Rethinking Electric Vehicle Incentives

Michael D. Miller*

This Note analyzes whether policies designed to promote the use and adoption of electric vehicles serve two important values: (1) that a policy's benefits should exceed its costs and (2) that a policy furthers—or, at minimum does not frustrate—distributive justice goals. Using these two values, this Note analyzes the Colorado and federal tax credits for electric vehicle purchases, and it also analyzes a proposed government-funded interstate electric vehicle charging corridor. Although electric vehicles offer many potential environmental advantages over conventional vehicles, the tax incentives and charging corridor employed to accelerate electric vehicle adoption likely only serve the two values in limited and narrow circumstances.

After concluding that the tax incentives and interstate charging corridor initiatives only serve the criteria values in limited and narrow circumstances, this Note argues that policymakers should consider several alternatives through which to promote electric vehicle adoption and use. It first argues that a revenue-neutral carbon tax would generate benefits greater than its costs while also redistributing wealth in ways that further distributive justice. Given, however, that a revenue-neutral carbon tax is almost certainly not politically feasible at the national level, this Note next offers other, likely more feasible alternatives. These alternatives include tailoring the tax incentives—through means testing and adjustments based on a state's electricity generation portfolio—and partnering with private electric utility companies when developing charging corridors. These alternatives will likely produce benefits greater than their costs, and they likely will not interfere with distributive justice goals.

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* J.D. Candidate, 2018, University of Colorado Law School.

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INTRODUCTION

In 2016—for the first time in forty years—the transportation sector in the United States emitted more greenhouse gases ("GHGs") than the electricity sector.[1] Accordingly, many policies target transportation emissions reductions in the United States,[2] and some of the most common among them include those promoting electric vehicle adoption.[3] Despite these policies' popularity, this Note argues that some of them serve their desired ends at costs that do not likely justify their benefits and do so in ways that distribute societal resources unjustly.

Generally, when people refer to electric vehicles, they are referring to one of two varieties of vehicles: Plug-In Hybrid Vehicles ("PHEVs") or All-Electric Vehicles ("EVs"). Although this Note analyzes policies that also provide incentives to encourage adoption of PHEVs,[4] it focuses only on policies as applied to EVs because PHEVs' battery capacities vary widely.[5] Because of this variance in capacity, federal and state tax credits that depend on battery capacity apply differently depending on the battery capacity of a particular vehicle, which makes assessing the implications of each tax incentive more complex without offering further insights relating to the incentives' costs, benefits, and effects on wealth distribution.

This Note evaluates whether selected policies that are intended to promote EV adoption and usage serve the following two criteria values: (1) that a policy's benefits justify its costs and (2) that the policy serves distributive justice goals. It aims to improve laws, regulations, and policies promoting EV adoption and use by showing how these policies can better serve the two criteria values. Part I describes the advantages and disadvantages EVs hold over gasoline-powered vehicles, and the

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1 John Olivieri, *New Federal Data Show Transportation Sector Now the Largest Source of Carbon Emission*, U.S. PUB. INTEREST RESEARCH GRP., http://www.uspirg.org/news/usp/new-federal-data-show-transportation-sector-now-largest-source-carbon-pollution-united (Aug. 4, 2016); *see also* U.S. ENERGY INFO. ADMIN., MONTHLY ENERGY REVIEW MARCH 2017 184–85 tbls.12.5, 12.6 (2017), https://www.eia.gov/totalenergy/data/monthly/archive/00351703.pdf.

2 *See, e.g.*, Control of Air Pollution from Mobile Sources, 40 C.F.R. pt. 85 (2018).

3 *See* Kristy Hartman & Emily Dowd, *State Efforts to Promote Hybrid and Electric Vehicles*, NAT'L CONFERENCE OF STATE LEGISLATURES (Sept. 29, 2017), http://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx.

4 *See, e.g.*, I.R.C. § 30D (2012).

5 *See* Stephen Edelstein, *Plug-in Hybrid Price Guide: Every 2017 Model, with Specs*, GREEN CAR REPS. (Feb. 10, 2017), http://www.greencarreports.com/news/1108383_plug-in-hybrid-price-guide-every-2017-model-with-specs (listing vehicle specifications—including battery capacity—for various PHEVs).

Part classifies these advantages and disadvantages based on whether they depend on the context in which the vehicle operates. Part II then defines the two criteria values as used in this Note and lays a theoretical and practical foundation for why legislators, regulators, and other policymakers should strive to serve both values. Part II explains that requiring a law's benefits to be greater than its costs promotes overall societal welfare, but it cautions that cost-benefit analysis might be an insufficient measure of a policy's acceptability when a law's costs and benefits are distributed unevenly. Thus, in addition to weighing a law's costs and benefits, Part II urges policymakers to also consider a law's distributive effects.

Part III then applies the two criteria values to evaluate whether two policies promoting EV adoption are justified. Part III first evaluates state and federal income tax credits available to purchasers of EVs. Next, Part III evaluates a proposed EV charging corridor between Nevada, Utah, and Colorado. Part III concludes that the income tax credits produce benefits greater than their costs only in circumstances where vehicles are charged using low-carbon electricity or are used in polluted urban areas. Further, because the tax credits are largely realized by more wealthy buyers, the tax credits likely do not further distributive justice goals. Part III next concludes that the charging corridor is unlikely to produce benefits greater than costs, and it is also likely to distribute its benefits to wealthier groups, which thus frustrates attaining outcomes satisfying the distributive justice criterion.

Finally, Part IV offers alternatives that would likely serve the two criteria values more robustly than tax credits for EV purchases or government investment in an electrification corridor. Part IV suggests that policymakers instead consider pursuing a carbon tax with a rebate, tailoring current tax credits to better reflect their benefits, or leaving the development of charging infrastructure to electric utilities.

I. ADVANTAGES AND DISADVANTAGES OF EVS AS COMPARED TO INTERNAL COMBUSTION VEHICLES

This Part examines EVs' relative advantages and disadvantages as compared with conventional, internal combustion vehicles. Understanding these relative advantages and disadvantages helps in assessing whether policies promoting EV adoption deliver significant social benefits. For example, Section I.A.1 explains that EVs tend to emit fewer GHG emissions and other pollutants but that this benefit is tempered when an EV is charged using electricity from coal-fired generating units.

A. Advantages

EVs hold many advantages over vehicles powered by internal combustion engines. Some of these advantages are inherent to electric engine technology and therefore do not depend on outside factors. For instance, EVs accelerate quickly at low speeds,[6] run more quietly than conventional vehicles,[7] and produce zero direct tailpipe emissions.[8] By contrast, other advantages result from EVs' context in the energy system and are dependent on where a particular EV operates. These contextual advantages include the capability to reduce both carbon emissions[9] and local air pollution[10] while also reducing dependence on imported oil.[11] This Section first describes EVs' contextual advantages and then turns to their inherent advantages.

1. Contextual Advantages

EVs' most prominent advantage is their potential to use fuel that produces no direct GHG emissions.[12] Although EVs do not produce any tailpipe emissions, their total emissions depend on the emissions intensity of the electricity they use. For example, an EV powered completely by solar power would produce zero carbon dioxide ("CO_2") emissions for each kilowatt-hour ("kWh") of energy consumed, whereas one powered entirely by coal-fired electricity would emit about 2.07 pounds of CO_2 per kWh consumed.[13] This equates to about 0.66 pounds

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6 David Morelo, *The Pros and Cons of Electric Cars*, FLEETCARMA (Feb. 22, 2017), https://www.fleetcarma.com/electric-cars-pros-cons/.

7 *See NHTSA Sets 'Quiet Car' Safety Standard to Protect Pedestrians*, NAT'L HIGHWAY TRAFFIC SAFETY ADMIN. (Nov. 14, 2016), https://www.nhtsa.gov/press-releases/nhtsa-sets-quiet-car-safety-standard-protect-pedestrians.

8 *See Emissions from Hybrid and Plug-in EVs*, U.S. DEPARTMENT OF ENERGY: ALTERNATIVE FUEL DATA CTR., http://www.afdc.energy.gov/vehicles/electric_emissions.php (last visited Apr. 12, 2018).

9 *See id.*

10 *Reducing Pollution with Electric Vehicles*, ENERGY.GOV, https://energy.gov/eere/electricvehicles/reducing-pollution-electric-vehicles (last visited Jan. 15, 2018).

11 *The Benefits of Electric Vehicles*, PLUG-IN NC, http://www.pluginnc.com/vehicles/benefits-of-electric-vehicles/ (last visited Jan. 15, 2018).

12 Internal combustion engines are also capable of producing zero net GHG emissions when using renewable biofuels from certain sources. Solar and wind, however, have achieved deeper commercial adoption than biofuels. *Renewables and Carbon Dioxide Emissions*, U.S. ENERGY INFO. ADMIN.: SHORT-TERM ENERGY OUTLOOK (Mar. 6, 2018), https://www.eia.gov/outlooks/steo/report/renew_co2.php?src=Environment-b1. Electric cars thus appear more likely to deliver a carbon-free automobile option.

13 Calculated using 93.3 kilograms of CO_2 per Million Btu and a heat rate of 10,059 Btu per kWh. *See Average Tested Heat Rates by Prime Mover and Energy Source, 2007–*

of CO_2 per mile.[14] By comparison, a gasoline-fueled passenger vehicle with average fuel economy (24.8 miles per gallon)[15] emits about 0.98 pounds of CO_2 per mile.[16] Thus, an EV powered exclusively by coal would emit CO_2 equivalent to a car that achieves about thirty-five miles per gallon.[17] As a result, an EV powered exclusively by coal-fired electricity would still reduce about 0.32 pounds of CO_2 per mile compared to a gasoline vehicle with average fuel economy.[18]

If EVs replace an average vehicle driven 11,824 miles per year—the average number of miles driven per year in the United States[19]—then an EV could save between 5.2 metric tons of CO_2 emissions per year (when powered by zero-emissions electricity)[20] and 1.7 metric tons of CO_2 emissions per year (when powered exclusively by electricity generated from coal).[21] Significantly, however, these comparisons are between EVs and cars with average fuel economy. When compared to more fuel-efficient vehicles like hybrids, EVs can emit *more* GHGs when using power generated primarily from coal.[22]

2015, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/electricity/annual/html/epa_08_02.html (last visited Apr. 10, 2018); *Carbon Dioxide Uncontrolled Emissions Factors*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/electricity/annual/html/epa_a_03.html (last visited Apr 10, 2018).

14 Assuming 0.32 kWhs per mile. *See*, *Hybrid and Plug-in EV Emissions Data Sources and Assumptions*, U.S. DEP'T OF ENERGY ALTERNATIVE FUEL DATA CTR., [hereinafter *Emissions Assumptions*], http://www.afdc.energy.gov/vehicles/electric_emissions_sources.html (last visited Apr. 12, 2018).

15 The AFDC uses 24.3 miles per gallon as the average fuel economy of a passenger vehicle in the United States. Though this may represent average fuel economy of vehicles under the CAFE standard, EVs tend to be smaller than the average car. *See id.* Thus, a better comparison might be a smaller car like a Honda Accord, which gets about 33 miles per gallon. *See* Thomas Covert et al., *Will We Ever Stop Using Fossil Fuels?*, 30 J. ECON. PERSP. 117, 131 (2016).

16 *See Emissions Assumptions*, *supra* note 14 (author's calculation using 24.3 miles per gallon fuel economy and 23.5 pounds of CO_2 per gallon of gasoline using a well-to-wheels calculation).

17 *See id.* (calculated using 8.887 kg CO_2 per gallon of gasoline burned).

18 *See* text accompanying notes 14–16 (subtracting 0.66, the emissions rate from an electric vehicle powered by coal-generated power, from 0.98, the emissions rate of a typical gasoline vehicle).

19 *Emissions Assumptions*, *supra* note 14.

20 *Emissions from Hybrid and Plug-in EVs*, *supra* note 8 (providing annual emissions of a gasoline vehicle in pounds, which the author converted to metric tons).

21 *See supra* text accompanying notes 14–16 (calculated by taking the difference in emissions rates per mile (0.98 minus 0.66) and multiplying that quantity by the miles driven per year, giving 3,783 pounds, converted to 1.7 metric tons).

22 *See, e.g.*, *Emissions from Hybrid and Plug-in EVs*, *supra* note 8 (select "Colorado" in the dropdown).

Because the electricity generation mix varies across the United States, the quantity of CO_2 emissions reductions an electric car produces ultimately varies, but 1.7 and 5.2 metric tons per year establish a lower and upper bound on the CO_2 emissions reduced by using an EV.[23] No states, however, produce electricity exclusively from either coal or renewables. Nevertheless, as a demonstration of how widely emissions rates vary across states, an electric car powered in Washington State—a state with significant hydroelectric resources—would be responsible for only 0.38 metric tons of CO_2 equivalent emissions per year.[24] Stunningly, the same car powered in Wyoming—where coal-fired power plants produce almost all its electricity—would emit over ten times that amount.[25]

Beyond these CO_2 emissions reduction advantages, EVs also have the potential to reduce emissions of other air pollutants.[26] As with CO_2 emissions, however, emissions for each kWh (and therefore each mile driven) vary by electricity generation source.[27] Whereas electricity generation sources that produce no carbon emissions (namely, wind, solar, geothermal, and hydroelectric) likewise emit no air pollutants, fossil-fired electricity generation emits significant quantities of air pollutants.[28]

Unfortunately, calculating EVs' advantages from reducing other air pollutants is more difficult than calculating those for CO_2 emissions for two principal reasons. First, the emissions rates of these more "local" pollutants differ greatly across power plants, even across ones consuming the same fuel.[29] For instance, some coal power plants have more

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23 *See* text accompanying notes 19–21.

24 *Emissions from Hybrid and Plug-in EVs*, *supra* note 8 (select "Washington" in the dropdown).

25 *See id.* (select "Wyoming" in the dropdown).

26 These include particulate matter, hydrocarbons, carbon monoxide, sulfur dioxide, nitrogen oxides, and toxic air pollutants. *Cars, Trucks, and Air Pollution*, UNION OF CONCERNED SCIENTISTS, https://www.ucsusa.org/clean-vehicles/vehicles-air-pollution-and-human-health/cars-trucks-air-pollution#.WtDqDYjwYuU (last visited Apr. 4, 2018).

27 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

28 *See, e.g.*, *Coal and Air Pollution*, UNION OF CONCERNED SCIENTISTS, https://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/coal-air-pollution#.Wl0Z6N-nEuU (last visited Jan. 15, 2018).

29 *See Annual ARP, CAIR, and CSAPR SO2 Emissions, SO2 Emission Rates and Heat Input Over Time, 1990 to 2016 Versus 1990*, U.S. ENVTL. PROT. AGENCY, https://www3.epa.gov/airmarkets/progress/datatrends/ARPCAIRSO21990to2016vs1990.html (last visited Jan. 15, 2018).

pollution abatement controls installed than others.[30] Second, CO_2 is a "global" pollutant, and the location of an emission source does not matter in determining the harm that it imposes on society.[31] Whereas the total quantity of CO_2 emissions reduced provides a direct indicator of benefits to society, the quantity of local air pollutants abated is not a good proxy for societal benefits because a pound of a local pollutant released in New York City would do far more damage than a pound released in a remote location where no one would breathe it before it disperses.[32]

Next, EVs also offer a means to reduce reliance on petroleum as an energy source by shifting from petroleum-powered transportation to electricity-powered transportation because almost no electricity in the United States is generated using petroleum.[33] This offers two advantages. First, petroleum prices have historically been more volatile than electricity prices, and therefore reducing reliance on petroleum reduces EV drivers' exposure to price volatility.[34] Second, reducing petroleum consumption would help reduce dependence on foreign oil.[35]

Another advantage is that EVs are generally cheaper to fuel than gasoline-powered vehicles. The U.S. Department of Energy calculates that the equivalent fuel cost in electricity for a typical EV is $1.15 per gallon when fueled by electricity that costs 0.1269 $/kWh.[36] Note, however, that the Department of Energy calculates this cost by comparing EVs with a conventional car that obtains twenty-eight miles per gallon.[37]

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30 *See* Reid Frazer, *Coal-Fired Power Plants Clean Up Their Act*, INSIDE ENERGY (Jan. 6, 2016), http://insideenergy.org/2016/01/06/coal-fired-power-plants-clean-up-their-act/.

31 Severin Borenstein, *Fight Both Local and Global Pollution, But Separately*, ENERGY INST. AT HAAS (Jan. 17, 2017), https://energyathaas.wordpress.com/2017/01/17/fight-local-and-global-pollution-but-separately/.

32 *See* THOMAS H. TIETENBERG & LYNNE LEWIS, ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS 344 (10th ed. 2016).

33 *See Electric Power Monthly*, U.S. ENERGY INFO. ADMIN., at tbl.1.1 (Feb. 2017), https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1.

34 Mark Detsky & Gabrielle Stockmayer, *EVs: Rolling Over Barriers and Merging with Regulation*, 40 WM. & MARY ENVTL. L. & POL'Y REV. 477, 479 (2016).

35 This advantage is hard to quantify, but many EV proponents nonetheless cite it as a consideration without explaining why it is valuable. *See, e.g.*, *The Benefits of Electric Vehicles*, *supra* note 11. These arguments probably assume that there are geopolitical advantages to reducing dependence on foreign oil. Insofar as foreign oil imports affect price volatility, this advantage then overlaps with the price volatility argument.

36 *The "eGallon,"* ENERGY.GOV at 2, https://www.energy.gov/sites/prod/files/2016/01/f28/eGallon%20methodology%20%28Updated%20January%202016%29.pdf (last visited Apr. 4, 2018).

37 *Id.*

Finally, EVs may help provide valuable grid services as more intermittent, renewable energy technologies are installed on the grid.[38] Electric batteries in vehicles could be coordinated in aggregate to store power during times of intermittent supply surplus, and then the energy could be released later in times of need.[39] Tesla's CTO has explained, however, that EVs selling electricity back to the electric grid would not justify the increased wear and tear on the battery.[40] Instead, he recommends coordinating when EVs charge so that they can absorb excess generation.[41]

In short, EVs offer a number of contextual advantages over conventional vehicles; most notably, they emit fewer pollutants (GHGs and others), but they also have the potential to reduce oil imports, reduce fuel costs for consumers, and provide opportunities to help manage intermittent renewable electricity resources.

2. Inherent Advantages

In addition to their contextual advantages, EVs offer several inherent advantages over gasoline vehicles.[42] First, EVs are more efficient: they convert fifty-nine percent to sixty-two percent of the energy collected from the grid into mechanical energy, whereas gasoline vehicles only convert seventeen percent to twenty-one percent of the energy stored in gasoline to energy at the wheels.[43] This efficiency advantage is part of what drives the cost savings, on a per mile basis, described in the previous section. Nevertheless, one should recognize that the electricity an EV uses has already been converted from another source of energy (whether it be wind, solar, gas, or coal), and these efficiency values must be interpreted in that context. For example, because the average gas-fired power plant (both simple- and combined-

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38 *See* Detsky & Stockmayer, *supra* note 34, at 480; TONY MARKEL, PLUG-IN EV INFRASTRUCTURE: A FOUNDATION FOR ELECTRIFIED TRANSPORTATION 1, 2 (2010), https://www.nrel.gov/docs/fy10osti/47951.pdf.

39 MARKEL, *supra* note 38, at 2.

40 Zachary Shahan, *Tesla CTO JB Straubel on Why EVs Selling Electricity to the Grid Is Not as Swell as It Sounds*, CLEANTECHNICA (Aug. 22, 2016), https://cleantechnica.com/2016/08/22/vehicle-to-grid-used-ev-batteries-grid-storage/.

41 *Id.*

42 Note, however, that these advantages do not include pollution benefits because those benefits vary depending on the generation source producing the electricity where the EV charges. *See* text accompanying notes 23–25.

43 *All-Electric Vehicles*, U.S. DEP'T OF ENERGY: ENERGY EFFICIENCY & RENEWABLE ENERGY, https://www.fueleconomy.gov/feg/evtech.shtml (last visited May 11, 2017).

cycle) in the United States has an efficiency of about forty-six percent,[44] and the average transmission and distribution system in the United States has an efficiency of ninety percent,[45] the total system efficiency of an EV would be approximately twenty-five percent when powered exclusively by electricity produced from natural gas.[46]

Next, whereas gasoline engines produce their highest torque values at higher RPMs,[47] electric motors produce their highest torque when the vehicle is starting from a standstill.[48] This provides a better driving experience because drivers tend to need acceleration power the most at low speeds.[49] Further, electric drivetrains are less complicated and therefore tend to require less maintenance.[50] EVs are also quieter than gasoline vehicles. Indeed, EVs are so quiet at low speeds that the National Highway Traffic Safety Administration will require EVs and hybrids to create sound at low speeds to ensure pedestrian safety.[51]

Finally, EVs also offer drivers the opportunity to fuel their vehicles where they park, thus reducing fueling hassle.[52] As noted below in Section I.B, however, charging requires substantially more time than fueling a conventional vehicle.[53] Nonetheless, the opportunity to charge at home offers a boon for people who do not need to drive more than

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44 *See Natural Gas-Fired Electricity Conversion Efficiency Grows as Coal Remains Stable*, U.S. ENERGY INFO. ADMIN (Aug. 21, 2017), https://www.eia.gov/todayinenergy/detail.php?id=32572 (the author then converted the heat rate provided from this source to an efficiency by dividing the number of British thermal units in a kWh by the listed average heat rate).

45 *See* RODERICK JACKSON ET AL., OAK RIDGE NAT'L LABORATORY, OPPORTUNITIES FOR ENERGY EFFICIENCY IMPROVEMENTS IN THE U.S. ELECTRICITY TRANSMISSION AND DISTRIBUTION SYSTEM 3, 12 (2015).

46 Multiplying the average efficiencies of natural-gas power plants (forty-six percent), the average efficiency of transmission and distribution systems (ninety percent), and electric vehicles (about sixty percent).

47 *See* Michael Barnard, *Why Are Teslas Quicker than Gas Cars?*, CLEANTECHNICA (Dec. 19, 2015), https://cleantechnica.com/2015/12/19/teslas-quicker-gas-cars/.

48 *See id.*

49 *See id.*

50 Matthew C. Keegan, *Electric Car Maintenance: What You Need to Know*, NAPA KNOW HOW BLOG (Jan. 24, 2016), http://knowhow.napaonline.com/electric-car-maintenance-need-know/ (explaining that EVs require "comparatively little maintenance").

51 *NHTSA Sets 'Quiet Car' Safety Standard to Protect Pedestrians*, *supra* note 7.

52 *See* 142 CONG. REC. E1427 (daily ed. Aug. 2, 2012) (statement of Rep. Hahn, Introducing the Electric Vehicle Purchasing Credit Expansion Act) (stating that because she owns an electric vehicle, "I get to drive right on past the gas station. In fact, I have not been to a gas station in almost a year.").

53 *All-Electric Vehicles*, *supra* note 43.

their EV's range during a single day and can therefore satisfy their daily driving requirements through nightly charging.

B. Disadvantages

In contrast to EVs' advantages, EVs' disadvantages are mostly inherent to the current technologies they employ and depend on battery technology. Consequently, EVs do not produce significant contextual disadvantages, but their inherent disadvantages are considerable.

Most importantly, EVs cost more than equivalent internal combustion vehicles over their projected useful lifetime.[54] Several economists have explained that high battery capacity costs drive this disadvantage.[55] The economists estimate that battery capacity currently costs about $325 per kWh of capacity.[56] That cost, however, is expected to decrease to $150–$300 per kWh over the next fifteen years.[57] The economists also estimated the battery capacity costs required for EVs to achieve the same present discounted value as a gasoline-powered vehicle,[58] and they found that even if battery capacity costs fall to $125 per kWh of capacity, oil would need to cost $115 per barrel for EVs to be cost-competitive.[59] If, on the other hand, battery capacity costs remain at $325 per kWh, then oil prices would have to increase to $420 per barrel for EVs to be cost-competitive.[60] Finally, the economists estimated that if oil costs $55 per gallon, battery costs would then have to fall from $325 per kWh to $64 per kWh for EVs to compete on cost.[61] For context, as of this writing, the price of West Texas Intermediate oil is just over $71 per barrel,[62] which is significantly lower than the $115 needed for EVs to be cost competitive even if battery costs fall significantly.

Next, manufacturing EVs emits more GHGs than manufacturing comparable conventional vehicles.[63] The large batteries required for EVs

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54 *See* Covert et al., *supra* note 15, at 131–34.

55 *See id.* at 132.

56 *Id.*

57 *Id.* at 133.

58 *Id.*

59 *Id.* at 133–34.

60 Covert et al., *supra* note 15, at 133 fig.6.

61 *Id.*

62 *Energy: Crude Oil & Natural Gas*, BLOOMBERG, https://www.bloomberg.com/energy (last visited May 16, 2018).

63 *See* Troy R. Hawkins et al., *Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles*, 17 J. OF INDUS. ECOLOGY 53, 60–61 (2012).

are solely responsible for this difference,[64] but EVs usually make up for this manufacturing difference over their driving lifetime as a result of their lower emissions per mile driven.[65]

In addition to their higher lifetime costs and greater emissions produced during manufacturing, EVs cannot travel long distances in a single day. Two factors drive this disadvantage. First, EVs can typically travel between only 60 and 120 miles on a single charge.[66] Only Tesla vehicles achieve ranges over 200 miles, but those vehicles can cost nearly $70,000.[67] Although the Model 3 starts at $36,000, its range is significantly lower than the Model S,[68] and Tesla has thus far only been able to produce the Model 3 at one tenth of the rate it had originally intended.[69] Second, charging an EV takes considerable time: fully charging a battery pack takes four to eight hours.[70] Further, even "fast charging"[71] still takes twenty minutes.[72] Neither of these factors in isolation would necessarily impose a significant daily range disadvantage, but the combined effect of low range per charge and long charging times makes traveling farther than 60 to 120 miles time consuming.

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64 RACHAEL NEALER ET AL., UNION OF CONCERNED SCIENTISTS, *CLEANER CARS FROM CRADLE TO GRAVE* 21 (2015), http://www.ucsusa.org/sites/default/files/attach/2015/11/Cleaner-Cars-from-Cradle-to-Grave-full-report.pdf.

65 *Id.* Note, however, that whether and when the EV achieves this depends on how many miles it is driven each year.

66 *All-Electric Vehicles*, *supra* note 43.

67 *Tesla*, CAR & DRIVER, http://www.caranddriver.com/tesla (last visited Jan. 11, 2018).

68 *See Model 3*, TESLA, https://www.tesla.com/model3 (last visited Jan. 11, 2018).

69 Tom Randall, *Tesla's Production Problems Spawn a Legion of Model 3 Stalkers*, BLOOMBERG (Mar. 12, 2018), https://www.bloomberg.com/news/articles/2018-03-12/tesla-s-production-problems-spawn-a-legion-of-model-3-stalkers.

70 *All-Electric Vehicles*, *supra* note 43.

71 Fast charging involves using direct-current chargers at higher voltages to decrease the time necessary to provide a charge. *See* Zach McDonald, *A Simple Guide to DC Fast Charging*, FLEETCARMA (Feb. 4, 2016), https://www.fleetcarma.com/dc-fast-charging-guide/.

72 *See Developing Infrastructure to Charge Plug-In Electric Vehicles*, U.S. DEP'T OF ENERGY ALTERNATIVE FUEL DATA CTR., http://www.afdc.energy.gov/fuels/electricity_infrastructure.html (last visited Apr. 29, 2017).

II. TWO CRITERIA VALUES: BENEFITS JUSTIFY COSTS AND DISTRIBUTIVE JUSTICE

This Note evaluates whether certain tax incentives and infrastructure plans that are intended to promote EV adoption serve two criteria values: (1) the benefits of the incentives and plans justify their costs, and (2) the incentives and plans promote distributive justice. Although each of the two values is important, this Part argues that cost-benefit analysis ("CBA") should be the primary criterion considered in designing laws and policies promoting EVs and that the distributive justice criterion serves as a backstop to prevent these policies from aggravating existing wealth stratification.

A. Benefits Should Justify Costs

Satisfying the criterion that the benefits of a policy justify its costs simply means that the policy should pass a cost-benefit analysis—or, put another way, the policy should produce benefits greater than its total costs.[73] This Note employs this evaluation measure for several reasons. The most basic reason is that some prominent observers argue that CBA provides the best tool available for evaluating regulatory requirements.[74] Moreover, presidents of both parties since President Reagan have required that economically significant rules[75] pass a CBA.[76]

Some justify using CBA on both Pareto efficiency and Kaldor-Hicks efficiency grounds,[77] whereas others justify it as a decision

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73 Some forms of CBA use a more rigorous approach in which each marginal benefit from an increment in a policy's scope or degree needs to be greater than the marginal costs associated with that increment, but that approach is not required by the Office of Information and Regulatory Affairs. *See* Cass R. Sunstein, *The Real World of Cost-Benefit Analysis: Thirty-Six Questions (and Almost as many Answers)*, 114 COLUM. L. REV. 167, 178 n.47 (2014).

74 *E.g.*, Cass R. Sunstein, Cost-Benefits and the Knowledge Problem 1–2 (Oct. 10, 2014) (unpublished manuscript), https://dash.harvard.edu/bitstream/handle/1/16152306/hayekdemocracy10_10.pdf?sequence=1.

75 These are rules that will have an impact of $100 Million or more per year. OFF. INFO. & REG. AFF., https://www.reginfo.gov/public/jsp/Utilities/faq.jsp (last visited May 19, 2018).

76 *See* Exec. Order No. 12,291, 46 Fed. Reg. 13.193 (Feb. 17, 1981); Exec. Order No. 13,563; *see generally* CASS R. SUNSTEIN, VALUING LIFE: HUMANIZING THE REGULATORY STATE (2014).

77 *See* Matthew Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 188–91, 194–95 (1999) (describing but not supporting CBA justifications resting on efficiency rationale).

procedure but not "a criterion of moral rightness or goodness."[78] In the Pareto conception of efficiency, a policy produces an improvement if it makes at least one person better off while making no one else worse off.[79] But because actual Pareto improvements are rare or nonexistent, the Pareto guide is not used directly as a guide for public policy.[80] The Pareto criterion may reject projects that society would generally agree are normatively justified because the requirement that no one be made worse off is too strict.[81]

The Kaldor-Hicks conception, however, addresses this strictness concern by relaxing the Pareto requirement that no one be made worse off.[82] The Kaldor-Hicks conception instead holds that if those who are made better off by a policy could hypothetically compensate those made worse off, so that the policy produces a Pareto improvement, then the policy still produces an improvement and should be adopted.[83] This conception of efficiency is related to CBA in that a project that passes a CBA test fulfills the necessary condition required to achieve a Kaldor-Hicks improvement—namely, that a policy's total benefits must outweigh its total costs.[84] Importantly, however, Kaldor-Hicks efficiency does not require that those made better off under the policy *actually* compensate those made worse off.[85]

Two legal scholars—Matthew Adler and Eric Posner—urge, however, that Kaldor-Hicks improvements are not normatively defensible because hypothetical compensation does not assure real compensation.[86] Advocates of the Kaldor-Hicks justification respond to this criticism by arguing that policies satisfying the Kaldor-Hicks criterion will, in aggregate, tend to even out across individuals and will thereby benefit all.[87] To this, Adler and Posner counter that there is no

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78 *See id.* at 188–91, 194–95.

79 *See id.* at 188.

80 Robert N. Stavins et al., *Interpreting Sustainability in Economic Terms: Dynamic Efficiency Plus Intergenerational Equity*, 79 ECON. LETTERS 339, 341 (2002).

81 Adler & Posner, *supra* note 77, at 188 (presenting an example in which a vaccine would improve the health of millions but would require taxing one person a small amount).

82 *See id.* at 190.

83 *Id.*

84 Stavins et al., *supra* note 80, at 342 (explaining that this is "the fundamental theoretical foundation . . . for employing [CBA]").

85 *See* Adler & Posner, *supra* note 77, at 190.

86 *Id.* at 190–91.

87 *Id.*

guarantee that the evening out will occur, and therefore, the Kaldor-Hicks understanding fails to offer a moral justification for CBA.[88]

Given their criticisms of the Kaldor-Hicks efficiency justification for CBA, Adler and Posner instead offer a practical alternative, arguing that irrespective of the moral justifications, CBA provides the best decision procedure available.[89] First, they argue that it is cheaper, more reliable, and more transparent than directly estimating welfare effects for every person possibly affected by a proposed policy.[90] Next, they argue that CBA is generally more accurate than unidimensional decision procedures.[91] Finally, they argue that CBA captures more dimensions of well-being than other multidimensional decision procedures while tending to be more reliable, more transparent, and cheaper.[92]

Adler and Posner's concern that Kaldor-Hicks cannot serve as a normative justification for CBA carries force especially in circumstances where policies never provide more benefits to those with less wealth. In some instances, however, a policy may benefit those with less wealth. Therefore, the Kaldor-Hicks criterion may be justified from a normative perspective to an even greater degree by furthering wealth-equality goals.

Thus, to account for the variability in a policy's outcomes vis-à-vis wealth distribution, this Note uses CBA as the primary factor combined with a careful consideration of the EV policies' effects on distributive justice (as defined in the following Section).[93] Analyzing a policy's

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88 *See id.*

89 *Id.* at 194–97, 216–17.

90 *Id.* at 227–29.

91 *Id.* at 229. By "unidimensional" procedures Adler and Posner refer to measures that evaluate only one criterion (e.g., premature deaths). *Id.* This approach asks regulators to "compare the total number of premature deaths in the project world with the total number of premature deaths in the status quo." *Id.* In the EVs context, policymakers might instead choose to compare policies using another objective (e.g., total carbon emissions).

92 *Id.* at 238.

93 Indeed, Adler and Posner recommend a related approach. They urge that when "the endowments of affected people vary a great deal," the agency should either (1) adjust monetary estimates in light of wealth differences, (2) encourage the political branches to construct a deal that compensates losers, or (3) abandon CBA. *Id.* at 246. This Note selects another option that combines parts of 1 and 2—it combines CBA with a consideration of distributive justice. Cass Sunstein supports using a similar process. *See* SUNSTEIN, *supra* note 76, at 128 (distinguishing between four different policy outcomes using monetary benefits and welfare benefits: "(1) net monetary benefits and net welfare benefits; (2) net monetary benefits but net welfare costs; (3) net monetary costs and net welfare costs; and (4) net monetary costs but net welfare benefits."). Under Sunstein's conception, welfare benefits may point in a different direction than monetary benefits if and because those receiving the benefits are lower income than those who bear the costs,

distributional effects together with CBA as factors also inoculates the analysis from the criticism that CBA ignores fairness concerns.[94]

Finally, although CBA has been applied most frequently as a criterion with which to measure regulatory rulemaking, the theories justifying its use also extend to legislative policy making. All policy making entities should strive to allocate resources efficiently, and CBA, by ensuring a policy satisfies the Kaldor-Hicks criterion, screens out those policies that would inefficiently allocate government resources. Furthermore, Adler and Posner's justification of CBA as a decision rule has force in the legislative context because CBA "is a tool of good government,"[95] and applying CBA to legislative actions helps make legislators more transparent to the public.[96] Lastly, government actions have opportunity costs; a dollar spent on one policy cannot be spent on any other policies.[97] Consequently, all policymakers should follow procedures that are most likely to consistently yield benefits greater than their costs so that societal resources are not consumed pursuing a path with costs greater than benefits.

B. Distributive Justice

As noted in the preceding Section, considering a policy's distributional effects provides a complimentary, normative criterion with which to evaluate policies because a CBA evaluation is not always morally justified.[98] Considering distributive justice concerns in tandem with CBA can fill that gap. This Section defines distributive justice, explains how the definition can be interpreted to contemplate the context in which the policy is created, and proposes two conceptions of the distributive justice criterion.

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and thus the beneficiaries' willingness to pay would be lower than their net welfare gain. *Id.* at 127–28.

94 *See, e.g.*, Frank Ackerman & Lisa Heinzerling, *Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553, 1573–76 (2002) (criticizing CBA for, among other things, exacerbating inequality).

95 Jonathan Masur & Eric A. Posner, *Cost-Benefit Analysis and the Judicial Role* 10, (Coase-Sandor Working Paper Series in L. and Econ., 2016), https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=2456&context=law_and_economics.

96 *Cf.* Adler & Posner, *supra* note 77, at 246 (arguing that CBA's quantitative assessments make it easier for political branches to monitor agency actions).

97 Duanjie Chen, *The Framework for Assessing Tax Incentives: A Cost-Benefit Analysis Approach* 10, (U.N. Workshop on Tax Incentives and Base Protection, 2015), http://www.un.org/esa/ffd/wp-content/uploads/2015/04/2015TIBP_Paper Chen.pdf.

98 *See* SUNSTEIN, *supra* note 76, at 128.

Distributive justice is the "[j]ustice owed by a community to its members, including the fair allocation of common advantages and sharing of common burdens."[99] The illustrative phrase, "the fair allocation of common advantages and sharing of common burdens," maps directly onto CBA analysis in that "common advantages" may be understood to represent benefits while "common burdens" may in turn represent costs. In this way, the definition could be understood as "the fair allocation of [benefits] and sharing of [costs]." Under this conception, the "fair allocation" that distributive justice demands represents an end to be reached rather than a means to reaching that end. Because this Note uses distributive justice as a check on CBA (which measures effects in monetary terms), it focuses on the allocation of monetary benefits and the sharing of monetary costs among people with differing levels of wealth.

Whether a policy serves distributive justice depends on the context in which the policy operates. For instance, in assessing the distributive justice effects of a policy providing benefits of $100 for each member of group *A* while costing $5 for each member of group *B*, one must know who comprises each group. If people comprising group *A* are relatively wealthy while group *B* is less wealthy, then one would rightly question the policy because it moves away from a "fair" allocation of advantages and burdens. Conversely, when group *A* has less wealth and group *B* has more, the hypothetical policy may promote distributive justice.

Importantly, this Note identifies two forms through which a policy might serve the distributive justice criterion. The first (call it the "affirmative" form) asks whether a policy redistributes wealth from rich to poor.[100] The second (call it the "passive" form) only asks whether a policy does not contribute to increased wealth stratification and therefore places no affirmative duty on the policy to remedy existing wealth stratification.

This Note argues that policymakers should look to both a policy's chosen means and desired ends in determining whether a policy should passively or affirmatively serve distributive justice goals. Beginning with the policy's means, Louis Kaplow and Steven Shavell argue that the income tax and welfare system together provide a more efficient means through which to redistribute wealth than a legal rule.[101] Notably, Kaplow and Shavell define "legal rule" as "rules other than those that

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99 *Justice*, BLACK'S LAW DICTIONARY (10th ed. 2014).

100 For example, tiered income brackets combined with the welfare system are an example of a policy structured to redistribute wealth in equitable ways.

101 *See* Louis Kaplow & Steven Shavell, *Why the Legal System is Less Efficient than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667 (1994).

define the income tax and welfare system,"[102] and any non-tax policy thus falls under this definition. Though some have challenged this argument on political feasibility grounds,[103] it is nonetheless useful in determining whether EV policies should passively or affirmatively serve distributive justice.

Applying Kaplow's and Shavell's conclusion, it follows that tax policies should affirmatively serve distributive justice because policies that redistribute wealth most efficiently should be charged with doing so.[104] As a corollary to this conclusion, other policy domains should not be burdened with affirmatively serving distributive justice because they cannot mitigate inequitable wealth distribution as efficiently as tax policies.[105] Yet society may demand that policymakers at least consider whether a given policy will further contribute to wealth stratification—or, using this Note's typology: to consider whether a policy would serve distributive justice passively.[106]

One should also look to a policy's goals in determining which form of distributive justice it should serve because ensuring that all policies affirmatively serve distributive justice could, as a practical matter, be paralyzing. But where a policy's expressed goal is to redistribute wealth to promote distributive justice, then it should surely be measured under the affirmative form.[107] However, where a policy is totally unrelated to wealth redistribution (for instance, policies surrounding space exploration, energy policy, and the like), then using the passive form as a factor would not unnecessarily impose the same paralyzing burden. Nevertheless, evaluating such a policy using the passive form would still provide a valuable check or backstop to prevent a policy from redistributing wealth regressively.

Many policies designed to promote EV adoption operate through tax credits, and thus inject ambiguity in determining whether these credits should passively or affirmatively serve distributive justice goals because they are susceptible to definition as either a tax policy or an environmental policy with no concern for wealth redistribution. Looking,

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102 *Id.* at 667 n.1.

103 *See, e.g.*, Lee Anne Fennell & Richard H. McAdams , *The Distributive Deficit in Law and Economics*, 100 MINN. L. REV. 1051, 1079–81, 1111–12 (2016) (arguing that because establishing redistributive tax policies is often not achievable in political reality, legal rules should still contemplate distributive consequences).

104 Kaplow & Shavell, *supra* note 101, at 667–68.

105 *Id.*

106 *See* Sunstein, *supra* note 74, at 2 (noting that "it is tempting" for policymakers to focus on other considerations than CBA).

107 This assumes that one agrees that policies should be evaluated at least by how well they serve their expressed goals.

however, to the tax credits' desired ends suggests that EV policies need only passively serve distributive justice. Even though the credits operate as part of the tax system, that is more a matter of convenience in that tax credits offer a politically feasible way to provide a subsidy without a direct outlay of funds.[108] This Note thus proceeds by analyzing whether tax credits and the proposed EV charging corridor serve the passive form of distributive justice. Significantly, this Note does not contend that all policies that pass a CBA test must also serve the passive form of distributive justice. It proposes instead that the two criteria serve as factors to be used in evaluating a policy, where one factor's strengths can compensate for deficiencies in the other. Using the two as factors would still approve of a project that provides benefits far greater than its costs but that distributes those benefits to the wealthy. When a project's net benefits are small, however, the distributive justice criterion may very well outweigh the net benefits and make the project morally unsupportable.

III. EV INCENTIVES' BENEFITS ARE LOCATION-SPECIFIC AND THEY CONTRIBUTE TO UNEQUAL WEALTH DISTRIBUTIONS

Having described why policies should produce benefits greater than their costs and why they should do so in ways that at least passively serve distributive justice, this Part applies those criteria in analyzing two policies promoting EVs: income tax credits (both state and federal) and state investment in EV charging infrastructure.

A. State and Federal Tax Credits

The federal tax credit for purchasing an EV is $7,500,[109] and Colorado currently offers an additional state tax credit of $5,000.[110]

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108 *See* Len Burman et al., *Economic and Distributional Effects of Tax Expenditure Limits, in* THE ECONOMICS OF TAX POLICY ch. 5.2 (Alan J. Auerbach & Kent Smetters eds., 2017).

109 *See* I.R.C. § 30D(b)(1)–(3) (2012) (providing $2,500 for any new plug-in electric drive vehicle plus an additional $417 for each kWh of capacity in excess of five kWh but not exceeding $5,000). This means that any battery with greater than twelve kWh capacity will reach the maximum $5000 credit to be added to the base credit of $2,500. All EVs sold in the United States obtain more than seventeen kWh of capacity and are therefore eligible for the entire $7,500 tax credit.

110 Tax Credit for Innovative Motor Vehicles, COLO. REV. STAT. § 39-22-516.7(4)(a)(II)–(IV) (2016) (providing a base tax credit of $2,500 plus an additional $417

Under the U.S. Tax Code EV buyers receive a $7,500 nonrefundable income tax credit and PHEV buyers receive at least a $2,500 tax credit.[111] The Code, however, provides a limit and phase-out period for this tax credit.[112] EVs from a particular manufacturer are eligible for the tax credit up to one year after that manufacturer has sold more than two hundred thousand PHEVs or EVs starting from December 31, 2009.[113] An example helps demonstrate how this works. If a company sells only one qualifying PHEV and only one qualifying EV, then purchasers of either the PHEV or EV will no longer be able to claim the full tax credit one year after the company's combined sales of the PHEV and EV exceed two hundred thousand.[114] After the manufacturer sells more than two hundred thousand qualifying vehicles, the tax credit is phased out over a one-year period.[115]

In addition to the federal tax credits, states also provide a variety of incentives, including income tax credits to incentivize EV adoption and use.[116] Colorado provides purchasers of PHEVs and EVs with one of the most generous state income tax credits—$5,000 until 2020 for EVs.[117] This Section analyzes whether the federal and Colorado income tax credits produce benefits greater than their costs and whether these tax credits distribute wealth justly. It finds that the direct GHG abatement benefits fail to justify the taxes' costs and finds that it is ambiguous whether the benefits from reducing other pollutants justify the costs. Furthermore, it argues that these income tax benefits distribute wealth unjustly.

1. The Tax Credits Create Benefits Greater than Their Costs Only in Limited Circumstances

This Section evaluates whether the Colorado and federal tax credits produce benefits greater than their costs. In doing so, it only looks to

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credit for each additional kWh of battery capacity, not to exceed $6,000 until 2017, then providing $5,000 between 2017 and 2020, $4,000 between 2020 and 2021, and $2,500 dollars between 2021 and 2022).

111 *See* I.R.C. § 30D(b)(1)–(3).

112 *See* I.R.C. § 30D(e).

113 *Id.*

114 *See id.*

115 *See id.*

116 *See* Hartman & Dowd, *supra* note 3.

117 *See* COLO. REV. STAT. § 39-22-516.7(4)(a)(II)–(IV) (2016) (providing a base tax credit of $2,500 plus an additional $417 credit for each additional kWh of battery capacity, not to exceed $6,000 until 2017, then providing $5,000 between 2017 and 2020, $4,000 between 2020 and 2021, and $2,500 dollars between 2021 and 2022); Hartman & Dowd, *supra* note 3.

those benefits that arise from pollution because these benefits are positive externalities (i.e., benefits that the driver does not capture), and should therefore be provided through policy levers. Conversely, EV customers already experience EVs' inherent benefits directly,[118] and thus do not need an extra incentive to obtain these benefits.[119] This Note further assumes that the "cost" of a tax credit is the forgone revenue associated with the credit.[120] Although a tax credit is merely a transfer (and therefore should not impose a net cost on society), taxes' distortionary effects impose a societal cost that can be a significant fraction of the direct revenue costs.[121]

a. Abating Greenhouse Gases

EVs have the potential to emit zero GHG emissions for each mile driven. Further, as noted above, the average EV produces fewer net emissions than the average gasoline-powered vehicle even when powered by electricity produced from coal.[122] For this reason, both the federal income tax credit and Colorado's income tax credit are motivated in part by a desire to reduce emissions. These two tax credits, however, reduce carbon emissions at costs far above the benefits from reducing those emissions.

Turning first to the benefits, estimating the avoided social costs from reducing carbon emissions is complex.[123] However, given the requirement that important agency actions pass a CBA, and given that

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118 *See supra* text accompanying notes 47–52.

119 This assumes that consumers have full information about EVs' direct advantages over conventional vehicles.

120 The assumption being that the revenue could be used elsewhere in government to generate a benefit at least as great as its dollar amount. Others recommend this approach. *See* Alexander Klemm, *Causes, Benefits, and Risks of Business Tax Incentives* 11, Int'l Monetary Fund, Working Paper, 2009), https://www.imf.org/~/media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2009/_wp0921.ashx (explaining that the costs of tax benefits are not limited to revenue losses).

121 *See* Martin Feldstein, *Tax Avoidance and the Deadweight Loss of the Income Tax*, 81 REV. OF ECON. & STAT. 674, 678 (1999) (modeling using 1994 income tax rates shows a deadweight loss equal to 32% of the total revenue raised).

122 *See supra* text accompanying notes 16–18.

123 *See* William D. Nordhaus, *Revisiting the Social Cost of Carbon*, 114 PROC. NAT'L ACAD. SCI. 1518 (2017), http://www.pnas.org/content/114/7/1518.pdf ("Estimates of the SCC are necessarily complex because they involve the full range of impacts from emissions, through the carbon cycle and climate change, and including economic damages from climate change.").

agencies have recently promulgated rules addressing GHG reductions,[124] estimating these benefits has become necessary.[125] Because of this necessity, the U.S. Interagency Working Group on Social Costs of Greenhouse Gases has estimated these costs,[126] and this Note uses the value of avoiding these costs to estimate the benefit from reducing GHG emissions.

The Interagency Working Group estimated that in 2020 each ton of carbon emitted would impose costs on society between $12 and $123 per ton.[127] Admittedly, this is a wide range, but the estimates depend on the discount rate used and the modeled sensitivity of the climate system to increased GHG concentrations.[128] The $12 estimate reflects the average costs produced across all models, discounted at a five percent rate, while the $123 estimate reflects the ninety-fifth percentile estimate of costs discounted at a three percent rate.[129] Finally, the middle estimates for 2020—$42 and $62—represent the average of all estimates discounted using a three percent and 2.5 percent discount rate, respectively.[130]

Importantly, the Interagency Working Group does not recommend using any one specific cost estimate; rather, it emphasizes considering all estimates.[131] Given that emphasis, this Note uses the whole range of estimates while nonetheless noting that the $123 estimate is for the ninety-fifth percentile of estimated costs and therefore represents an upper estimate.[132]

Having determined the range over which estimated avoided costs from reducing CO_2 emissions lie, the next natural step in the cost benefit comparison is to estimate the implied cost of reducing carbon emissions through the federal and state income tax credits. The Congressional

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124 *See, e.g.*, Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83,008 (Nov. 18, 2016) (to be codified at 43 C.F.R. pts. 3100, 3160, and 3170).

125 *See* Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Sept. 30, 1993).

126 *See* U.S. INTERAGENCY WORKING GRP. ON SOCIAL COST OF GREENHOUSE GASES, TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (2016).

127 *Id.* at 4 tbl.ES-1.

128 *See id.*

129 *Id.*

130 *Id.*

131 *Id.* ("For purposes of capturing uncertainty around the SC-CO2 estimates in regulatory impact analysis, the [Interagency Working Group] emphasizes the importance of considering all four SC-CO2 values.").

132 *See id.*

Budget Office ("CBO") estimated these costs for the federal tax credit,[133] but no such estimate has been done for Colorado's tax credit. Fortunately, however, the CBO's calculations can easily be applied to Colorado's tax credit.

The CBO estimates that the implied cost to the government of CO_2 abatement flowing from the federal income tax credit is $230 to $4,400 per ton.[134] In effect, this means that these policies would only provide benefits greater than their costs if the social cost of carbon were greater than $230 to $4,400. Adjusting these costs by increasing each to include the Colorado tax credit yields combined costs between $383 and $7,330 per ton,[135] and Colorado may be at the higher end of this range because electricity generation in the state emits more GHGs than the national average.[136] Not only is this entire cost range far greater than the central cost estimated by the Interagency Working Group, it is also far greater than the higher estimate of $123.

Importantly, the CBO's cost estimates also assume that an EV replaces either a light-duty truck with low fuel-economy, an average fuel economy vehicle, or a high fuel-economy compact car.[137] If, however, the EV replaces a hybrid and the electricity powering the local grid is more carbon-intensive, then emissions may *increase*.[138] In that case, the tax credits would indirectly be subsidizing greenhouse gas emissions[139] in states like Colorado.[140] Even if some EV owners in places like Colorado use their own solar panels to charge their EV, the panels would then be used to charge the vehicle rather than displace any fossil generation.[141]

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133 *See* U.S. CONG. BUDGET OFFICE, EFFECTS OF FEDERAL TAX CREDITS FOR THE PURCHASE OF ELECTRIC VEHICLES 3 (2012).

134 *Id.* at IV, 18.

135 This approach increases the CBO estimates by a factor of 1.67 (12,500 divided by 7,500).

136 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

137 U.S. CONG. BUDGET OFFICE, *supra* note 133, at 8 fig.1, 9 fig.2.

138 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8 (estimating that a hybrid vehicle emits fewer greenhouse gases than both PHEVs and EVs in Colorado); *see also* U.S. CONG. BUDGET OFFICE, *supra* note 133, at 18.

139 U.S. CONG. BUDGET OFFICE, *supra* note 133, at 18.

140 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

141 Or, if the customer charges at night, then the solar power would displace fossil-fired generation during the day, but the vehicle would then be charged from baseload fossil fuels at night. *See* David Biello, *Why Charging an Electric Car at Night is Worse for the Environment*, PBS NEWSHOUR: THE RUNDOWN (May 16, 2016), http://www.pbs.org/newshour/rundown/why-charging-an-electric-car-at-night-is-worse-for-the-environment/.

Significantly, the CBO, in calculating its estimates, assumed that the income tax credit would only be responsible for thirty percent of EVs purchased (i.e., seventy percent of the EVs would have been purchased even without the tax credit).[142] In choosing thirty percent, the CBO relied on a several empirical studies estimating the rate at which an incentive for hybrids actually caused purchases.[143] These studies estimated that hybrid vehicle tax credits were responsible for approximately twenty-five percent of those sales.[144] In adapting those estimates to the tax credits here, the CBO chose thirty percent to account for the larger federal incentive.[145]

The CBO's thirty percent estimate, however, may have been an overestimate. Considering EVs' inherent advantages, it is possible that more customers would have bought an EV even without any incentives.[146] Vehicles produced by Tesla Motors, for example, are the most likely to have been purchased regardless of the tax credit benefits because they perform so well. Tesla's most powerful Model S sedan can accelerate from zero to sixty in 2.3 seconds—faster than any production car *MotorTrend* has ever tested.[147] Moreover, even less powerful, less expensive Teslas can still accelerate quickly.[148] Thus, someone who wanted to buy a very fast car may have purchased a Tesla anyway. Even though Teslas are the only electric cars to accelerate that quickly, 120,000 Teslas have been sold in the United States (the most of any EV),[149] and they thus compose a significant portion of EV sales in the United States.[150] For this reason, the tax credit's true responsibility for

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142 Put differently, this assumes that seventy percent of the EVs would have been purchased even without the tax credit.

143 *See* U.S. CONG. BUDGET OFFICE, *supra* note 133, at 32.

144 *Id.*

145 *Id.* (noting that the $3,400 federal tax credit for traditional hybrids was lower than the $7,500 tax credit for EVs).

146 This parallels the observation that some offsets used in permit markets for climate mitigation may not be additional. *See generally* Brian Joseph McFarland, *Carbon Reduction Projects and the Concept of Additionality*, 11 CLIMATE L. REP. 15 (2011).

147 Frank Markus, *2017 Tesla Model S P100D First Test: A New Record - 0–60 MPH in 2.28 Seconds!*, MOTORTREND (Feb. 7, 2017), http://www.motortrend.com /cars/tesla/model-s/2017/2017-tesla-model-s-p100d-first-test-review.

148 *See Tesla 0-60 Times*, ZERO TO 60 TIMES, http://www.zeroto60times.com/ vehicle-make/tesla-0-60-mph-times/ (last visited Feb. 3, 2018) (showing that even some of the oldest and cheapest Teslas still accelerate from zero to sixty in under six seconds).

149 *See* Mark Looper, *Cumulative Sales of Electric and Plug-in Hybrid (and Fuel-Cell) Vehicles in the USA*, ALTFUELS, http://www.altfuels.org/misc/evsales.shtml (last updated Jan. 5, 2018).

150 *See IRC 30D – Plug-in Electric Drive Motor Vehicle Credit Quarterly Sales*, INTERNAL REVENUE SERV., tbl.Year 2017, https://www.irs.gov/businesses/irc-30d-plug-

causing EV purchases may be even lower than the thirty percent the CBO estimated, and the implied cost of emissions abatement would therefore be greater than the $230 to $4,400 range it estimated.

Finally, and significantly, the CBO did not account for the difference in manufacturing emissions in estimating the implied cost of GHG abatement.[151] Although EVs usually make up for this manufacturing difference over their driving lifetime,[152] the CBO's cost estimates would have been higher had it considered this manufacturing difference because the estimated net reduction in emissions would have been lower.

b. Abating Other Air Pollutants

EVs produce no direct tailpipe emissions and can therefore help improve air quality, especially in urban areas.[153] By contrast, vehicles fueled by gasoline and diesel emit pollutants regulated under the Clean Air Act's National Ambient Air Quality Standards ("NAAQSs").[154] Thus, switching from vehicles fueled by gasoline and diesel has the potential to reduce pollutants covered by the NAAQSs.[155] The benefit of this switch, however, varies by geography for two reasons. First, the magnitude of the harms imposed by vehicle pollution depend on the population density where the pollutants are emitted.[156] Second, as explained above, electricity generation portfolios vary from state to

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in-electric-drive-motor-vehicle-credit-quarterly-sales (last updated Nov. 17, 2017) (showing total cumulative sales at the end of 2017 by Ford, Mercedes, and BMW equaled 172,478).

151 *See* U.S. CONG. BUDGET OFFICE, *supra* note 133.

152 NEALER ET AL., *supra* note 64, at 25.

153 *Reducing Pollution with Electric Vehicles*, *supra* note 10.

154 Daniel S. Greenbaum, *Sources of Pollution: Gasoline and Diesel Engines, in* 161 INT'L AGENCY RES. CANCER, AIR POLLUTION AND CANCER 49–50 (Straif K. at al., eds. 2013); s*ee NAAQS Table*, ENVTL. PROT. AGENCY, https://www.epa.gov/criteria-air-pollutants/naaqs-table (last visited May 11, 2017) (table showing the six pollutants regulated under NAAQSs as Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particle Pollution, and Sulfur Dioxide).

155 *See* Uarporn Nopomongcol et. al., *Air Quality Impacts of Electrifying Vehicles and Equipment Across the United States*, 50 ENVTL. SCI. & TECH. 2830, 2835–36 (2017) (modeling the impact of electrifying the auto fleet by 2030 in the United States and concluding that electrification would decrease concentrations of all air pollutants).

156 *See* Heather Strosnider et al., *Rural and Urband Differences in Air Quality, 2008-2012, and Community Drinking Water Quality, 2010-2015—United States*, 66 MORBIDITY & MORTALITY WKLY. REP. 1 (2017), http://dx.doi.org/10.15585/mmwr.ss6613a1.

state—some deliver electricity with few emissions while others are fueled mostly by coal.[157]

Although this geographic variability makes estimating the precise benefits of increased EV penetrations difficult without detailed modeling,[158] one can still rank areas by the likely benefits EVs would provide. For instance, one would likely rank a city with significant pollution from motor vehicles but without local fossil-fired electricity generation (e.g., Los Angeles) higher than a city with a coal-fired power plant within city limits (e.g., Colorado Springs).[159] Whereas EVs driven in Los Angeles could displace vehicle pollution to distant fossil generation or even eliminate that pollution with emission-free generation, EVs driven in Colorado Springs might simply be shifting pollution from one source to another within the city.

The National Renewable Energy Lab ("NREL") conducted a modeling assessment of local pollution impacts resulting from 500,000 PHEVs charging in Colorado based on the type of electricity generation source the PHEVs would likely use to charge.[160] Because NREL's assessment modeled Colorado's electric generation at the power plant and hour level, NREL was able to determine which power plants would provide the incremental generation to charge the PHEVs.[161] Using that data, NREL then compared net emissions of Nitrogen Oxides ("NOx"), Sulfur Dioxide ("SO_2"), and CO_2 from a conventional vehicle, a hybrid vehicle, and PHEV charged under different scheduling regimes.[162]

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157 *See Emissions from Hybrid and Plug-in EVs, supra* note 8.

158 *See* PARKS ET AL., NAT'L RENEWABLE ENERGY LAB., COSTS AND EMISSIONS ASSOCIATED WITH PLUG-IN HYBRID VEHICLE CHARGING IN THE XCEL ENERGY COLORADO SERVICE TERRITORY 24 (2007), http://www.altomelbilen.dk/rapporter/El%20vehicles%20%20and%20hybrids%20study.pdf ("Without the use of an air quality model, it is difficult to quantify the net benefits of reducing tailpipe NOx while increasing generator NOx emissions."). And even with modeling, teasing out local effects may be beyond the scope of analysis. *See, e.g.*, ENVTL. PROT. AGENCY, REGULATORY IMPACT ANALYSIS FOR THE FINAL MERCURY AND AIR TOXICS STANDARDS ES-3 (2011), https://www3.epa.gov/ttnecas1/regdata/RIAs/matsriafinal.pdf ("the $PM_{2.5}$-related co-benefits of the regulatory alternatives were derived through a benefit-per-ton approach, which does not fully reflect local variability in population density").

159 *See* Bruce Finley, *Colorado Springs Still Rolls Coal in Heart of City, but May Shut Drake Plant by 2025 as Residents Fume*, DENVER POST (Nov. 16, 2017), https://www.denverpost.com/2017/11/16/colorado-springs-drake-plant-closure-2025/ (noting that Colorado Springs is home to one of the United States' last coal-fired power plants located within a city).

160 PARKS ET AL., *supra* note 158, at 7.

161 *Id.* at 15–16.

162 *Id.* at 19, 21.

NREL also accounted for the upstream emissions associated with refining the gasoline required by all the vehicles.[163]

NREL determined that net emissions of NOx, SO_2, and CO_2 for PHEVs charged from the Colorado grid would be lower than conventional vehicles and hybrids.[164] Significantly, however, the upstream emissions from electricity generation would still emit significant quantities of all pollutants, especially when vehicles are charged during off-peak hours—when more coal-fired generation is running.[165]

Although Colorado's power generation portfolio has incorporated more natural gas and renewables since the NREL analysis was conducted,[166] NREL's work nonetheless illustrates that powering vehicles with coal-fired power still produces significant quantities of all three pollutants.[167] In states with more natural gas and renewable energy resources, however, the pollution reduction benefits from switching to EVs could be significant. Thus, even though it is difficult to calculate the precise net benefits from switching to EVs, the relative net benefits across states can roughly be ordered by the emissions rates of the grid in each state and the number of drivers in urban areas. Accordingly, the federal tax credit creates net benefits that vary considerably across states and localities.

Two other factors may also attenuate the emissions reductions from switching to EVs. First, the rebound effect resulting from the decreased price of fueling the vehicle may cause EV owners to drive more.[168] Second, consumers who purchased a vehicle for environmental reasons may display a different sort of rebound effect whereby reducing the environmental guilt from driving leads the person to drive more.[169] To

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163 *Id.* at 21.

164 *Id.* at 20–24.

165 *Id.*

166 *See* Lesley McClurg, *Colorado Looks Away from Coal Toward Renewable Energy Sources*, COLO. PUB. RADIO (June 4, 2014), http://www.cpr.org/news/story/colorado-looks-away-coal-toward-renewable-energy-sources.

167 *Id.* at 21, fig.17.

168 *See* Kenneth A. Small & Kurt Van Dender, *Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect*, 28 ENERGY J. 25, 25–27 (2007) (finding that drivers respond to price changes with a short-term elasticity of 4.5% and long-term elasticity of 22.2%). This effect may be tempered, however, by EVs' limited range.

169 *See* Matthew Harding & David Rapson, Does Absolution Promote Sin?: The Conservationist's Dilemma 2, 17 (Feb. 2, 2013), http://old.econ.ucdavis.edu/faculty/dsrapson/HR_Absolution.pdf (unpublished manuscript) (finding, in the electricity context, that customers who enrolled in a voluntary green program with their utility increased consumption by three percent and attributing this effect to the removal of an "ethical dissonance").

the extent that these factors encourage more driving, the implied benefits of the tax credits decrease.

c. Reducing Future EV Costs & Developing Infrastructure

Proponents of EV tax credits argue that the credits encourage EV charging infrastructure development while also decreasing future EV costs through technological learning.[170] Unfortunately, there is even less data available with which to assess the benefits flowing from infrastructure and technological learning induced by tax credits than there is data available on local air pollution benefits.[171] Thus, rather than compare monetized costs and benefits, this Section highlights the assumptions underlying these claims to understand whether they are likely to hold true.

The arguments that tax credits encourage infrastructure development and lower EV costs reflect an inverse version of the precautionary principle. One form of the precautionary principle holds "that action should be taken to correct a problem as soon as there is evidence that harm may occur, not after the harm has already occurred."[172] Relatedly, the logic driving EV development appears to hold that action should be taken to realize a benefit as soon as there is evidence that the conditions necessary to produce that benefit *may* occur, not after those conditions already come to exist.

Thus, the argument goes as follows: when renewable sources compose most generation portfolios, the infrastructure for mass EV adoption should be available and EVs should be affordable.[173] This argument, however, faces two criticisms. First, government resources are finite and spending has attendant opportunity costs. Therefore, money spent incentivizing EVs could have been spent on renewable energy research and development. In this way, incentivizing EVs is akin to putting the cart before the horse, except it also depletes resources that could have been devoted to obtaining the horse.

Second, as with the precautionary principle, sometimes precautionary measures themselves induce more harm than they were

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170 E-mail from Ken Wilson, Engineering Fellow, Western Resource Advocates, to Michael Miller (Mar. 16, 2017, 10:36 MST) (on file with author).

171 This, however, evokes the criticism that costs lend themselves to quantification more easily than benefits, and that cost-benefit analysis is therefore systematically biased toward the conclusion that projects are not justifiable. *See* Ackerman & Heinzerling, *supra* note 94, at 1579–80.

172 Cass Sunstein, *Irreversible and Catastrophic*, 91 CORNELL L. REV. 841, 849 (2006).

173 E-mail from Ken Wilson, *supra* note 170.

meant to avoid.[174] In states like Colorado, where hybrid vehicles produce fewer GHGs than EVs,[175] EV policies may divert potential hybrid vehicle purchasers toward EVs instead and thereby produce more GHG emissions than would occur in the absence of any EV policy. The magnitude of this effect depends on how long it takes for states with GHG-intensive generation to develop cleaner generation sources so that EVs emit less than hybrid vehicles in those states. A faster transition will mitigate this concern. Alternatively, if the transition takes longer, then much time will have been wasted while EVs in states like Colorado will have emitted more GHGs than hybrid vehicles would have.

2. Tax Credits Do Not Serve Distributive Justice

The federal income tax credit for EVs and PHEVs is nonrefundable, meaning that the tax credit can only be used to displace tax liability.[176] Thus, potential customers with lower incomes (i.e., people who therefore have low income tax liability) may be eligible to receive only a fraction of the credit's nominal value.[177] Consequently, the federal tax credit likely serves neither the affirmative nor the passive forms of distributive justice described in Part II. It does not serve the affirmative form because the tax credit does not help the less wealthy, and therefore does not affirmatively reduce wealth stratification. Further, because only those with incomes sufficient to generate $7,500 of tax liability (about $42,000 annual income with the standard deduction) may benefit from the full tax credit,[178] it further aggravates existing wealth stratifications and therefore does not even passively serve distributive justice goals.

Colorado's tax credit, however, allows customers to transfer the tax credit to an entity providing customers with financing for the new vehicle for "the full nominal value of the tax credit."[179] Thus, the value of the tax credit that a customer may obtain does not depend on her income because the financing entity must pay for the full tax credit. As a result, Colorado's tax credit serves the passive form of distributive justice better than the federal income tax credit because all potential customers—wealthy or not—may realize the full value of the tax credit.

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174 *See* Sunstein, *supra* note 172, at 850–51 (describing beneficial drugs that are kept from market in fear that they may cause harm).

175 *Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

176 U.S. CONG. BUDGET OFFICE, *supra* note 133, at 3.

177 *Id.*

178 *Federal Income Tax Calculator*, SMARTASSET, https://smartasset.com/taxes/income-taxes (last visited May 11, 2017).

179 COLO. REV. STAT. § 39-22-516.7(2)(e)(I)(D) (2016).

Although the Colorado tax credit's full value is available to all EV customers (regardless of taxable income), the people comprising electric EV customers are more likely to have greater wealth for several reasons. First, customers who purchase an EV are more likely to live in a multi-vehicle household,[180] in part because EVs have limited range, so the flexibility provided by a second, conventional vehicle lowers the risk that a household will not be able to serve its daily driving needs.[181]

Second, EVs are more expensive to purchase.[182] Including the tax credits, a new EV can be more expensive than its new conventional counterpart. For example, the starting price of a Fiat 500e is $18,000 more than the starting price of a Fiat 500.[183] Though the difference between a Ford Focus and its electric counterpart is not as large, the electric Focus still costs more than $16,000 after both the federal and Colorado tax credits.[184] Moreover, even Tesla's most affordable model will start at $22,500 after applying the federal and Colorado tax credits.[185] Perhaps the exception that proves the rule and as a result of isolated promotions, the Nissan Leaf, however, was available for as little as $8,000 in 2016 in Colorado.[186]

Finally, as an empirical matter, publicly available demographics of EV purchasers show that most customers have been wealthier than

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180 *See* ERIK FIGENBAUM & MARIKA KOLBENSTVEDT, INST. TRANSP. ECON., ELECTROMOBILITY IN NORWAY—EXPERIENCES AND OPPORTUNITIES WITH ELECTRIC VEHICLES, at VI (2013), https://www.toi.no/getfile.php?mmfileid=33828 (explaining that 91% of households in Norway with an electric vehicle own a second vehicle).

181 *See* Niklas Jakobsson et al., *Are Multi-Car Households Better Suited for Battery Electric Vehicles?—Driving Patterns and Economics in Sweden and Germany*, 65 TRANSP. RES. PART C: EMERGING TECH. 1, 12 (2016) (explaining results from modeling households with different vehicle ownership and finding that households owning other cars in addition to an EV have more transportation flexibility). Though this study was done for vehicle owners in Sweden and Germany, the assumptions that people have varying distances they travel over a given month are likely to hold true in the United States as well. Given that public transportation infrastructure in the Germany and Sweden is more developed than the United States, customers in the United States may derive even more option value from owning a second car.

182 *See* Edelstein, *supra* note 5 (showing the prices of 2017 electric vehicles).

183 *Compare 2017 Fiat 500e*, FIAT, http://www.fiatusa.com/500e.html (last visited Mar. 4, 2018) (costing $32,995), *with 2017 Fiat 500*, FIAT, http://www.fiatusa.com/500.html (last visited Mar. 4, 2018) (costing $14,995).

184 *Focus*, FORD, http://www.ford.com/cars/focus/2017/models/focus-electric/ (last visited Mar. 3, 2018).

185 *See Model 3*, TESLA, https://www.tesla.com/model3 (last visited Mar. 4, 2018).

186 Megan Mitchell, *Aurora Program Offers $10,500 Discount on Nissan Electric Cars to Metro Residents Until Nov. 10th*, DENVER POST (Oct. 26, 2016) https://www.denverpost.com/2016/10/26/aurora-program-offers-105000-discount-on-nissan-electric-cars-to-metro-residents-until-nov-10/.

average. In California, a survey in 2015 of over 15,000 EV rebate recipient households showed that only twenty three percent of those households earned less than $99,000, but the average household income in California was $60,000.[187] Another survey compared the household incomes between customers who purchased the conventional and the electric model of a particular vehicle type, which thus reveals the differences in household income between those customer groups.[188] Whereas buyers of the conventional Fiat 500 had an annual household income of $73,000, households that bought the electric version made $145,000 on average.[189] Similarly, conventional Ford Focus buyers earned $77,000 per year while buyers of the electric version made about $199,000.[190] Significantly, the average household income of buyers purchasing even modestly priced new vehicles like the Ford Focus is as high as $77,000.[191] Households with less wealth may be less likely to buy *any* type of new cars and are therefore also ineligible for the tax incentives.

In summary, even though Colorado's tax credit is available to all customers, it likely does not serve even the passive form of distributive justice. Though it does better than the federal tax credit in that it does not require a threshold tax liability to realize its benefit, it still only benefits customers who choose to buy an EV, and those people tend to be wealthier than other new car buyers.

Note, however, that broader EV adoption may produce air pollution benefits for low income and minority communities as one study of Los Angeles air pollution found in a different context.[192] If that is the case, then even though wealthier people tend to capture the direct tax benefit, the less wealthy may also benefit from pollution abatement.[193] This would moderate any distributive justice concerns. Still, to the extent that

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187 Patrick McGreevy, *California Limits Hybrid Rebates to Households Earning Less Than $500,000*, L.A. TIMES (Aug. 23, 2015), http://www.latimes.com/local/politics/la-me-pol-electric-cars-20150824-story.html.

188 *See* Christopher DeMorro, *EV Buyers Are Younger, Richer & Looking for a Deal*, EVOBSESSION (May 6, 2015), http://evobsession.com/ev-buyers-are-younger-richer-and-looking-for-a-deal/.

189 *Id.*

190 *Id.*

191 *Id.*

192 Matthew E. Kahn, *The Beneficiaries of Clean Air Act Regulation*, REG. MAG., Spring 2001, at 34–37 (showing that less wealthy people and minorities in the Los Angeles Basin experienced greater improvements in air quality than wealthier people based on the spatial distribution of air pollutants while wealthier people tended to bear the costs of newer, cleaner vehicle ownership).

193 *See id.*

EV customers might have purchased an EV even without tax credit incentives,[194] and thereby reduced pollution in any case, the tax operates more as a transfer to the wealthy than an incentive with secondary benefits flowing to the less wealthy.

B. Electric Charging Infrastructure Connecting Colorado, Nevada, and Utah

The Governors of Colorado, Nevada, and Utah agreed to coordinate programs developing EV charging infrastructure on the highways passing through the three states.[195] In a press release, the Colorado Governor's office explained that the project will ensure that "[o]ur residents and the millions of visitors to our states will be able to drive EVs from Denver to Salt Lake City to Las Vegas."[196] According to the press release, the project will reduce "range anxiety," which is described as "the concern that recharging may not be available for long-distance travel or trips outside of major cities," and it will provide smaller communities with access to charging infrastructure.[197] This section concludes that the project's benefits do not likely justify its costs and that the distributional outcomes are difficult to assess.

1. The Infrastructure's Benefits Will Likely Not Be Greater than Its Costs

To begin, the States' explicit goal in developing the corridor is to reduce "range anxiety,"[198] but the States' further goal is to thereby incentivize EV adoption.[199] And this goal, in turn, is likely an intermediate goal in the service of reducing future EV costs and ultimately reducing GHG and other polluting emissions.[200] To evaluate

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194 *See supra* notes 143–43 and accompanying text.

195 *Governors of Colorado, Utah, and Nevada Announce Joint Action to Build Regional Electric Vehicle Corridor*, COLO. GOVERNOR JOHN HICKENLOOPER: NEWS (Dec. 19, 2016), https://www.colorado.gov/governor/news/governors-colorado-utah-and-nevada-announce-joint-action-build-regional-electric-vehicle [hereinafter COLO. GOVERNOR'S OFFICE].

196 *Id.*

197 *Id.*

198 *Id.*

199 STATE OF COLO. ET AL, REGIONAL ELECTRIC VEHICLE WEST PLAN 2 (2017), https://www.colorado.gov/governor/sites/default/files/rev_west_plan_mou_10_3_17_final_for_signature1.pdf.

200 The press release does not state so explicitly, perhaps because politicians in all three states would be less likely to support the plan if it were associated directly with

how well this policy is likely to serve the intermediate goal (i.e., to promote EV adoption), this Section analyzes whether interstate range anxiety is a likely deterrent to customers considering an EV and whether the corridor is likely to reduce that deterrent. This Section finds that interstate range anxiety is not a likely deterrent. Moreover, even if range anxiety does act as a deterrent, the corridor is unlikely to reduce that deterrent. Consequently, the corridor likely will not produce net benefits.

Two factors already mitigate range anxiety concerns associated with interstate travel and therefore call into question the corridor's necessity. First, households with EVs tend to own more than one vehicle.[201] For those households, interstate range anxiety simply would not exist because they could use one of their conventional vehicles for the road trip. Second, some companies offer their EV customers cars for loan through dealerships or credits with a rental car company precisely to reduce the range anxiety concern.[202]

Moreover, even if some potential EV customers do have interstate range anxiety, the corridor may not do much to relieve it unless customers are willing to spend a substantial portion of a road trip charging their vehicle.[203] Currently, EVs with the greatest ranges can travel from 150 to 335 miles on a single charge.[204] Unfortunately, however, even the fastest charging technologies take twenty minutes to provide seventy miles of charge.[205] And stations with lower voltages can

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concerns about climate change. And it is also possible that the states also seek to provide some economic stimulus in rural communities through these building projects.

201 *See supra* notes 180–181 and accompanying text.

202 *See* John Voelcker, *BMW Launches Flexibility Mobility Program for i3 Electric Car*, GREEN CAR REPS. (Dec. 8, 2014), http://www.greencarreports.com/news/1095812_bmw-launches-flexible-mobility-program-for-i3-electric-car (describing BMW's and Fiat's programs offering cars for loan through dealerships or rental car credits when EV customers want to travel farther than their vehicle will allow). Notably, Tesla does not offer these benefits, but Teslas have better range than other electric vehicles, so range anxiety may be less of a concern for Tesla drivers. *See* David Z. Morris, *Tesla Quietly Introduces Longest-Range Electric Car on the Market*, FORTUNE (Jan. 22, 2017), http://fortune.com/2017/01/22/tesla-long-range-electric-car/.

203 Bengt Halvorson, *Electric-Car Road Trips: Be Prepared, with Charging Apps and Realism*, GREEN CAR REPS. (Dec. 10, 2014), http://www.greencarreports.com/news/1095840_electric-car-road-trips-be-prepared-with-charging-apps-and-realism/page-3 (describing how a road trip that typically takes three hours took four and a half in an electric vehicle after stops for charging).

204 Zachary Shahan, *The 10 Electric Cars with Most Driving Range*, CLEANTECHNICA (Dec. 24, 2017), https://cleantechnica.com/2017/12/24/10-electric-cars-driving-range/. Importantly, the vehicle achieving the 335-mile range is a Tesla Model S, which costs upwards of $70,000. *Id.*; *Tesla*, *supra* note 67.

205 *See Developing Infrastructure to Charge Plug-In Electric Vehicles*, *supra* note 72.

take up to three hours to fully charge a vehicle.[206] Accordingly, covering long distances between destinations in Nevada, Utah, and Colorado would require frequent charging stops and extra time spent on the road, all of which would discourage EV use.

2. It Is Uncertain Whether the Charging Infrastructure Will Serve Distributive Justice

The interstate charging corridor's implications for distributive justice are difficult to assess because the project is in its early stages. As a result, this Section does not conclude whether the corridor will satisfy the affirmative or passive forms of distributive justice. Instead, it lays out the considerations that would determine whether the corridor serves either forms of distributive justice. The reader is then invited to weigh these considerations as more information about the corridor becomes available.

First, one should consider which groups will likely benefit from the corridor. The primary beneficiaries of the corridor will be people who own EVs. Because EV owners are wealthier than average[207] and likely to live in urban areas[208] (urban Colorado households earn approximately twenty-nine percent more than rural Colorado households),[209] the corridor is likely to directly benefit Colorado's wealthier residents more than any other group.[210] The charging corridor may, however, provide

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206 Michael Hill, *Charge Me Up: Rural Electric Drivers Face "Range Anxiety*,*"* DENVER POST (Apr. 23, 2017), http://www.denverpost.com/2017/04/23/electric-car-charging-rural-towns/.

207 *See supra* text accompanying notes 180–191.

208 *Cf.* Gil Tal et al., *Modeling the Spatial Distribution of Plug-In Electric Vehicle Owners in California: A GIS Scenario Planning Tool* 5 tbl.1 (UC Davis Inst. of Transp. Studies, Working Paper No. UCD-ITS-WP-14-06, 2014), https://its.ucdavis.edu/research/publications/?frame=https%3A%2F%2Fitspubs.ucdavis.edu%2Findex.php%2Fresearch%2Fpublications%2Fpublication-detail%2F%3Fpub_id%3D2613 (showing that of all EV purchases in California, only one percent live in rural areas, whereas ninety-seven percent live in urban areas). Though Colorado may have a different share than California, EV ownership skews so heavily urban in California, Colorado's ownership distribution would have to vary significantly from California's for there to be no rural-urban disparity in Colorado.

209 COLO. RURAL HEALTH CTR., THE STATE OF HEALTH IN RURAL COLORADO 4–5 (2016), http://coruralhealth.wpengine.netdna-cdn.com/wp-content/uploads/2016/01/2016-Snapshot-of-Rural-Health-CRHC.pdf. This report assumes, however, that rural communities located along the corridor are similar to rural communities across all of Colorado. *See id.*

210 Note that this only considers rural income in Colorado. The difference between rural and urban income may be different in Utah and Nevada. *See* Alemayehu Bishaw & Kirby G. Posey, *A Comparison of Rural and Urban America: Household Income and*

indirect benefits to rural Colorado communities near it because charging requires a significant amount of time,[211] requiring drivers to stop more frequently and perhaps spend money locally while waiting to charge. Rural communities may therefore receive an economic boost from increased visitors who spend more time in the area. Developing charging infrastructure in rural communities may also increase EV ownership by lowering barriers to adoption for rural customers.[212]

Similarly, air pollution benefits are difficult to assess because the amount and distribution of pollution reductions would depend on how many EV drivers use the charging corridor, which vehicles they would have used instead, and where fossil-fired generation stations are located. Thus, the total allocation of benefits depends mostly on whether rural residents increase EV adoption and the extent to which EV drivers spend extra money in rural areas.

Next, one should consider which groups would pay for the corridor. The project will be funded with money the States received in a settlement from Volkswagen relating to the company's diesel vehicles' emissions.[213] Eighty percent of the diesel vehicles sold and recalled in Colorado were sold in the Front Range.[214] Assuming those eighty percent were mostly driven in—and therefore imposed harms in—the Front Range, then the charging corridor, though helping predominantly urban EV buyers, may benefit the people most harmed by the polluting Volkswagen vehicles. Alternatively, if local communities along the corridor pay for the charging stations, then they may be providing benefits for the mostly wealthier urban residents who are more likely to realize the corridor's immediate and direct benefits.

Poverty, U.S. CENSUS BUREAU (Dec. 8, 2016), https://www.census.gov/newsroom/blogs/random-samplings/2016/12/a_comparison_of_rura.html (stating that median income in rural areas across the United States is only four percent less than median urban income).

211 *See* Hill, *supra* note 206.

212 It would do so by reducing range anxiety. *See* COLO. GOVERNOR'S OFFICE, *supra* note 195.

213 Joe Rubino, *Western Governors Set Sights on Electric Vehicle Charging Network Spanning Seven States*, DENVER POST (Oct. 4, 2017), https://www.denverpost.com/2017/10/04/western-governors-electric-vehicle-charging-network-spanning-seven-states/.

214 CITY AND COUNTY OF DENVER, COMMENTS TO CDPHE ON THE ENVIRONMENTAL MITIGATION TRUST FUND (2017), http://environmentalrecords.colorado.gov/HPRMWebDrawer/Record/917175/File/Document.

IV. PROPOSALS FOR FUTURE EV POLICIES AND INCENTIVES

To be sure, EVs offer great promise for reducing both carbon emissions and local pollution from the transportation sector; in regions with more natural gas, nuclear, and renewable generation, EVs emit the lowest GHGs of any vehicle type.[215] But the policies promoting EVs likely do not produce benefits greater than their costs in all regions,[216] and they do so through means that benefit the wealthy more than the poor.[217] For these reasons, policymakers at all levels should consider these criticisms when developing future policies to address climate change, local air pollution, and alternative vehicle policies. This Part presents several examples of policies promoting EV use and adoption that would be more likely to both pass a CBA and serve at least the passive form of distributive justice.

A. Revenue-Neutral Carbon Tax with a Dividend Payment

Insofar as EV policies are intended to reduce GHG emissions, a carbon price could accomplish that end at lower costs and could be designed to do so while delivering wealth outcomes that are distributively just. A carbon tax plan proposed by two former Secretaries of State and one Secretary of the Treasury[218] provides such an example. The proposal would begin by pricing carbon dioxide at $40 per ton—raising between $200 billion and $300 billion a year—with scheduled increases over time.[219] The tax, however, would be revenue-neutral as its revenues would be refunded directly to consumers via a "carbon dividend," which would return about $2,000 a year to a household of four.[220] The tax would be imposed on fossil fuels where they enter the economy (e.g., at the mine, well, or port),[221] thereby increasing the cost of those fuels relative to other sources of energy. This would provide an

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215 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

216 *See supra* Sections III.A.1, III.B.1.

217 See *supra* Sections III.A.2, III.B.2.

218 *See* John Schwartz, *'A Conservative Climate Solution': Republican Group Calls for Carbon Tax*, N.Y. TIMES, Feb. 8, 2017, at A13. These include former Secretary of State James A. Baker III, former Secretary of State George P. Shultz, and Henry M. Paulson, Jr., a former Secretary of the Treasury. *Id.*

219 *Id.*; JAMES A. BAKER, III ET AL., CLIMATE LEADERSHIP COUNCIL, THE CONSERVATIVE CASE FOR CARBON DIVIDENDS 3 (2017), https://www.clcouncil.org/wp-content/up loads/2017/02/TheConservativeCaseforCarbonDividends.pdf.

220 Schwartz, *supra* note 218.

221 *Id.*

incentive to reduce consumption of polluting fuels through switching to renewable fuels, conservation measures, efficiency measures, or through all of those means.[222]

Comparing the proposed carbon tax to the income tax credits for EVs shows why the carbon tax is much more likely to be cost justified if set at a level approximating the social cost of carbon. First, the federal tax credit—by virtue of its constant rate, which does not vary by location—is a blunt instrument that does not account for the differing emissions rates of electricity generation across regions.[223] By contrast, the proposed carbon tax would provide the greatest marginal incentive to invest in EVs in those places with the lowest rates of GHG emissions because fueling a vehicle would become relatively cheaper in those regions.[224] Next, the income tax credits, do not differentiate between customers who, in extreme cases, simply leave their cars in the driveway and those customers who drive hundreds of miles a week.[225] The carbon tax, however, would induce those who drive more (and who therefore have more to gain from fuel cost savings) to invest in an EV. Finally, the carbon tax would provide incentives to all drivers to purchase fuel-efficient vehicles or drive less by cutting out trips, using public transportation, or carpooling because it would make all of those activities relatively cheaper as compared with driving a conventional vehicle.[226] By contrast, tax credits for EVs do nothing to substantially affect the relative costs of those behaviors.

222 *See* William G. Gale, *A Carbon Tax Is a Win-Win for the Economy and the Environment*, TAX POL'Y CENT.: TAXVOX (Mar. 12, 2013), http://www.taxpolicycenter.org/taxvox/carbon-tax-win-win-economy-and-environment.

223 *See supra* text accompanying note 140.

224 *See* Philip Wild et al., *Impact of Carbon Prices on Wholesale Electricity Prices, Carbon Pass-Through Rates and Retails Electricity Tariffs in the NEM*, at 6 (Energy Econ. & Mgmt. Grp., Working Paper No. 5-2012) (noting that the pass-through costs of a carbon tax were correlated with average emissions intensity).

225 Comparing the Investment Tax Credit for renewable energy investments with the Production Tax Credit for renewable energy production reveals a similar incentive difference where only the Production Tax Credit provides an incentive to produce a marginal unit of renewable energy.

226 *See* Paul Joskow, Keynote Address at the University of Colorado Annual Schultz Lecture (Sept. 22, 2016) ("[P]utting a price on CO_2 emissions is very very important: it gets the short- and long-run incentives right on every margin; it gives all supply- and demand-side technologies an equal opportunity to take advantage of providing a low- or no-carbon supply or reducing consumption; and it does not get us stuck with subsidizing a specific set of technologies that in the long run may not . . . be the best.").

Even though the tax would increase the cost of most products, and thus risks being regressive,[227] the proposal's dividend helps prevent low-income households from being adversely affected by higher prices. Whether a household is left better or worse off depends on how much its spending increases relative to other households because of the carbon tax. The comparison between other households matters because all the funds would be refunded, so a household whose spending increases below the average increase would receive more money back from the dividend than it paid. Thus, when the department of the treasury modeled the likely distributional effects of a $49 per ton carbon tax with a dividend, it found that the average household earning in the seventieth percentile of income and below would experience a net increase in after-tax income.[228] More impressively, a rebate distributed through reductions in payroll taxes would increase after-tax income for all households but those in the top fifth income percentile.[229] Though these estimates are averages, and the Treasury's analysis does not include an analysis of the sensitivity of its estimates to different household characteristics, the analysis nonetheless estimates that the tax and rebate approach increases after-tax incomes in low-income households by the largest percentage.[230]

Moreover, from a global perspective, a carbon tax in the United States would serve distributive justice because the United States has enjoyed the fruits of GHG-producing services more than many less-developed countries.[231] Poorer countries, by contrast, are likely to bear proportionally higher costs resulting from climate change.[232]

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227 *See* CARL DAVIS ET AL., INST. ON TAX'N & ECON., WHO PAYS?: A DISTRIBUTIONAL ANALYSIS OF THE TAX SYSTEMS IN ALL 50 STATES 12 (5th ed. 2015), http ://www.itep.org/pdf/whopaysreport.pdf.

228 John Horowitz et al., *Methodology for Analyzing a Carbon Tax* 26 tbl.6 (Dep't of the Treasury Office of Tax Analysis, Working Paper No. 115, 2017), https:// www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/WP-115.pdf.

229 *Id.* Although the amounts saved by the lower income deciles are smaller under this scenario. *See id.*

230 *Id.* (showing that the first tenth percentile after-tax income would increase by 8.9% while the seventieth percentile would only increase by 0.1 percent).

231 Mengpin Ge et al., *6 Graphs Explain the World's Top 10 Emitters*, WORLD RESOURCES INST.: BLOG (Nov. 25, 2014), https://wri.org/blog/2014/11/6-graphs-expl ain-world%E2%80%99s-top-10-emitters (showing that the United States emits the second highest GHG emissions per person, second only to Canada).

232 JAMES J. MCCARTHY ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: IMPACTS, ADAPTATION, AND VULNERABILITY § 19.4.3 tbl.19-4 (2001), http://www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=675 (showing that developed countries are expected to suffer lower costs of climate impacts as a percentage of GDP than developed countries).

Although the carbon tax and dividend approach would likely serve the two criteria values, it is almost certainly not politically feasible.[233] For that reason, this Note next presents alternatives to current EV policies that would better serve one or both of the criteria values.

B. Other Policy Options

The federal income tax credit on EVs could be adjusted to better serve the criteria values. First, the tax credit could be adjusted to affirmatively serve[234] distributive justice by means testing the tax credit payment. Such approaches have been used in other states.[235] Texas's Vehicle Replacement Assistance Program encourages people to replace their polluting vehicles by offering up to $3,500 to households with less than a threshold level of income (for example, the threshold for one-person households is $36,180).[236] Alternatively, the federal tax credit could adopt Colorado's approach and allow customers to transfer the credit's value to financing entities in exchange for a discount.[237] This would decouple a customer's ability to realize the tax credit's full value from the customer's taxable income.[238] In this way, the federal tax credit could better serve distributive justice in at least the passive form.

Next, to produce benefits greater than its costs in more instances, the value of the federal tax credit could be adjusted up or down depending on the electric generation portfolio of the state where a vehicle is purchased and driven. For instance, the credit for an EV purchased (and subsequently driven) in states like California with a relatively clean generation portfolio would be worth more than in states

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233 *See* Charles Komanoff, *Progressives Need to Get Over Themselves and Support This GOP-Backed Carbon-Tax Plan*, NATION (Feb. 14, 2017), https://www.thenation.com/article/progressives-need-to-get-over-themselves-and-support-this-gop-backed-carbon-tax-plan/ (explaining that neither the right nor the left appear willing to make the compromises necessary to agree on the proposed carbon tax).

234 Although this Note has supported the view that one should not expect non-tax policies to affirmatively redistribute wealth under the Kaplow and Shavell argument, that is not to say that a non-tax policy that affirmatively serves distributive justice is undesirable.

235 *See, e.g.*, TEX. HEALTH & SAFETY CODE ANN. § 382.209 (West 2016); *AirCheckTexas Drive a Clean Machine—Vehicle Replacement Assistance Program*, TEXAS COMM'N ON ENVTL. QUALITY, http://www.tceq.texas.gov/airquality/mobilesource/vim/driveclean.html (last visited May 8, 2017).

236 *AirCheckTexas Drive a Clean Machine—Vehicle Replacement Assistance Program*, *supra* note 235 (the program also requires that the applicant's car to be replaced has failed an emissions test or is greater than ten years old).

237 *See* COLO. REV. STAT. § 39-22-516.7(2)(e)(I)(D) (2016).

238 *See supra* text accompanying notes 176–179.

with more coal-fired electricity generation. Though this may add an administrative complexity, nothing would fundamentally prohibit such a scheme. The data exist to assess the emissions rates at a state level,[239] and concerns that consumers may try to arbitrage the credit differences (perhaps by buying a vehicle in an area receiving a larger tax credit) could be mitigated by requiring the customer to reside within the state in which she is claiming the credit.

Although varying the tax credit by state would help align its value with EVs' likely GHG reductions, the variation would not likely capture localized benefits from decreased air pollution. The federal tax credit could be further adjusted depending on whether the purchaser lives in a rural, suburban, or urban area. Introducing this additional granularity would allow the credit to track the value of using an EV more closely. To be sure, the attendant complexity required of such a granular tax may not be worth the additional benefits.[240] Additional complexity may also deter potential customers from purchasing a vehicle.[241] Thus, the tax credits should strike a balance between being simple and being carefully tailored to approximate their expected benefits. If policymakers continue to support EV adoption at the national level, then a credit that varies by state would likely strike a better balance than the nationally uniform credit currently in place.

As for EV charging station development, this Note recommends leaving the space entirely to utilities while providing them with adequate incentives to invest in charging station infrastructure. Given that providing fuel for EVs presents an opportunity for utilities to "shore up their flattening business of supplying electricity," utilities are likely willing investment partners.[242] Indeed, Kansas City Power and Light ("KCP&L") recently invested in developing EV charging infrastructure, and its experience demonstrates how this model can be successful in

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239 *See Emissions from Hybrid and Plug-in EVs*, *supra* note 8.

240 *See* Louis Kaplow, *How Tax Complexity and Enforcement Affect the Equity and Efficiency of the Income Tax* 5–7, 12–19 (Nat'l Bureau of Econ. Research, Working Paper No. 5391, 1995), http://www.nber.org/papers/w5391.pdf (arguing that tax complexity increases compliance costs and administrative costs while decreasing efficiency).

241 *See* Tamara Chuang, *Buying an Electric Car in Colorado Just Got $5,000 Cheaper*, DENVER POST (Mar. 17, 2016), https://www.denverpost.com/2016/05/17/buying-an-electric-car-in-colorado-just-got-5000-cheaper/ (noting that states with simpler tax credits have had some of the highest EV adoption rates and inferring that increased complexity deters customers).

242 Diane Cardwell, *Utilities Push into Fuel Stations for Electric Cars*, N.Y. TIMES, Feb. 20, 2015, at B8.

incentivizing EV adoption.[243] KCP&L installed more than one thousand charging stations in its service area at a time when only eight hundred EVs were registered in the Kansas City metropolitan area.[244] Thereafter, EV purchase growth in Kansas City subsequently outpaced coastal cities with higher EV usage from mid-2016 through the end of 2017.[245]

Private investment from utilities could help reduce government spending on charging stations, thus alleviating some distributive justice concerns that all taxpayers would be paying for the stations when only EV drivers may benefit. Some distributive justice concerns may remain, however, if the utilities are allowed to pass the investment costs through to all ratepayers.[246] These concerns could be tempered by requiring utilities to pay for the charging stations with only investor capital or the revenues generated at the stations. Indeed, the Missouri Public Service Commission has not yet allowed KCP&L to collect its costs through rates, but this approach may lead to a slower network buildout.[247]

Not only would utilities likely be willing investors in charging infrastructure, but the utilities would likely have better incentives than government to invest in the most useful charging stations because they would be putting capital at risk.[248] This approach can better serve the benefits greater than costs criterion by ensuring that charging stations are built where they will be used most frequently, thus allowing for greater economies of scale.[249]

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243 *See* Jeffrey Tomich, *Chargers Bring EVs to Midwest, but Cost Recovery's Elusive*, ENERGYWIRE (Feb. 15, 2018), https://www.eenews.net/stories/1060073983.

244 *Id.*

245 *Id.*

246 *See* Shelly Welton, *Clean Electrification*, 88 U. COLO. L. REV. 571, 603 (2017) (noting that ratepayer advocates have questioned whether utilities should spread these costs over the majority of ratepayers when the benefits are uncertain).

247 Tomich, *supra* note 243.

248 *See id.* This, however, would run the risk that fewer charging stations are installed, as a commissioner of the Missouri Public Service Commission recently noted in his opinion dissenting from the Commission's decision not to allow a utility to recovery charging station costs through its rate base. *See* Union Elec. Co. d/b/a Ameren Mo. for Approval of a Tariff Setting a Rate for Elec. Vehicle Charging Stations, Mo. P.S.C., ET-2016-0246 (Apr. 2017) (Rupp, Comm'r, dissenting).

249 *See* Portland General Elec. Co., Application for Transportation Electrification Programs, Or. P.U.C. 18-054, at 11 (Feb. 2018), http://apps.puc.state.or.us/orders/2018ords/18-054.pdf.

CONCLUSION

Although this Note criticizes tax credits promoting EVs and the proposed charging corridor connecting Colorado, Utah, and Nevada, it is important to note that it does not criticize EVs more broadly. As noted in Part I, EVs hold many environmental advantages over conventional vehicles, and those advantages may prove essential to achieving emissions reduction goals. EVs will hopefully provide a low- or zero-emissions transportation option across much of the United States in the near future. A search for an immediate solution, however, should not distract from a rational evaluation of policies promoting EVs. Given current generation portfolios in many states, it may still be premature to promote EV adoption so robustly. Although EVs offer great promise for moving toward a low-carbon future, policymakers should remember that EVs provide a means to reducing emissions but are not an end in themselves.

This Note therefore recommends that policymakers evaluate laws, regulations, and projects promoting EVs by making sure that their benefits justify their costs while also checking that the policies produce distributively just outcomes. This process can help show where more information is needed to assess a policy's costs and benefits,[250] and it also ensures that a policy does not interfere unreasonably with achieving distributive justice goals. The alternatives proposed in Part IV would likely serve the criteria values better than current approaches, and policymakers should give them ample consideration. Finally, because the normative considerations that undergird using the two criteria apply in most contexts, the analysis employed here can serve as a model for policymakers when they consider laws, regulations, and projects in contexts that extend beyond those related to EVs, climate change, or the environment.

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250 *See, e.g.*, ENVTL. PROT. AGENCY, *supra* note 158, and accompanying text (describing how local air pollution effects are difficult to assess without quantitative modeling).