, Hajer, 2006 #213; Stone 2012).

The multi-level perspective (MLP), which has its roots in evolutionary economics and technology studies, examines the interactions among three interconnected levels: the landscape, the regime, and the niche (Geels 2002). It assumes that socio-technical transitions are the result of landscape pressures (e.g., accelerating decarbonization efforts), problems within a regime (e.g., pollution from personal transportation), and the preparedness of niche innovations (e.g., electric vehicles) to exploit windows of opportunity to destabilize and eventually displace the existing socio-technical configuration. Destabilization is a process of political and cultural delegitimization (Turnheim and Geels 2012). The preparedness of niche innovations to displace incumbent configurations is a function of not just technological prowess but also

garnering sufficient legitimacy (Geels 2011). This legitimacy can be acquired through support and resources from already powerful, incumbent actors.

The multi-dimensional discursive approach brings together the MLP with discourse theory and methods to examine how "actors struggle to build legitimacy within transition fulfills an important role in these dynamic, multi-causal, and multifaceted processes" (Rosenbloom, Berton, and Meadowcroft 2016: 1277). This hybridized approach examines (1) how actors within the MLP frame technologies in public policy debates; and (2) the iterative process by which frames are developed by the ideational capacity of actors (i.e., resources, creativity, and perceived interests) to connect content and contextual claims which both intentionally frames a given technology and proposes a certain path forward. Following Rosenbloom (2018), the units of analysis are a) actors, who perform so as to further their perceived interests; b) the content or claims of the socio-technical features of a technology; c) the context or setting where a technology is debated, created, and deployed; and d) the implications of storylines for a sustainability pathway (Figure 1). In a dynamic and repeated process, actors strategically shape and select content-related claims about an innovation while simultaneously considering the context of where that innovation is diffusing. Storylines emerge from this process that cast the innovation in a particular manner and carry different implications for sustainability transitions.



Figure 1: The multi-dimensional discursive approach to storyline formation (Rosenbloom 2019)

In order for a storyline to be used as a political tool and gain traction with policymakers and the public, it must have discursive resonance. Based on Benford and Snow (2000), Geels (2011) and more recent work by Roberts (2018) and Rosenbloom (2018), the discursive resonance is a function of the strength of a storyline's constituent parts (i.e., believability of claims, centrality of issue, credibility of the messenger) and the degree of alignment among these parts. A claim is believable when there is compatibility between its content and widely-acknowledged, though not necessarily objectively accurate, perceptions of reality. Issue centrality concerns the perceived importance of the debate, as it relates to broader contextual developments. Messenger credibility relates to the perceived knowledge and trustworthiness of storyline messengers, which can vary across communities based on differing worldviews. If these three storyline parts (i.e., content, context, and actors) are strong and there is alignment among them, then a storyline has discursive resonance.

This research examines two questions: What are the most notable electromobility storylines in each jurisdiction and within relevant sectors? And what implications do these sectoral storylines have for a regional transition to electromobility? In answering these questions, analysts can better understand why some regions have quickly become electromobility leaders while other regions have struggled to adopt and promote this technology. More practically, this analysis provides insights into how incumbent regional economic actors can alter the stories they tell about electromobility to better capture the benefits from this potentially disruptive technology.

3.0 METHODS

Through discourse analysis of regional and sector-specific trade association publications from January 2014 to April 2020, this research identifies the dominant storylines voiced in different sectoral trade publications in Ontario, Québec, and Alberta. During this time period the diversity, affordability, range, and number of EVs rapidly increased. While EVs have existed since the dawn of the automobile, their emergence on the production lineup of modern automakers has been relatively recent.

Between 2014 and 2018, the global deployment of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) increased seven-fold from 712,250 to 5,122,460 (International Energy Agency 2019).

These three provinces were selected because of their analytically useful variation in EV adoption and EV policies. While all three provinces began with very few EV policies and EVs on the road, each province has followed a different electromobility pathway. As will be shown below, Alberta has long had an unfavourable EV policy environment and very few EVs. In 2018, there was 0.4 EVs (battery electric, plug-in hybrid electric, hybrid) registered per 1000 inhabitants in Alberta (Figure 2). Québec has had consistent and comprehensive EV policies and a relatively high number of EVs. In 2018, there was 2.9 EVs registered per 1000 inhabitants in Québec (Figure 2), over seven times the amount in Alberta. In between Alberta and Québec is Ontario. Canada's most populous province has had a number of important EV policies many of which have recently been repealed. The province has a moderate amount of EVs: in 2018 there was 1.8 EVs registered per 1000 inhabitants in Ontario (Figure 2).

These three provinces were also selected because each has a different dominant economic sector: oil production in Alberta, auto manufacturing in Ontario, and electricity in Québec. The three economic sectors were chosen because of their oversized economic and cultural impact in each province. Canada's oil industry is largely based in Alberta and has been the economic mainstay of the province since the 1950s. In 2019, oil and gas extraction contributed \$81B or 24 per cent to the provincial economy (Statistics Canada 2020f), and directly employed 141,700 Albertans (Statistics Canada 2020d). The Government of Alberta is highly dependent on revenue from the oil industry, which in fiscal year 2018/19 amounted to \$5.2B or 11 per cent of annual government revenue (Government of Alberta 2020). During boom years of 2004/5, 40 per cent of government revenue came from the industry. In February 2020, Canada's oil industry generated \$6.8B in export earnings (Statistics Canada 2020b).

Canada's automotive manufacturing industry is primarily based in Ontario. In 2019, Ontario's motor vehicle and parts manufacturing sector contributed \$13.9B to Canada's GDP, representing 87 per cent of the national contribution of this sector (Statistics Canada 2020g). In 2019, the auto industry generated around 2 per cent of Ontario's GDP (Ontario Ministry of Finance 2020). In February 2020, there were 40,891 Canadians directly employed in auto assembly and 74,195 in auto parts manufacturing (Statistics

Canada 2020e). In February 2020, the auto parts and vehicles sector contributed to \$7.4B in export earnings (Statistics Canada 2020c).

Ontario's auto sector has been highly integrated with auto production in the United States — especially since the 1964 Automotive Products Trade Agreement — but the sector begun to contract over the last few decades. As of 2016, 85 per cent of Canadian vehicle production and two-thirds of parts production are sold in the United States (Stanford 2017). Over the past two decades, only one new assembly plant opened and six plants operated by Ford, GM, and Fiat Chrysler have closed as auto manufacturers move to lower cost jurisdictions in the Southeastern United States and Mexico (Yates and Holmes 2019). Canada produced 967,0777 passenger vehicles in 2000 and 461,370 passenger vehicles in 2019 (OICA 2020). Combined with increasing automation, Ontario's auto sector has lost 45,000 jobs or 26 per cent of its workforce from its peak in 2000 (Rubin 2017).

Most of the passenger vehicle assembled in Ontario are fossil-fueled large sedans or sport-utility vehicles. Only one plug-in hybrid electric passenger vehicle is made in Ontario, the Chrysler Pacifica. No battery electric passenger vehicles are made in the province.

While proportionally smaller than Alberta's oil industry, Québec's electricity sector, led by Hydro-Québec, exerts a disproportionately large presence on the province's cultural landscape and remains a leading symbol of Québec economic nationalism (Savard 2013). Through a monopoly, the public utility manages the generation, transmission, and distribution of electricity in Québec and exports power to neighbouring provinces and the northeastern United States. In 2019, Hydro-Québec generated \$2.9B in profit for the provincial government and the broader electricity sector directly contributed \$11.7B to the provincial GDP (Hydro-Québec 2020; Statistics Canada 2020f). In 2018, the sector directly employed 40,200 Québec residents and created \$5B in exports (AIEQ 2020). Over 99 per cent of electricity generated in Québec is from sources that do not emit greenhouse gases (AIEQ 2020).

I selected member-facing publications from these three regional industry associations that were publicly and digitally available and published between January 2014 and April 2020. These publications present issues that are of interest and relevance to industry association members. By identifying if, when, and how these industry associations mention electromobility, it is possible to assess the relative importance and

discursive resonance of electromobility for these sectors. The Alberta-based Canadian Association of Petroleum Producers (CAPP) was selected because it represents most upstream oil and gas producers and is the largest and most active oil and gas industry association in the country. CAPP members produce approximately 80 per cent of Canada's oil and gas, principally from Alberta. This analysis examined the storylines present in CAPP's Context magazine. While CAPP is a national association and represents upstream producers in British Columbia, Saskatchewan, and Newfoundland and Labrador, around 82 per cent of Canada's oil is produced in Alberta. As a result, the *Context* magazine has a heavy focus on Alberta and for the purposes of this analysis the magazine serves to represent the views of the upstream petroleum industry in Alberta. Ontario-based Automotive Parts Manufacturers' Association (APMA) was selected because of the relatively large size of the auto parts manufacturing subsector within the broader auto industry. APMA's 192 members comprise original equipment manufacturers (OEM) that produce parts, tools, supplies, advanced technology, and offer services for the auto industry. This analysis studied the storylines present in APMA's member magazine, Lead, Reach, Connect. The Association de l'industrie électrique du Québec (AIEQ) is Québec's electricity sector industry association. AIEQ's 350 members include power producers, engineering firms, manufacturers. This analysis examined content from AIEQ's member newsletters and its *Lumière* magazine.

This discursive analysis contained three phases. First, a detailed review of articles (i.e., at the sentence and paragraph-level) identified emergent themes and categories. These articles were selected via keyword search. Second, I refined previously identified themes and categories. Third, I assessed article-level frequency of storylines. Since the newsletters and magazines contain multiple articles, multiple article-level references exist in some publications.

To supplement this analysis, I used secondary sources (e.g., academic articles, other industry publications) to provide relevant contextual data. Moreover, feedback was sought by sectoral experts during semi-structured interviews to confirm the storylines identified in the textual analysis and to share alternative views. This helped to test our assumptions, enlarge the range of our samples, and catalogue counter-discourses.

4.0 ELECTRIC VEHICLE POLICY SUPPORT AND ADOPTION

This section describes the policy and adoption of EVs in Ontario, Alberta, and Québec and is followed by the discourse analysis, which outlines the dominant storylines in each of the three trade sector publications.

4.1 Ontario

For two decades, Ontario has had a variety of purchase and use incentive policies to promote electromobility; however, these policies have not resulted in a significant adoption of electric passenger vehicles (Figures 2 and 3). In 2001, the provincial government introduced a \$1,000 provincial sales tax rebate for purchased hybrid electric passenger vehicles (Chandra, Gulati, and Kandlikar 2010). The following year, the program was expanded to include hybrid electric SUVs and trucks. In 2006, the tax rebate was doubled to \$2,000 and made available at point of sale (Antweiler and Gulati 2013). A 2007 climate plan pledged a 13 per cent reduction of passenger vehicle emissions from 1990 levels by 2020. However the plan lacked any comprehensive longterm vision and largely catalogued existing initiatives (Winfield and MacDonald 2012). In 2009, the province set a goal for five per cent EV sales by 2020. In 2010, Ontario expanded its purchase incentive program for hybrid electric vehicles to include PHEVs, becoming the first province in Canada to do so. Between 2011 and 2015, the Ontario government introduced six programs to support installation of home and public charging facilities. In 2016, the province once again increased the purchase incentive for both EVs and home charging infrastructure. A June 2016 climate plan by the then Liberal government proposed several new EV policies, including changing the building code to require new buildings to be EV-ready and free overnight residential charging. However, when a Conservative government was elected in 2018, it cancelled all of the EV purchase incentive programs and began to remove electric vehicle chargers from commuter rail parking lots. This weak and intermittent policy support for decarbonizing transportation in Ontario contrasts considerably from the province's leadership in decarbonizing electricity generation (Rosenbloom 2018; Winfield 2012).

Between 2011 and 2018, Ontario's combined hybrid, PHEV, and BEV car sales largely mirrored the Canadian average (Figure 2). When the purchase incentive program was removed in Q3 2018 EV sales plummeted. In 2019, BEV and PHEV sales in Ontario fell by 48 per cent compared to 2018 (Statistics Canada 2020a). As of Q1 2019,





Figure 2: New BEV, PHEV and Hybrid car registrations per 1000 people in Canada, Québec, Ontario, and Alberta. Source: Statistics Canada, Government of Alberta, author's calculations





4.2 Alberta

Alberta continues to be a laggard on policies to support the purchase and use of EVs. The province has never had an EV strategy and the 2015 Climate Leadership Plan did not identify transportation as a strategic area of emissions reduction. Unlike Ontario and Québec, there have never been any provincial incentives for Alberta residents to purchase an EV. There have been only two EV-related provincial grants, both by the centre-left New Democratic Party government of Rachel Notley (2015-2019). In 2018, Alberta provided \$5m to the Municipal Climate Change Action Centre to subsidize the purchase or lease of EVs for municipalities and for EV charging infrastructure at municipal facilities. By April 2020, only \$400,000 of these funds had been allocated. The other provincial initiative that promoted the use of EVs was in 2019 for a one-time \$1.2m in funding for 20 fast charging (Level 2) stations in Southern Alberta.

Despite the absence of provincial government support, in 2018 the cities of Edmonton and Calgary introduced zero emission vehicles (ZEV) strategies. In 2020, Edmonton announced a partial rebate for e-bikes and home and business-based EV charging equipment.

As of Q1 2019, Alberta had an estimated 2269 BEV and PHEVs in the province (Electric Mobility Canada 2019). On a per capita basis, this is approximately 5x fewer ZEV than the national average and 10x less than Québec ownership levels (Figure 3). Even including non-plug-in hybrid, ownership levels for electric vehicles in Alberta remains far below Ontario and Québec (Figure 2).

4.3 Québec

Of the three provinces, Québec has had the longest and most ambitious engagement with electromobility. Shortly after the 1973 oil-price shock, Hydro-Québec's *Institut de Recherche d'Hydro-Québec* (IREQ) began working on groundbreaking battery and electric drive research for the transportation sector (Haley 2014). IREQ's work from the 1980s and 1990s, eventually led to the commercialization of a solid-state lithium polymer battery and electric drive technology. Beginning in 1996, the Québec government funded an EV experimentation centre (CEVEQ) that promoted the design, development, and testing of EVs in the Laurentides region north of Montréal. CEVEQ would play a key role in creating an EV innovation ecosystem in Québec, with strategic linkages to France's auto sector. In 2000, Québec announced a provincial sales tax rebate of up to \$1,000 for vehicle model years 2006 onwards — a sum that was doubled in 2006 (Chandra, Gulati, and Kandlikar 2010).

Following Hydro-Québec's electric ground transportation plan of 2009 (Hydro-Québec 2009), the provincial government released a 2011-2020 Electric Vehicle Action Plan (Gouvernement du Québec 2011). This plan included EV targets for light passenger vehicles (5% of fleet by 2020 or around 300k vehicles, 18% by 2030) and public transportation (95% of trips by 2020). It also included additional purchase incentives for households, as well as new incentives for car sharing and taxi companies and public transport authorities. In 2012, a point-of-sale cash incentive of \$5,000 to \$8,000 was given to PHEVs or BEVs (Antweiler and Gulati 2013). The plan also promoted industrial development through research, cluster development and the design and construction of a Québec electric bus, which included Québec-based companies like bus manufacturer Nova Bus, battery manufacturer Bathium Canada, electric drive company TM4 and the Montréal-based Aluminum Association of Canada.

In 2015, the Québec government released a five-year Transportation Electrification Action Plan. This plan revised downwards the EV fleet targets and further increased the scope of policies to promote the purchase and use of EVs. As part of this plan, in 2016 the provincial government adopted a zero-emission vehicle (ZEV) mandate that required car manufacturers to accumulate a minimum number of ZEV credits from sales of ZEVs and low-emission vehicles. The ZEV mandate, which came into force in 2018, requires that 10-12 per cent of light duty vehicle sales must be EVs by 2025. In 2017, green license plates for EVs became mandatory which allowed EV owners free access to certain charging stations, ferries, and toll roads, and privileged access to certain carpool lanes. These provincial incentives helped to reduce the cost of EV ownership and reduce commute times for EV owners.

Alongside these provincial efforts, Montréal developed its own ambitious 2016-2020 Transportation Electrification Strategy. This strategy proposed the purchase of nearly 1,000 electric or hybrid buses by 2025 and exclusive purchase of electric buses after that, as well as the installation of a 1000 EV charging stations.

On an absolute and per capita basis Québec leads Ontario in ownership of BEV and PHEVs with 42,551 vehicles in Q1 2019 representing approximately 5 vehicles per 1000 people (Figure 3) (Electric Mobility Canada 2019). Between 2012 and 2018, the number of new registrations of EVs per year in Québec surpassed both Alberta and Ontario (Figure 2).

5.0 DISCURSIVE STORYLINES

Based on the discourse analysis of regional industry association publications between 2014 and 2020, three legitimizing storylines, one neutral storyline, and three delegitimizing storylines emerged as contending accounts of electromobility. In terms of legitimizing storylines, electromobility was framed as *enhancing competitiveness* (L1 in Table 1), *reducing pollution* (L2 in Table 1), and *increasing convenience* (L3 in Table 1). One neutral storyline focused on the *disruptive* potential of electromobility (N1 in Table 1). With respect to delegitimizing storylines, electromobility was cast as *not ready* (D1 in Table 1), not benign (D2 in Table 1), and ineffective (D3 in Table 1).

Storylines	Illustrative narratives using storylines
L1: Enhance Competitiveness	EVs creates new demand for electricity and are a source of innovation
L2: Reduce Pollution	EVs reduce greenhouse gas emissions and local air pollution compared to ICEVs
L3: More Convenient	EVs are more comfortable and equipped with the latest technologies
N1: Disruptive	EVs reduce oil demand; EVs will change how we manage our supply chain
D1: Not Ready	It takes too long to charge an EV; The battery supply chain is underdeveloped
D2: Not Benign	EVs can be more polluting than ICEVs on a coal- powered electricity grid; Battery materials create social and environmental harm
D3: Ineffective	More emissions can be reduced at a lower cost in other sectors

 Table 1: Contending storylines on electromobility

Using the multi-dimensional discursive approach to storyline formation, this analysis of the seven storylines focuses on components of storylines (i.e., actors, content, and context) and their occurrence over the study period. In general, storyline use varied significantly among industry associations and over time (Tables 2 and 3). AIEQ was the earliest to mention electromobility and the most consistent user of legitimizing storylines. CAPP was the latest to the electromobility debate and the most consistent user of delegitimizing storylines.



Figure 4: Storyline instances from 2014 to 2020 from all three sectoral trade publications.

An examination of the Auto Parts Manufacturers' Association *Lead, Reach, Connect* magazine reveals how little electric vehicles are mentioned in communication to its members. Between 2014 and 2020, there were only eleven articles that mentioned electromobility, in 2015, 2016, 2017, and 2018 (Table 2). Of these eleven articles, two contained delegitimizing storylines ('not ready' (D1) and 'not-benign' (D2)), and nine contained legitimizing storylines (three mentioned 'enhances competitiveness' (L1), three mentioned 'reduces pollution (L2), and three mentioned 'more convenient) (Table 3). Given the disruptive potential of electromobility for automotive parts manufacturers, the limited discussion of this new technology on the sector is somewhat surprising. In contrast, the disruptive potential for connected and autonomous vehicles was the subject of much more extensive and positive discussion in APMA's magazine.

Table 2: Article-level mentions over time by industry association

	CAPP	APMA	AIEQ
2014			1

2015		2	1
2016		3	7
2017	3	1	1
2018	2	7	2
2019	3		4
2020	1	1	1

CAPP's coverage of electromobility was most notable by its absence. During the study period, no articles were written exclusively on electric vehicles. The oil industry association's *Context* magazine only started to mention electromobility in 2017 and then, only infrequently (Table 2), appearing in articles about other topics. Between 2014 and 2020, there were only nine articles that mentioned electromobility, in 2017, 2018, and 2019. These passing references suggests that transportation electrification was not a priority for CAPP's membership. Perhaps unsurprisingly, when CAPP mentioned electromobility it was consistently presented in a delegitimizing storyline (Table 3). Electrified transportation was portrayed as not ready (D1) and not benign (D2). More often than not, attention was redirected to more effective alternatives (D3). By contrast eight articles referred to the economic and environmental promise of natural gas vehicles (NGVs) despite the market for NGVs remaining non-existent. In 2018, there were only 182 NGVs registered in Alberta, 104 times less than the already small market of EVs (Government of Alberta 2019).

Given the potential for electricity to erode the oil industry's transportation fuel monopoly, both domestically and internationally, it is somewhat surprising that there was very little discussion of electromobility in the *Context* magazine. Admittedly, Albertan or Canadian EV policies may have little impact on overall demand for Alberta crude oil — 88 per cent of Alberta's oil production was exported to the United States in 2019 (Canada Energy Regulator 2020). However, low-carbon fuel or vehicle policies in the United States, such as California's recent ban on ICEV sales by 2035, or in potential new markets like China, could have a significant impact on Alberta's oil demand. In 2019, 74.5 per cent of oil refinery production in the United States was for gasoline and diesel fuel (United States Energy Information Administration 2020). If demand for transportation fuels declined, distant, high-cost, high-carbon oil sources, such as those found in Alberta, would be most vulnerable.

The AIEQ's newsletter and *Lumière* magazine contained, in a sustained manner, exclusively positive electromobility storylines. Articles in these publications mentioned electromobility every year from 2014 to 2020 (Table 2), with fourteen articles that mentioned how electromobility enhances the competitiveness of Québec's electricity sector (L1) and two articles that mentioned how electrified transportation in Québec is virtually carbon-free (L2; Table 3).

		CA	APM	AIE
		PP	А	Q
L1	Enhances Competitiveness	0	3	14
L2	Reduces Pollution	0	3	2
L3	More Convenient	0	3	0
N1	Disruptive	2	3	1
D1	Not Ready	1	1	0
D2	Not Benign	2	1	0
D3	Ineffective	4	0	0
	Total	9	14	17

Table 3: Storyline mentions by industry association

The following section examines the most frequently cited legitimizing, neutral, and delegitimizing storylines in more detail (L1, N1 and D3). Using the multi-dimensional discursive approach, these storylines can be analyzed to examine the actors involved, content-related claims, contextual factors, and the implications. The characterization of these narratives was tested for accuracy and completeness with sector stakeholder interviews.

L1: Enhances Competitiveness

- Actors: Hydro-Québec, AIEQ, IREQ, TM4, Government of Québec, battery manufacturers and recyclers, APMA
- Content-related claims: Source of innovation, develops new markets, increases demand, leverages existing companies, policy support
- Contextual factors: Québec has long used electricity to pursue regional economic development, IREQ has been an early leader in electric drivetrain and battery technologies, many governments plan to ban sales of ICEVs within two decades, major automakers plan to introduce many new BEV models in next five years, rapid adoption of EVs underway in China and EU
- Implications: Design and manufacture of electromobility technologies in Québec, export these technologies, new markets created (battery recycling), attract skilled labour to the region

The competitiveness enhancing storyline was by far the most dominant legitimizing storyline in the AIEQ texts, representing 14 of 17 article-level mentions. Competitiveness was seen broadly. Actors referred to electromobility as helping not only electricity sector in Québec but also firms in other sectors, such as mining or transportation, and the province overall. There were many constituent narratives that could be grouped under this storyline including casting electromobility as a source of sectoral innovation, an opportunity to develop new markets, a way to increase demand for existing products. Moreover, electromobility was depicted as having a firm foundation with existing public policy support and established companies engaged in capitalizing on this new form of mobility. Of the three mentions of the competitiveness storyline in the APMA magazine, one was from Québec's Minister of Economy, Innovation, and Exports, one was from auto sector consultants, and one from APMA's President noting how electromobility is enhancing the competitiveness of China's economy. Of note, all three cases did not explicitly frame electromobility as enhancing the competitiveness of Ontario's auto sector but rather of other sectors or regions.

N1: Disruptive

- Actors: CAPP, APMA, AIEQ, International Energy Agency
- Content-related claims: EVs can create uncertainty, EVs may reduce oil demand or change how supply chains are managed

- Contextual factors: The disruption from EVs is in an early phase, there are competing understandings of the timing and magnitude of the disruption
- Implications: Stimulate demand for existing products, increase supply chain resilience, reposition to secure economic gains from electromobility

All three industry associations mentioned the disruptive potential of electromobility in a total of six different articles. However, these mentions were not evenly distributed. APMA publications had three mentions of this storyline, CAPP had two mentions, and AIEQ had a single reference (Table 3). Given the small proportion of transport that is currently electrified, significant uncertainty remains for how broader electrification will impact these three industries. This is especially true for Alberta's oil sector and Ontario's auto sector which, beyond the rise of electromobility, are already facing significant change. This uncertainty storyline could infer both positive and negative economic outcomes.

D3: Ineffective

- Actors: CAPP, International Energy Agency, Canadian Fuels Association
- Content-related claims: Other sectors are more polluting than transport, other technologies have lower abatement costs, demand for gas and diesel remains strong
- Contextual factors: EVs represent very small proportion of existing vehicles, GHG emissions come from many sectors
- Implications: Electromobility has less decarbonization potential than other sectors, Prioritize climate policy efforts on other economic sectors

The delegitimizing storyline that pursuing electromobility was ineffective was promoted exclusively in four articles within CAPP's *Context* magazine and highlighted analysis of the International Energy Agency and the Canadian Fuels Association, Canada's association for petroleum refining, distribution and marketing. This storyline minimized the disruptive potential of electromobility, emphasized the continued demand for gasoline and diesel, and redirected attention to decarbonization efforts elsewhere, since other sectors are a) more polluting than transportation, and b) provide lower cost greenhouse gas abatement opportunities. Proponents of this storyline also emphasized the current dominance of ICEVs. The implication of this storyline is that climate policy interventions should be focussed on other economic sectors.

6.0 DISCUSSION

This study explores how three different sectors from three different regions portray electromobility. It applies the multi-dimensional discursive approach to examine how these three powerful incumbent industries framed the disruptive potential of electrified transportation, and in doing so shows how ideas, interests, institutions, and infrastructure interact to shape the transition to electrified transportation. To undertake this analysis, we looked to the dialogue taking place in sectoral safe places, where industry actors speak to their peers: sectoral trade publications. In this section, we assess the discursive resonance of electromobility storylines in each industry, we locate these industries on a timeline of discursive patterns, and we probe the potential intersectoral dynamics among these industries in a future where transportation is overwhelmingly electrified.

6.1 Discursive Resonance

A storyline has discursive resonance when its constituent parts (i.e., believability of claims, centrality of issue, credibility of the messenger) are both strong and aligned. As underscored in the multi-dimensional approach to storyline formation, the broader context and implications of storylines are also crucial to assessing the impacts on sustainability pathways.

All three sectors are currently undergoing significant regional change. Alberta's high-cost and emission-intensive upstream oil sector is witnessing the flight of global capital and facing increasing difficulty getting its product to market. Ontario's auto sector is grappling with increasing automation, digitization, and increased competition from other auto manufacturing regions in North America. Québec's electricity sector is seeing heightened demand for its low-cost, emission-free energy both from within the province and from neighbouring jurisdictions.

During the 2014 to 2020 study period, each of these regionalized sectors took three different approaches to electromobility. Alberta-based CAPP first ignored and then

sought to delegitimize the disruptive potential of vehicle electrification and stabilize the existing discursive regime of fossil-fueled mobility. The ineffective storyline promoted by Alberta oil producers — who sought business-as-usual expansion — had strong discursive resonance. It was believable and aligned with a perception of reality in the province that demand for fossil fuels will continue to grow for decades. It had issue centrality, as the debate over EVs in Alberta is linked to the broader debate about the future of the oil industry. And it had credible messengers, CAPP and the sources it used to discuss electromobility, such as the International Energy Agency. With the strength and alignment of content, context, and actors, the ineffective storyline easily managed to avoid a discursive contest within CAPP's member publication with any competing pro-electromobility storylines.

Ontario's auto sector has been reticent to discuss the impacts of electromobility on regional auto parts manufacturers. When they are discussed in APMA's magazine, there is not a single storyline that receives significantly more attention than others, unlike with CAPP (D3) and AIEQ (L1). Also, unlike the other two industry associations, APMA published narratives that were both for and against electromobility. The lack of consistent focus undermines the believability of the claims and the perceived importance of the electromobility debate. Despite APMA's credibility as a messenger, the poor alignment across storylines reduced the discursive resonance of a proelectromobility discourse.

Québec's electricity sector consisted of exclusively positive electromobility storylines. Unlike APMA, AIEQ focussed its commentary on the competitivenessenhancing potential of electromobility (L1). Given the long-standing image of electricity as driver of provincial economic development, the competitiveness storyline is believable. Further, AIEQ linked the success of electromobility to the success of the electricity sector, contributing to the centrality of transportation electrification. Credible messengers in the form of senior leadership from AIEQ, Hydro-Québec, and the provincial government all shared the strategic importance of electromobility. When combined, the claim believability, issue centrality, and messenger credibility, all aligned and underscored the strong discursive resonance of the pro-electromobility storyline.

6.2 Timeline of Discursive Patterns

This analysis took a snapshot of the discursive struggles over electromobility within three powerful economic sectors. From this snapshot, it is possible to situate these incumbent industries on a generalized timeline of discursive patterns, as proposed by Rosenbloom (2018), which mark the framing struggles of sustainability transitions, in this case within a specific sector (Figure 5). As this timeline indicates, there is no single discursive trajectory. Instead, multiple outcomes are possible as disruptive storylines emerge, fade away or take hold. By examining the timing and frequency of legitimizing or delegitimizing storylines, it is possible to infer the location of sectoral discourses on Figure 5.

No storylines exist within Alberta's upstream oil sector that legitimize the disruptive potential of electromobility. A within-sector discursive struggle has not occurred, and industry actors have either ignored or firmly held on to storylines that delegitimize electromobility.

Ontario's auto sector is at a tumultuous moment in the discursive contest over electromobility. The existing discursive regime supporting ICEVs is destabilizing and storylines that promote electromobility are appearing in APMA's trade publication. New Ontario-based institutional actors such as Electric Autonomy Canada, the Autonomous Vehicle Innovation Network, and Plug N' Drive are promoting new legitimizing storylines. That said, in the case of APMA's publication, these legitimizing storylines have not achieved the discursive resonance necessary to overwhelm status quo storylines.

In contrast, there is a strong discursive resonance for electromobility storylines within Québec's electricity sector during our study period. These legitimizing storylines have overcome what framing struggles existed over electromobility in earlier time periods in Québec. For instance, Haley (2015) described that between 1995 and 2007 there was conflict within the electricity sector over electromobility, particularly over the fate of electromobility technologies developed by Hydro-Québec. The utility pivoted away from commercializing some of its battery technologies for the auto sector and instead targeted application for the telecommunications sector. It also reduced the scope of its motor-wheel project. These controversial actions prompted a parliamentary committee hearing, and several prominent scientists to leave Hydro-Québec. In sum, this snapshot reveals that these three sectors occupy unique locations on a timeline of discursive patterns regarding framing struggles. Those locations carry with them

different implications for the strategic and region-specific next steps for those promoting electromobility.





6.3 Inter-sectoral Dynamics

Beyond describing within-sector framing struggles, this analysis also provides insights on inter-sectoral dynamics regarding electromobility. Building on the sociotechnical regime literature, Raven and Verbong (2007) created a useful four-fold typology to describe multi-regime interactions: competition, symbiosis, integration, and spill-over. Competition occurs when different regimes start realizing similar functions. Symbiosis describes a mutually-beneficial relationship among regimes. Integration is when previously distinct regimes more or less merge. Spill-over refers to when rules are transferred from one regime to another. For this analysis, I have added separation, which indicates a lack of interaction among regimes.

During the ICEV-dominant study period, Québec's electricity sector was largely separate from Alberta's oil industry and Ontario's auto industry (Figure 6). By contrast,

the oil industry and the auto industry have long reaped the benefits of a symbiotic relationship, where increased demand for ICEVs and increased vehicle kilometres travelled stimulated demand for fossil fuels, and cheap fossil fuels stimulated demand for large, inefficient ICEVs (Sovacool 2009).

In an EV-dominant world, each sectoral dyad could have multiple outcomes. The auto and electricity sectors may see increased competition over aspects of the electromobility paradigm, such as ownership of EV charging facilities and EV-related intellectual property; whereas the use of electricity as a fuel may create similar symbiotic dynamics as the auto and oil industries have historically enjoyed. The electricity and oil sector dynamic will likely turn to competition as electricity increasingly substitutes gasoline and diesel as a transportation fuel. However, there could be some integration if fossil fuel companies become major electricity producers. This is already the case for some oil sands producers in Alberta and some international oil companies (e.g., BP, Total, Shell) who are growing their electricity generation assets as a strategic hedging strategy should electrification accelerate and reduce demand for fossil fuels. The interaction between the oil and auto industries will also likely change in an EV-dominant future. As global auto makers drop ICEVs from their product offerings, oil companies may look to increase demand elsewhere, such as petrochemicals. This shift may cause significant decline for Ontario's predominantly ICEV-tooled auto industry, if the industry does not pivot to manufacturing parts for and assembling EVs. Alternatively, oil companies could also seek to supply alternative fuels such as hydrogen for fuel cell EVs or electricity should they become major electricity generators, or coordinate with auto makers to stall electric vehicle policy.

These potential sectoral interactions also shed light on the coalitions which could emerge to accelerate electromobility. The once highly-aligned pro-ICEV narratives of the oil and auto industries are destabilizing. Instead, new narratives are beginning to be advanced that could promote pro-electromobility coalitions among powerful incumbent industries. These coalitions could facilitate integration and symbiosis or separation and competition among the auto, electricity and oil sector actors.

While this analysis did not examine electromobility storylines from civil society or other potentially impacted industries, advancing certain storylines could also aid in rallying other societal interests around electrified transportation. For instance, promoting the health benefits of EVs could apply the same coalitions of environmental

and health organizations that formed in Alberta and Ontario to phase out coal-fired electricity generation (Rosenbloom 2018).



Figure 6: Multi-regime interactions in ICEV-dominant present and EV-dominant futures using Raven and Verbong (2009) typology.

7.0 CONCLUSIONS

The global transition to electromobility is already underway. Nearly all the global automakers are making the switch with plans to produce 400 battery electric vehicle models by 2025 (Gersdorf et al. 2020). Moreover, some governments have plans to ban the sale of ICEVs within the next few decades (e.g., Norway (2025), Germany (2030), India (2030), United Kingdom (2035), California (2035), France (2040)). Regardless of the stories that auto parts manufacturers in Ontario and upstream oil producers in Alberta tell themselves, macro-level trends of reduced oil demand, growing stigmatization of ICEVs, and increased EV production are being imposed on regional incumbent industries.

The ability for Alberta's oil industry and Ontario's auto industry — or other regional economies acutely dependent on the continued use of fossil-fueled vehicles — to navigate a transition to electromobility will be contingent on how regional actors

modify the existing industrial asset base, in light of these global trends. Far from the highly structural accounts of industrial path development, there is room for firm and system level agency. Regional actors can engage and transform pre-existing industrial structures, organizational support structures, institutional set-ups, and natural assets to help initiate a greener path (Trippl et al. 2020). These entrepreneurial actions can be carried out, for example, through asset creation processes (e.g., educational programs, awareness, collaboration) and the reorientation and redeployment of existing assets (e.g., R&D programmes, natural resources) (Trippl et al. 2020). Beyond potentially triggering green path development, these actions could also destabilize non-green paths, such as the ICEV-tooled auto sector and the oil industry, accelerating regional change. Regardless, these actions will require new storylines that hold strong discursive resonance in a given region.

Electromobility storylines weave together regional actors, context, and content, and carries implications for regional path development. As Figure 6 alludes, different transition storylines could stimulate or stymie the entrepreneurial actions needed to prepare for electromobility and create distinct industrial development pathways. The Alberta oil industry's framing of electrifying transportation as an ineffective and costly way to reduce emissions suggests a growing competition could emerge with the electricity sector and the beginning of a separation from the auto sector. Further, this framing legitimizes Alberta's absence of EV policies and supports the perpetual oil and gas expansion narrative that dominates the province. Instead, regional actors could promote narratives of how the legacy of the oil and gas industry could contribute to the shift to electromobility by using existing assets (e.g., retail refuelling stations for EV charging, depleted reservoirs for in-situ hydrogen production or lithium recovery). Leaders of Alberta's oil industry are already talking about the marketing of oil sands for non-combustible purposes, which they hope will enable the industry to reduce its emission footprint and compete in a decarbonized economy (Little and Kilcrease 2020).

Ontario's auto sector already often refers to the province's ICT sector when promoting connected and autonomous vehicle technologies, yet during the study period discursive linkages to the electricity sector were rare. Regional auto parts makers could more frequently and consistently support vehicle electrification by highlighting existing complementary expertise in the ICT or other sectors. This change is already underway. In 2020, APMA announced Project Arrow, which plans to custom build an

electric car made exclusively with auto parts made in Canada by 2022 (APMA 2020). Also, in 2020, Ford announced that starting in 2024 it would build five EV models in an Oakville, Ontario assembly plant and Fiat Chrysler announced it would build at least one EV by 2025 at its Windsor, Ontario facilities. By promoting storylines that legitimize electromobility and seeking to deepen their discursive resonance, regional actors can exercise additional agency to help reposition incumbent economic sectors to succeed in a world of decarbonized transportation.

To better prepare some regions for future electromobility and respond to global trends, sustainability transition storylines can also link to pre-existing and regionallyspecific stories. This linkage could help increase the discursive resonance of these new storylines. To do so, it could increase the believability of electromobility claims by invoking widely-known regional histories or long-standing identities. It could help make electromobility seem more central or pressing by associating this form of mobility with other already-important issues. It could also leverage messengers that already have credibility and trust with key constituencies. For example, Québec linked its promotion of electromobility to long-standing themes of economic nationalism and control over the provincial economy or being *maîtres chez nous*. This story also enabled regional actors to promote the Québec-based electromobility supply chain. Beyond this, Québec's success in promoting electromobility is materially aided by an absence of ICEV passenger vehicle assembly plants, unlike neighbouring Ontario. GM closed the last passenger vehicle plant Sainte-Thérèse plant in 2002. Ontario, as noted, has linked the auto sector's promotion of connected and autonomous vehicle technologies to the province's successful ICT sector. In doing so, actors tied the future of this new automotive technology to the past triumphs of ICT companies like Blackberry or Nortel. While CAPP did not connect electromobility to Alberta's oil industry, future efforts to prepare for this new technology can also link to existing stories that promote the historic entrepreneurship, *savoir-faire*, and innovation of the oil industry. Through these strategic linkages, new coalitions can be empowered to better prepare regions for this likely disruptive vehicle technology.

Of course, more is needed than simply new stories or new coalitions. New business models are also likely required. For instance, oil companies could sell electricity at retail refuelling stations or electricity companies could pay EV owners to store surplus electricity in their batteries. The private car ownership model of auto companies is

already being challenged by ride-hailing and car-sharing companies which employ a mobility-as-a-service business model that could potentially integrate with mass public transit. Electromobility could further disrupt the sector by opening business opportunities for battery recycling or EV charging facilities. Concurrent to stimulating business opportunities, the Schumpeterian transformation of these sectoral business models could also create new governance challenges (Marsden and Reardon 2018) and generate stranded assets from obsolete ICEV-related infrastructure.

This analysis stimulates several avenues for future research. To better understand how within sector framing struggles over electromobility evolved over time, the time period under examination can be lengthened, using additional archival material. To consider how other actors from different sectors have engaged in the electromobility debate or to generate insights on coalitional politics, the breadth of data can be expanded to include other sectoral publications or opinion editorials from mainstream media. This would also enable analysts to map the extent to which sectoral storylines spilled-over into the broader public discourses over electromobility. Both of these avenues would heed the call of Geels (2011) on the need for more empirical attention on the power struggles and discursive actions in socio-technical transition case studies.

References

- AIEQ. 2020. "Rapport Annuel 2019-2020." Montreal: Association de l'Industrie Électrique du Québec.
- Antweiler, Werner, and Sumeet Gulati. 2013. 'Market-Based Policies for Green Motoring in Canada', *Canadian Public Policy*, 39: 81-94.
- APMA. 2020. 'Project Arrow', Automotive Parts Manufacturers' Association, Accessed 7 July. https://apma.ca/projectarrow/.
- Barry, John, Geraint Ellis, and Clive Robinson. 2008. 'Cool Rationalities and Hot Air: A Rhetorical Approach to Understanding Debates on Renewable Energy', *Global Environmental Politics*, 8: 67-98.
- Benford, Robert, and David Snow. 2000. 'Framing Processes and Social Movements: An Overview and Assessment', *Annual Review of Sociology*, 26: 611-39.
- Bosman, Rick, Derk Loorbach, Niki Frantzeskaki, and Till Pistorius. 2014. 'Discursive regime dynamics in the Dutch energy transition', *Environmental Innovation and Societal Transitions*, 13: 45-59.
- Canada Energy Regulator. 2020. 'Crude Oil Annual Export Summary 2019', Canada Energy Regulator, Accessed 24 September. https://www.cerrec.gc.ca/nrg/sttstc/crdlndptrlmprdct/stt/crdlsmmr/crdlsmmr-eng.html.

- Chandra, Ambarish, Sumeet Gulati, and Milind Kandlikar. 2010. 'Green drivers or free riders? An analysis of tax rebates for hybrid vehicles', *Journal of Environmental Economics and Management*, 60: 78-93.
- Electric Mobility Canada. 2019. "Electric Vehicle Sales in Canada Q1 2019."
- Geels, F. W. 2002. 'Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study', *Research Policy*, 31: 1257-74.
- Geels, F. W., and B. Verhees. 2011. 'Cultural legitimacy and framing struggles in innovation journeys: A cultural-performative perspective and a case study of Dutch nuclear energy (1945–1986)', *Technological Forecasting and Social Change*, 78: 910-30.
- Geels, Frank W. 2011. 'The multi-level perspective on sustainability transitions: Responses to seven criticisms', *Environmental Innovation and Societal Transitions*, 1: 24-40.
- Gersdorf, Thomas, Russell Hensley, Patrick Hertzke, Patrick Schaufuss, and Andreas Tschiesner. 2020. "The road ahead for e-mobility." New York: McKinsey & Company.
- Goffman, E. 1974. *Frame Analysis: An Essay on the Organisation of Experience* (Harper & Row: New York).
- Gouvernement du Québec. 2011. "Running on Green Power! Electric Vehicles: 2011-2020 Québec Action Plan." Québec: Gouvernement du Québec.
- Government of Alberta. 2019. "Motorized Vehicle Registrations by Fuel Type as of March 31." Ministry of Transportation. Edmonton.
- ———. 2020. "Budget 2020: Fiscal Plan a Plan for Jobs and the Economy 2020-23." Alberta Treasury Board and Finance. Edmonton: Government of Albertya.
- Hajer, Maarten A. 1995. *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (Oxford University Press: Oxford).
 - ——. 2006. 'Doing discourse analysis: Coalitions, practices, meaning.' in M. Van den Brink and T. Metze (eds.), *Words Matter in Policy and Planning - Discourse Theory and Method in the Social Sciences* (Netherlands Geographical Studies: Utrecht).
- Haley, Brendan. 2014. 'Promoting low-carbon transitions from a two-world regime: Hydro and wind in Québec, Canada', *Energy Policy*, 73: 777-88.
- ------. 2015. 'Low-carbon innovation from a hydroelectric base: The case of electric vehicles in Québec', *Environmental Innovation and Societal Transitions*, 14: 5-25.
- Hydro-Québec. 2009. "Strategic Plan 2009-2013." Montréal: Hydro-Québec.
- ———. 2020. "Rapport annuel 2019." Montréal: Hydro-Québec.
- International Energy Agency. 2019. "Global EV Outlook 2019." Paris: IEA.
- Isoaho, Karoliina, and Kamilla Karhunmaa. 2019. 'A critical review of discursive approaches in energy transitions', *Energy Policy*, 128: 930-42.
- Kern, Florian. 2012. 'The discursive politics of governing transitions towards sustainability: the UK Carbon Trust', *International Journal of Sustainable Development*, 15.
- Little, Mark, and Laura Kilcrease. 2020. 'Canada's oil sands are best positioned to lead

the energy transformation', Corporate Knights, 1 June

- Marsden, Greg, and Louise Reardon (eds.). 2018. *Governance of the Smart Mobility Transition* (Emerald Publishing: Bingley, UM).
- Mattioli, Giulio, Cameron Roberts, Julia K. Steinberger, and Andrew Brown. 2020. 'The political economy of car dependence: A systems of provision approach', *Energy Research & Social Science*, 66.
- OICA. 2020. '2019 Global Production Statistics', International Organization of Motor Vehicle Manufacturers, Accessed 6 July.

http://www.oica.net/category/production-statistics/2019-statistics/.

- Ontario Ministry of Finance. 2020. "Table 16: Ontario Production by Industry at 2012 Prices, Annual Data."
- Pangbourne, Kate, Dominic Stead, and Miloš Mladenović. 2018. 'The Case of Mobility as a Service: A critical reflection on challenges for urban transport and mobility governance.' in Greg Marsden and Louise Reardon (eds.), *Governance of the Smart Mobility Transition* (Emerald Publishing: London, UK).
- Raven, Rob, and Geert Verbong. 2007. 'Multi-Regime Interactions in the Dutch Energy Sector: The Case of Combined Heat and Power Technologies in the Netherlands 1970–2000', *Technology Analysis & Strategic Management*, 19: 491-507.
- Roberts, Cameron, and Frank W. Geels. 2018. 'Public Storylines in the British Transition from Rail to Road Transport (1896–2000): Discursive Struggles in the Multi-Level Perspective', *Science as Culture*, 27: 513-42.
- Roe, E. 1994. *Narrative Policy Analysis: Theory and Practice* (Duke University Press: Durham).
- Rosenbloom, Daniel. 2018. 'Framing low-carbon pathways: A discursive analysis of contending storylines surrounding the phase-out of coal-fired power in Ontario', *Environmental Innovation and Societal Transitions*, 27: 129-45.
- ------. 2019. 'A clash of socio-technical systems: Exploring actor interactions around electrification and electricity trade in unfolding low-carbon pathways for Ontario', *Energy Research & Social Science*, 49: 219-32.
- Rosenbloom, Daniel, Harris Berton, and James Meadowcroft. 2016. 'Framing the sun: A discursive approach to understanding multi-dimensional interactions within socio-technical transitions through the case of solar electricity in Ontario, Canada', *Research Policy*, 45: 1275-90.
- Rubin, Jeff. 2017. "How Has Canadian Manufacturing Fared under NAFTA? A Look at the Auto Assembly and Parts Industry." Waterloo, ON: Centre for International Governance Innovation.
- Savard, Stéphane. 2013. *Hydro-Québec et l'État Québécois 1944 2005* (Les éditions du Septentrion: Québec, QC).
- Schmidt, Vivien A. 2008. 'Discursive Institutionalism: The Explanatory Power of Ideas and Discourse', *Annual Review of Political Science*, 11: 303-26.
- Smith, Adrian, and Florian Kern. 2009. 'The transitions storyline in Dutch environmental policy', *Environmental Politics*, 18: 78-98.

Sovacool, Benjamin K. 2009. 'Early modes of transport in the United States: Lessons for modern energy policymakers', *Policy and Society*, 27: 411-27.

Sperling, Daniel. 2018. *Three Revolutions: Steering automated, shared, and electric vehicles to a better future* (Island Press: Washington, DC).

Stanford, Jim. 2017. 'Play the Trump cards right, and Canada's auto sector will benefit', *The Globe and Mail*, 5 January.

Statistics Canada. 2020a. "Table 20-10-0021-01 New motor vehicle registrations." Statistics Canada. Ottawa.

------. 2020b. "Table 12-10-0121-01 International merchandise trade by commodity, monthly (x 1,000,000)."

------. 2020c. "Table 12-10-0121-02 International merchandise trade in motor vehicles and motor vehicle parts (x 1,000,000)."

-----. 2020d. "Table 14-10-0023-01 Labour force characteristics by industry, annual (x 1,000)."

- ———. 2020f. "Table 36-10-0402-01 Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000)."
- ———. 2020g. " Table 36-10-0402-01 Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000)."

Stauffacher, Michael, Nora Muggli, Anna Scolobig, and Corinne Moser. 2015. 'Framing deep geothermal energy in mass media: the case of Switzerland', *Technological Forecasting and Social Change*, 98: 60-70.

Stone, Deborah. 1989. 'Causal Stories and the Formation of Policy Agendas', *Political Science Quarterly*, 104: 281-300.

——. 2012. *Policy Paradox: the art of political decision making* (W.W. Norton And Company: New York).

Swidler, Ann. 1986. 'Culture in action: Symbols and strategies', *American Sociological Review*, 51: 273-86.

- Trippl, Michaela, Simon Baumgartinger-Seiringer, Alexandra Frangenheim, Arne Isaksen, and Jan Ole Rypestøl. 2020. 'Unravelling green regional industrial path development: Regional preconditions, asset modification and agency', *Geoforum*, 111: 189-97.
- Turnheim, Bruno, and Frank W. Geels. 2012. 'Regime destabilisation as the flipside of energy transitions: Lessons from the history of the British coal industry (1913– 1997)', Energy Policy, 50: 35-49.
- United States Energy Information Administration. 2020. "Refinery and Blender Net Production." United States Department of Energy.
- Winfield, M. 2012. *Blue-Green Province: The Environment and the Political Economy of Ontario* (UBC Press: Vancouver, BC).
- Winfield, M., and D. MacDonald. 2012. 'Federalism and Canadian Climate Change

Policy.' in G. Skogstad and H. Bakvis (eds.), *Canadian Federalism: Performance, Effectiveness and Legitimacy* (Oxford University Press: Toronto).

Yates, Charlotte, and John Holmes. 2019. "The Future of the Canadian Auto Industry." Ottawa, ON: Canadian Centre for Policy Alternatives.