LSU Journal of Energy Law and Resources

Volume 8
Issue 1 *Fall 2019*

3-4-2020

An Electric Future for Today: An Analysis of Policy Options for State & Provincial Electric Vehicle Impact Standards to Expand Electric Vehicle Use

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INTRODUCTION

It is Detroit, Michigan, in September of 1907. Horse-drawn carriages roll along littering the streets with filth. Horse manure left behind flooding the streets and causing significant health concerns. Occasionally, a robust vehicle passes by, drawing awes from onlookers, but nothing dramatic. The health problems left behind by horses persisted. By 1913, a new horse-powered carriage filled the streets—the Tin Lizzie. The automobile removed the horse manure problem as now there is a new form of affordable transportation. Henry Ford's innovation significantly cut down production time, leading to rapid automobile production, and most importantly created a healthier society by removing the manure in the streets. This innovation created a new technology that has been one of America's key contributors to society. The Tin Lizzie was one of several internal combustion engines ("ICE") in the market, but what separated Henry Ford's model from other manufacturers was that he built a desirable, affordable product for the average consumer. From that point forward, two major industries were created: the automobile production industry and the oil and gasoline industry. These new industries brought unforeseen problems—the industry's contribution to increased greenhouse gases in the atmosphere.

Fast forward to today: the market is seeing another dramatic innovation taking place in technology through the expansion of Electric Vehicles ("EV") and Plug-in Hybrid Electric Vehicles ("PHEV"). The EV

and PHEV enter the marketplace to limit greenhouse gases that enter into the atmosphere. In 2016, the transportation section became the leading Greenhouse gas emitter.[1] The United States Department of Energy projects this to become the new norm with more people driving on the road.[2] EVs and PHEVs offer a solution to improving overall air quality and still allowing drivers to keep their travel independence. Unfortunately, EVs and PHEVs have not been able to penetrate the marketplace as fast as the environmental concerns continue to rise, but the vehicles are poised to do so with improving technology. Policymakers are in a unique position to help fight climate change by creating a healthy environment for EV and PHEV in their states and provinces.

Part I of this Article will introduce EV and PHEVs in its current position in the automobile industry. This includes the labor investment undertaken to develop the technology and the potential impact it can have on the market. Part II of this Article will discuss the global policies that affect EV and PHEV development. Part III of this Article looks at the current environmental policies in the United States. This section reviews how each relates with one another and EVs and PHEVs. Part IV discusses policies that state and provincial policymakers can introduce in their own jurisdiction for the improvement. This section includes EV and PHEV incentives as well as a separate taxing system to ensure fairness across the board. Lastly, Part V is a brief summation of the issues.

I. BACKGROUND

A. The Electric Vehicle and its Development in the United States

The automobile industry plays a significant role in the United States economy and accounts for a significant portion of the American workforce. According to the U.S. Department of Energy, the automobile industry employed over 2.46 million workers in 2017.[3] With the growth of this multi-billion-dollar industry came many environmental concerns and a fear of limited resources. As a result, automobile manufacturers are addressing these concerns by limiting greenhouse gas ("GHG") emissions

1. *See Monthly Energy Review*, U.S. ENERGY INFO. ADMIN. (Apr. 10, 2017), https://www.eia.gov/todayinenergy/detail.php?id=30712 [https://perma.cc/72GP-SF2B].

2. *Id.*

3. NAT'L ASS'N OF STATE ENERGY OFFICIALS & ENERGY FUTURES INITIATIVE, U.S. ENERGY AND EMPLOYMENT REPORT 14 (2018), https://www.usenergyjobs.org/s/2018-US-Energy-and-Employment-Report-6akj.pdf [https://perma.cc/C8K9-HQZK] [hereinafter USEER].

released into the environment while cutting its dependence on nonrenewable energy.[4] In 2017, the automobile industry dedicated 220,000 of its employees toward alternative fuel vehicles ("AFV"). Alternative fuel vehicles is an umbrella term that encompasses natural gas, hybrids, PHEV, EV, and fuel cell/hydrogen vehicles.[5] Of these 220,000 employees, 197,000 worked on developing PHEVs and EVs while other AFV development like fuel cell and hydrogen fueled vehicles took a decline from previous years.[6] This large portion of the labor force shows the manufacturer's commitment toward EV and PHEV development.

Both PHEVs and EVs derive all or part of their power from electricity from the electric power grid.[7] EVs rely solely on electricity as its "fuel." Unlike the EV, PHEVs have a shorter electric range, but once the battery reaches neutralization instead of rendering the car immobile, it automatically switches over to an internal combustion engine running on gasoline. Both vehicles contain the regenerative braking system that generates electricity from the energy normally lost while braking in normal ICE vehicles. The regenerative braking system captures kinetic energy that would normally be released as heat from friction between the brake pads and wheels.[8] The energy is then repurposed, charging the vehicle's battery and creating an efficient redistribution of energy. This technology has helped expand EVs and PHEVs throughout the market.

Certainly, EVs and PHEVs do not dominate the market. As of April 2018, EVs only make up about 1% of the United States new car sales.[9]

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4. Greenhouse gases are those gases, such as water vapor, carbon dioxide, nitrous oxide, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride, that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface. *Glossary*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/glossary/index.php (search "greenhouse gases" in the provided search box) (last visited Aug. 31, 2019) [https://perma.cc/QX5V-6NHR].

5. USEER, *supra* note 3, at 14.

6. *Id.*

7. The electric power grid is a system of synchronized power providers and consumers connected by transmission and distribution lines and operated by control centers. U.S. ENERGY INFO. ADMIN., *supra* note 4 (search "electric power grid" in the provided search box).

8. S. Jeremy Clegg, *A Review of Regenerative Braking Systems* 1 (Inst. for Transp. Studies, Univ. of Leeds, Working Paper No. 471, 1996).

9. EDISON ELEC. INST., ELECTRIC VEHICLE TRENDS AND KEY ISSUES (2018), https://www.eei.org/issuesandpolicy/electrictransportation/Documents/EV_Trends_and_Key_Issues_March2018.pdf [https://perma.cc/LVS2-2R8X].

Nonetheless, this is not something that should be immediately overlooked. A deeper investigation shows that there was a 32% increase of EV sales in the first quarter of 2018 compared to the first quarter of 2017. There is a strong push from within the automobile industry alone that is making this happen.

It would be inappropriate to completely ignore the fact that the automobile industry is still trying to find ways to improve ICE's fuel efficiency. This effort is evidenced by the amount of component parts employees that are working toward these improvements.[10] Out of the total 1,088,786 component parts employees, over 467,000 employees spent 2017 working to increase fuel efficiency in ICEs.[11] This number does not reflect the number of people that worked on mining, nor does it extract elements used in the production line.[12] Labor investments toward efficiency have already shown positive returns. Across all component parts, 23% of manufacturers involved indicated that it received all of its revenue from products that increase fuel economy for these vehicles.[13] A closer examination into the vehicle breakdown between automobiles, light-duty trucks, and heavy-duty trucks shows that the rise of fuel efficiency increase saw its greatest increase with light-duty trucks. At least 66.7% of light-duty trucks can attribute most or all of its revenue derived from fuel efficiency component parts; meanwhile 47.6% of automobile revenue is attributable to fuel efficiency component parts and 33.3% of heavy-duty trucks is attributable to increasing fuel efficiency.[14] This review shows that not only are automobile industries investing into increasing fuel efficiency, but consumers are opting into these features as they increase among these light-duty trucks.

B. The Electric Vehicle Industry is Adapting to Consumers' Concerns

Within the development of EVs and fuel efficiency for ICE, there is a common theme—reduce GHG emissions and reduce consumption of non-renewable resources. EVs and PHEVs reduce carbon emissions from tailpipes, drive economic growth, and promote domestic energy independence. However, EVs and PHEVs draw criticism for the expensive upfront costs, limited driving range, lengthy recharging time, dependability

10. The "component parts" employees are those employees that develop vehicle engine and drive parts, exhaust system parts, body parts, and other various parts.
11. USEER, *supra* note 3, at 91.
12. *Id.*
13. *Id.*
14. *Id.* at 92.

on charging infrastructure, and lack variety.[15] Manufacturers are currently developing EVs and PHEVs to become more marketable to consumers by addressing these areas of concern.

Driving range anxiety is often cited as a major drawback toward EVs because there is a limit on how far one can travel before having to spend time recharging the battery. Range anxiety is the fear that a car's battery will run out before reaching the nearest charging point.[16] This fear can be relieved in two ways: increasing EV's range or adding more charging infrastructure. For example, Tesla's 2018 vehicle line supports driving ranges between 220 to 335 miles.[17] Recent driving habit studies suggest that 75% of distances traveled in a passenger vehicle per day are less than 50 miles.[18] This is well within the range limits of current EV technology for most daily driving routines. EVs can satisfy over 90% of average passenger car trips if drivers are consistent with charging patterns.[19] However, this is only optimal if drivers couple their regular driving patterns with consistent charging routines. The overwhelming majority of EV owners charge their vehicle at home, in their garages, carports, or parking spaces.[20] Outside of these areas, EVs are not able to support the longer "road trips" that a traditional ICE can provide for its consumers and can do so without a refueling delay.

PHEVs are the bridge between the two technologies of ICE and EV. PHEVs offer the alternative, hybrid option of a longer range that kicks in once the electric battery is used. Typically, PHEVs' electric range is between 10 to 50 miles on electricity with a total range of 300 to 600 miles.[21] PHEVs cure range anxiety and cut down on transportation emissions. However, it must be noted that most PHEVs do not remedy the

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15. *See* NIC LUTSEY, INT'L COUNCIL ON CLEAN TRANSP, TRANSITION TO A GLOBAL ZERO-EMISSION VEHICLE FLEET: A COLLABORATIVE AGENDA FOR GOVERNMENTS 8–9 (2015), https://theicct.org/sites/default/files/publications/ICCT_GlobalZEVAlliance_201509.pdf [https://perma.cc/L39K-3RHA].

16. GOLDMAN SACHS, FROM PUMP TO PLUG 6 (2017).

17. ELEC. POWER INST., A U.S. CONSUMER'S GUIDE TO ELECTRIC VEHICLES 9 (2018), http://mydocs.epri.com/docs/public/3002012521_Print.pdf [https://perma.cc/BGM4-Z4TU].

18. TIM TRIPLETT ET AL., AAA FOUND. FOR TRAFFIC SAFETY, AMERICAN DRIVING SURVEY: 2014-2015 (2016), https://aaafoundation.org/ american-driving-survey-2014-2015/ [https://perma.cc/64YQ-NGNG].

19. GOLDMAN SACHS, *supra* note 16.

20. ERICK FIGENBAUM & MARIKA KOLBENSTVEDT, NORWEGIAN CTR. FOR TRANSP. RESEARCH, LEARNING FROM NORWEGIAN BATTERY ELECTRIC AND PLUG-IN HYBRID VEHICLE USERS--RESULTS FROM A SURVEY OF OWNERS 4 (2016).

21. ELEC. POWER INST., *supra* note 17, at 2.

upfront cost concerns expressed by consumers that are attributed with this technology.

Another major drawback of EVs is their lack of variety.[22] Automobile manufacturers have pledged to remedy this problem for consumers by offering more EV and PHEV options. By 2019, approximately 53 different models are expected to be available. The Electric Power Research Institute predicts this number will nearly double to 90 by 2022.[23] Yet, providing more options does not necessarily mean consumers will choose these vehicles. In the EPA's 2012 projections, the car to light-duty truck ratio was projected to be 67% to 33%. However, the EPA's 2017 Fuel Economy Trends reports that the gap has narrowed 55% car to 45% light-duty truck.[24] The report further states that consumers are trending more toward sport utility vehicles ("SUV") and light-duty trucks since gasoline prices remain low.[25] Since the trend indicates that consumers prefer fuel efficient SUV/crossover vehicles rather than cars, automobile manufacturers are committed to meeting consumers' tastes and preferences by offering at least 19 EV and PHEV SUV/crossover options by the end of 2018.[26] This commitment shows that manufacturers are trying to cater their product to help facilitate EV and PHEV penetration into the marketplace.

C. The Automobile Industry is Becoming More Efficient to Pierce the Market as it Continues to Develop the Electric Vehicles

The major upfront cost presented by EVs and PHEVs is certainly not going unnoticed by automobile manufacturers. Currently, ICEs are much cheaper to purchase than new EVs. EV and PHEV prices are significantly decreasing in cost as Tesla, General Motors, Hyundai, and Nissan offer a variety of affordable electric options ranging from $22,000 to $37,495, with a median roughly at $29,747.[27] However, the price will ultimately

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22. *Id.* at 1.

23. *Id.*

24. Mid Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022-2025 Light-Duty Vehicles, 83 Fed. Reg. 16,077, 16,083 (Envtil. Prot. Agency Apr. 13, 2018) (notice).

25. *See* AARON HULA, AMY BUNKER, ANDREA MAGUIRE & JEFF ALSON, U.S. ENVTL. PROT. AGENCY, LIGHT-DUTY AUTOMOTIVE TECHNOLOGY, CARBON DIOXIDE EMISSION, AND FUEL ECONOMY TRENDS: 1975 THROUGH 2017, at 20 (2018).

26. *Id.* at 77.

27. *See* Constance Douris, *The Bottom Line on Electric Cars: They're Cheaper to Own*, FORBES (Oct. 24, 2017, 8:00 AM), https://www.forbes.com/sites/constancedouris/2017/10/24/the-bottom-line-on-electric-cars-theyre-cheap

depend on advancing efficiency of the product, just as Henry Ford did with the Tin Lizzie in 1908.

The two areas most vulnerable to cost cuts are battery improvements and Silicon Carbide ("SiC") chip adoption. Battery development continues to shift the outlook for sales of EV and PHEVs.[28] When EVs were first introduced for mass production, the lithium-ion batteries cost about $1,000 per kilowatt-hour ("kWh"). Today, that price has rapidly dropped to around $190 per kWh in the latest Tesla Model 3.[29] This improvement significantly exceeded 2013 United States Energy Information Administration ("EIA") projections, which predicted prices to be in a range of $400/kWh to $600/kWh.[30] As companies continue to conduct more research and development, battery prices continue to drop. Most researchers believe that once battery prices reach the $100/kWh cost performance, EVs and PHEVs will be able to compete with ICEs, perhaps as soon as the early 2020s.[31] Some researchers believe that this point can be achieved sooner at $125–$165/kWh depending on average gas prices by 2020.[32] This price point only looks at the upfront cost of the vehicle. Meanwhile, other ownership costs, including fueling the vehicle, are already much cheaper. With the national gas averages at $2.87 per gallon of unleaded gasoline, the comparable cost for an electric gallon is more than half the cost at $1.15 per gallon.[33] If gas prices continue to rise, consumers may be willing to adopt EVs and PHEVs more quickly.

The second major cost cutting factor is automobile manufacturers adopting SiC chips, which improve driving range and charging time by 20%. SiC chips cost about 150% more than cheaper insulated-gate bipolar

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er-to-own/ [https://perma.cc/6JHL-J95V].

28. *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2017, at 33 (2017), https://www.eia.gov/outlooks/archive/aeo17/pdf/0383(2017).pdf [https://perma.cc/XY4H-JM2G].

29. *See Electric Vehicle Battery: Materials, Cost, Lifespan*, UNION OF CONCERNED SCIENTISTS, https://www.ucsusa.org/clean-vehicles/electric-vehicles/electric-cars-battery-life-materials-cost [https://perma.cc/Q8N5-DPYP] (last visited Sept. 1, 2019).

30. *See* JOHN MAPLES, U.S. ENERGY INFORMATION ADMINISTRATION VEHICLE CHOICE MODELING AND PROJECTIONS FOR THE ANNUAL ENERGY OUTLOOK 15 (2013), https://www.eia.gov/outlooks/aeo/workinggroup/transportation/evworkshop/pdf/maples.pdf [https://perma.cc/U7XB-3CLK].

31. *See* GOLDMAN SACHS, *supra* note 16, at 48.

32. *See* Noah Kitner, Felix Lill & Daniel Kammen, *Energy Storage Deployment and Innovation for the Clean Energy Transition*, 2 NATURE ENERGY 1, 3 (2017).

33. *See eGallon,* U.S. DEPT. OF ENERGY, https://www.energy.gov/maps/egallon [https://perma.cc/E5WK-JC3E] (last visited Sept. 3, 2019).

transistors.[34] Because SiC chips increase production costs, competitive EV manufacturers are adopting SiC chips for their performance advantages and decrease of battery size. SiC chips make EVs more marketable to consumers because they allow for an increased driving range.[35] Investment experts predict that automobile manufacturers will fully adopt SiC Chips as they continue to develop between 2020–2025.[36] These improvements will help EVs and PHEVs become more competitive with ICEs.

D. The EV and PHEV Market is Trending Upwards

Automobile manufacturers' labor and technology investment in EV and PHEV development is not going unnoticed as recent EVs and PHEVs show promising growth. While the United States Energy Information Administration projects that ICEs will remain the dominant vehicle type through 2050, it indicates that EVs and PHEVs will make up about 7% of the new vehicles sold in the United States by 2025.[37]

Unlike the EIA, investors are predicting quicker adoption rates. Goldman Sachs ran three varying scenarios with EV and PHEV growth: a base, hyper adoption, and the Paris Agreement standard. Under the base scenario, PHEV and EVs are projected to account for over 14% of car sales by 2030 and 39% by 2040.[38] This breakdown attributes a larger, immediate growth in PHEVs, but this growth drops as EVs continue to develop. Under the hyper adoption scenario, EVs and PHEVs will account for 24% of vehicle sales by 2030 and 58% by 2040.[39] PHEVs continue to follow a similar trend as the base, but they see an increase in early adoption and maintain a more even approach. The Paris Agreement measurement calls for a more rapid adoption of EVs and PHEVs at 15% by 2030; however, the growth cools to 47% by 2050.[40] Of course, these projections are not to be taken as absolutes, but they do provide insight as to what leading investors are noticing in the EV and PHEV marketplace.

While electricity-fueled transportation presents several market penetration issues, projections indicate a continued upward trend in the development of the technology that addresses consumer needs. Within the

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34. *See* MORGAN STANLEY, TOWARDS COST PARITY FOR EVS 1 (2017).
35. *Id* at 10.
36. *Id*.
37. *See* U.S. ENERGY INF. ADMIN., ANNUAL ENERGY OUTLOOK 2018 WITH PROJECTIONS TO 2050, at 116 (2018), https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf [https://perma.cc/35YD-RSAL].
38. *See* GOLDMAN SACHS, *supra* note 16, at 32.
39. *Id*.
40. *See Id*.

United States, transportation-related carbon dioxide emissions surpassed electric power generation, the former leading GHG contributor. In 2016, the gap widened to an 8% difference.[41] As global concern for air toxins rises, EVs do not contribute to this problem as EVs tailpipes do not emit air toxins. EVs present an alternative in the transportation department. GHG create a disturbing amount of health issues by contributing to smog. In heavily polluted areas, such as India, overall air pollution contributes to an estimated one in every eight deaths in 2017.[42] This major health concern has not only contributed to a loss of citizens, but it negatively impacts India's gross domestic product (GDP). Air pollution has contributed to productivity loss, forced school closures, and mandatory private industry closures. Air pollution alone has contributed to an estimated $30 billion in economic losses in 2019.[43] India is seeking to address this health and economic concern by adopting policies aiming to ban new ICE sales by 2030 and to help rapidly introduce EVs and PHEVs into the market to cut down air pollution. India recognizes that EVs and PHEVs can positively impact the health of its citizens and its society's economics.

EVs and PHEVs offer more than just health and efficiency benefits. These vehicles can help the nation become more energy independent. The increase in electricity consumption promotes growth within domestic energy providers in both the fossil fuel industry and renewable industry. Electricity continues to diversify its sources within the grid showing an increase in zero emission consumption. In 2017, the United States produced 4,178 billion kWh of electricity in utility scale facilities.[44] Of this massive production, almost 40% of electricity sources did not emit GHG, and most fossil fuel production split evenly between coal and natural gas.[45] The United States alone can increase its GDP through this energy expansion as it recently has become a net gasoline and diesel

41. *See* U.S. ENERGY INFO ADMIN., MARCH 2018 MONTHLY ENERGY REVIEW (2018).

42. *See* Kalpana Balakrishnan et al., *The Impact of Air Pollution on Deaths, Disease Burden, and Life Expectancy Across the States of India: The Global Burden of Disease Study 2017*, 3 LANCET PLANETARY HEALTH 26, 27 (2018), https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30261-4/fulltext [https://perma.cc/K3SL-4ACC].

43. *See India's Stubble Burning Air Pollution Causes USD 30 Billion Economic Losses, Health Risks*, SCI. DAILY (Mar. 4 2019), https://www.sciencedaily.com/releases/2019/03/190304095938.htm [https://perma.cc/JHN7-83AU].

44. *See U.S. Electricity Generation by Source, Amount, and Share of Total in 2017*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=427&t=3 [https://perma.cc/4K2C-QSJX] (last updated Mar. 1, 2019).

45. *Id.*

exporter.[46] The domestic energy sector will continue to thrive under EV adoption and promote energy independence while diversifying its energy portfolio.

II. INTERNATIONAL POLICIES AFFECTING ELECTRIC VEHICLE GROWTH

Several nations are taking measures to ensure that there is a place for EV and PHEV vehicles in their jurisdictions globally and nationally. The policies enacted range from local municipalities to nations. Though these policies vary in tactics, the goal remains the same: to reduce the sovereign's carbon footprint and develop economic growth. Research and practical applications of governmental policies can encourage sales.[47] Policymakers can draft legislation that entices consumers to demand more EVs or create environments that promote manufacturers to produce more EVs. This is a key distinction that any legislator must consider before drafting legislation, and it must fit specifically into their jurisdiction.

A. Norway Leads the Way with Electric Vehicle Friendly Policies

In the international realm, several countries have already initiated a number of policies to shift toward EVs. These countries are favoring EV's ability to decrease GHG while increasing energy efficiency. For example, Norway, the global leader in new EV sales, can largely attribute its success to its Parliament's favorable policies. The Norwegian Parliament has enacted an extensive combination of supply and demand policies to encourage EV penetration growth amongst its citizens. The Norwegian overarching supply policy has the most aggressive approach so far—a nonbinding ban on ICE new car sales by 2025. In order to help ease this transportation transition, Norway has incorporated several demand policies to incentivize its citizens toward EVs and PHEVs. Norway has implemented a nationwide registration tax on newly purchased vehicles that varies by vehicle weight, engine power, and carbon dioxide emissions.[48] In 2016, Norway taxed larger vehicles with high emissions at

46. *U.S. Exports of Finished Petroleum Products*, U.S. ENERGY INFO. ADMIN, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MTPEXUS2&f=A [https://perma.cc/AS79-UAVY] (last visited Oct. 20, 2019).

47. JOHN AXSEN, CANADA'S ELECTRIC VEHICLE POLICY REPORT CAR 5 (2016).

48. ERIK FIGENBAUM & MARIKA KOLBENSTVEDT, INSTITUTE OF TRANSPORT ECONOMICS, NORWEGIAN CENTRE FOR TRANSPORT RESEARCH LEANING FROM NORWEGIAN BATTERY ELECTRIC AND PLUG-IN HYBRID VEHICLE USERS—RESULTS FROM A SURVEY OF VEHICLE OWNERS 2 (2016).

€15,000 (approximately $17,678.25) compared to light-duty vehicles taxed on a scale from €2000–€6000 (approximately $2,357.10–$7,071.30).[49] However, EV and PHEVs are exempt from this extra expense.[50] This large financial incentive has led to a large EV and PHEV penetration in the market by offsetting a portion of the upfront cost of purchasing an EV and making it competitive with ICE.

Norway has provided other incentives to make the EV experience more enticing, including granting EV drivers free access to toll roads, bus lanes, free parking, access to the most extensive EV charging network, and free recharging.[51] As of 2018, Norway has strengthened its policy by adding a 50% reduction on ferries, zero annual road tax, a 40% company car tax, and a zero re-registration tax for used EVs and PHEVs purchases.[52] Together, these aggressive policies have led to quick EV and PHEV penetration in the market. In 2017, the Norwegian Road Federation reported that EV and PHEV sales accounted for over 52% of all new car sales.[53] A few years later, EVs surpassed over 58% of all new car sales in March 2019.[54] This marked the first time that EVs and PHEVs were chosen over ICEs in any market. These policies are greatly influencing the new vehicle market by alleviating a significant burden associated with the upfront cost of EVs and PHEVs to make these vehicles competitive with ICEs.

B. Review of Great Britain's Efforts into EV and PHEV Policies

Several other countries have enacted similar policies that mirror Norway's efforts to eliminate GHG emission producing vehicles from being sold within their countries, including France and the United Kingdom, but the policies would not take effect until 2040.[55] Specifically,

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49. *Id.*

50. *Id.*

51. LUTSEY, *supra* note 15, at 13.

52. *Norwegian EV Policy*, NORSK ELBILFORENING, https://elbil.no/english/norwegian-ev-policy/ [https://perma.cc/3KM2-QC3N] (last visited Sept. 6, 2019).

53. Camilla Knudsen & Alister Doyle, *Norway Powers Ahead (Electrically) - Over Half New Car Sales Now Electric or Hybrid,* REUTERS (Jan. 3, 2018, 9:51 AM), https://uk.reuters.com/article/uk-environment-norway-autos/norway-powers-ahead-over-half-new-car-sales-now-electric-or-hybrid-idUKKBN1ES1DB [https://perma.cc/C3JV-283S].

54. Bill Chappel, *Electric Cars Hit Record In Norway, Making up Nearly 60 Percent Of Sales In March*, NAT'L PUB. RADIO (Apr. 2, 2019, 4:08 PM) https://www.npr.org/2019/04/02/709131281/electric-cars-hit-record-in-norway-making-up-nearly-60-of-sales-in-march [https://perma.cc/P7MN-QSWY].

55. Knudsen & Doyle, *supra* note 53.

the United Kingdom has made considerable legislative investments of AEVs. The British parliament allotted the Office for Low Emission Vehicles over £900 million (approximately $1.2 billion) into developing an area that can support EV/PHEV penetration. The United Kingdom has introduced several demand side initiatives to help reach its goal of only allowing the sale of Zero Emission Vehicles (ZEV) for new cars within its borders by 2040. Parliament enacted the "Plug-In Car Grant" in 2016 to incentivize consumers with a tax incentive up to £5000 (approximately $6,604.49) depending on the vehicle's type.[56] In order to add an even stronger incentive for consumers, the burden of filling out paperwork for the tax incentives is upon the dealer.[57] This minor detail removes certain barriers for the consumer to enter into the market and still receive the tax benefit.

Because of this increase in EV sales, Britain is anticipating a large need for charging stations to fulfill its citizens' needs. Local municipalities can apply for a charging infrastructure station grant from a £4.5 million allotment in the "On-State Residential ChargePoint Scheme."[58] Despite the availability, municipalities are not fully taking advantage of this funding opportunity. This hesitancy is hindering a full application of the policies that are in place to aid EV and PHEV development. Though EVs increased their total sales by 30% in 2017, a cohesive effort amongst local municipalities will help proliferate the market even more by offering more charging capabilities for its citizens. This unity will grant access to electricity for those citizens that want to purchase an EV but cannot because it is not reasonably feasible for charging purchases. Investing in EV charging infrastructure will help ease its 2040 transition goal while keeping up with this upward trend in EV and PHEV sales.

The Procedia Environmental Studies recently conducted a policy impact study of the United Kingdom's Plug-in Car Grant. This study identified various stakeholders that could potentially be affected by this policy. The study grouped stakeholders by the continuity of general interests toward the Plug-In Car Grant including: government, citizens likely to switch to plug-in cars, citizens unlikely to switch to plug-in cars, electric suppliers, PHEV and EV manufacturers, ICE manufacturers,

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56. *See Low-emission Vehicles Eligible for a Plug-in Grant,* GOV.UK, https:// www.gov.uk/plug-in-car-van-grants [https://perma.cc/6J2L-AUT4] (information site for Central Government) (last visited Sept. 6, 2019).

57. *Id*.

58. Norman, Jesse, *Funding for Thousands of Electric Car Charge Points Unused by Councils,* GOV.UK (Jan. 12, 2018), https://www.gov.uk/government/news/funding-for-thousands-of-electric-car-charge-points-unused-by-councils [https://perma.cc/Q88K-R9UF] (information site for Central Government).

renewable energy producers, fossil fuel energy producers, power grid operators, and petrol producers.[59] Surprisingly, the study saw mixed results for all stakeholders; even the stakeholders that would be most likely to receive negative impacts, such as ICE manufacturers and petrol producers, still slightly benefit from this policy.[60] Due to electricity's rise, petrol will decline in price making it more marketable to consumers. Nonetheless, ICE and petroleum producers net the largest negative impact from this policy. Unsurprisingly, electric suppliers and renewable producers collect the largest net gain as their consumption rate increase. One of the most interesting negative impacts within electricity suppliers and power grid operators are the problems created by the sudden expansion of the market. This creates instability, grid operational risks, and an imbalance between energy demand and supply.

The biggest surprise in this study lies between citizens likely to switch to a plug in vehicle and the citizens unlikely to switch, as both groups net a positive impact from the Plug-in Car Grant.[61] The policy undoubtedly favors citizens likely to switch in a visceral fashion because it provides a tax incentive for people purchasing new EVs and PHEVs.[62] The expected negative impacts of switching vehicles include upfront costs and rises in energy consumption associated with these vehicles. Citizens unlikely to switch indirectly receive more positive impacts through a reduction of GHG emissions and improved air quality rather than the more apparent negative impacts that arise with increased electricity costs.[63]

While the overall result of a net positive is reassuring, the divide between the two groups raises societal concerns. Citizens likely to switch are affluent people that are able to buy new cars, those living in urban settings, who identify as environmentalists, and are early technology adopters. Meanwhile, citizens unlikely to switch are people who cannot afford to buy a new car, people who do not drive, consumers risk-averse to new technologies, and people who live in rural areas.[64] This policy can create a divide by favoring the citizens likely to switch and devalue the importance of the EV by seemingly making it accessible to only one group. The British Plug-in Car Grant will yield mixed results for all stakeholders in some fashion. While the degree varies amongst stakeholders, overall it

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59. Anton Talantsev, *Who Gains and Who Loses in the Shift to Electric Vehicles: Assessment Through Multi-Criteria Multi-Stakeholder Analysis,*" 37 PROCEDIA ENVTL. SCIS., 263 (2017).

60. *Id.* at 265.

61. *Id.*

62. *Id.*

63. *Id.*

64. *Id.*

helps Britain achieve its main goal: to reduce GHG emissions and improve energy efficiency. Additionally, this approach allows for a smooth transition period towards its zero-emission goal by 2040 without drastically affecting the market.

III. UNITED STATES POLICIES AFFECTING ELECTRIC VEHICLE AND PLUG-ELECTRIC VEHICLE GROWTH

The United States has enacted its fair share of environmental laws that have greatly affected fuel economy standards and EV development: (1) the Clean Air Act ("CAA"); (2) the National Highway Transportation Safety Administration's ("NHTSA") Corporate Average Fuel Economy ("CAFE") Standards; and (3) California's waiver against Federal preemption. In 1970, Congress enacted the CAA[65] to regulate GHG emissions within the United States, including tailpipe emissions. The overall purpose of the statute aims to protect public health and welfare and regulate emissions of hazardous air pollutants from stationary and mobile sources.[66] Specifically regarding fuel economy, the CAA regulates GHG emissions by grams of Carbon Dioxide emissions per mile. In 1975, Congress then authorized NHTSA the power to create CAFE standards to improve overall fuel economy.[67] CAFE standards are measured using the miles per gallon standard. Together, these two laws have set vehicle fuel economy standards for automobile manufacturers' compliance.

A. The Impact of the California Waiver Written Intro the Clean Air Act

Almost two decades prior to the CAA's inception, California enacted several acts to deal with the smog related issues plaguing the state. In 1967, Congress granted California a waiver to enforce its own stricter standards.[68] When Congress enacted the CAA, it codified this waiver in Section 209, allowing California to set its own stricter emission standards for motor vehicles.[69] The EPA must grant a waiver of federal preemption provided that California's standards are at least as protective of public

65. *See* 42 U.S.C. §§ 7401–7671 (2018).

66. *Summary of the Clean Air Act*, ENVTL. PROTECTION AGENCY, https://www.epa.gov/laws-regulations/summary-clean-air-act [https://perma.cc/C6KY-WZ34] (last visited Sept. 1, 2019).

67. *See* 49 U.S.C. § 32902 (2012).

68. *See California State Motor Vehicle Standards,* 78 Fed. Reg. 2112, 2113 (Jan. 9, 2013).

69. *See* 42 U.S.C. § 7543 (2012).

health and welfare as applicable federal standards.[70] The EPA can deny this waiver to set emission standards only upon its finding that the requested standard does not meet compelling and extraordinary conditions or that the standard and enforcement procedures are not consistent with Section 202(a) of the CAA.[71] It is important to note that the EPA has never denied a waiver against preemption under the CAA toward California. In 2009, California sought to increase its standards and lead the nation's directives to reduce GHGs when it enacted the California Low-Emission Vehicle program to provide significant reductions of ozone precursor pollutant emissions from passenger cars and light-duty vehicles. Within this program is the Zero Emission Vehicle ("ZEV") program, which requires manufacturers to sell a certain amount of ZEV vehicles in California.[72] ZEVs encompass AEVs, EVs, and PHEVs. The premise behind the ZEV program is to issue credits to manufacturers for selling ZEVs within the state, and then allows these credits to be applied to offset SUV and light-duty truck purchases, which are more aligned with consumer taste and preference trends. By 2025, California's ZEV program mandates that at least 15% of vehicle sales are ZEV. Furthermore, nine states have adopted California's ZEV program since it began, which represents almost 40% of the United States population.[73]

For a long time, the CAFE and EPA's GHG standards operated on a slower linear path. The ZEV program quickly created an imbalance between the federal standards and the state's standards causing confusion for automobile manufacturers. In 2011, the EPA agreed to follow California's lead to form a unified national tailpipe emission standard for automobile manufacturers; NHTSA agreed to raise its fuel economy structures accordingly. This agreement unified action aggressively altered previous projections by nearly doubling the emission standard goals.[74] This program aims to avert approximately six billion tons of carbon

70. *See* 42 U.S.C. § 7543(b)(1)–(3) (2012).

71. *Id*.

72. *See* CAL. CODE REGS. tit. 13 § 1962.1 (2009).

73. *See* Robinson Meyer*, The Coming Clean-Air War Between Trump and California,* ATLANTIC: SCI. *(*Mar. 6, 2017*),* https://www.theatlantic.com/science /archive/2017/03/trump-california-clean-air-act-waiver-climate-change/518649/ [https://perma.cc/MRH4-9AJQ].

74. *See* U.S. ENVTL. PROT. AGENCY, OFF. OF TRANSP. & AIR, NHTSA AND EPA SET STANDARDS TO IMPROVE FUEL ECONOMY AND REDUCE GREENHOUSE GASES FOR PASSENGER CARS AND LIGHT TRUCKS FOR MODEL YEARS 2017 AND BEYOND (2012), https://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE_ 2017-25_Fact_Sheet.pdf [https://perma.cc/6W48-82NX].

dioxide emissions from being released into the atmosphere by 2025 if its directives are followed accordingly.[75]

The agreed terms between the EPA, NHTSA, and California legislature charged the EPA to review the program's aptitude in a mid-term evaluation to be conducted in 2017 and announced by April 2018. In order to determine if the program was appropriate, the agreement outlined a multifactor test including:

> (1) the availability and effectiveness of technology, and appropriate level of technology;
> (2) cost on automobile manufacturers;
> (3) impact on the standards on reduction of emissions, oil conversation, energy security, fuel savings;
> (4) impact on standards of reduction of emissions;
> (5) impact on the standards of the automobile industry;
> (6) impact on automobile safety;
> (7) impact of GHG emission standards on CAFE standards; and
> (8) impact of other relevant factors.[76]

The EPA conducted its mid-term evaluation a year early in 2016 and announced in January 2017 that the model year standards for 2022–2025 are proper.[77]

Nonetheless, in April 2017, the new EPA administration announced that the previous administration conducted a premature status review of the program's progress. At that time, it announced that it would be making a new mid-term evaluation in accordance with the original guidelines set forth in 2011.[78] In April 2018, the EPA announced that the previous determination was improperly conducted and that a new standard for Model years 2022–2025 would be forthcoming while coordinating its evaluation with NHTSA to set new corresponding CAFE standards.[79] On May 1, 2018, California and 17 other states jointly filed suit against the EPA in the United States Court of Appeals for the District of Columbia

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75. *See* Chris Mooney, *California, 17 Other States Sue Trump Administration to Defend Obama-Era Climate Rules for Vehicles,* WASH POST: CLIMATE AND ENVIRONMENT (May 1, 2018), https://www.washingtonpost.come/news/energy-envrionment/wp/2018/05/01/california-17-other-states-sue-trump-administration-to-defend-obama-era-vehicle-efficiency-rules/?nodirect=on [https://perma.cc/FJ6D-CWQC].

76. *See* 40 C.F.R. § 86.1818-12(h) (2016).

77. *See* 81 Fed. Reg. 87927-01 (Dec. 6, 2016), 2016 WL 7049294.

78. *See* 83 Fed. Reg. 16077-01 (Apr. 13, 2018), 2018 WL 1759649.

79. *Id.*

Circuit regarding these actions. Presumably, the plaintiffs are expecting that the EPA's standards are going to rollback mandates for the model years. This is evident throughout the 2018 Mid Term Evaluation. The EPA states that there is a misalignment between the increasing stringency of the standards and decreasing consumer demand for fuel efficiency.[80] This theme ostensibly indicates that the new standards will decrease the stringency for vehicle emission standards.

B. California and the EPA's Action Could Divide Manufacturers to Choose Which States to Sell Their Vehicles

The ramifications of the EPA and NHTSA's actions could divide the nation's vehicle standards again. Creating new standards that differ too much from the ZEV program could jeopardize American automakers' ability to fully compete in the markets since they may have to choose which states to sell their vehicles to. This would limit American consumer options and create a larger nationwide division. The Edison Electric Institute, Alliance of Automobile Manufacturers, American Public Power Association, Association of Global Automakers, and the National Rural Electric Cooperative Association wrote a joint letter to the EPA and NHTSA emphasizing their displeasure with this recent Mid Term Evaluation. Automakers have advocated for continued flexibilities in order to comply with CAFE and GHG such as extending technology multipliers within the CAFE standards, keeping GHG emissions registered at zero for EVs and PHEVs instead of shifting electricity production emissions on vehicles, and efficiently improving manufacturers access to off-cycle credits. Automakers recognize the importance that these standards set, and EV and PHEV production plays an integral role in ensuring the policies' goals to improve fuel economy and reduce carbon emissions.

In the case between *California v. EPA*, the first barrier plaintiffs must cross is proving their grounds to bring the case.[81] Federal courts are courts of limited jurisdiction.[82] Article III, Section 2 of the United States Constitution requires a case or controversy be brought before the federal court. A state can bring a suit on behalf of its citizens under the doctrine of *parens patriae* to protect the state's sovereign or "quasi sovereign"

80. *Id.* at *16079.

81. *See generally* No. C 07-2055 JSW, 2008 WL 5384623 (N.D. Cal. Dec. 22, 2008).

82. U.S. CONST. art. III, § 1.

interests from injury.[83] For example, in *Massachusetts v. E.P.A,* the court held that an injury occurred due to the rise in sea levels associated with tailpipe GHG emissions.[84] The court found that Massachusetts met the proper requirements to bring an action against the EPA. The plaintiffs in the current case have a significant sovereign interest in protecting the air rights of its citizens to ensure that excess GHG do not leak into its borders and it is likely that the court will hold standing for a majority of these states. In *Massachusetts*, the Supreme Court further held that an agency's decision not to promulgate a new rule "must conform to the authorizing statute."[85]

As part of its review of the existing standards, EPA was obligated to promulgate a revision "as appropriate" under § 7409(b). The EPA, exercising its authority to interpret ambiguous provisions of the Clean Air Act, determined that a revision was not "appropriate" when scientific uncertainty deprived the agency of a "reasoned way to choose" an appropriate standard.[86] The CAA mandates that "the EPA must address known or anticipated harms" associated with GHG.[87] The EPA must set its standards under the CAA based on reasoned judgments that are "not arbitrary" or "capricious."[88] Courts have granted deference to the EPA to allow for it to enact preventive action in the face of adversity, but at some point, action without uncertainty cannot be called reasoned.[89] This limits the scope of acting without reasoned judgment when there is a sufficient amount of information available to enact a policy. The EPA will likely argue that the built-in Mid Term Evaluation shows that at the time of the increased standards, this procedure fully allows the administration's actions to reevaluate the GHG emission standards as new practical information becomes available. The plaintiffs will likely argue that the data overwhelmingly supports the standards as several countries have moved for more strict standards, including the complete ban of new ICE vehicle sales to combat GHG.[90] If the plaintiffs are successful in this suit,

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83. *See* Alfred L. Snapp & Son, Inc. v. Puerto Rico, 458 U.S. 592, 600–01 (1982).

84. Massachusetts v. E.P.A., 549 U.S. 497 (2007).

85. *Id*.

86. *See* Ctr. for Biological Diversity v. E.P.A., 749 F.3d 1079, 1089 (D.C. Cir. 2014). *See also* 40 C.F.R. §§ 50.1–50.19 (2012).

87. *See* 42 U.S.C. § 7409(b)(2) (2018).

88. *See* 42 U.S.C. § 7607(d)(9)(A) (2018).

89. *See* Ethyl Corp. v. E.P.A., 541 F.2d 1, 28 (D.C. Cir. 1976).

90. Norway has enacted a statute for the ban of ICEs sales by 2025. India and Germany have moved for the ban of ICEs sales by 2030. France and the United Kingdom have moved for ICE ban by 2040. China and the Netherlands have

it will keep the national unified standard in place through 2025. If defendants prevail, it will dramatically affect EV and PHEV development and American automobile manufacturers substantially.

IV. TWO MAJOR CONCERNS EV AND PHEV GROWTH POSE TO POLICYMAKERS: STRAIN ON THE ELECTRIC GRID AND HIGHWAYS TAXES

As EVs and PHEVs increases their presence in the transportation industry, newer issues accompany this growth, including an increase in electricity consumption and a decrease in highway and road taxes. State legislators have the capability to immediately address constituent needs by enacting policies that are directly catered to addressing these potential areas of concern within their jurisdiction in order to help ensure stability. Otherwise, inactivity amongst states could place itself into a larger political, environmental, and economic predicament for years to come.

A. The Electric Grid Can Handle the Increase Usage by Working with Policymakers

The first major concern with EV and PHEV growth is the expansion of electricity that will be necessary to support the demands from consumers. The most cost-effective solutions find a way to optimize the current market. The electric grid can currently support the increased electricity demand.[91] However, the main problem EVs and PHEVs pose is mostly associated with peak load increases, transformer and substantive impacts, and "timer peaks."[92] EVs and PHEVs contributed approximately 1 terawatt ("tW") of annual consumption with just over 580,000 units sold.[93] If EV and PHEV are increasing the grid's power load during peak hours, it could significantly strain transformers leading to power outage. EV and PHEV related transformer overloads are estimated to cost $7,400

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announced that it is moving toward the ban of ICEs soon. *See,* Dom Galeon*, These 7 Countries Want to Say Goodbye to Fossil Fuel Based Cars*, FUTURISM (Sept. 20, 2017), https://futurism.com/these-7-countries-want-to-say-goodbye-to-fossil-fuel-based-cars/ [https://perma.cc/3YCB-ZMZE].

91. SMART ELEC. POWER ALL., UTILITIES AND ELECTRIC VEHICLES: THE CASE FOR MANAGED CHARGING 4 (2017), https://sepapower.org/resource/ev-managed-charging/ [https://perma.cc/PZJ9-AEKU].

92. *Id.*

93. Jessica Shankleman, Tom Biesheuvel, Joe Ryan & Dave Merrill, *We're Going to Need More Lithium*, BLOOMBERG (Sept. 7, 2017), https://www.bloomberg.com/graphics/2017-lithium-battery-future/ [https://perma.cc/S9Z6-DDHP].

per transformer fixed.[94] Public utility companies are seeking innovative techniques to adopt managed charging as a solution. It allows a public utility or third party to remotely control vehicle charging by increasing, decreasing, or turning it off to correspond with grid needs.[95] This reduces grid stress and maintains stability by minimizing charging rates while not over-exhausting transformers.[96] Policymakers can encourage public utilities to incorporate managed charging methods into their current system through several tested pilot programs.

The San Diego Gas and Electric Public Utility has initiated a day ahead price program that communicates varying grid prices to consumers through a user-friendly app.[97] This program promotes complete transparency between the consumer and the electricity provider by allowing consumers to optimize the best rate possible. Legislators can further improve access through increasing the regulatory approval process for electric companies seeking to deploy EV charging infrastructure. Electric companies are committed to investing over $300 million in EV infrastructure to handle the demand across nine states.[98] This increases awareness about EV integration by educating consumers about EV and PHEV benefits. Public utilities and electric power companies are capable to handle and educate consumers on the road about a transportation transition similar to the San Diego Model. Policymakers should be initiating policies in coordination with their public utilities to optimize this capability for their citizens.

B. Electric Vehicles Drivers Should Still Pay Their Fair Share of the Highway Taxes

EVs and PHEVs pose another primary concern for policymakers because they decrease revenue that is typically accumulated through gasoline taxes. The federal government taxes gasoline at 18.4¢ per gallon to fund interstate highways.[99] States are allowed to impose higher taxes to improve their own intrastate highways and roads. The current United

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94. SMART ELEC. POWER ALL., PLANNING THE DISTRIBUTED ENERGY FUTURE, VOLUME II: A CASE STUDY OF UTILITY INTEGRATED DER PLANNING FROM SACRAMENTO MUNICIPAL UTILITY DISTRICT 1 (2017), https://sepapower.org/resource/beyond-meter-planning-distributed-energy-future-volume-ii/ [https://perma.cc/4VKJ-DLRW].

95. *Id.*

96. *Id.* at 10.

97. *Id.* at 18.

98. EDISON ELEC. INST., *supra* note 9.

99. *See* 42 U.S.C. § 4041.

States national average has a combined state and federal tax for gasoline at 52.12¢ per gallon of gasoline.[100] Most states have not adopted new policies to keep up with inflation rates and funds are seeing a decline in value. However, a decrease in gasoline consumption through EVs and PHEVs will directly lead to a decrease in highway fund revenue generated for the state. Policymakers can address this issue through either raising the state's gasoline tax or placing a vehicle registration fee on EV and PHEV purchases.

An increase in gasoline taxes will lead to an unpopular result of higher gasoline prices but will not generate highway revenue from those drivers that are still using the road in an EV. The registration fee has increasingly garnered interest amongst states. In 2017, over nineteen states addressed EV and PHEV registration fees with eight states adopting new fees.[101] These vary from state to state, and not all fund allocations are appropriated directly toward the highway fund. For example, California enacted Senate Bill 1 to add a new annual $100 registration fee on zero-emission vehicles Model Year 2020 and later with an inflation adjustment to be deposited directly into the Road Maintenance and Rehabilitation Account.[102] Idaho amended its $140 EV registration fee to include a separate $75 fee for PHEVs with all fees deposited into the Iowa highway distribution account.[103] West Virginia has made a similar distinction in registration fees noting that PHEVs interact with both the grid and gasoline taxes. Therefore, the West Virginia legislature set a registration fee of $100 for PHEVs and $200 for EVs.[104] Some states have had these registration fees enacted for a few years. Colorado enacted a $50 registration fee for EVs and PHEV in 2013 that appropriated 60% of generated funds toward the highway users tax fund and 40% toward EV infrastructure development.[105] This is comparable to Minnesota's recent legislation that only imposes a $75 registration fee on EVs and expressly excludes PHEVs.[106] While not every state's registration fee arrangement is the same, these examples show the flexibility in options in fees and variations to combat depletion of highway funds and invest in further EV infrastructure.

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100. AM. PETROLEUM INSTI., GASOLINE TAX, http://www.api.org/oil-and-natural-gas/consumer-information/motor-fuel-taxes/gasoline-tax [https://perma.cc/FM7H-KBSM] (last visited Sept. 2, 2019).

101. N.C. CLEAN ENERGY TECH. CTR., THE 50 STATES OF ELECTRIC VEHICLES: 2017 POLICY REVIEW 26 (2018).

102. *See* CAL. VEH. CODE § 9250.6 (2017).

103. *See* IDAHO CODE ANN. § 49-457 (2017).

104. *See* W. VA. CODE § 17A-10-3C (2017).

105. *See* COLO. REV. STAT. § 42-2-304 (2017).

106. *See* MINN. STAT. § 169.011 (2018).

For the remaining states that are looking for registration fee options that ensure EVs will contribute to the state's highway road funds at the same rate as ICEs, another model exists. This is a base policy model that starts by reviewing the total amount of gasoline consumed in a year, dividing it by the number of licenses issued in the state, and multiplying it by the gasoline tax rate. An additional plus or minus $25 is accounted for error. Furthermore, the registration fee should be reduced in half for PHEVs because those drivers will contribute to the highway road fund. This policy model gives states a base to address this increasing issue, but it is imperative to consider its negatives. This policy does not consider those gallons that are purchased by out of state licensed drivers and commercial freight truckers. On the other hand, it does allow for the potential excess funds that to be reinvested in EV infrastructure similar to Colorado's system. This should be an attractive policy for all states that have yet to adopt EV and PHEV registration fees.

V. POLICY OPTIONS TO INCORPORATE EVS AND PHEVS

EVs and PHEVs are shaping up to become an integral portion of the transportation market. This developing technology is on the brink of fully entering the market and will likely shape the way consumers approach transportation as progress continues. If a state is interested in promoting electric vehicles in its jurisdiction or merely just interested in providing an environment that allows for consumers to fully execute their choice in a product, then policymakers have an abundance of opportunities to model legislation. The state's market dictates whether it needs more demand incentives or needs to increase supply. Each state is unique in its needs, but the most effective legislation involves a combination of supply and demand policies.

A. Policymakers can make Positive Steps to Increase the Electric Vehicles in the Marketplace without Taking Drastic Measures

The major supply policy that can be introduced is California's ZEV Program. The CAA allows for states to adopt standards in line with California's emission standards without the fear of being preempted by federal law.[107] Nine states and one Canadian province have adopted this program. The ZEV program mandates strict standards that allow for manufacturers to receive credits for each EV and PHEV sold within the state. This policy cuts down on emissions and requires that a manufacturer

107. *See* 42 U.S.C. § 7543(b) (2012).

sell EV and PHEVs within the state. Another supply policy that state legislators can adopt to affect EV and PHEV growth without fully embracing California's ZEV is a joint resolution in support of flexibility within the current CAFE standards. These flexibilities promote a single national program for fuel economy and GHG standards by cooperating with both ZEV standards and the Federal standards that are currently in effect. It is likely that joint support from the states will carry strong weight into the EPA's consideration. A state's promotion of such flexibilities would coordinate with the automobile manufacturers' support to market more EVs and PHEVs in that state, resulting in a reduction of the state's carbon intensity.

Supply side policies alone do not ensure that consumers will always purchase these vehicles. This is evidenced by several automobile manufacturers' letters addressed to governors in ZEV states, where consumers still appear to not be opting into the EV and PHEV market for several reasons.[108] Automobile manufacturers have stated that in order to meet ZEV's requirements, states must incentivize consumers by making EVs and PHEVs more attractive through demand policies.[109] The manufacturers are providing the supply, but the demand is lacking, which creates an imbalanced economy of scale. Therefore, demand incentives can be used to increase consumers' interests in early EV and PHEV adoption by increasing the overall consumer experience. Financial incentives directly address the most cited EV and PHEV barrier: upfront cost. One major demand policy is to provide a direct tax incentive for EV and PHEV purchasing. The current federal tax incentive provides automobile manufacturers a tax incentive up to 200,000 EVs and PHEVs sold, but the consumer does not initially see this benefit.[110] A state legislator can model legislation similar to the United Kingdom's Plug-in Car Grant, which switches the tax incentive to be deducted directly from the consumer's purchase.[111] The policy can further incentivize the purchaser by shifting the burden of filling out paperwork to the automobile dealer. This policy ensures that the citizen experiences the least amount of financial and transactional barriers. Another initiative can be to extend the tax incentive to businesses that purchase EVs and PHEVs as company cars. This aggressive extension promotes EV and PHEV adoption in the

108. *Sharing the Road: Policy Implications of Electric and Conventional Vehicles in the Years Ahead*: *Hearing Before the H. Subcomm. on Env't of the H. Comm. of Energy & Commerce*, 115th Cong. 1–2 (2018) (statement of Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers).

109. *Id*.

110. EDISON ELEC. INST., *supra* note 9.

111. *See Low-emission Vehicles Eligible for a Plug-in Grant, supra* note 56.

state more quickly and it provides companies with an incentive to reduce their own carbon output. While this incentive rewards businesses, it also encourages a larger scale adoption of EVs and PHEVs.

B. Policymakers can Reinvest Electric Vehicle Taxes to Better Benefit the Users

As mentioned earlier,[112] the second most cited barrier toward EV and PHEV adoption has been range anxiety. While manufacturers work to increase the range in vehicles, legislators can also alleviate the problem by offering more charging opportunities for consumers. A policymaker can encourage a public utility to provide more electric infrastructure throughout cities on public parking places. Another major demand incentive would be to encourage electricity companies with a tax incentive for supplying home charging unit installation. In turn, this would reflect in a rebate for the individual consumer. Tax incentives for electricity companies offering clean energy is not a new concept. For example, in 2009, Louisiana offered an income tax credit for the purchase and installation of a solar electric system.[113] A program of this magnitude creates another outlet promoting EV and PHEV adoption. An option for the purchase and installation of electric vehicle station offers an incentive toward property owners and gives consumers another viable reason to adopt EVs and PHEVs. In Wisconsin and Iowa, private companies are already offering a rebate up to $500 for the purchase and installation of Level 2 chargers.[114] This shows the market value that electric companies are placing on EV and PHEV adoption remains competitive. Installation incentives are not limited to just the electricity companies: a state can enact a policy to encourage private employers to provide electric charging stations at their business with over fourteen employees. Massachusetts enacted the workplace charging program in 2014 to provide 50% or up to $25,000 in funding for EV and PHEV charging station stations.[115] This policy actively engages businesses, promoting EV and PHEV growth amongst its citizens. Additionally, it is imperative that any tax incentive program be temporary in order to make sure that the state treasury is not fully depleted. For example, the Louisiana Solar Tax credit cost the state

112. *See supra* Part I.A.

113. *See* LA. REV. STAT. § 47:6030 (2009).

114. *See* Douris, *supra* note 27.

115. *See Apply for Mass EVIP Workplace Charging Incentives,* MASS GOV, https://www.mass.gov/how-to/massevip-workplace-charging [https://perma.cc/7ASC-92ML] (last visited Aug. 30, 2019).

$147 million from 2009 to 2017.[116] Because of how much it cost the state to continue to support, this increased cost led to the credit's end in 2017.[117] Perhaps had there been a way for the solar panel users to reinvest the energy they captured into the grid, then it is possible that the program could continue free of outrage from other tax payers. In the case with EVs if policymakers reinvested the funds collected from the vehicle's registration tax, then a portion of it could be used to help ease the cost of building electric vehicle infrastructure. This reinvestment toward infrastructure ensures that EV drivers can drive free of range anxiety and do not become a strain on non-EV taxpayers.

Policymakers have direct influence upon their constituents in more ways than just providing funding. Policymakers can set the standard within their own state to further EV and PHEV growth by encouraging local municipalities to purchase fleets for the public welfare. This investment cuts the government's own contribution to transportation emissions and, thus, improves overall air quality for its citizens. Another major incentive to promote awareness in the community is to create state funded research grants at local universities. As mentioned previously,[118] research and development in this industry will further EV and PHEV progress. This research actively engages citizens and gives students an opportunity to be on the cutting edge of technology.

While it appears though the only solution is to offer direct financial incentives, legislators are not restricted to initial tax breaks. Legislators can promote EV and PHEV adoption by improving the overall owner experience. This includes allowing EV and PHEV access to HOV driving lanes, access to bus lanes, free parking at state government buildings, and free toll road access. Several states and Canadian provinces have enacted these types of policies to improve the driving experience. Furthermore, while these are seemingly minor policies, they can substantially improve the transportation experience for average drivers and benefit the environment at the same time.

CONCLUSION

EVs and PHEVs offer a more efficient driving experience than the normal ICE. EVs and PHEVs give automobile manufacturers the

116. *See* Jennifer Larino, *Louisiana has no More Tax Credits for Solar Owners*, TIMES PICAYUNE (July 20, 2016, 11:23 PM), https://www.nola.com/business/index.ssf/2016/07/solar_tax_credit_reaches_limit.html [https://perma.cc/FX3Y-Q4X5].

117. *See* H.B. 147, 2017 Leg., 43rd Reg. Sess. (La. 2017).

118. *See supra* Part I.B.

flexibility to offer more options to comply with governmental standards by releasing zero tailpipe emissions for most passenger trips and helping improve the overall air quality for public health. These vehicles are currently poised to penetrate the transportation market as they continue to advance in technology and decrease in price. State and municipal legislators can have a direct influence on the early consumer adoption rate by providing a barrier-free environment for this developing technology.