

Literature Review

Transitioning into Electric Vehicle Fleet

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Introduction

With the ever-changing climate and the necessity for sustainable systems, electric vehicles have been increasingly popular amongst the public as a way to reduce emissions. Emissions from standard gas vehicles have played a large role in the negative impact transportation has had on the environment. The solution to this problem, specifically in the form of sustainable transportation via car, is seen as fully electric vehicles (EVs) and plug-in hybrid vehicles (PHEVs). One of the largest adopters of electric vehicles is public agencies that utilize agency-owned vehicles that are used for work purposes (Sierzchula, 2014).

While the switch from gas to electric vehicles seems like a promising solution, there are a few psychological apprehensions and potential drawbacks associated with this transition. This ranges from the impact on infrastructure, new technology development, and especially, range limitations (Farhar, et. al, 2016). The following sections will review and discuss various both psychological and physical advantages and disadvantages associated with electric vehicle adoption, both as a public consumer, but also from the perspective of public agencies.

Consumer Trends & Attitudes

The jump from standard gas vehicles to PHEVs or EVs as a whole has been met with both enthusiasm and apprehension. Specifically, one of the largest considerations when purchasing an electric vehicle is the all-electric range (AER), otherwise known as the distance that the vehicle can go using solely the battery (Farhar, et. al, 2016). In order to preserve or maintain a charge on an electric vehicle, it must be charged at a charging station for an extended period of time (≥ 3 hours). This is a similar concept to bringing a standard gas vehicle to a gas station, and filling up the gas tank, which normally takes less than ten minutes. This phenomenon has caused anxiety within consumers, out of fear of running out of battery; A concept which has been deemed “range anxiety” (Rainieri, et. al, 2023).

Range anxiety stems from the consumer concern of charge management. Comparatively speaking, public electric vehicle charging stations are much more scarce than gas stations for

standard gas cars. A field study was conducted at the University of Colorado at Boulder, that studied human adaptation over time with plug-in electric vehicles, and the human factors that impact electric range management. Participants were given plug-in electric vehicles as well as at-home charging stations, and were randomly assigned a “managed” electric range or an “unmanaged” electric range. Over the course of nine weeks, participants presumed a normal day-to-day life with their electric vehicle, and questionnaires were distributed to gauge the attitudes around the adoption of their electric vehicle. The study concluded with 90% of participants across the board noting that they either loved or liked their electric vehicle. Specifically, with a charging station at home, consumers found electric vehicles to be practical and environmentally friendly (Farhar, et. al, 2016).

Alternatively, there have been various incentives that influence consumer behavior. A common example of this is new electric vehicle purchasers receiving a monetary tax incentive. Another example is workplace promotion. Specifically, a company conducted a workplace study which observed the impact of company incentives on employee purchase behavior. With no surprise, the incentive from the workplace greatly increased the number of electric vehicle purchases (Decrinis, et. al, 2023). With both financial and workforce incentives, electric vehicle apprehension is met with great positive reinforcement.

Electric Vehicles in Public Agencies

Public agencies already have a strong relationship with the automotive industry, given their frequent usage and purchases. These public agencies often have a large fleet of vehicles that are used by employees for work related purposes. This factor makes public agencies a target consumer to companies that produce electric vehicles. An analysis of agency behavior was conducted, specifically through fleet manager interviews, to find how these agencies were adopting electric vehicle fleet management (Sierzchula, 2014).

After observing and analyzing fourteen different organizations that adopted electric vehicle fleets, as well as interviewing their fleet managers, public agencies were strongly in-favor of the electric vehicle adoption. These public agencies found that they enjoyed the advanced technologies, operational capabilities, and the positive environmental impact. Most public agencies were also in favor of expanding their electric vehicle fleets, with the exception being some fleets not wanting to expand their fleet due to costs. Overall, public agencies have a mostly positive attitude towards the adoption of electric vehicles for their company fleets.

Conclusion

In today's environment, there is a dire need for a solution to the rise in CO2 emissions produced from transportation. One of the most promising solutions is the adoption of electric vehicles. From a consumer perspective, there are both advantages and disadvantages to be considered. Specifically, there is the psychological concern of range anxiety and battery range management. Alternatively, there are benefits such as financial and potentially employment incentives. From an agency integration perspective, electric vehicles, when adopted on a fleet scale, have a positive impact on its consumers. Public agencies have found that the capabilities both technologically and operationally are a good fit for their frequent vehicle usage needs (Sierzchula, 2014). Conclusively, electric vehicle integration is associated with positive attitudes when managed properly.

References

B.C. Farhar, D. Maksimovic, W.A. Tomac, T.C. Coburn, A field study of human factors and vehicle performance associated with PHEV adaptation, *Energy Policy*, Volume 93, 2016, Pages 265-277, ISSN 0301-4215, <https://doi.org/10.1016/j.enpol.2016.03.003>.

Decrinis, L., Freibichler, W., Kaiser, M., Sunstein, C. R., & Reisch, L. A. (2023). Sustainable behaviour at work: How message framing encourages employees to choose electric vehicles. *Business Strategy and the Environment*, 32(8), 5650–5668. <https://doi.org/10.1002/bse.3441>.

Giuseppe Rainieri, Chiara Buizza, Alberto Ghilardi, The psychological, human factors and socio-technical contribution: A systematic review towards range anxiety of battery electric vehicles' drivers, *Transportation Research Part F: Traffic Psychology and Behaviour*, Volume 99, 2023, Pages 52-70, ISSN 1369-8478, <https://doi.org/10.1016/j.trf.2023.10.001>.

Vibhor Tiwari, Paulus Aditjandra, Dilum Dissanayake, Public Attitudes towards Electric Vehicle adoption using Structural Equation Modelling, *Transportation Research Procedia*, Volume 48, 2020, Pages 1615-1634, ISSN 2352-1465, <https://doi.org/10.1016/j.trpro.2020.08.203>.

William Sierzchula, Factors influencing fleet manager adoption of electric vehicles, *Transportation Research Part D: Transport and Environment*, Volume 31, 2014, Pages 126-134, ISSN 1361-9209, <https://doi.org/10.1016/j.trd.2014.05.022>.

