ELECTRIFYING TRUCK FLEETS: CHALLENGES AND OPPORTUNITIES FOR ELECTRIC TRUCK ADOPTION

Y. CIMON
Professor at Université Laval, Director, Interuniversity Centre for Enterprise Networks, Logistics and Transportation (CIRRELT), Obtained his Ph.D. (Strategy) at HEC Montréal.

Abstract

In recent years, transportation has been an important contributor to greenhouse gas (GHG) emissions globally. Electrification is an important step toward a more sustainable transportation industry, The purpose of this paper is to outline various challenges and opportunities associated with the adoption of electric trucks. A systematic literature review is undertaken to identify the relevant themes for electric truck adoption. Brief case studies of manufacturers serve to illustrate results from the literature review. Among the findings, technological, human, public policy, industrial and business factors emerge. The paper concludes that electric truck adoption is a complex multifaceted phenomenon beyond purely technological considerations. Future research should focus on making better models of adoption that encompass a wider range of issues.

Keywords: Electrification of Transportation, Electric Fleets, Heavy Vehicles, Electric Trucking, Green Logistics and Transportation, Review, Factors for EV Adoption, Battery Electric Trucks, Long Haul Electric Transportation and Logistics; Electric Road Freight Carriage.

1. Introduction

In recent years, many governments have launched initiatives to promote sustainable practices in transportation and logistics. Indeed, transportation is an important contributor to greenhouse gas (GHG) emissions globally. As such, emissions reduction comes with a reduction in the use of fossil fuels, especially when using internal combustion engine (ICE) vehicles as a baseline. Over the years, a range of alternatives have been developed. Compressed natural gas (CNG) is sometimes positioned as a potential solution to decrease GHGs., especially "renewable natural gas" since that may be carbon neutral depending on how it is produced and used. Gas producers pitch this as a perfect solution to decarbonize trucking over longer distances (Doyon, 2023) even though is does entail the combustion of a fossil fuel. Hybrid powertrains also bring benefits as they also reduce fuel consumption and extend total vehicle range – thus reducing GHGs – yet they do not eliminate tailpipe emissions because of the limited range afforded by the battery pack. Plugin hybrid electric vehicles (PHEVs) for their part do typically show an extended electric-only range when compared to "regular" hybrid powertrains but they do not eliminate tailpipe emissions either. Another potential alternative ICE vehicles comes in the form of FCEVs, or fuel cell electric vehicles. While this offers fast refueling and better range than classical battery electric vehicles (BEVs), they lack sufficient refueling and fuel (i.e. hydrogen) production infrastructure at the time of writing this paper. Sources of energy (hydro, coal, nuclear) also have an impact on the amount of carbon attached to a particular GHG reduction technology.

A significant portion of the literature points to battery electric vehicles (BEVs) and trucks (BETs) for the great potential they hold to help meeting emission targets globally, if only because of their lack of tailpipe emissions. Our research question is focused on electric truck adoption (i.e. BETs) in the context of an increasing need for greener transportation. We look into the main themes identified in the literature that center on electric truck adoption and briefly examine how they correlate with the cases of three original equipment manufacturers. We conclude by extracting challenges and opportunities for electric truck adoption and identify overarching issues that reach across themes contained in the literature.

This paper is structured as follows. It starts with the case for electrification in the greening of transportation. Then, the methods used to address the research question are described. After which, the paper delves into the findings in the form of themes identified in the literature: Batteries, infrastructure, holistic perspectives, costs, government-related factors and operator experiences. The paper concludes with challenges and opportunities as the relate to electric truck adoption.

2. Greening transportation

Trucking is a significant source of GHGs in transportation and while an important strand of the literature focuses on vehicle routing, load optimization and related issues, such as metaheuristics for charging strategies (Peng, Wu, & Boriboonsomsin, 2024), a lot of work remains to be done on trucks themselves, the infrastructure that surrounds them as well as the conditions necessary to gain a better understanding of the conditions that help the transition away from fossil fuels in trucking.

One way to decrease GHGs from trucking revolves around electrifying them. It is an important step toward a more sustainable transportation industry, whether on long-haul routes or for last mile logistical purposes in the context where many jurisdictions are trying to

achieve net-zero objectives in the transportation sector as in the case of the USA (e.g. Mohammed & Villegas, 2023).

This may have some obvious benefits on the sustainability side in part because of the reduction in tailpipe emissions and fuel costs, it nevertheless brings a wide range of challenges both for independent and fleet operators. The purpose of this paper is to map the challenges and opportunities associated with the adoption of electric trucks.

3. Methods

This research is undertaken in two phases. First, a systematic literature review is carried out to identify the relevant elements of a mapping effort. Second, case studies of pure-electric truck original equipment manufacturers (OEMs) are examined. The results from these steps are then clustered and presented around the relevant topics that were uncovered.

For the first phase, a systematic literature review was conducted using the PRISMA principles (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group*, 2009), implying that a documented search strategy underlined the review complete with an appreciation of the biases and limitations of the technique. A keyword search strategy was used from general formulations to more specific ones as the search progressed. This led to a narrowly scoped pool of articles from which the analysis stems.

For the second phase, the case study method (Yin, 2009) was applied to three pure-electric OEMs that constituted a convenience sample in line with the exploratory objectives of this research. This was done through publicly available sources of information. These sources were triangulated (Mathison, 1988) to ensure sufficient levels of internal richness within cases alongside acceptable diversity across cases so that results and findings would be empirically rigorous and if not generalizable, they would at least show high levels of internal consistency. Following the aforementioned two-sept process ensured the research met accepted and sufficient thresholds of reliability and validity (Carmines & Zeller, 1979). The results from each step are then presented and clustered around the themes uncovered in the literature with the relevant implications that follow.

4. Results

4.1 Phase one: exploring the literature

Major databases containing transportation or transportation-related journals were interrogated with a series of keywords related to electric trucks. The databases were selected for their academic contents and their breadth of scientific articles related to the research question. ScienceDirect, Web of Science, Taylor and Francis Journals, Business Source Premier (EBSCO) and ABI/Inform (Proquest) were interrogated. Keywords allowing for simple and broad coverage were used such as: “electric trucks”, adoption, fleet and obstacles to adoption were used. Results are reported in table 1.

Table 1 – Keyword and relevant articles from the databases surveyed on electric trucks

Keywords	ScienceDirect	Web of Science	Taylor & Francis	Business Source Premier	ABI/Inform
"Electric Trucks"	1414	392	119	110	18
AND Adoption	571	41	101	12	0
*AND Fleet	403	21	62	6	2
*AND Obstacles	149	0	16	1	0
*AND obstacles AND fleet	106	0	12	1	0
Total selected	41	21	9	12	15

The selection criteria were the following. Only academic peer-reviewed publications (including book chapters) were selected. Other types of publications (i.e. trade journals, magazines, etc.) were excluded. Article contents were filtered for relevance by keywords, then by titles for appropriateness.

Relevant articles abstracts were collated, and 98 papers were selected across all five databases. 28 were deleted as similar journals are covered by more than one database. After removing duplicates, 70 papers in total were included in the sample. All papers were directly related to road freight, heavy vehicles, heavy trucks and similar themes.

4.2 Phase two: Pure player electric trucking cases

After scoping the literature, we sought to gain insights into whether the outcomes reported were aligned with the reported experiences of pure player electric truck OEMs. This paper sought to illustrate this with companies that – at the time this research was started – were considered leaders in their fields.

Since the industry is very dynamic, as multiple projects are launched for electric truck manufacturing globally, and given the exploratory nature of this research, this paper settled on a convenience sample. The following criteria were applied to select relevant OEMs.

First, they had to have had important coverage in the business and trade journals so that sufficient information was published about them to help in pursuing this research. Second, these players had to come from a geography that demonstrates high levels of similarity and/or compatibility in infrastructures, regulations, and business environment. Third, these players had to be "pure players" (i.e. not have legacy ICE truck manufacturing activity) to achieve better comparability in that competitive space and eliminate the biases that may arise from legacy players trying to optimize their ICE-related activities at the expense of the electric products.

Following the determination of these criteria, three companies were selected: Lion Electric, Nikola and Tesla. All three companies have wide media coverage. They come from North America which is a highly integrated economic space where countries have a compatible regulatory environment.

All are so-called electric "pure players" since they do not have legacy ICE activities. Even though Nikola also has hydrogen ambitions, they have not appeared to be at the expense of the electric activities. Finally, all three companies manufacture and sell trucks commercially.

Table 2 – Companies and their product lineups*

	Lion Electric[1]	Nikola[2]	Tesla
Country of origin	Canada	USA	USA
Products	Medium to heavy trucks and school buses	Heavy trucks	Semi trucks
Shipped volumes (2024)	386 vehicles shipped deliveries (as of Q3 2024)	203 trucks shipped from Q1 to Q3 2024	PepsiCo and DHL have received units, number N/A
Technology	BEV	FCEV + BEV	BEV
Miles logged	Approx 10M miles driven **	Approx 3.3 M miles driven as of Feb 2025	Approx 4.6M miles driven as of Sept 2024
Access to charging	Operated a battery plant***, access to public charging infrastructure	Operated a battery plant, hydrogen stations and affiliates	Operates a battery plant, access to proprietary charging stations

Notes: [1] Lion filed for bankruptcy on Dec 19th, 2025. [2] Nikola filed for bankruptcy under chapter 11 on Feb 19th, 2025
Sources: *Corporate websites. ** As of 2022. ***Closed down in bankruptcy proceedings

5. Findings and discussion

Once the papers were analyzed, they were grouped into their general research themes. Papers focused on batteries, infrastructure as it leads to adoption, trends toward holistic perspectives, cost-related issues, government-related factors, and operator experiences. The papers were mapped according to interlocking conceptual levels ranging from individual truck characteristics to a fleet-level perspective. They also examined issues linked to policy and technology. These are mapped in figure 1, with the truck – fleet issues on the horizontal axis and the technology – policy issues on the vertical axis.

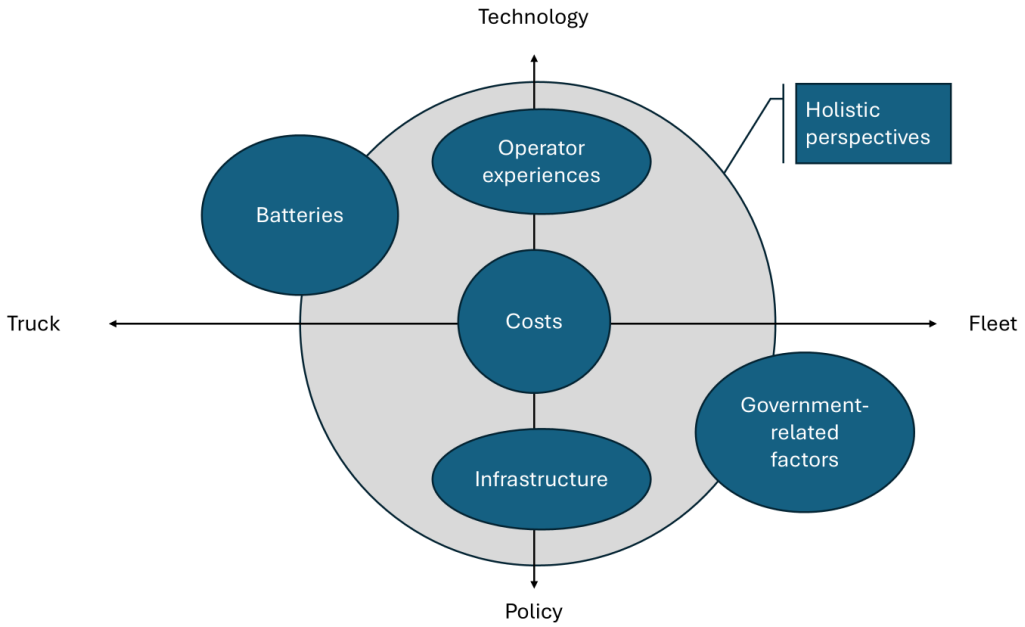

Figure 1: The main themes uncovered in the literature

While cost-centric issues were central to many papers, issues surrounding batteries were usually covered in the upper left quadrant at the intersection of technology and individual trucks perspectives. Infrastructure issues were often explored from a policy perspective whether they concerned trucks or fleets. Many papers advocated for a range of holistic perspectives as they recognized the existence of systemic intertwined issues when it comes to electric trucking. Government related factors tend to be examined from perspectives encompassing regulatory issues at the intersection of fleets and policy. Operator experiences for their part are often explored from a technology perspective, whether it touches trucks or fleets. The mapping presented in figure 1 is a stylized view of the literature as some individual papers may have broader or narrower views on these topics. Yet, it is a useful tool to understand the extent to which the literature has studied these issues since all electric truck OEMs were confronted to them to varying degrees.

Among the findings, technological, human, public policy, industrial and business factors emerge. On the technical side, autonomous driving, range, battery technology and lifecycle management emerge as relevant. Human factors such as the operator's proficiency and training also appear. Public policy issues like tax incentives or policies that promote social acceptability, are also believed to have an impact. On the industrial and business front, charging infrastructure (availability, available power and network quality), industry-level business models (including sales and servicing, insurance, finance and insurance), prices as well as operating costs are shown to be important. The following sections will review batteries; the link between adoption and infrastructure; the emergence of holistic perspectives; cost-related issues; government-related factors; and operator experiences.

5.1 Batteries

Energy storage is a key piece of the electrification puzzle as battery design and usage patterns have some impact on user barriers like range anxiety and the need for an adequate charging infrastructure (Ahmad, Khalid, & Panigrahi, 2021). Such infrastructure needs to be shared

with usage optimized through a platform approach (Govik, 2024). Some have suggested battery-swapping as a potential solution (Çatay & Sadati, 2023). This in a context where the relevance of long range batteries is sometimes put into question (Alp, Tan, & Udenio, 2022). Industry specialists contend that battery weight remains an important issue to work on (Bolduc, 2022).

Batteries themselves have proven important for OEMs. Indeed, Lion, Nikola and Tesla have chosen to develop their batteries focussing on range and their commonality across their respective vehicle platforms. They also deliberately chose to invest in battery manufacturing to ensure a steady supply. They benefitted from having more control over design and production volumes. However, given their precarious financial situations and recent bankruptcies, Lion and Nikola no longer have battery manufacturing abilities.

5.2 Adoption and infrastructure

Electric truck adoption is often contingent on reasons linked to sustainability. There also appears to be a growing link between adoption and charging infrastructure quality and availability. Over the years, many systematic reviews on EV adoption have been carried out. Among other factors that extend beyond the usual sustainability issues and cost trade-offs (e.g. Gillström, Björklund, Stahre, & Abrahamsson, 2024), Alarcon et al. (2023) identified long-haul trucking, charging infrastructure and business models as research opportunities, while Lu et al. (2023) show that optimizing fleet charging strategies yield substantial benefits for operators and that attractive charging infrastructure may yield to a positive effect on emissions reduction because of its attractiveness.

Furthermore, adoption needs to consider the development of – and investment in – the charging infrastructure as it does constitute a perceived barrier (e.g. Alp et al., 2022; Anderhofstadt & Spinler, 2019). Indeed, charging infrastructure that integrates reverse logistics yields interesting emission reductions as demonstrated in the Norwegian case (Yu & Sun, 2024).

Charging infrastructure has proven to be an important part of the adoption puzzle. For example, Tesla can count on a proprietary network and has developed “Megachargers” to be used by Tesla semis. Nikola has collaborated with Chargepoint to use, develop and accelerate the deployment of a charging infrastructure. Lion has chosen to work with its customers to meet their charging needs.

Past work also shows that overhead lines, or catenaries, have great potential to decrease emissions from transportation and truck deliveries (Plötz, Gnann, Jochem, Yilmaz, & Kaschub, 2019). Along the same lines, ehighways, that have segments outfitted with a catenary, are a piece of innovative infrastructure that may constitute a solution to significantly reduce truck GHG emissions (Colovic, Marinelli, & Ottomanelli, 2024) but such infrastructure’s penetration is impacted negatively by the high capital costs they entail (Haddad et al., 2022). Wireless charging systems are another option believed to have shown potential (Un-Noor et al., 2024; X. K. Wu, Zhang, & Chen, 2023).

Other research finds that while electric roads yield important social benefits, these benefits vary as a function of the electrification technology and vehicle energy storage characteristics (Sällberg, Börjesson, & Jienwatcharamongkhol, 2024). The general implication is that the adoption of electric trucks, because of the constraints they entail – whether infrastructure

related or others (charging, range, etc.) - mean that business models need to be revisited, i.e. scaling up operations in a given geographical area implies the need for an "ecosystem" and overcoming organizational challenges within the firms involved in this change (Baron & Apitsa, 2017). As such, ecosystem-thinking requires a shift in perspective.

5.3 Towards holistic perspectives on trucking

Electric trucking should be thought of in a systemic way in the same manner as EVs should be from a holistic mobility perspective (Tilly, Yigitcanlar, Degirmenci, & Paz, 2024). A systemic perspective is also posited to allow for better informed decision-making at the strategic level (Raoofi, Brodin, & Pernestål, 2024) for all actors involved. From this, an emphasis on a "whole of lifecycle" perspective is needed to work on the full spectrum of GHG emissions that come from heavy trucks (Bhardwaj & Mostofi, 2022).

To a certain extent, all three OEMs studied here are looking into "whole of lifecycle" perspectives. Their focus centers on their trucks and the technology portfolio around them. They also indirectly position themselves across the spectrum of GHG emissions from their usage and, to a lesser extent, from manufacturing activities.

5.4 Cost-related issues

Truck reliability and cost of ownership are seen as significant issues by experts in a study conducted with German experts (Anderhofstadt & Spinler, 2019) and others (Vijayagopal & Rousseau, 2021) with some works focussing on the Indian context (Singh, Patil, Sharma, & Jarial, 2024). In other usage contexts, such as New York City, electric trucks have been shown to use less energy and to emit less GHGs than their diesel powered equivalents while being cheaper or slightly more expensive to operate depending on their drive cycles (Lee, Thomas, & Brown, 2013). Similar tests in Sao Paulo have shown that efficiency was contingent on ambient temperature (Lima, Baldo, & de Souza, 2024).

There is a trade-off between the lower energy costs afforded by electric trucks when compared to diesel vehicles and the costs that may be attributed to longer charging times (see Cheng & Lin, 2024). BETs may also be an interesting tool that allows for 24h urban delivery as they are silent relative to gas-powered trucks and can have competitive operations costs (Moll, Plötz, Hadwich, & Wietschel, 2020). Yet, research in the Swedish context has shown that BET/BEV have a cost advantage over ICE trucks especially in cases of high asset utilization with depot charging as a most cost-effective strategy (Engholm, Allström, & Akbarian, 2024). Some suggest that charging while driving may be an option for long haul routes (Boysen, Briskorn, & Schwerdfeger, 2023).

Furthermore, inducing companies to shift toward alternative fuels (including electricity) implies a great sensitivity to costs, which in turn may favour hybrid vehicles in emerging markets (Cantillo, Amaya, Serrano, Cantillo-Garcia, & Galvan, 2022). In Latin America, it is posited that initial costs and costs of ownership represent substantial barriers and in that context it is possible the medium trucks may be a segment that is prone to higher levels of adoption than heavy trucks (see Tanco, Cat, & Garat, 2019).

While the OEMs that are examined in this paper have been paying attention to their own production costs. They do provide maintenance and software updates, although to uncertain degrees in the cases of Nikola and Lion.

5.5 Government-related factors

Short term wins are important in implementing successful green measures, there has been research on the trade-offs between carbon pricing, emission standards and energy efficiency measures touting the importance of the former (e.g. Parry, Evans, & Oates, 2014). These debates are often permeated by technology as an overarching factor to work on. But beyond the technology, political processes matter greatly (see Meyer, von der Gracht, & Hartmann, 2022). Lawmakers see the energy transition problem essentially through funding (Sciara, Waxman, & Buchanan, 2024). For example, BET Fleet deployment priorities should be around favourable areas where this is encouraged by policymakers as in the case of China (Qiao & Raufer, 2022). Beyond the usual technical factors for adoption, the Volvo Low-Impact Heavy Green Transport Solution (LIGHTS) project lessons further emphasize the importance of government incentives to accelerate the adoption process (Fenton & Kailas, 2021). An interesting example is truck weight regulatory incentives. For example, the European Union has weight exemptions for two tons over class; in California, they are 2000 pounds over class; while other jurisdictions like Canada or Japan do not have such policies in place (International Energy Agency, 2021). Another tool to induce the transition could be the phasing out of fuel subsidies in some economies (Charabi, Al Nasiri, Al Awadhi, Choudri, & Al Bimani, 2020).

In any case, legislative issues and those that relate to charging infrastructure seem to be underestimated by lawmakers who tend to overemphasize financial/fiscal incentives (Taefi, Kreutzfeldt, Held, & Fink, 2016). Yet, public policies on electrification should also take into account the need for low carbon energy that will power the grid as electricity requirements are bound to increase with the growth of the charging infrastructure (e.g. Talebian, Herrera, Tran, & Mérida, 2018).

The most visible issue related to government issues has been that of government incentives and mandates. Anecdotal evidence shows that sales volumes of BETs have continued to rise in North America (Shchedrina, 2025) despite the lack of mandates in many geographies. These incentives are usually useful inducements for operators to acquire trucks or to start electrifying their fleets. Also, governments have invested in OEMs directly or through public investment vehicles (e.g. Lion Electric) or by providing important tax breaks (e.g. Tesla).

5.6 Operator experiences

A lot of work has been done on whether electric trucks (including long haul) are competitive or not (Kallionpää, Nair, & Liimatainen, 2023). This notion of being competitive is one of importance for operators and fleet managers. Indeed, fleet composition and mileage have a bearing on transportation managers' opinion of battery electric trucks (e.g. Konstantinou & Gkritza, 2023). Some others have found that a lack of information for operators may also be a limit to adoption (İmre, Çelebi, & Koca, 2021). Fleet managers deem infrastructure, purchase costs and range to be among the top factors that impact electrification (Sugihara, Hardman, & Kurani, 2023).

Along the same lines, the timing of fleet renewal is paramount to successfully achieving the transition toward greening the fleet with special consideration to not make the transition too early as to not bear higher costs (Winkelmann, Spinler, & Neukirchen, 2024) with perceptions

and timing being important variables explaining acquisitions (C. Wu, Li, Zhou, & Zhou, 2023).

In the case of city logistics, more space should be given to EVs in city logistics (see Iwan et al., 2019). In such a context, the substitution between ICE trucks and BETs may be slowed by the formers increasing levels of efficiency while the latter may see immediate advantages in city logistics related applications (see Sacchi, Bauer, & Cox, 2021). Some posit that hybrid electric may indeed be the best choice (Saha et al., 2024).

Operators generally like electric trucks, but balk at the higher acquisition costs when compared to ICE trucks. However, when OEMs produce trucks that can fit in their business models, they tend to adopt them like PepsiCo did with Tesla semis. PepsiCo reports hauling over short and long distances – "gross vehicle weight plus load of over 70 000 pounds" (Lockie, 2023). But adoption comes with a caveat, especially for long-haul trucks as BETs have been shown to have load limitations because of the sheer weight of batteries (Larson, Parsons, & Kalluri, 2024). This makes the question of the type of freight that is hauled central to the sustainability of business models built around BEVs that remains understudied as opposed to range even though they are related.

6. Conclusion and future research

In conclusion, electric truck adoption is a complex multifaceted phenomenon beyond purely technological considerations. This paper has started by positioning the importance of electric trucks in the effort to green transportation. Using a two-pronged approach by carrying out on the one hand a literature review and on the other brief OEM case studies, a range of themes was extracted: batteries, infrastructure, holistic perspectives, costs, government-related factors and operator experiences. Each theme came with a set of challenges and opportunities for adoption presented in table 3. A set of overarching issues across themes was identified as optimizing the constraints associated with the various elements uncovered in the literature, adopting a platform perspective, and a particular focus on sustainability.

Table 3 – Challenges and opportunities for BET adoption with regards to themes identified in the literature

Theme	Challenges	Opportunities	Overarching issues
Batteries	-Range anxiety -Long-range batteries	-Energy storage -Battery swapping	
Infrastructure	-Adequate charging infrastructure -Infrastructure quality -Business model -Development -Investment -High capital costs	-Shared infrastructure -Attractiveness -Integration of reverse logistics -Catenaries -Wireless charging -Electric roads	
Holistic perspectives		-"Ecosystem thinking" -Whole-of-lifecycle perspective	
Costs	-Cost of truck ownership -Cost of energy -Long-haul deliveries -Asset utilization -Heavy trucks	-Urban deliveries -Charging-while-driving -Hybrid -Medium trucks	-Optimization under relevant constraints -Platform perspectives -Sustainability
Government-related factors	-Types of technologies supported -Funding -Legislative issues -Grid energy generation	-Deployment in incentivized areas -Incentives -Phasing out fuel subsidies	
Operator perspectives	-Competitiveness -Fleet composition -Mileage -Infrastructure -Purchase costs -Range -Timing of fleet renewal	-Increase the space for EVs -Hybrid electric vehicles	

Future research should focus on making better models of adoption that encompass a wider range of issues. Such issues may examine other technical factors and tools like vehicle 2 grid, full self driving capability, fleet management automation and the importance of artificial intelligence. Other issues may involve supply chain issues for OEMs and battery makers through a research strand that examines the issue from the perspective of the availability of critical minerals to support the transition to EVs, like for example cobalt (Seck, Hache, & Barnet, 2022). Another possible grouping of issues may be related to health as some papers have started to affirm that there are measurable health benefits behind the transition to electric (Tong, Jenn, Wolfson, Scown, & Auffhammer, 2021).

7. References

Ahmad, F., Khalid, M., & Panigrahi, B. K. (2021). Development in energy storage system for electric transportation: A comprehensive review. *Journal of Energy Storage, 43*, 103153. doi:https://doi.org/10.1016/j.est.2021.103153

Alarcón, F. E., Cawley, A. M., & Sauma, E. (2023). Electric mobility toward sustainable cities and road-freight logistics: A systematic review and future research directions. *Journal of Cleaner Production, 430*, 138959. doi:https://doi.org/10.1016/j.jclepro.2023.138959

Alp, O., Tan, T., & Udenio, M. (2022). Transitioning to sustainable freight transportation by integrating fleet replacement and charging infrastructure decisions. *Omega, 109*, N.PAG-N.PAG. doi:10.1016/j.omega.2022.102595

Anderhofstadt, B., & Spinler, S. (2019). Factors affecting the purchasing decision and operation of alternative fuel-powered heavy-duty trucks in Germany – A Delphi study. *Transportation Research Part D: Transport & Environment, 73*, 87-107. doi:10.1016/j.trd.2019.06.003

Baron, M.-L., & Apitsa, S. M. (2017). Le défi de la transition énergétique et les conditions d'adoption des éco-énergies dans le secteur du transport : le cas des tracteurs électriques. *Logistique & Management, 25*(2), 84-95. doi:10.1080/12507970.2017.1340815

Bhardwaj, S., & Mostofi, H. (2022). Technical and Business Aspects of Battery Electric Trucks—A Systematic Review. *Future Transportation, 2*(2), 382. doi:https://doi.org/10.3390/futuretransp2020021

Bolduc, C. (2022, 1e novembre). En route… pour une industrie des transports électriques made in Québec. *Transport routier*. Retrieved from https://www.transportroutier.ca/nouvelles/en-route-pour-les-transports-electriques-au-quebec/

Boysen, N., Briskorn, D., & Schwerdfeger, S. (2023). How to charge while driving: scheduling point-to-point deliveries of an electric vehicle under overhead wiring. *Journal of Scheduling, 26*(1), 19-41. doi:https://doi.org/10.1007/s10951-022-00758-2

Cantillo, V., Amaya, J., Serrano, I., Cantillo-Garcia, V., & Galvan, J. (2022). Influencing factors of trucking companies willingness to shift to alternative fuel vehicles. *TRANSPORTATION RESEARCH PART E-LOGISTICS AND TRANSPORTATION REVIEW, 163*. doi:10.1016/j.tre.2022.102753

Carmines, E. G., & Zeller, R. A. (1979). Reliability and validity assessment. *Quantitative Applications in the Social Sciences/Sage*.

Çatay, B., & Sadati, İ. (2023). An improved matheuristic for solving the electric vehicle routing problem with time windows and synchronized mobile charging/battery swapping. *COMPUTERS & OPERATIONS RESEARCH, 159*, N.PAG-N.PAG. doi:10.1016/j.cor.2023.106310

Charabi, Y., Al Nasiri, N., Al Awadhi, T., Choudri, B. S., & Al Bimani, A. (2020). GHG emissions from the transport sector in Oman: Trends and potential decarbonization pathways. *Energy Strategy Reviews, 32*, 100548. doi:https://doi.org/10.1016/j.esr.2020.100548

Cheng, X., & Lin, J. (2024). Is electric truck a viable alternative to diesel truck in long-haul operation? *Transportation Research Part D: Transport & Environment, 129*, N.PAG-N.PAG. doi:10.1016/j.trd.2024.104119

Colovic, A., Marinelli, M., & Ottomanelli, M. (2024). Towards the electrification of freight transport: A network design model for assessing the adoption of eHighways. *Transport Policy, 150*, 106-120. doi:https://doi.org/10.1016/j.tranpol.2024.03.012

Doyon, F. (2023). *Renewable natural gas (RNG) : Decarbonize long-haul trucking today*. Paper presented at the HEC Montreal Chair in Energy Sector Management, Montreal.

Engholm, A., Allström, A., & Akbarian, M. (2024). Exploring cost performance tradeoffs and uncertainties for electric- and autonomous electric trucks using computational experiments. *European Transport Research Review, 16*(1), 41. doi:https://doi.org/10.1186/s12544-024-00662-0

Fenton, D., & Kailas, A. (2021). Redefining Goods Movement: Building an Ecosystem for the Introduction of Heavy-Duty Battery-Electric Vehicles. *WORLD ELECTRIC VEHICLE JOURNAL, 12*(3). doi:10.3390/wevj12030147

Gillström, H., Björklund, M., Stahre, F., & Abrahamsson, M. (2024). Wired for change: Sustainable business models in the transition towards electrified road freight transport. *Cleaner Logistics and Supply Chain, 13*, 100185. doi:https://doi.org/10.1016/j.clscn.2024.100185

Govik, L. (2024). Digital platforms for sharing and booking electrical vehicle charging infrastructure. *International Journal of Sustainable Transportation, 18*(9), 777-790. doi:10.1080/15568318.2024.2407139

Haddad, D., Konstantinou, T., Aliprantis, D., Gkritza, K., Pekarek, S., & Haddock, J. (2022). Analysis of the financial viability of high-powered electric roadways: A case study for the state of Indiana. *Energy Policy, 171*, 113275. doi:https://doi.org/10.1016/j.enpol.2022.113275

İmre, Ş., Çelebi, D., & Koca, F. (2021). Understanding barriers and enablers of electric vehicles in urban freight transport: Addressing stakeholder needs in Turkey. *Sustainable Cities and Society, 68*, 102794. doi:https://doi.org/10.1016/j.scs.2021.102794

International Energy Agency. (2021). Policies to promote electric vehicle deployment. In *Global EV Outlook 2021* (pp. 64): International Energy Agengy.

Iwan, S., Allesch, J., Celebi, D., Kijewska, K., Hoé, M., Klauenberg, J., & Zajicek, J. (2019). Electric mobility in European urban freight and logistics – status and attempts of improvement. *Transportation Research Procedia, 39*, 112-123. doi:https://doi.org/10.1016/j.trpro.2019.06.013

Kallionpää, E., Nair, S., & Liimatainen, H. (2023). Perspectives of using Electric- and Alternatively Fuelled Freight Transport Vehicles among Road Haulage Companies in Finland. *Transportation Research Procedia, 72*, 1894-1901. doi:https://doi.org/10.1016/j.trpro.2023.11.668

Konstantinou, T., & Gkritza, K. (2023). Are we getting close to truck electrification? U.S. truck fleet managers' stated intentions to electrify their fleets. *Transportation Research Part A: Policy & Practice, 173*, N.PAG-N.PAG. doi:10.1016/j.tra.2023.103697

Larson, P. D., Parsons, R. V., & Kalluri, D. (2024). Zero-Emission Heavy-Duty, Long-Haul Trucking: Obstacles and Opportunities for Logistics in North America. *Logistics, 8*(3), 64. Retrieved from https://www.mdpi.com/2305-6290/8/3/64

Lee, D.-Y., Thomas, V. M., & Brown, M. A. (2013). Electric Urban Delivery Trucks: Energy Use, Greenhouse Gas Emissions, and Cost-Effectiveness. *Environmental Science & Technology, 47*(14), 8022. Retrieved from https://acces.bibl.ulaval.ca/login?url=https://www.proquest.com/scholarly-journals/electric-urban-delivery-trucks-energy-use/docview/1411298290/se-2?accountid=12008

https://ulaval.on.worldcat.org/atoztitles/link?sid=ProQ:&issn=0013936X&volume=47&issue=14&title=Environmental+Science+%26+Technology&spage=8022&date=2013-07-16&atitle=Electric+Urban+Delivery+Trucks%3A+Energy+Use%2C+Greenhouse+Gas+Emissions%2C+and+Cost-Effectiveness&au=Lee%2C+Dong-Yeon%3BThomas%2C+Valerie+M%3BBrown%2C+Marilyn+A&id=doi:

Lima, E. S., Baldo, C. R., & de Souza, C. P. G. (2024). Seasonal energy efficiency: a case study of an urban distribution battery electric truck operating in Brazil. *JOURNAL OF THE BRAZILIAN SOCIETY OF MECHANICAL SCIENCES AND ENGINEERING, 46*(7). doi:10.1007/s40430-024-05003-9

Lockie, A. (2023, 27 september). Pepsi spills the beans on Tesla Semi's real-world hauling performance. *Commercial Carrier Journal*. Retrieved from https://www.ccjdigital.com/alternative-power/article/15635242/pepsico-on-tesla-semis-realworld-hauling-performance#:~:text=The%20Semis%20in%20Sacramento%20%22run,full%20and%20lightens%20throughout%20the

Lu, J., Shan, R., Kittner, N., Hu, W., & Zhang, N. (2023). Emission reductions from heavy-duty freight electrification aided by smart fleet management. *Transportation Research Part D: Transport & Environment, 121*, N.PAG-N.PAG. doi:10.1016/j.trd.2023.103846

Mathison, S. (1988). Why triangulate? *Educational researcher, 17*(2), 13-17.

Meyer, T., von der Gracht, H. A., & Hartmann, E. (2022). Technology foresight for sustainable road freight transportation: Insights from a global real-time Delphi study. *Futures & Foresight Science, 4*(1), 1-16. doi:10.1002/ffo2.101

Mohammed, J., & Villegas, J. (2023). Total impact of electric vehicle fleet adoption in the logistics industry. *FRONTIERS IN SUSTAINABILITY, 4*. doi:10.3389/frsus.2023.1158993

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group*, t. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine, 151*(4), 264-269.

Moll, C., Plötz, P., Hadwich, K., & Wietschel, M. (2020). Are Battery-Electric Trucks for 24-Hour Delivery the Future of City Logistics?-A German Case Study. *WORLD ELECTRIC VEHICLE JOURNAL, 11*(1). doi:10.3390/wevj11010016

Parry, I. W. H., Evans, D., & Oates, W. E. (2014). Are energy efficiency standards justified? *Journal of Environmental Economics and Management, 67*(2), 104-125. doi:https://doi.org/10.1016/j.jeem.2013.11.003

Peng, D. B., Wu, G. Y., & Boriboonsomsin, K. (2024). Energy-Efficient Dispatching of Battery Electric Truck Fleets with Backhauls and Time Windows. *SAE INTERNATIONAL JOURNAL OF ELECTRIFIED VEHICLES, 13*(1), 107-123. doi:10.4271/14-13-01-0009

Plötz, P., Gnann, T., Jochem, P., Yilmaz, H. Ü., & Kaschub, T. (2019). Impact of electric trucks powered by overhead lines on the European electricity system and CO2 emissions. *Energy Policy, 130*, 32. doi:https://doi.org/10.1016/j.enpol.2019.03.042

Qiao, Y. P., & Raufer, R. (2022). Electric truck deployment in Chinese cities: Promotion policies and implications for future policymaking. *Wiley Interdisciplinary Reviews: Energy and Environment, 11*(4). doi:10.1002/wene.433

Raoofi, Z., Brodin, M. H., & Pernestål, A. (2024). System-level impacts of electrification on the road freight transport system: a dynamic approach. *International Journal of Physical Distribution & Logistics Management, 54*(6), 631-651. doi:https://doi.org/10.1108/IJPDLM-11-2023-0436

Sacchi, R., Bauer, C., & Cox, B. L. (2021). Does Size Matter? The Influence of Size, Load Factor, Range Autonomy, and Application Type on the Life Cycle Assessment of Current and Future Medium- and Heavy-Duty Vehicles. *Environmental Science & Technology, 55*(8), 5224. doi:https://doi.org/10.1021/acs.est.0c07773

Saha, A., Simic, V., Dabic-Miletic, S., Senapati, T., Yager, R. R., & Deveci, M. (2024). Evaluation of Propulsion Technologies for Sustainable Road Freight Distribution Using a Dual Probabilistic Linguistic Group Decision-

Making Approach. *IEEE Transactions on Engineering Management, 71*, 7227-7241. doi:https://doi.org/10.1109/TEM.2023.3253300

Sällberg, H., Börjesson, M., & Jienwatcharamongkhol, V. (2024). The Case for Electric Motorways in Sweden. *Journal of Transport Economics and Policy, 58*(3), 227-252. Retrieved from https://acces.bibl.ulaval.ca/login?url=https://www.proquest.com/scholarly-journals/case-electric-motorways-sweden/docview/3081386163/se-2?accountid=12008

https://ulaval.on.worldcat.org/atoztitles/link?sid=ProQ:&issn=00225258&volume=58&issue=3&title=Journal+of+Transport+Economics+and+Policy&spage=227&date=2024-07-01&atitle=The+Case+for+Electric+Motorways+in+Sweden&au=S%C3%A4llberg%2C+Henrik%3BB%C3%B6rjesson%2C+Maria%3BJienwatcharamongkhol%2C+Viroj&id=doi:

Sciara, G.-C., Waxman, A., & Buchanan, R. (2024). State legislator views on funding 21st century Transportation:Important problems, missed connections. *Transport Policy, 150*, 206-218. doi:https://doi.org/10.1016/j.tranpol.2024.02.021

Seck, G. S., Hache, E., & Barnet, C. (2022). Potential bottleneck in the energy transition: The case of cobalt in an accelerating electro-mobility world. *Resources Policy, 75*, 102516. doi:https://doi.org/10.1016/j.resourpol.2021.102516

Shchedrina, K. (2025, 28 April). Clean truck adoption rises as fleets bet on natural gas, BEVs, renewable diesel. *Trucknews.com*. Retrieved from https://www.trucknews.com/transportation/clean-truck-adoption-rises-as-fleets-bet-on-natural-gas-bevs-renewable-diesel/1003196509/

Singh, A., Patil, A. J., Sharma, R. N., & Jarial, R. K. (2024). Assessing the cost-effectiveness of electric trucks in Indian food supply chains. *International Journal of Electric Power Systems*. doi:10.1515/ijeeps-2023-0221

Sugihara, C., Hardman, S., & Kurani, K. (2023). Social, technological, and economic barriers to heavy-duty truck electrification. *RESEARCH IN TRANSPORTATION BUSINESS AND MANAGEMENT, 51*. doi:10.1016/j.rtbm.2023.101064

Taefi, T. T., Kreutzfeldt, J., Held, T., & Fink, A. (2016). Supporting the adoption of electric vehicles in urban road freight transport – A multi-criteria analysis of policy measures in Germany. *Transportation Research Part A: Policy and Practice, 91*, 61-79. doi:https://doi.org/10.1016/j.tra.2016.06.003

Talebian, H., Herrera, O. E., Tran, M., & Mérida, W. (2018). Electrification of road freight transport: Policy implications in British Columbia. *Energy Policy, 115*, 109. Retrieved from https://acces.bibl.ulaval.ca/login?url=https://www.proquest.com/scholarly-journals/electrification-road-freight-transport-policy/docview/2068016242/se-2?accountid=12008

https://ulaval.on.worldcat.org/atoztitles/link?sid=ProQ:&issn=03014215&volume=115&issue=&title=Energy+Policy&spage=109&date=2018-04-01&atitle=Electrification+of+road+freight+transport%3A+Policy+implications+in+British+Columbia&au=Talebian%2C+Hoda%3BHerrera%2C+Omar+E%3BTran%2C+Martino%3BM%C3%A9rida%2C+Walter&id=doi:

Tanco, M., Cat, L., & Garat, S. (2019). A break-even analysis for battery electric trucks in Latin America. *Journal of Cleaner Production, 228*, 1354-1367. doi:10.1016/j.jclepro.2019.04.168

Tilly, N., Yigitcanlar, T., Degirmenci, K., & Paz, A. (2024). How sustainable is electric vehicle adoption? Insights from a PRISMA review. *Sustainable Cities and Society, 117*, 105950. doi:https://doi.org/10.1016/j.scs.2024.105950

Tong, F., Jenn, A., Wolfson, D., Scown, C. D., & Auffhammer, M. (2021). Health and Climate Impacts from Long-Haul Truck Electrification. *Environmental Science & Technology, 55*(13), 8514. doi:https://doi.org/10.1021/acs.est.1c01273

Un-Noor, F., Vu, A., Tanvir, S., Gao, Z. M., Barth, M., & Boriboonsomsin, K. (2024). Application of Wireless Charging at Seaports for Range Extension of Drayage Battery Electric Trucks. *IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, 73*(4), 4599-4609. doi:10.1109/TVT.2023.3344213

Vijayagopal, R., & Rousseau, A. (2021). Electric Truck Economic Feasibility Analysis. *WORLD ELECTRIC VEHICLE JOURNAL, 12*(2). doi:10.3390/wevj12020075

Winkelmann, J., Spinler, S., & Neukirchen, T. (2024). Green transport fleet renewal using approximate dynamic programming: A case study in German heavy-duty road transportation. *TRANSPORTATION RESEARCH PART E-LOGISTICS AND TRANSPORTATION REVIEW, 186*. doi:10.1016/j.tre.2024.103547

Wu, C., Li, P., Zhou, H., & Zhou, Y. (2023). The changing adoption behaviors on electric trucks over time during the intention-purchase stage: Insights from freight enterprises' states and perception features. *Journal of Cleaner Production, 421*, N.PAG-N.PAG. doi:10.1016/j.jclepro.2023.138476

Wu, X. K., Zhang, Y. T., & Chen, Y. C. (2023). A Dynamic Programming Model for Joint Optimization of Electric Drayage Truck Operations and Charging Stations Planning at Ports. *IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, 24*(11), 11710-11719. doi:10.1109/TITS.2023.3285668

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5): sage.

Yu, H., & Sun, X. (2024). Can an Industry-Led infrastructure development strategy facilitate electric truck Adoption? *Transportation Research Part D: Transport & Environment, 134*, N.PAG-N.PAG. doi:10.1016/j.trd.2024.104356

Corporate websites

Lion Electric. https://thelionelectric.com/

Nikola. https://www.nikolamotor.com/

Tesla. https://www.tesla.com/en_ca/semi