

Sustainable Mobility: Are Electric Cars the Answer?

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The impact of the transportation sector on climate has necessitated the development of more sustainable transportation. Over the past decade in the U.S., electric vehicles have become a popular form of sustainable mobility. As a result of regulatory pressure on emissions and investment in electric vehicles (EV), it is projected that EV sales will increase from 2 million in 2018 to 10 million in 2026 (McKerracher, 2019). Both proponents and critics of EVs have organized to advance their visions of sustainable mobility. The prevailing vision will greatly impact the global climate. Greenhouse gas emissions (GHGs) have been directly linked to climate change, poor air quality, and cardiovascular disease (Ahuja et al, 1990; Chan et al 2011; Ostro 2004). The transportation sector accounted for 29 percent of all GHG emissions in the U.S. in 2017 (EPA, 2019). A wholesale transition to EVs could result in great reductions in GHG emissions (Delgado et al, 2012), but more aggressive changes, such as the development of more compact, walkable cities, may be required to avoid serious affects from climate change.

The Union of Concerned Scientists supports the adoption of EVs as more sustainable than internal combustion engine vehicles. Electrify America, LLC, in conjunction with Chargepoint and EVgo, is building the charging infrastructure EVs require. The Edison Electric institute also intends provide infrastructure. Some automakers, such as Tesla, Audi, Ford, and Mercedes-Benz, have invested heavily in EV technology, while Toyota, Fiat Chrysler, and others have yet to make significant investment. Ride-sharing companies promote EV usage and offer scooter and bicycle sharing to appear more sustainable to consumers. The American Energy

Alliance and the American Fuel and Petrochemical Manufacturers have campaigned to end Federal EV tax credits to stall EV sales. Transportation Alternatives, and many coalitions like it, advocate for car-free cities and infrastructure that supports alternatives to personal vehicles.

In the United States, proponents of EVs attempt to change consumer perceptions and claim to offer a stronger value proposition, while others promote their adoption to appear sustainable. Opponents of EVs influence regulatory policy to maintain the status quo in the automotive industry. Automakers who are skeptical of EV adoption have invested in hybrid and alternative fuel technology to capture the automotive market. Many have organized to advocate for a future with fewer cars on the road.

Review of Research

Rogers (1995) created a framework that describes how innovation diffuses in society, and expanded on this framework by studying the differences in the diffusion of preventive innovation, an innovation that must be adopted at one point in time to prevent future consequences (Rogers, 2002). Using Rogers' framework, Bassier et al. (2019) contends that PHEVs should be given greater emphasis than BEVs, as they may be more appealing to consumers who enjoy driving ICE vehicles. Li et al (2020) found that high profile demonstrations of EVs in China significantly increased EV sales. Promoters of electric cars can learn from Chidambaram and Kwon (2000), who found that perceived ease of use and apprehensiveness greatly influenced consumers' decision to use cellphones (Chidambaram et al., 2000). Various studies have shown that consumers have fears about EV range, cost, charging ability, and environmental impact (Carley et al, 2012; Bodin et al, 2014; Egbue & Long, 2012; Carley et al, 2019). Similarly, findings from Bai et al (2018) support that advancing EV

technology to minimize risk and promote environmental benefits will increase adoption. Franklin et al (2016) found that policy incentives increase the likelihood of EV purchase if the consumer has not considered the use of EVs previously. This indicates that policy incentives are more effective early in the process of EV adoption. Barth et al (2016) found that social norms and collective efficacy may have as strong of an effect as cost-related factors on EV adoption.

Companies may use the transition to more sustainable mobility to greenwash their services. Laufer (2003) outlines common greenwashing tactics that corporations employ, and argues that third-party auditing of claims can mitigate risks. Gangadharbatla et al (2012) found that green advertising results in negative attitudes independent of the brand's environmental performance.

The widespread adoption of EVs could destabilize the fossil fuel industry, and those who support EVs for environmental reasons support this destabilization. Normann (2019) studied the destabilization of the U.S. tobacco industry and the Dutch coal industry and contends that destabilization can occur if the competing agendas of industry supporters cause them to work against one another. Meadowcroft (2015) argues that coalitions and policymakers must force changes against the oil and gas lobby for Canada to transition to a low carbon economy.

Adams (1981) contended that defense contractors were able to maintain the status quo in their industry by creating an iron triangle between Congress, the Department of Defense, and themselves. Fossil fuel companies may have developed a similar relationship between themselves, Congress, and the Department of Energy. Givel and Glantz (2001) found that tobacco companies attempted to ally themselves with consumers to fight regulation in the 1990s. With increased regulation on carbon emissions and scrutiny on fossil fuel companies, these companies have worked to maintain their profitable position in a fossil fuel-driven growth

economy. Gundersen et al (2019) argues that these companies have supported carbon capture and storage technology as a method to maintain this position.

Automakers

Automakers advance EV technology to encourage consumer adoption. Consistent with the theory of diffusion of innovation (Rogers, 1995) and the technology acceptance model, automakers increase the relative advantage of EVs to increase the perceived ease of use and mitigate apprehensiveness regarding EV performance. The distance an EV can travel on a full charge is a common source of apprehensiveness (Carley et al, 2012) and even has been labeled “range anxiety.” Tesla’s model S sedan debuted with a range of 265 miles in 2012, and the most recent model S claims a range of 370 miles (Tesla, 2020). GM and VW have debuted platforms that boast ranges of more than 330 miles (GM, 2020; VW, 2019). Charging station speed and availability concern many consumers (Carley et al, 2012). Porsche claims that its newest EV can be charged for 100 km of travel in under 5 minutes in ideal conditions (Porsche AG, 2020).

Tesla, GM, VW, and Porsche cleverly market their EVs to emphasize their relative advantage and alter consumer perceptions of EVs. VW’s website provides infographics titled “7 Big Misconceptions – EV fact check” and “the big cost comparison – e-car vs. internal combustion engine” (VW, 2020). Fighting the perception that electric vehicles’ range is too short, Tesla’s and Audi’s websites provide maps of trips that could be completed on a single charge (Tesla, 2020; Audi, 2020). Ford wants consumers to “forget what [they] think [they] know about electric vehicles” (Ford Motor Company, 2019), and Mercedes-Benz has an electric vehicle FAQ section for customers that reassures them that charging stations are easy to use

(Mercedes-Benz USA, LLC, 2019). These automakers market electric vehicles to consumers as easy-to-use and advantageous.

While many automakers have pushed for fully electric vehicles (EVs), Toyota develops hybrid electric vehicles, which combine a gasoline engine and electric motor, to meet emissions standards and consumer demand. In a recent interview, Jack Hollis, the marketing lead for Toyota North America stated that “demand for electric is less than it is on hybrid...right now, there is no demand for [fully electric vehicles]” (Berman, 2019). Toyota is skeptical that consumers will adopt EVs, as they do not fully understand hybrid technology, which has existed for 20 years (Nerad, 2019). In the 2020 model year, Toyota will offer four basic types of powertrains, but it will not offer a fully electric vehicle. (Toyota, 2020). By offering multiple powertrains, Toyota hopes to hedge its bets in the market and pursue the options that are highly demanded.

Toyota organized with other automakers to form the Coalition of Sustainable Automotive Regulation to encourage less stringent emissions and fuel economy standards. The coalition petitioned to intervene in the Union of Concerned Scientists’ (UCSA) appeal of the Safer Affordable Fuel-Efficient Vehicles (SAFE) Rule in defense of the EPA (Corley et al, 2019). The rule gives the EPA power to implement national fuel economy and emissions standards and overrules state standards, even if they are more stringent (EPA & NHTSA, 2018). Currently, EPA standards are significantly lower than California’s standards. Toyota reasoned that the implementation of a singular national standard will reduce development costs and allow more consumers to switch more fuel-efficient vehicles (Toyota, 2019). EVs produce no tailpipe emissions and are more efficient than hybrids and gasoline-powered cars (Delgado et al, 2012), so pro-EV automakers support UCSA in the appeal (Knickmeyer & Krisher, 2019), as they

would not need additional development to meet higher standards. Toyota would need to invest more heavily in development to meet higher standards. While GM has joined Toyota in the coalition, GM's EV strategy differs greatly from Toyota's. Toyota argues that consumers and manufacturers alike are not ready for EVs, so they support a market that encourages various powertrain options.

Charging Platforms

Electrify America plans to promote the growth of EVs by providing charging services. The VW group subsidiary is building a network of charging stations in the U.S. The company was founded by VW group to invest in zero-emission vehicle (ZEV) infrastructure as required by the settlement reached after the VW emissions scandal (Breyer, 2016). It will invest 2 billion dollars over ten years in purposefully brand-neutral public education, community charging infrastructure, and a network of highway fast charging stations (VW Group, 2017). Its platform includes an app that allows for convenient payment and charge monitoring. While VW was mandated to make the investments, it stands to profit from an extensive charging network. It has partnered with two other charging platforms, Chargepoint and EVgo, so that customers may charge at any of their locations. EA hopes to make charging more convenient and encourage more drivers to buy electric (Chargepoint, 2019; Electrify America, 2019).

The Edison Electric Institute encourages EV adoption by lobbying Congress to promote EV tax credits. Representing all investor-owned electric utilities in the U.S., EEI could benefit from investment in charging infrastructure (Knox & Schefter, 2018). In 2018, EEI supported the Driving America Forward Act (EEI, 2018), which would increase the number of tax credit-eligible vehicles a manufacturer could sell. EEI deployed multiple lobbyists who helped to create

the bill (Secretary of the Senate, 2018). EEI also runs PowerPAC, a political action committee that protects EEI's interests by lobbying. PowerPAC raised over \$400,000 in the 2019-2020 fiscal year (FEC, 2020). In 2018, PowerPAC donated \$2,500 directly to Sen. Debbie Stabenow's campaign (FEC, 2020), the sponsor of the Driving America Forward Act.

Although EEI publicly supports EV adoption, it also benefits from the status quo in the energy industry. In 2017 and 2018, PowerPAC made 3 contributions to the "Friends of John Barrasso" group, which totaled \$10,000 (FEC, 2020). Sen. Barrasso has supported the "Fairness for every driver Act," which would eliminate all EV tax credits (Barrasso, 2019), and is financially supported by fossil fuel trade associations. By supporting both sides of the EV debate, EEI can ensure that it benefits from the future of transportation.

Lobbying and Regulatory Battles

The Union of Concerned Scientists publicizes the environmental advantages of EVs over gasoline-powered vehicles to encourage EV adoption. UCSA claims that EVs produced fewer greenhouse gas emissions and were more efficient than internal combustion engines from their inception around 2009, and further reductions in emissions will be realized as renewable energy sources contribute to the grid (Reichmuth, 2018). It also claims that it is cheaper to buy and own an EV than gasoline-powered cars (USCA, 2019). UCSA argues that busses and heavy-duty vehicles should be electrified, because electrification will reduce their environmental impact and decrease their operating costs (O'Dea, 2019). UCSA conducted a survey with Consumer Reports to understand consumer intentions to purchase EVs (UCSA, 2019). It used the social norms approach to show that consumers do intend to purchase EVs, contrary to popular misconception

(UCSA, 2019). By performing their own research, UCSA gains credibility as a source of trusted information, and uses this authority to advocate for their causes more effectively.

UCSA fights for strict regulation of emissions and fuel economy standards to reduce vehicle emissions and to encourage the proliferation of EVs. They recently appealed a section of the SAFE Rule that eliminated states' rights to mandate stricter fuel economy and emissions standards than the Federal Government (Littleton, 2019). Many states have more stringent regulations than the EPA, so this action would ease standards for automakers. UCSA filed a Freedom of Information Act lawsuit against the EPA for a more accurate study of subsidies for fossil fuel companies (Wood, 2018). The action shows that UCSA often takes legal action to pursue interests. Engaging in legal action allows UCSA to advance their agenda through policy.

Fossil fuel trade associations lobby Congress to inhibit the growth of the EV market. They contend that subsidies for EVs burdens taxpayers, many of whom cannot afford an EV (AFPM, 2019). An AFPM-commissioned study found that the renewal and expansion of Federal EV tax credits would cost more than \$16 billion over ten years (Ernst & Young, 2019). The organizations argue that the subsidies only benefit wealthy individuals. According to the AFPM, 78 percent of those who claimed the tax credit earn over \$100,000 (Sherlock, 2019), whereas the median U.S. household income in the same year was about \$60,000 (U.S. Census Bureau, 2016). In October 2019, Sen. John Barrasso sent a letter to Sen. Mitch McConnell highlighting these points in an argument to end the EV tax credit, and the AEA followed suit in December when the credit was up for renewal (AEA, 2019; Barrasso, 2019).

AFPM takes legal action to prevent emissions and fuel economy regulation. AFPM petitioned to intervene in the appeal made by UCSA over the SAFE ruling in defense of the EPA and NHTSA (Chipley, 2019). The trade association has challenged the EPA over a different

section of the Clean Air Act involving use of renewable fuels (Lorenzen & Kline, 2019). By lobbying Congress and fighting regulation in courts, AFPM can influence regulatory policy before and after laws are enacted.

In 2019, Senator John Barrasso also introduced the “Fairness For Every Driver” Act, which would end the EV tax credit and impose a fee on all “alternative fuel vehicles,” which includes ZEVs (Barrasso, 2019). Oil and gas companies are his largest contributors, having given more than \$500,000 in the last 5 years (CRP, 2020). Cosponsors of the bill include Sens. James Inhofe, Joni Ernst, Mike Braun, Michael Enzi, and Pat Roberts. Each cosponsor has an oil or gas company or affiliate in their top 20 donors list, and most have multiple (CRP, 2020). The donations and resultant regulatory policy suggest that oil and gas companies exert influence on the Senators’ through campaign finance.

Alternative Mobility Options

Uber and Lyft claim to support sustainable transportation by encouraging the adoption of EVs and investing in electric scooters and bicycles. Having come under fire for increasing congestion and pollution in cities (Castiglione et al, 2018; Anair et al, 2020), Uber and Lyft have supported sustainable transportation initiatives to bolster their reputation. Uber incentivized drivers to use EVs by offering monetary bonuses (Uber, 2018). Uber launched a dockless electric scooter and bicycle company (Uber, 2018), and Lyft offers scooters under the Lyft name. Uber and Lyft are members of Veloz, an industry-run non-profit organization that advocates for EV adoption (Veloz, 2020). Uber partnered with EVgo, an EV charging platform, to facilitate EV ride sharing more effectively (EVgo, 2019). Lyft allows riders to ask for EVs via its “green

mode” in its app (Lyft, 2019). Ride-sharing companies greenwash their products by creating dubious initiatives to encourage EV and alternative transportation usage.

The Car Free Movement is an informal network of organizations and people who believe motorized vehicles are too dominant in cities. The San Francisco Bike Coalition, Transportation Alternatives, Critical Mass, The Bicycle Coalition of Greater Philadelphia, and the Active Transportation Alliance advocate for regulation to protect pedestrians and cyclists, streets that encourage pedestrian and cyclist use, and reduction of private vehicle usage (SFBC, 2020; BCGP, 2017; TA, 2020). In 2018, Brian Wiedenmeier, the executive director of the San Francisco Bicycle Coalition, wrote “For the health of our planet and the health of our cities, we must reduce the number of car trips, not grow them.” (Wiedenmeier, 2018). The San Francisco Bicycle Coalition advocated for the Better Market Street Plan, which redesigned a section of San Francisco Market Street for pedestrians and cyclists and banned private automobile travel (SFBC, 2020). In New York City, Transportation Alternatives advocated for a car ban in a busy section of Manhattan (Transportation Alternatives, 2020).

The movement advances its agenda through public outreach. Critical Mass holds monthly rides through city streets to raise awareness (Wright, 2011; Seth’s Bike Hacks, 2017; Critical Mass, 2020). SFBC, Bicycle Coalition of Greater Philadelphia, and the Active Transportation alliance organize events to build their communities (SFBC, 2020; GPBC 2020; ATA, 2020). SFBC, BCGP, and ATA also curate social media accounts to interact with community members and publicize their agenda on the internet (BCGP, 2020). Through their advocacy, outreach events and social media presence, the Car Free Movement builds relationships with governments and community members to promote their vision of sustainable transportation.

Conclusion

For the first time since the invention of the automobile, the future of mobility is in flux. The recent explosion of EV development was not the natural progression of automotive development, but a solution to the issues of stringent emissions and fuel economy standards and consumer consciousness about the environment. The possibility of EV adoption threatens to destabilize the industries that fuel gasoline-powered vehicles, so they have organized to protect themselves. Those who believe EVs will help to protect the environment have organized to fight back, while the industries that could fuel EVs build the infrastructure. Others, who believe more vehicles will solve nothing, demand unconventional change.

As climate change and other factors cause shifts in governmental policy, more industries may face the same type of transition that the transportation industry is undergoing. Industry giants will lobby to maintain the status quo, because they benefit most from it. The companies that succeed will convince the consumers that their new technology is worth buying. Groups who desire wholesale change must convince both people and government that the change is necessary. Opportunistic companies will support the transition to repair brand image.

As this transition progresses, future research could examine the effectiveness of fossil fuel lobbying, EV marketing, and the Car Free Movement. Studying how these participants have advanced their agendas outside the U.S. could give more insight to the problem. The EV share of the automotive market and urban infrastructure and transportation policy in the coming years could indicate which participants successfully advance their agendas. The true indicator will be how Americans get from point A to point B.

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