REPORT OF THE VIRGINIA DEPARTMENT OF MINES, MINERALS AND ENERGY

Electric Vehicle Incentive Working Group Feasibility Report (Chapter 973, 2020)

TO THE GENERAL ASSEMBLY OF VIRGINIA

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November 1, 2020

Members of the General Assembly:

The Department of Mines, Minerals and Energy, on behalf of the Departments of Environmental Quality, Motor Vehicles, and Taxation, is submitting this report on the feasibility of an electric vehicle rebate program. The impetus for this report was Delegate David Reid's HB717 from the 2020 General Assembly session, which directed the state agencies (the Electric Vehicle Incentive Working Group) to consult with stakeholders in developing its recommendations and report.

During the summer of 2020, the working group gathered input and best practices from industry and community stakeholders through a variety of channels. The group sponsored four online webinars, hosted speakers from states with existing rebate programs, and received public comment for 30 days. The recommendations resulting from the robust stakeholder input can form the foundation for an electric vehicle-rebate incentive program that is simple, timely, equitable, and durable.

The Electric Vehicle Incentive Working Group thanks Delegate David Reid for his leadership on this legislation. The working group also thanks the automobile manufacturers, motor vehicle dealers, electric vehicle charging network representatives, electric vehicle manufacturers, environmental organizations, energy utility organizations, and other stakeholders for their contributions to this process.

The Commonwealth Energy Policy establishes an ambitious target of net-zero carbon emissions across all sectors of Virginia's economy by 2045. Because the transportation sector produces the greatest amount of greenhouse gas emissions in the Commonwealth, it will undoubtedly take a number of policy actions to achieve that target. An efficient and effective electric vehicle rebate program could be one such tool, should the General Assembly elect to enact it. Thank you for the opportunity to participate in this process.

Sincerely,

Al Christopher
Director
Division of Energy

Electric Vehicle Incentive Working Group Feasibility Report

Recommendations on Implementing a Rebate Program to Encourage the Adoption of Electric Vehicles in the Commonwealth

November 1, 2020

Acknowledgements

The Electric Vehicle Incentive Working Group (EVIWG) wants to thank Delegate David A. Reid for his vision and to acknowledge the contributions to this effort of Virginia state agencies, environmental groups, vehicle manufacturers, electric vehicle enthusiasts, automobile dealerships, and many others. For a detailed list of the stakeholders, please see Appendix 1: Electric Vehicle Incentive Working Group Stakeholders.

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Cover Photograph
Electric vehicles at a Virginia Clean Cities charging station, in Harrisonburg, VA.

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Executive Summary

In 2020, the Virginia General Assembly passed, and Governor Ralph S. Northam signed into law, Delegate David A. Reid's House Bill 717. HB717 tasked the Department of Mines, Minerals and Energy, in cooperation with the Departments of Environmental Quality, Motor Vehicles, and Taxation, with convening a working group to *determine the feasibility of an electric vehicle (EV) rebate program for the Commonwealth of Virginia.* (See Appendix 2: HB 717).

Transportation represents the largest sector of energy consumption in Virginia; and the significant financial, energy security, and environmental costs to the Commonwealth of using imported oil are challenges that many, including legislators and the Governor seek to overcome. In 2018, the Virginia Energy Plan included initiatives to support the adoption of electric vehicles and the advancement of clean and domestic fuel options for transportation among Governor Northam's energy priorities.

During the summer of 2020, the working group was formed to explore the feasibility of an electric vehicle incentive that would be simple, timely, equitable, and durable. The group gathered input and 'best practices' from industry and community stakeholders through a variety of channels, including four webinars, to hear from speakers from other states to share their experiences with rebate programs and to solicit input and comments from the automobile dealers/manufacturers, environmental and social justice advocates, utility representatives, and others. There was universal interest in incentives to support the adoption of electric vehicle technology in Virginia, with sometimes diverging ideas about how these should work.

This report concludes that an electric vehicle rebate program can produce significant economic and environmental benefits to the Commonwealth. Electric vehicles use less expensive, local, homegrown electricity instead of out-of-state oil. This keeps Virginians' fuel dollars circulating in the state's economy through the consumption of electricity and other goods and services purchased with the savings from the switch to electricity. Additionally, though the conversion to electric vehicles may result in lower fuels tax revenues, the omnibus transportation bill adopted this year imposes vehicle registration fees on EVs that are nearly equal to the average amount of fuels taxes paid by average drivers.

Jobs creation is another metric to measure economic benefit. Recent economic analyses of transportation electrification show that for each $1 million spent on Port of Baltimore electrification (vehicles and cargo handling equipment), there would be 40 new jobs created (Schenk, 2020). This is twice the number of jobs created by $1 million of spending in the petroleum sector. These differences are associated with fuel funds staying within the local economy instead

of being transferred to other states and countries involved in petroleum extraction, refining, and distribution.

In addition to potential economic benefits, EV adoption can result in environmental and health benefits. Producing roughly 48% of Virginia's greenhouse gas emissions (48 million metric tons annually), the highly-polluting transportation sector represents an important area of focus for reducing emissions. In some peer states, metrics from EV adoption programs are used to demonstrate the achievement of emissions goals. Although Virginia does not have a formal transportation emissions reduction goal or a goal to achieve a certain market share for electric vehicles, an incentive program could lead to increased EV adoption and aid in meeting future emissions targets for the Commonwealth. Conversion to cleaner electric vehicles can result in lower health care costs, as air quality improves. Further, as the Commonwealth continues its recovery from the impacts of the global COVID-19 pandemic, strategies to advance EV adoption would be a timely support for clean air along with economic recovery goals.

An EV deployment target of 10-20% of market share by 2027 could result in significant transportation emissions reductions and has been selected for the scenarios presented in this report. The percentage of market share is based on the Transportation Climate Initiative's (TCI) EV sales forecast model. TCI is a regional collaboration of 13 Northeast and Mid-Atlantic jurisdictions that seeks to develop the clean energy economy, improve transportation, and reduce carbon emissions in the transportation sector. Over the vehicle's lifetime, the decrease in greenhouse gases in the Commonwealth will range from 4,000,000 tons (10% market share) to 8,850,520 tons (20% market share), representing a 2% reduction in overall transportation emissions. (See Appendix 3: Emissions Reductions).

Based on the Transportation Climate Initiative's electric vehicle sales forecast numbers for Virginia, the program would require an initial year of funding at $43 million which would fund rebates for an average of 13,150 electric vehicles (total program funding = projected annual EV sales multiplied times the average rebate amount). On average, each of these vehicles has the potential to generate up to $450 of net social benefit annually, achieving a simple payback to the Commonwealth of the initial investment of between five and seven years. Net social benefits are the total benefits to society resulting from economic or environmental activities such as driving EVs, minus the external costs such as reducing gasoline usage.

Currently available electric vehicle technology includes plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs), and fuel cell electric vehicles (FCEVs). Nearly two percent of the state's new vehicles sales were EVs in 2019, roughly paralleling the national average. In that same year, Virginia consumers had registered 41 different models of EVs, including some models only available out-of-state. As auto manufacturers are more likely to send vehicles to markets with the most supportive conditions, the number of EV offerings will continue to grow, year-by-

year, resulting in more options, functionality, and price points from which customers may choose. Virginia's support of growth in EV sales through use of an incentive program, along with robust investments in charging infrastructure and introduction of other complementary policies, can critically serve to expand the market and consumer interest in this technology.

Many states have established electric vehicle adoption programs with a range of incentive values and administrative systems. These examples have served as a resource in developing this program, and are summarized in Appendix 4: EV Incentives in Other States.

Proposed Incentive Program

A successful electric vehicle rebate program offered by the Commonwealth of Virginia to stimulate the adoption of electric vehicles should adhere to four core values: simplicity, timeliness, equity, and durability. These values will ensure greater results for the Commonwealth's citizens.

Simplicity – The program should be simple to understand, easy to navigate, and publicly available to consumers. It should include specific and intentional efforts to promote consumer awareness, ensure that both consumers and dealers have information about EV options, and minimize barriers to participation. Consideration of an EV may be a new idea for buyers. Therefore, ease of access and implementation of the program can support the consumer during this potentially complex vehicle purchase.

Timeliness – Incentives should be available to buyers up-front, at the time of vehicle purchase -- also called 'on the hood'. Research indicates that consumers respond more favorably to rebates and sales tax exemptions that occur closer to the point-of-sale, than to income tax incentives, which must be applied for and received at a later time.

Equity – An EV policy should promote program access to communities and populations that face disproportionately high and adverse health, environmental, social, and economic burdens, including minority populations and low-income populations. Equity considerations ensure that persons having a higher marginal utility of income can benefit from strategies like eligibility for higher or enhanced rebates.

Durability – Durability suggests that an incentive can be relied upon to be in place and available throughout the budget period and for many years, allowing manufacturers to arrange product distribution, dealers to acquire the necessary inventory, and consumers to plan their investments. Challenges experienced in peer states that have instituted program cut-backs or changes to incentives are often due to lack of long-term funding. Durability suggests that the program should be in place at least until electric vehicles reach cost equivalency to traditional vehicles.

EV Rebate Process

If we were to establish an EV rebate program in Virginia, it should offer two tiers of incentive: a Standard EV Rebate, along with the add-on of an additional Enhanced EV Rebate for income-qualified Virginians, as consistent with equity values. It should be administered by a designated program management agency (PMA), utilize a real-time web-based program data dashboard, and receive guidance from an appointed EV Rebate Advisory Board. Program funds must cover administrative costs. To maintain transparency, an annual program performance review should be conducted and appropriate programmatic revisions implemented.

The Standard EV Rebate: The Standard EV Rebate serves as a core of the program. Supported with 75% of the program's funding, the standard rebate can be applied to the purchase or lease of most new and used public, private, or light-duty electric fleet vehicles procured from dealerships or through direct automaker sales.

The rebate would be applicable for both battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs), although FCEVs are not currently available in Virginia. At this time, the standard rebate for the purchase or lease (minimum 36-month lease) of a new EV should be a maximum of $2,500; and for a used EV (fewer than 7 years old), the standard rebate should be $1,250. Under the proposed rebate program, new and used Plug-in Hybrid Electric Vehicle (PHEV) purchases will receive a $1,000 standard incentive, provided the PHEV has an all-electric range of at least 25 miles.

During the first year of the program, there should be no vehicle price or customer income caps. Allowing use of the rebate for purchase of any new electric vehicle can translate into more options and the availability of previously-owned EVs. The used vehicle market may provide advantages, opportunity, and value to move many citizens into electric vehicles. This serves to promote program access, universality, and simplicity.

The EV purchaser or lessee should be required to produce a Virginia Driver's License and complete a paper or online application with the dealership that provides the buyer's name, address, contact information, make and model of EV, vehicle identification number (VIN), and name of seller. The dealer should verify that the customer is eligible for the rebate and review the program's website to ensure the availability of program funds. The dealer will disclose the rebate amount, deduct this from the total vehicle sales price, conclude the sales transaction, and submit the documentation to the PMA for reimbursement.

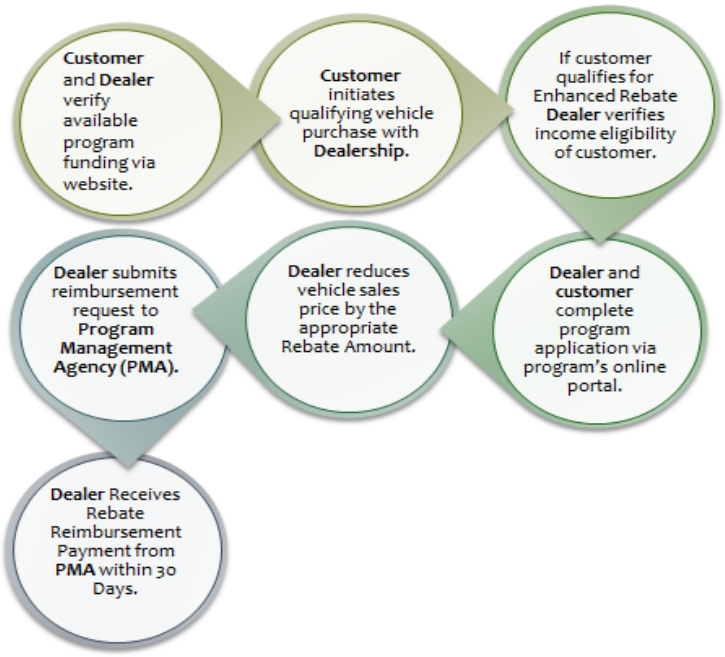
Enhanced EV Rebate: The Enhanced EV Rebate represents an additional incentive amount available to low- and moderate-income EV purchasers earning below 300% of federal poverty

guidelines, a milestone of equity as allowed by the statute. (See Appendix 5 for a discussion of Program Equity).

Twenty-five percent (25%) of annual program funding should be set aside for Enhanced Rebates. This represents an additional $2,000 for the purchase or lease (minimum 36-month lease) of new and used EVs, up to a maximum rebate value of $4,500. New or used Plug-in Hybrid (PHEV) purchases can earn an additional $500, to receive up to a maximum rebate value of $1,500, provided the PHEV has an all-electric range of at least 25 miles.

Applicants may demonstrate their eligibility for the enhanced rebate in a variety of ways, compliant with other Commonwealth programs. For example, the Virginia Clean Economy Act of 2020 (VCEA, 2020) uses the Percentage of Income Payment Program (PIPP) to identify clients that pay a disproportionate share of their income for energy and that can provide proof of participation in other public assistance programs (See Appendix 6 for a listing of PIPP Programs). Alternative documents such as a Federal/state income tax return or W-2 or IRS Form # 4506 (proof of income verification) can also be used to demonstrate income.

EV Standard and Enhanced Rebate Process Flow



EV Rebate Program Administration

Program Management Agency: The Program Management Agency (PMA) should be responsible for overseeing the program, maintaining the program's website, receiving EV sales and rebate details from the dealers, processing reimbursements, and preparing monthly and annual reports. The PMA services can be assigned to a Virginia state agency such as the Departments of Environmental Quality (DEQ), Mines, Minerals and Energy (DMME), or Motor Vehicles (DMV), the Virginia Motor Vehicle Dealer Board (VMDB), or contracted through an agency to a third-party vendor. The PMA will also market and promote the program and website.

EV Rebate Advisory Board: The establishment of an EV Rebate Advisory Board consisting of representatives from dealerships, environmental justice organizations, environmental advocates, automobile and other original equipment manufacturers (OEMs), and others can provide review and oversight and advise the Program Management Agency on recommendations for Program refinements. The Board will be supported and staffed by the PMA.

Rebate Program Website: The PMA should develop and administer an interactive website through which consumers can learn about EVs and find instructions for utilizing the EV Rebate Program.

The website should provide timely program information and give buyers and dealers real-time certainty on the availability of rebate funds at the point-of-sale. The website should also host data dashboards, maintain key program statistics--number of rebates distributed, the available funds remaining, and program performance metrics, including data for equity impact mapping, cumulative environmental impacts, pollution hotspots, or other social impacts.

This online platform can be a valuable tool for educating the public and generating awareness of EV benefits. Program data can provide valuable insights for policymakers, researchers, and other stakeholders. The program website should host education EV tools and resources and will utilize existing dealership and advocacy group channels to raise awareness of this incentive.

Participation of Automotive Manufacturers: In order to enable Virginians to purchase electric vehicles in-state, products must be available at dealerships for buyers to experience (test drives, charging options, operations and maintenance, etc.). Outreach and collaboration with automotive manufacturers will demonstrate the degree of support of Virginia policymakers for the adoption of electric vehicles. Virginia dealers must become recipients of the long-term distribution plans for automotive manufacturers' electric vehicles (which are currently only available in limited other states).

Participation of Dealerships: Full participation of Virginia's auto dealers and vehicle manufacturers represents a significant opportunity for the success of this industry. Electric

vehicles are changing the industry for the better and inspiring new ways of thinking about transportation, while facilitating a cleaner environment. Therefore, dealerships will play a critical role in the success of the rebate process, and, subsequently, in this industry's transformation. All motor vehicle dealers will have the opportunity to voluntarily engage sales staff or management as electric vehicle specialists, use the state vehicle incentive as a tool to sell vehicles, and assist customers at the point of purchase/lease. Additionally, manufacturers that hold dealers licenses can participate in the program through similar assistance at point-of-sale and should not be excluded.

Dealer / Salesman Incentive: In order to support participation and to ensure the success of the transaction, each EV sale/lease processed through the rebate program should result in a $50 incentive for the Dealership. This could compensate the sales staff for the increased training on EVs, the work to educate and support the customer, and the processing of the rebate at the point-of-sale. The Commonwealth acknowledges that this $50 incentive is not intended to compensate the dealer entirely for their participation. Additional recognition and support activities from the program will necessarily further support dealers and sales representatives.

Range of Program Administration Costs: The costs associated with program administration vary based on programmatic complexity. Publicly-disclosed information shows the average expense to administer an incentive program at 5% of the program budget, including program development and management, website design and maintenance, marketing, education and outreach, and reporting. While many states manage their programs in-house, larger programs are often hired in-part or in-full to third-party contractors.

Program Feasibility

The electric vehicle incentive program described in this report is feasible and similar to programs that currently operate in other states. It strives to achieve feasibility by streamlining the rebate process and easing the EV buying experience for purchasers and dealers. The program achieves simplicity by utilizing an online application portal and timeliness by applying the rebate at time-of-purchase. Developing a user-friendly online application portal will require development and support of an interactive program website. To ensure cost-effectiveness and efficiency, the program connects the customer and the dealer in the application process. The PMA oversees the process and should conduct regular audits to ensure program compliance.

Other EV Rebate Program Elements

Program Duration: To promote and enhance durability, the incentive should be funded to operate for a minimum of 5-to-7 years. Consumers, dealerships, and vehicle manufacturers need a substantial planning period to plan purchases, acquire inventory, train staff, and obtain financing. Enhancements in battery electric vehicles also come with cost premiums during this 5-to-7 year

period relating to the initial and improving costs of battery technology. According to U.S. Department of Energy data, battery chemistry advancements in the United States suggest that light-duty vehicle battery costs will reach equivalency or parity with the internal combustion transmissions by 2027. An incentive can ensure and contribute to a thriving electric vehicle market, affordable for all Virginians.

Leased Vehicles Are Eligible: In 2019, nearly 80% of EVs were leased. By allowing this incentive to be available for leases, EVs can be more attractive to and affordable for consumers. A lease typically requires less money due at signing compared to an outright purchase. A point-of-sale rebate for a leased EV will enable the dealership to reduce the final sales price and therefore require lower monthly lease payments. Allowing leases to be eligible for this incentive can result in the capture of a significant percentage of EV transactions.

Public and Private Fleets Are Eligible: Fleet participation in the program represents an opportunity to retire older vehicles that accumulate significant annual mileage and to replace them with zero-emissions EVs, multiplying the benefits over the lifetime of the vehicle. Under certain conditions, fleets could become a large portion of the program and limit the access of individual buyers. In order to ensure broad availability and equity of the rebate, the program may elect to restrict the number of incentives claimed by a fleet. While the EV Rebate Program may not be adequate to fully serve private or government fleets, policymakers may consider developing tools for additional fleet vehicle support, future infrastructure, and education.

No Price or Income Caps: Caps or limits on the type or cost of vehicles or the income of the buyer can complicate and damage the program's efficacy and efficiency. These limits can create confusion in this nascent market that includes a range of vehicle technologies that are by nature higher cost. Removing caps improves program simplicity and universality, avoiding lengthy review of vehicle eligibility, income limits, EV range limits, or manufacturer's suggested retail price (MSRP) cap limits. Caps can unnecessarily restrict the EV market, by making a comparable non-electric vehicle more attractive to purchase. It has been shown that programmatic delays can diminish a customer's motivation to consider an electric vehicle.

Avoidance of caps on vehicles can also ensure that the new electric vehicle models expected in the market in the near term, i.e., pickup trucks and other larger vehicle applications, will qualify. More EV choices in the market and the program can facilitate improvements in the supply chain and production of vehicles and batteries, thereby reducing vehicle costs for all consumers. As a point of interest, some stakeholders have suggested that high MSRP caps might be considered in future program years, based on lessons learned during implementation.

Plug-In Hybrid Vehicles. In order to ensure a smooth transition to battery electric vehicle (BEV) adoption, a limited rebate should be available for Plug-In Hybrid Electric Vehicle (PHEV)

technology. A PHEV is an EV with an integrated gasoline-powered system that provides increased long-range driving options, allowing customers to drive all-electric, without 'range anxiety'. It can also support those who do not have readily-available charging capability, travel longer distances, or are not ready to commit to the full EV-lifestyle. PHEVs may prove to be a critical transition to mass adoption of new energy alternatives in transportation. The PMA and Board should reassess the value and necessity of PHEV incentives after the program's second year.

Fuel Cell Electric Vehicles (FCEV). Fuel cell electric vehicles (also known as zero emission hydrogen fuel cell vehicles) will be eligible for the same rebates as battery electric vehicles. Hydrogen fuel cell technology allows hydrogen to serve as an energy carrier that operates like EVs but stores the hydrogen fuel in a pressurized tank rather than a recharging battery. Fuel Cell Electric Vehicles provide customers with an all-electric option that can refuel in approximately five minutes like gasoline-fueled vehicles, and that travel between 250 and 400 miles before refueling. This technology is scalable to other transportation sectors as well (buses, boats, trains, etc.). Although hydrogen vehicle technology is available in other states, (California has 42 fueling stations at present), Virginia currently has no established public fueling infrastructure for hydrogen vehicles nor automakers that sell the technology in the Commonwealth.

Complementary Clean Fuels Programming. Policymakers in the Commonwealth realize that transportation emissions reductions and economic enhancements can come in a range of solutions and recognize that incentives must be paired with other regulatory, educational, and infrastructure partnerships and programs. Current examples underway in the Commonwealth include the Governor's Clean Air Communities Program grant and the EV charging infrastructure development program, both led by DEQ; the Mid-Atlantic Electrification Partnership Program grant and the alternative fuels/vehicle conversions program, managed by DMME; and the EV signage program and the EV Readiness Study of transportation policy, strategies, and the infrastructure-build perspective needed to ready the Commonwealth for the increasing numbers of EVs in the state's network, overseen by VDOT; etc. Other programs, like adoption of the Advanced Clean Cars Program, a clean fuels standard, or the Transportation Climate Initiative's regional cap-and-invest program, may offer future opportunities to reduce the carbon intensity of fuels and generate additional revenues to support infrastructure and incentives. More information on these can be found in Appendix 7: Complementary Programs.

Funding the EV Rebate Program

The success of an EV rebate program in Virginia is dependent on securing robust funding and a program in Virginia would require the same. Consistent funding will enable sustained progress across the technology transition. Most peer-state programs operate year-round and over numerous years. Some state programs become oversubscribed and run out of funds or are not properly capitalized, which significantly delays EV adoption.

Virginia Clean Cities and DEQ have reviewed Virginia's EV sales projections, modeling from the Transportation Climate Initiative (TCI), direct testimony in 2020 to the SCC from Dr. Erin Camp, and 2019 Virginia electric vehicle registrations (from the Advanced Vehicle Sales Dashboard), in order to develop an adjusted, predictive model of likely emissions improvements and vehicle high- and low-sales sequences. These numbers are the basis for the budget numbers below.

Based on EV adoption scenarios over a six-year program, the funding amount would change annually, corresponding with the volume of electric vehicle sales. The estimated first-year program cost ranges from $28.2 million (low-adoption scenario) to $47.2 million (high-adoption scenario), with an additional 5% funding needed for program administration. Based on these estimated levels of consumer adoption, the incentive program is projected to increase the current 2020 EV market share of 2%, to between 10% and 20 % of annual vehicle sales, by 2027. The market alone is an inadequate driver of change. To advance this technology, policy action would be required. (See Appendix 8 for Projected EV Sales in Virginia and for Estimated Program Costs).

HB 717 directed the Working Group to identify potential sources for funding the rebate program, and so consideration may be given to the following:

Transportation and Climate Initiative's (TCI) Regional Clean Transportation Program: The Transportation and Climate Initiative is a bipartisan collaboration among 11 Northeast and Mid-Atlantic jurisdictions (including Virginia) that seeks regional solutions to transportation challenges such as congestion, equity, and pollution while developing the clean energy economy. The jurisdictions in TCI are developing a cap-and-invest program to reduce the consumption of on-road diesel and finished motor gasoline and make investments in clean transportation solutions to accelerate decarbonization. Under the proposed program, certain wholesale providers of gasoline and diesel would be required to purchase compliance allowances at auction. The pool of available allowances would decline over time and the proceeds from the auctions would be returned to the participating jurisdictions. Each jurisdiction will then decide how to invest their portion of the TCI proceeds, such as for electric vehicle rebate programs and other clean transportation projects. Policy development for TCI is ongoing and the program and associated proceeds are not expected to begin before 2023. Virginia's participation would require authorizing legislation and from the General Assembly.

General Funds: An appropriation of general funds, if approved by the General Assembly, could support all or a portion of the consumer rebates for electric vehicles. Currently, several states use general funds in part or in whole to fund consumer rebates for electric vehicles.

Transportation-Related Taxes and Fees: New fees or taxes could be imposed specifically to raise funds to support consumer rebates for electric vehicles. In particular, fees associated with gasoline and diesel vehicles could be used to fund the transition to clean vehicles. Such fees could

include new registration fees for certain higher polluting vehicles such as older vehicles, vehicles heavier than average for their class, or diesel vehicles. Similarly, new taxes such as a small increase in the sales tax on gasoline and diesel vehicles could support a rebate program for electric vehicles.

Another source of funding could be generated through the use of congestion prices or tolls. Congestion pricing, sometimes called value pricing, is a way of harnessing the power of the market to reduce the waste associated with traffic congestion. Congestion pricing works by shifting discretionary rush hour highway travel to other transportation modes or to off-peak periods. This approach takes advantage of the fact that the majority of rush hour drivers on a typical urban highway are not commuters. (FHWA)

Still another consideration could be given to use of Virginia's electric vehicle annual Highway Usage Fee ($88.20 per year in 2020). This fee is paid into the State's transportation fund, intended to replace some of the funds that the EV owner would have paid under the Fuels Tax if they were driving a gasoline or diesel powered vehicle. This annual fee is one of many dedicated state and federal revenue sources for Virginia's $6.4 billion transportation fund. The majority of these funds are used for program administration, road construction, and operations and maintenance. To fund its EV incentive California began by using its transportation funds, and then shifted to climate investment (CCI) funding. Alternatively, Texas utilizes a special sales tax on diesel equipment to fund its EV incentive program. Virginia could explore similar program models initially, and then shift to a carbon-pricing proceeds approach (such as TCI), when feasible.

Fuels tax revenue in Virginia is partially recovered through the state's Highway Use Fee (HUF). For an EV, the registration fee collects 85% of the fuels tax paid by a gasoline vehicle that averages 23.7 MPG and is driven 11,600 miles per year. Put another way, if an EV is driven more than 9,860 miles per year, the HUF will no longer compensate for the unpaid fuels tax. Over time, the HUF/fuels tax will contribute less to the transportation fund, as EVs and gasoline vehicles become more efficient and charging infrastructure expands.

Universal Service Fee: Some utilities across the country include funding built into their rates that provide societal benefits to support low-income assistance programs, energy efficiency and renewable energy programs, and other incentives. These "societal benefits charges" (SBC) or universal service fees, collected from utility ratepayers in a restructured utility market create a fund for programs that benefit residents, businesses, and municipalities.

For example, New Jersey uses its SBC to support social programs, the Nuclear Decommissioning Trust Fund, Universal Service Fund, Remediation Adjustment Clause Expenditures, Consumer Education, and its Clean Energy Program. This societal benefit charge is collected as a non-bypassable charge imposed on all customers of New Jersey's investor-owned electric and gas public utilities. In 2010, the utilities spent $698.2 million in support of SBC-funded programs. The SBC is a per kWh/therm charge that equates to approximately 3.8% of a customer's energy bill. Currently, an average residential electric utility customer using 8,700 kWh annually contributes

approximately $56 and an average residential gas utility customer using 1,000 therms annually contributes approximately $51 to fund the SBC components.

It is worth noting that Virginia is not a restructured utility market, so a societal benefits charge may not fit the existing structure. As a result, more exploration would be needed before this is advanced as an option.

Further, some utilities, including rural electric cooperatives, have concerns about the use of a universal SBC in areas where electric bills have a disproportionate impact on low- and middle-income consumers. Consumers often see utility fees and charges as additional taxes, a view that might be exacerbated if EV adoption is low in the utility's certificated service territory. Public sources of funds might be a consideration, used to augment an SBC in rural and low-income areas.

Alternative Sources of Funding: Two funding options used in other states did not meet the value criteria of timely, simple, equitable, and durable. These are:

- **Refundable Income Tax Credit.** A refundable income tax credit as a potential EV incentive funding source presents some challenges. Virginia law provides for two types of income tax credits, refundable and nonrefundable. For both types, a taxpayer may claim credits on their Virginia income tax return to the extent of their tax liability. If a credit is refundable, the taxpayer will receive a refund check to the extent the amount of the credit exceeds their tax liability. In contrast, if a credit is nonrefundable, the taxpayer will not receive a refund check. Instead, they generally will be permitted to carry the unused credits forward for use against their income tax liability for a specified number of future taxable years or until the credit is fully utilized.

  An option for an EV tax credit would be best served if it were a simple reported refundable income tax credit. Refundable income tax credits are generally favored by taxpayers of varied incomes as they can more quickly realize the full benefit of such incentives; however, this also makes such credits more expensive for budgetary purposes. Currently, for tax year 2020, Virginia allows thirty income tax credits. Of these credits, three are refundable: Agricultural Best Management Practices Tax Credit; Motion Picture Production Tax Credit; and Research and Development Expenses Tax Credit.

  In certain circumstances, Virginia residents are not required to submit income tax returns, including taxpayers with income below Virginia's filing threshold. Therefore, this option would not be universally applicable and may limit accessibility to the desired equity populations.

- **Sales and Use Tax (SUT) Funds**: In general, all sales and leases of vehicles used in Virginia are subject to the state's Motor Vehicle Sales and Use Tax, unless an exemption or exception is established. Virginia levies a 4.15% Motor Vehicle Sales and Use (SUT) Tax based on the vehicle's gross sales price or $75, whichever is greater. Electric vehicles, on average, cost an additional $12,000 to purchase, over traditional vehicles. Because of

this price premium, each EV generally contributes an additional $498 in sales and use taxes to transportation revenue funds. For the purposes of Motor Vehicle Sales and Use Tax collection, a vehicle's gross sales price includes the dealer-processing fee, and is the vehicle price after the manufacturers' rebates or manufacturers' incentives have been applied.

One policy option includes using SUT tax relief to incentivize EV purchases. The strength of using this kind of SUT exemption for EVs is that it can be administered within the existing titling process. Many dealers can process the exemption automatically through Virginia's online dealer portals without submitting additional paperwork or requesting a rebate reimbursement. Purchasers could receive the immediate benefit at the time of purchase or titling. A downside of this approach, however, is that a SUT exemption is a regressive tax, i.e., higher vehicle prices lead to greater tax liability. In addition, because this tax is based on the gross sales price on the vehicle, it would not be possible for purchasers eligible for enhanced rebates to receive the maximum amount of $4,500 envisioned by the General Assembly in HB717. Another outcome of using a SUT exemption to fund an EV incentive will result in an overall reduction in tax collections. Therefore, funds formerly generated by sales and use taxes would need to be found from new sources.

Program Benefits

Transportation is currently the leading source of emissions including greenhouse gases (GHG) in Virginia. These GHGs contribute to climate change, alter and damage Virginia's coastlines, and threaten frontline environmental justice communities. These adverse impacts of burning fossil fuels are part of the Social Cost of Carbon, which is defined as an estimate, in dollars, of the economic damages that result from emitting greenhouse gases into the atmosphere. Virginians import 100% of the oil used to fuel transportation and annually spend over $10 billion on gasoline and diesel. Therefore, transitioning to, and the increased use of zero-emission electric vehicles in the Commonwealth can have significant economic, environmental, and health effects.

Economic Benefits: Over each electric vehicle's 10-year lifetime, the motor fuel savings to our economy are estimated to be $5,040, which will recirculate in the Virginia economy. The purchase of local and low-carbon electricity also represents further economic benefits of $3,320. This activity supports the emerging market for renewable energy in Virginia.

Additionally, emissions reduction savings at the 2020 federal Social Cost of Carbon rate represent $2,529 in lifetime economic benefit per vehicle. This is calculated using a low-carbon electricity source that can result in an annual 6-ton reduction in carbon emissions per vehicle. This annual carbon benefit is multiplied by $42 (the 2020 EPA Social Cost of Carbon rate) per ton over the battery's lifetime.

Along with Virginia's road use fees, there are also additional state and local taxes generated from the purchase of an electric vehicle versus a comparable gasoline vehicle. For example, an EV owner in Fairfax County would pay $2,721 in taxes ($1,350 in sales tax and $1,371 in personal property taxes) on a $30,000 EV, in their first year of ownership, i.e., For a comparable gasoline vehicle that costs $12,000 less than an EV and the driver would pay $498 less in state and local taxes.

Taken per vehicle, these factors combined represent **an estimated $10,889 in economic benefits** over a 10-year electric vehicle's lifetime, or $1,089, annually. To better understand the specific economic impacts of transportation electrification in Virginia, it is recommended that the Commonwealth conduct further study, such as annual and cumulative cost-benefit analyses using input and output economic modeling. (See Appendix 9 for a discussion of the benefits of EV adoption.)

Environmental Benefits: Electric vehicles have zero tailpipe emissions and provide significant environmental benefits compared to vehicles powered by an internal combustion engine. No matter where an EV is charged, the electricity used to charge the vehicle will generate less pollution than if the vehicle were powered by gasoline or diesel. In addition to reducing carbon dioxide pollution, use of electric vehicles also results in fewer emissions of nitrogen oxides and particulate matter, both dangerous pollutants with significant health consequences.

Other environmental benefits of using electric vehicles include reduced deposition of air pollutants, such as nitrogen, into Virginia waters and the Chesapeake Bay. Further, use of EVs reduce runoff onto roads because they do not leak gasoline or other oils associated with internal combustion engines; and the regenerative braking employed in electric vehicles results in reduced brake dust and tire wear.

Health Benefits: According to a new report from the American Lung Association (ALA), The Road to Clean Air, adoption of EVs contribute significant opportunities to reduce health impacts in Virginia. It indicates that a "widespread transition to electric vehicles (EVs) could help avoid more than $72 billion in public health costs nationally in 2050 due to emission reductions." Benefits of this long-term transition include a 43% reduction in asthma attacks, with 1,783 reduced attacks avoided annually. The improvement in air quality is projected to prevent 115 premature Virginia deaths annually by 2050. Cleaner air also promotes higher worker productivity, with an estimated 8,189 avoided lost workdays annually by 2050. The ALA report concludes that pollution reduction would result in **avoided health impacts of over $1.3 billion in Virginia by 2050**. Prior to 2050, health benefits would be realized immediately and continue to accrue in the interim as more EVs are deployed and GHGs are reduced.

For additional program benefits, see Appendix 9: Benefits of EV Adoption.

Performance Metrics

Program progress can be measured through observed and modeled performance metrics. These include emissions reductions, economic, environmental, and health benefits. The PMA should prepare an annual report of these metrics and present to the EV Rebate Advisory Board to demonstrate program effectiveness. These may examine:

Observed Metrics

A. Number of Incentives Issued
B. Amount of Money Distributed
C. Remaining Funding Available
D. Maps (by zip code, location of EV rebate recipients, overall EV adoption)
E. Demographics of Rebate Recipients (internal report of race, sex, income, etc)
F. Number of Participating Dealerships and Manufacturers
G. Annual Program and Financial Status Reports on Performance
H. Growth in Electric Vehicle Sales and Percentage of Vehicle Sales Represented by EVs (registration data and model year)

Modeled Metrics

1. **Emissions Reduced (modeled in Tons of CO_2)**

   Tons of Greenhouse Gas Reduced: According to the Energy Information Administration's 2017 'State Energy Profiles', Virginia's transportation sector produces around 50 million metric tons of greenhouse gases, annually. Further, in a 2020 DEQ 'well-to-wheels' analysis of EV deployment potential (using Argonne National Lab's AFLEET calculator and EPA's e-GRID Virginia-North Carolina electric grid power profile), both low and high adoption scenarios will result in hundreds of thousands of tons of greenhouse gas reductions. The Union of Concerned Scientists released a study in 2015 that demonstrates the EVs utilizing electricity from coal are still cleaner than gasoline-powered vehicles. (UCS). Therefore, with projected new EV registrations between 2022 and 2027, Virginia could realize between 4,000,000 tons and 8,850,000 tons of GHG emissions reductions during the vehicle's lifetimes.

   As electricity generation improves, 'well-to-wheel' electric vehicle emissions reductions will be greater. The Virginia Clean Economy Act requires that Virginia's electricity grid convert to 100% clean energy by 2050 and that nearly all coal-fired power plants close by 2024. On January 1, 2021, Virginia will become a full participant in the Regional

Greenhouse Gas Initiative (RGGI), a cap-and-trade program to reduce emissions from fossil fuel electricity generation. See Appendix 10 for assumptions and more information on Program Performance Metrics.

Societal Value of Emissions Reduced (Social Cost of Carbon): EPA has calculated the 2020 social value of one ton of carbon dioxide at $42. By 2027, this value increases to $47 per ton. (EPA Technical Volume, 2016). Thus, the range of net social value to Virginia from carbon dioxide reduction from EV adoption during the program period is estimated to be between $16,800,000 and $41,595,000 by 2027. More information about the Social Cost of Carbon is detailed in Appendix 9.

2. Economic Impact (modeled in job years and dollars per year)

Economic Value of Electric Vehicles: Replacement of gasoline-consuming vehicles with EVs presents an opportunity for a shift in energy spending that will have beneficial economic impacts. Electric vehicles can capture and divert energy spending to other economic sectors, benefiting Virginia.

According to the *National Economic Value Assessment of Plug-In Electric Vehicles*, a study conducted by the National Renewable Energy Laboratory in 2016, each EV could generate between $379 and $449 of net benefit per year. The net benefit is composed of savings from reduced petroleum use, reduced vehicle maintenance expenses, reduced air pollution, and increased spending on domestically produced electricity and electrical products.

Jobs Creation Model: Virginia does not produce any gasoline or diesel; Citizens in the Commonwealth spend $25 million per day on imported oil which translates to the average Virginian spending almost $1,000 annually on gasoline and to meet their transportation energy needs, hence, very little of this money remains in Virginia.

A 2017 report from Energy and Environmental Research Associates estimates that every dollar not spent on gasoline generates 16 times as many jobs in the local economy (Winebrake, 2017). By keeping Virginians' dollars circulating in the local economy this spending creates new jobs in retail, hospitality, electrical services, and vehicle operations and maintenance, among others. As Virginia transitions to a 21st century economy with a focus on energy efficiency and renewable energy, EVs represent the perfect complement to protecting the environment and improving the Commonwealth's economy.

Currently there are 5,400 jobs in advanced transportation in Virginia (AAE, 2020). The potential for job creation in battery manufacturing, electrical service, and vehicle

production and maintenance can be realized through the growing EV market. Studies in other states have shown that the switch to EVs can generate up to $570,000 in additional economic impact for every million dollars of direct savings, resulting in up to 25 additional jobs in the local economy for every 1,000 PEVs in the fleet. (MJ Bradley, Florida).

3. **Health Impacts and Health Savings (modeled health costs, deaths, other impacts)**

The American Lung Association, in The Road to Clean Air: Benefits of a Nationwide Transition to Electric Vehicles, September 2020, has examined the impacts of electric vehicles on health. The ALA could be a partner of engagement for a future modeling collaboration on:

- Health cost impacts avoided, in dollars
- Premature deaths avoided, in # of lives
- Asthma attacks avoided, in number and percentage of previous year asthma attacks
- Work day loss avoided, in days

Additional Stakeholder Suggestions for Electric Vehicle Policies

During the working group process, several ideas for additional strategies and complementary programs were submitted that could enhance electric vehicle adoption in Virginia. Policymakers may consider additional actions. With a range of policies in place, healthy and incentivized EV markets can drive adoption of this technology in addition to building consumer confidence and interest. A list of these be found in Appendix 13: Additional Stakeholder Suggestions for Future Complementary EV Policies.

Conclusions

Transportation electrification is a key component of Virginia's developing clean economy. The efforts of the Electric Vehicle Incentive Working Group and stakeholders demonstrate that a durable and equitable electric vehicle incentive program is feasible and could generate significant economic, environmental, social, and public health benefits to the citizens of the Commonwealth. The program's success can result from collaboration among state agencies, vehicle manufacturers, automobile dealerships, EV enthusiasts, equity interests, environmental advocates, and private services companies; and has the potential to attract new and emerging transportation electrification industries to Virginia, while benefiting our environment.

Appendix List

1. **Electric Vehicle Incentive Working Group Stakeholders**
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11. **Electric Vehicles Incentives Report, Prepared by Virginia Clean Cities**
12. **EV Incentive Working Group Stakeholder Comments**
13. **Additional Stakeholder Suggestions for Future EV Policies**
14. **References**

Appendix 1 - Electric Vehicle Incentive Working Group Stakeholders

The Electric Vehicle Incentive Working Group stakeholders include individuals and organizations representing government, automobile manufacturing and sales, environmental and equity interests, ridesharing, EV enthusiasts, charging infrastructure providers, utilities, and others that were named in the statute.

Organization	**Name**	**Title**
DMME	Al Christopher	Division of Energy Director
DMME	Robin Jones	Energy Program Manager
DMME	Mike Skiffington	Director of Policy and Planning
DEQ	Chris Bast	Chief Deputy
DEQ	Angela Conroy	Senior Planner
TAX	Matthew Huntley	Lead Tax Policy Analyst
TAX	Vivek Bashiv	Tax Policy Analyst
DMV	Sam Davenport	Deputy Director/Vehicle Services Administration
DMV	Gabe Boisvert	Deputy Director/Fuels Tax Collections
DMV	Scott Cummings	Assistant Commissioner for Finance
VCC	Alleyn Harned	Executive Director
DGS	Beth Cooley	OFMS Director
VDOT	Ronique Day	Deputy Director / Intermodal Planning
VDOT	Catherine C. McGhee	Director of Research and Innovation
Delegate Reid's Office	David A. Reid	Delegate
Delegate Reid's Office	John McAuliff	Legislative Assistant

Sierra Club	Kelsey Crane	Conservation Program Coordinator
VADA	Tucker Bloom	Director of Public Affairs
Generation 180	Blair St. Ledger-Olson	Program Manager
Environment VA	Ellie Reynolds	Clean Cars Associate
Southern Environmental Law Center	Trip Pollard	Senior Attorney
Energy Foundation	Al Pollard	Consultant
Virginia Poverty Law Center	James W. (Jay) Speer, Esq	Executive Director
Drive Electric RVA	Charles Gerena	Founder and Organizer
EV Hybrid Noire	Shelly Francis	Executive Director
NAACP, Environmental Justice	Karen Campblin	Environmental and Climate Justice Committee
GWRCCC	Ira Dorfman	Executive Director
National Renewable Energy Lab (NREL)	Sandra Loi	Project Leader
Argonne	Marcy Rood	Principal Environmental Analyst
EVgo	Marcy Bauer	Vice President Account Management
Volkswagen Group of America	Nicole Barranco	Sr. Director Government Relations
VW	Michelle Satterland	Government Affairs
Virginia Conservation Network (VCN)	Wyatt Gordon	Land Use and Transportation Manager
VAEE	Harry Godfrey	Executive Director
Ford	Curtis Magleby	VP Government Relations Ford
GM	Marisa Bertoia	Fleet Account Executive
Nissan	Cynthia Maves	Electric Vehicle Business Development Manager
Dominion Energy	Kate Staples	Electrification

REC	Joyce Bodoh	Government Affairs and Demand Response Administrator
AEP/APCO	Daniel E. Francis	EV & Technology Policy Manager
Old Dominion Electric Co-op (ODEC)	Erin Puryear	Manager, Member Energy Innovation
Generation180	Stuart Gardner	Program Director
National Association of State Energy Officials (NASEO)	Cassie Powers	Managing Director, Programs
DC Council of Governments (COG)	Jeff King	Chief, Energy and Climate Programs
Carter Myers Automotive Nissan	Pete Borches	Co-Owner of CMA Properties
Virginia Motor Vehicle Dealer Board	William Childress	Executive Director
Virginia Motor Vehicle Dealer Board	Peggy Bailey	Program Manager
Gentry Locke	Matthew S. Moran	Represents the Carbon Solutions Group
Gentry Locke	Abigail E. Thompson	Administrative Assistant
Sierra Club Virginia	Gary Greenwood	EV Legislative Chair
Macaulay & Jamerson, PC	Alexander M. Macaulay	Attorney-at-Law
Volkswagen Group of America	Donald Davidson	Manager Government Relations
General Motors	Eric Henning	Regional Director Government Relations
Autos Innovate	Josh Fischer	Director State Government Affairs
Electrify America	Andrew Dick (or Matt Nelson)	State Government Affairs & Public Policy
McGuireWoods Consulting LLC	Michele Satterlund	SVP Government Relations - State
Sierra Club, VA Chapter	Daryl Downing	Chair
Virginia Automobile Dealers Association (VADA)	Anne Gambardella	Chief In-House Counsel
Virginia Independent Automobile Dealers Association (VIADA)	Alvin Melendez	Executive Director
The Electrification Coalition	Andrew Linhardt	EV Program Manager

Flywheel Government Solutions	Brandon Peck	Vice President
VA Energy Efficiency Council	Chelsea Harnish	Executive Director
Alliance for Automotive Innovation	Dan Bowerson	Director, Energy and Environment
Virginia Clean Cities	Matt Wade	Deputy Director
Center for Climate and Energy Solutions	Bob Perciaspe	President
Nature Conservancy	Lena Lewis	Energy and Climate Policy Manager
National Resource Defense Council	Walton Shepherd	Virginia Policy Director
Office of Virginia Attorney General	Katherine Creef	Assistant Attorney General
Tesla	Eric M. Page	Attorney
Greenlots	Annie Gilleo	Manager policy and Market Development

Appendix 2 - HB 717

CHAPTER 973, *Code of Virginia*

An Act to direct the Department of Mines, Minerals and Energy to convene a working group to determine the feasibility of an electric vehicle rebate program.
[H 717]
Approved April 9, 2020

Be it enacted by the General Assembly of Virginia:

1. § 1. That the Department of Mines, Minerals and Energy shall, in cooperation with the Department of Environmental Quality, the Department of Taxation, and the Department of Motor Vehicles, convene a working group to determine the feasibility of an electric vehicle rebate program. Other relevant stakeholders, including (i) automobile manufacturers, (ii) motor vehicle dealers, (iii) electric vehicle charging network representatives, (iv) electric vehicle manufacturers, (v) environmental organizations, and (vi) energy utility organizations, shall be invited to participate in such working group. Such working group shall (a) review potential methods of structuring and administering an electric vehicle rebate program, (b) review funding opportunities available to facilitate such a rebate, (c) evaluate the vehicle sales data in states in which an electric vehicle rebate program has been implemented before and after such implementation, and (d) determine the ideal metrics for an electric vehicle rebate program. Any recommendations issued by such working group shall be guided by the following parameters: (1) no program shall authorize rebates of more than $4,500 for individual consumer purchases of qualified zero-emission vehicles; (2) the program may include incentives for individuals with an income below 300 percent of the federal poverty guidelines; (3) the program shall allow both online and paper applications; and (4) the program, if properly funded, will be operational no later than December 30, 2021. The working group shall issue a report on the work completed by the working group and the recommendations of the working group to the General Assembly by November 1, 2020.

Appendix 3 - Emissions Reductions, in Low and High Adoption Scenarios

Low Adoption Scenario Lifetime Annual Emissions Benefit (short tons)							
Year	**Sales**	**GHG**	**CO**	**NOx**	**PM10**	**PM2.5**	**VOC**
2022	**10,250**	365,000	1,287	68	6	5	77
2023	**12,750**	455,000	1,605	84	7	6	96
2024	**12,250**	490,000	1,770	92	8	6	104
2025	**16,250**	650,000	2,348	122	10	8	138
2026	**22,000**	880,000	3,179	165	14	11	187
2027	**29,000**	1,160,000	4,191	218	18	14	247
Total	**102,500**	4,000,000	14,379	748	63	50	848

High Adoption Scenario Lifetime Annual Emissions Benefit (short tons)							
Year	**Sales**	**GHG**	**CO**	**NOx**	**PM10**	**PM2.5**	**VOC**
2022	**16,000**	595,000	2,117	111	9	7	126
2023	**21,850**	819,000	2,920	153	13	10	173
2024	**26,550**	1,062,000	3,836	199	17	13	226
2025	**36,900**	1,476,000	5,332	277	23	18	314
2026	**51,280**	2,051,200	7,410	385	32	25	436
2027	**71,300**	2,852,000	10,303	535	45	35	606
Total	**223,880**	8,855,200	31,918	1,659	139	110	1,880

Provided, Courtesy of DEQ utilizing the AFLEET Tool, 2020.

Appendix 4 - EV Incentives in Other States

State	State EV Rebate	State EV Tax Credit	Private Utility Rebate	Vehicle Cap	Income Cap	Vehicle Price Cap	Low Income Household	Low Income Household Incentive	Source of Funding	Annual Funds	Program Complexity /Admin Costs
California	$2,000		Yes	None	$150,000 for single, $300,000 for joint filers	None	300% of federal poverty level	Add $2,500	Air Resources Board	$200 million	High, 5%
Colorado	None	$4000 for purchase/ $2000 for lease	None	None	None	None	None	None			Low
Connecticut	$1,500	None	$1000 per EV	None	None	$42,000	None	None	General Fund	$3 million	Medium, 5%
Delaware	$2,500	No	No	None	None	None	None	None	RGGI		Low
Florida	None	None	Between $100 to $1000 per EV	None	None	None	None	None			N/A
Georgia	None	$5000 (Expired)	None	None	None	None	None	None			N/A
Illinois	None	None	Yes	None	None	None	None	None			N/A
Maine	$2,000	None	None	None	None	None	Yes	$3,000	VW Funds		Medium
Maryland	None	$3,000	Yes	Limited by funding	None	$63,000	None	None		$6 million	Low
Massachusetts	$2,500	None	None	None	None	None	None	None	General Fund	$27 million	Low, 5%
Nebraska	None	None	Up to $2500 per EV	None	None	None	None	None			N/A
New Jersey	Up to $5000	None	None	One per person	None	$55,000	None	None	Utility Society benefit charge, General Fund and RGGI		Low
New Hampshire	None	None	$1000 per EV	None	None	None	None	None		$30 million	Low, 5%
New York	$2,000	None	None	None	None	None	None	None			Low

Oregon	$2,500	None	None	None	None	None	Yes	$5000 per new EV, $2500 per used EV	0.5% Privilege tax on new car sales	$60 million	Medium, 5%
Pennsylvania	$750	None	None	$2,500	None	$55,000	Yes	Add $1000			Low
Rhode Island	None	None	Yes	None	None	None	None	None			N/A
Texas	$2,500	None	None	$2,000	None	None	None	None	Title fees and sales taxes on HD diesel		Low
Vermont	$2,500	None	None	None	Less than $96,122 per household	None	Yes	$5,000	General Fund		High, 5%
Washington State	None	Sales Tax $2500	None	None	None	$45000 new or $30000 used	None	None	General Fund		Low

Prepared by Virginia Clean Cities, 2020.

Appendix 5 - EV Rebate Program Equity

TCI Forecasted Sales Scenarios and Projected Cost of Rebate Program							
	EV & PHEV	**EV & PHEV**	**EV only**	**EV only**	**EV only**	**EV only**	
% of 2019 total sales	**4%**	**5%**	**5%**	**7%**	**10%**	**13%**	
Year	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**Total EVs & Program Cost**
Annual EV Sales	13,125	17,300	19,400	26,575	36,640	50,150	163,190
Projected Annual Funding (millions $)	$37.7	$48.8	$64.0	$87.7	$120.9	$165.5	$524.6
Standard + Enhanced Rebate Allocation %	55%	55%	55%	55%	55%	55%	
Standard Rebate Allocation %	45%	45%	45%	45%	45%	45%	

Projected Equity Model Assumptions and Calculations

HB 717 recommended that the EV rebate program be available to all Virginians, including individuals at or below 300% of Federal Poverty Guidelines. To arrive at income level eligibility, various measures were considered. For instance, currently, the federal poverty level for a family of four is $26,200. At 300% of poverty guidelines, the income for a family of four calculates to $78,600 or for an individual at $38,280. According to another measure of income, the 2019 American Community Survey of the U.S. Census puts the per capita income in Virginia at $37,763. Further, the median household income in Virginia is $71,564. The data indicates that nearly half of Virginians would qualify for the proposed program's Enhanced Rebate incentive.

The Working Group utilized the Transportation Climate Initiative's sales forecasts for its analysis. Using this sales forecast for EVs and PHEVs, the analysis seeks to project the total EV purchases by different incentive groups, in order to arrive at the dollars needed to support a rebate program for Standard and Enhanced-eligible buyers. It assumes that the enhanced incentive group is less likely to adopt EVs than the Standard incentive group. It further estimates that this group would comprise 40% of annual EV sales, as compared to a 60% amount for the Standard incentive group. In order to promote equity and faster EV adoption among all income-eligible buyers, the Enhanced Rebate incentive would provide an additional $2,000. This results in a higher allocation of program funding (55%) to the Enhanced incentive group as this group is eligible for a larger amount ($4,500) per vehicle. That is to say, in order to promote and ensure equity, it is recommended that the program allocate or set-aside 55% of program funds for enhanced rebates. So, a person qualifying for an enhanced rebate would be eligible to receive: 1) the standard rebate, plus 2) an enhanced rebate.

Appendix 6 - Percentage of Income Payment Program (PIPP) and Federal Poverty Guidelines

The Virginia General Assembly has approved an approach for using the Percentage of Income Payment Program (PIPP) to demonstrate the eligibility of citizens having large energy burdens for programs contained within the Virginia Clean Economy Act. PIPP eligibility can be demonstrated through participation in the following programs:

- Supplemental Nutrition Assistance Program,
- Temporary Assistance for Needy Families,
- Special Supplemental Nutrition Program for Women, Infants and Children (SNAP),
- Virginia Low Income Home Energy Assistance Program (LIHEAP),
- Federal Low Income Home Energy Assistance Program (LIHEAP),
- State plan for medical assistance,
- Medicaid,
- Housing Choice Voucher Program, or
- Family Access to Medical Insurance Security Plan.

The income requirements for these programs are not identical, but the maximum income for most of these programs is at or near 200% of federal poverty guidelines. A similar approach for qualifying customers to demonstrate their eligibility for an enhanced rebate can be utilized during the process of purchasing the vehicle at the dealership.

2020 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES & DC		
Household Size	**Poverty Guidelines**	**300% of Federal Poverty Guidelines**
1	$12,760	$38,280
2	$17,240	$51,720
3	$21,720	$65,160
4	$26,200	$78,600
5	$30,680	$92,040
6	$35,160	$105,480
7	$39,640	$118,920
8	$44,120	$132,360

Source: HHS Poverty Guidelines For 2020. Assistant Secretary for Planning and Evaluation for the Department of Health and Human Services. https://aspe.hhs.gov/poverty-guidelines

Appendix 7 - Existing Complementary Clean Fuels Programming in Virginia

Policymakers in the Commonwealth recognize that mobile emissions reductions and economic enhancement can come from a range of solutions and understand that an EV incentive program must be paired with other regulatory, educational, and infrastructure partnerships and programs.

Existing programs include the Governor's Clean Air Communities Program grant and the EV charging infrastructure development program, both led by DEQ; the Mid-Atlantic Electrification Partnership Program grant and the alternative fuels/vehicle conversions program, both underway at DMME; the EV signage program and the EV Readiness Study of transportation policy, strategies, and infrastructure build perspective to ready the Commonwealth for the increasing numbers of EVs in the state's network, both managed by VDOT. More information on those can be found at the following links:

Governor's Clean Air Communities Program – https://www.governor.virginia.gov/newsroom/all-releases/2020/july/headline-859146-en.html

EV charging infrastructure development program – https://www.deq.virginia.gov/programs/air/vwmitigation.aspx

Mid-Atlantic Electrification Partnership Program – Federal partnership grant awarded to Virginia DMME in September 2020 to advance a regional EV ecosystem including education, infrastructure in Virginia, DC, MD, and West Virginia.

Virginia Alternative Fuels/Vehicles Conversions Program – https://vacleancities.org/reports-2/cmaq-incentive-program/

Virginia's Integrated Directional Signing Program (IDSP) – https://www.virginiadot.org/programs/sign-default.asp

EV Readiness Study – Virginia Secretary of Transportation Shannon Valentine has initiated an effort involving stakeholders in addressing the issue of "EV Readiness" from a transportation infrastructure perspective. This effort seeks to identify opportunities, from both a policy and infrastructure "build" perspective, to enable the Commonwealth to prepare for the increasing numbers of EVs in the State's network. The study will identify strategies and initiatives to enhance existing platforms and to ensure a sustainable transportation system for all users.

Appendix 8 - Estimated Cost of the EV Rebate Program, Based On Projected EV Sales in Virginia

Sales of Light-Duty Vehicles by Vehicle Type for Upper South Atlantic Region							
Sales (000)	**Tech Type**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Car							
	Conv gas/flex	374	372	366	353	336	312
	Diesel	5	6	7	7	7	8
	Hybrid	35	36	36	36	35	33
	PHEV	6	6	6	8	8	8
	EV 100	3	3	4	4	5	5
	EV 200	7	8	10	11	13	16
	EV 300	18	23	29	41	59	83
	Other	2	2	2	4	4	3
Light Truck							
	Conv gas/flex	318	316	315	314	320	318
	Diesel	11	11	11	11	11	10
	Hybrid	4	4	4	4	4	4
	PHEV	3	5	5	6	6	6
	EV 100	2	3	3	4	5	5
	EV 200	1	2	2	3	4	5
	EV 300	1	1	1	2	2	2
	Other	2	4	4	5	5	4

Vehicle stock and sales projections for the Transportation & Climate Initiative (TCI) Modeling Reference Case, *TCI Reference Case Results Webinar*, August 8, 2019.

Low EV Sales Projections and Estimated Cost of Rebate Program						
Year	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
# of EVs Sold	**10,250**	**12,750**	**12,250**	**16,250**	**22,000**	**29,000**
Estimated Cost of EV Rebate Program (millions $)	$ 28.2	$ 33.8	$ 40.4	$ 53.6	$ 72.6	$ 95.7

High EV Sales Projections and Estimated Cost of Rebate Program						
Year	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
# of EVs Sold	**16,000**	**21,850**	**26,550**	**36,900**	**51,280**	**71,300**
Estimated Cost of EV Rebate Program (millions $)	$ 47.2	$ 63.8	$ 87.6	$ 121.7	$ 169.2	$ 235.3

Administrative expenses are estimated to be an additional 5% of total program funding.

These sales projections are extracted from the TCI EV sales forecasts for the Upper South Region and the scenarios were prepared by DEQ and VCC. Estimates are based on 2019 state population data, the presence of an existing EV incentive program, and whether a state is in ZEV or CARB. DC, Maryland, and Delaware are in ZEV and all have EV incentive programs; while Virginia is not a member of ZEV/CARB and does not yet have an EV Rebate Program.

Virginia EV Sales and Stock

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EV Sales Fraction	2.98%	3.38%	4.33%	4.33%	7.99%	9.34%	12.32%	15.30%	20.44%	25.73%	31.41%
EV Sales	11,314	12,793	16,016	16,085	29,768	34,860	46,136	57,311	76,911	96,918	119,652
LDV Sales	379,825	377,942	369,659	371,255	372,644	373,143	374,446	374,589	376,187	376,743	380,911
EV Stock	35,019	47,590	63,283	78,905	108,022	141,920	186,683	242,104	316,473	409,998	525,157

These sales forecasts are based on the direct testimony of Dr. Erin Camp, speaking on behalf of the Sierra Club, on the Virginia State Corporation Commission's (SCC) **Grid Modernization** docket (PUR-2019-0054), 2020.

Appendix 9 - Benefits of EV Adoption

Total per Vehicle Benefits for Virginia

- **Fuel savings recirculation in economy:** $504 annually
- **Road fees generated from auto registration:** $88.20 annually
- **Property tax generated to locality:** $548.40 annually (Fairfax)
- **Extra DMV sales tax per vehicle:** $1680 initial sale
- **Gasoline Gallons reduced:** 400 per year
- **Increased grid utilization:** $332 per vehicle annually
- **Enhanced energy security:** Lower dependence on foreign oil recirculates monies in Virginia and reduces costs of protecting the oil supply chain.
- **Enhanced employment:** 5,000 employed in VA EV industry today
- **Cleans Chesapeake Bay:** 35% of Chesapeake Bay nitrogen is from air pollution, including primarily from vehicles (would be eliminated as electric vehicles have no tailpipe emissions).
- Utilizing Virginia's electricity grid, electric vehicles produce 70% fewer well-to-wheels GHGs than gasoline vehicles. (1.7 annual tons compared to 5.7 annual tons)
- A low adoption scenario (Appendix 3 on Emissions Reductions) would cumulatively reduce 1,129,500 tons of greenhouse gas reductions by 2027. This is calculated by adding each year's worth of emissions reductions.
- A high adoption rate would cumulatively reduce 2,329,540 tons of greenhouse gas emissions by 2027. This is calculated by adding each year's worth of emissions reductions together. (See Appendix 3 on Emissions Reductions)
- For example, in California every dollar not spent on gasoline generates 16 times as many jobs in the local economy as a dollar spent on gasoline. (Winebrake, 2017)

Total Environmental and Health Benefits in Virginia

- Avoided health cost impacts in 2050: $1.3 billion
- Avoided premature deaths in 2050: 115
- Avoided asthma attacks in 2050 1783 (43.28% reduction over 2017)
- Work loss day avoided in 2050 8189 (31 full time jobs worth of time)
- **Deep emission reductions:** 70% reduction in net emissions with EV including today's electricity generation.
- Infrastructure investments are jobs. VA as a market hub for EVs. (Sierra Club)
- **Health outcomes improve:** Health benefits of EVs: PM, NOx, VOCs and air toxics.

Source: The American Lung Association Report, Road to Clean Air, September 2020.

Social Cost of Carbon

Virginia could also benefit from reducing the social cost of carbon by considering the carbon emissions from vehicles. The "social cost of carbon" is a concept used to inform the social benefits of carbon reducing technologies. The Virginia Clean Economy Act identifies this tool as one to be given programmatic consideration in the Commonwealth programs. The social cost of carbon as calculated by a U.S. Interagency Working Group uses a modeling system that lays out social costs over time; and to explain these societal costs as modeled over time, planners utilize discount rate calculations for those costs and presents these in four international standardized models. For each emissions year [2010 through 2050], four values presented by the Interagency Working Group are recommended for publication in any discussion of Social Cost of Carbon. These values are aligned with the Intergovernmental Panel on Climate Change's 4th Assessment Report (IPCC, 2007) and are associated with combined net cost, impacts on human health, net agricultural productivity, property damages, and the value of ecosystem services. Three of these values are based on the average modeled costs from the integrated assessment models, at discount rates of 2.5, 3, and 5 percent. A fourth value is added to the chart to account for "lower probability, high impact outcomes." Social Cost of Carbon modeling is presented by the following chart and will be periodically recalculated by the U.S. EPA, (EPA, 2016).

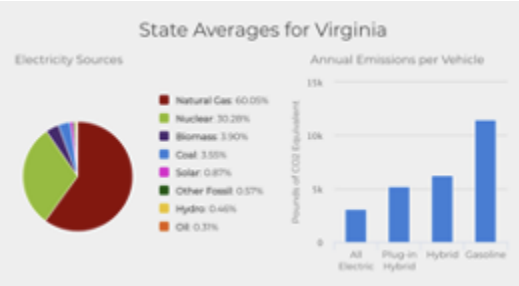
Table ES-1: Social Cost of CO_2, 2010 – 2050 (in 2007 dollars per metric ton of CO_2)

Year	5% Average	**3% Average**	2.5% Average	High Impact (95th Pct at 3%)
2010	10	**31**	50	86
2015	11	**36**	56	105
2020	12	**42**	62	123
2025	14	**46**	68	138
2030	16	**50**	73	152
2035	18	**55**	78	168
2040	21	**60**	84	183
2045	23	**64**	89	197
2050	26	**69**	95	212

Appendix 10 - EV Rebate Program Performance Metrics

Emissions Reductions: Electric vehicles are widely regarded as a technology that can reduce vehicle emissions that adversely affect air quality. The Energy Policy Act of 1992 (Pub.L. 102-486) established electricity as a federally-recognized alternative fuel. The National Renewable Energy Laboratory also estimates that use of low-carbon energy sources for electric vehicles in home and workplace charging scenarios, emissions are reduced, when compared with consumption of gasoline (McLaren, 2016).

The Virginia Department of Environmental Quality analyzed the deployment of electric vehicles showing possible greenhouse gas reductions (GHG) for low and high adoption scenarios, ending with hundreds of thousands of tons of greenhouse gas reductions. **Virginia's transportation sector emits nearly 50 million metric tons of greenhouse gases annually. Based on the projected new EV registrations between 2022 and 2027, Virginia could realize between 400,000 tons and 885,000 tons of GHG emissions reductions during the program period.** These estimates show that deep emissions reductions can result, especially when leveraging Virginia's increasing use of renewable energy and off-peak charging programs.



Annual Emissions Per Vehicle in Virginia (DOE)

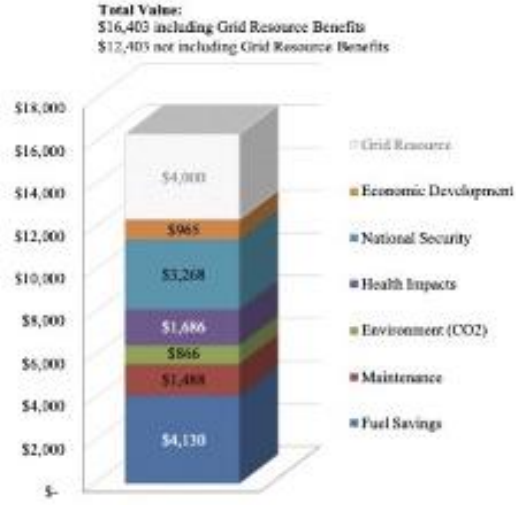
Daily Emissions Per Vehicle, NREL

Social Cost of Carbon:

The next chart from the National Renewable Energy Lab (NREL) illustrates the net total social benefit per year of two EV adoption scenarios, Aggressive and Low Cost. In the South Atlantic region NREL projects a net total social benefit of EV adoption to be between $5.70 billion and $7.34 billion per year.

Regional Breakdown of Social Benefits, Per Year and Per Vehicle for Aggressive and Low Cost Scenarios

In the 2016 study, *Quantifying the Societal Benefits of Electric Vehicles* by Ingrid Malmgren at the Vermont Energy Investment Corporation, Malmgren calculates the total net benefit of an electric vehicle at $12,403 over 10 years. This does not include a potential $4,000 benefit that an EV could provide as an electricity grid resource. The following chart shows the breakdown in the different areas of societal benefit.



Compiled EV Benefits over 10 Years & 120,000 miles. Prepared by VEIC, 2016.

Appendix 11 - Electric Vehicles Incentives Report, Prepared by Virginia Clean Cities

On May 21, 2020, Virginia Clean Cities issued an internal report on electric vehicle incentive activities in other states and internationally. This report is accessible at: https://www.virginiaev.org/?p=809

DMME
Virginia Department of Mines Minerals and Energy

State Electric Vehicle Incentives:

Initial background on implementing incentives, policies and rebates that encourage the adoption of electric vehicles.

May 21, 2020

Appendix 12 - Electric Vehicle Incentive Working Group Stakeholder Comments

Electric vehicle rebate stakeholders submitted written comments during the Summer of 2020. These are posted to: Virginiaev.org, and can be accessed at: https://www.virginiaev.org/?p=809

Written Comments Received

Virginia Department of Taxation
Sierra Club Virginia Chapter
Volkswagen Group of America
Nature Conservancy
Virginia Advanced Energy Economy
Alliance for Automotive Innovation
Virginia Automobile Dealers Association
Virginia Maryland and Delaware Association of Electric Cooperatives
Carter Myers Automotive
Southern Environmental Law Center
Lyft
Electrify NoVA
Generation180
Center for Sustainable Energy
EVgo
AEP
Drive Electric RVA
Virginia Department of General Services, Office of Fleet Management Services
Electric Drive Association of Washington D.C.

Written comments from stakeholders can be found at:
https://www.dropbox.com/sh/7vkk64u29mqnkeu/AAByXe-XqEo5YEVES60adQRea?dl=0

The matrix at this link summaries comments made by Stakeholders:

https://docs.google.com/spreadsheets/d/1t_gPt1N1jKu1WusUjNPY-rrUjuIUiCI-amViubVz4AE/edit?usp=sharing

Appendix 13 - Additional Stakeholder Suggestions for Future EV Policies

During the working group process, several ideas for additional strategies and complementary programs were submitted that could enhance electric vehicle adoption in Virginia. Policymakers may consider these and other additional actions. With a range of policies in place, healthy and incentivized EV markets can drive adoption of this technology and build consumer confidence and interest. These include:

1. **Streamlined Permitting:** Preparing for the increase in EV adoption will require substantial investment in construction of charging infrastructure. Localities can be best prepared for this construction by streamlining their permitting processes.

2. **EV-Ready Building Code Ordinances:** New and renovated buildings could be required to consider including preparations for electric charging infrastructure with pre-installation of conduit.

3. **Electricity Rate Reform:** Rate reform and rate designs could improve grid utilization and reduce costs for all ratepayers, including methods for reduced rates for EV charging. These reforms could also support a transition to use of more renewable energy sources and low-carbon domestic electricity as fuel.

4. **Lane Access:** Single-occupant EVs could be granted access to the High Occupancy Vehicle lanes. This approach has proven to be a strong incentive in increasing electric vehicle sales in California and has been an asset to the Northern VA region for promoting Hybrid Vehicle adoption.

5. **Toll Cost Reduction:** Virginia has several toll funded roads and could collaborate to use these tools to prioritize reduced emission transportation.

6. **Lead-by-Example:** State and local fleets could track the EV market and establish purchase requirements when costs are feasible. This lead-by-example could begin with pilot projects.

7. **Reduced Fees:** Several working group members mentioned the challenge of high Highway Usage Fee (HUF) of $88.20 assessed on electric vehicles. Virginia's annual registration fee for EVs is $58 more than that for internal combustion engine (ICE) vehicles, according to the American Council for Energy Efficiency (ACEE). While the additional HUF is paid up-front, it replaces fuels taxes which would have been paid

throughout the year as gasoline or diesel was purchased for use in a traditional vehicle. Working group members stated that this increased HUF can serve as a disincentive to buying or leasing an EV in the Commonwealth. Currently Connecticut, Illinois, and the District of Columbia offer reduced rather than higher registration fees for EVs, according to ACEE.

8. **Waiving Sales Taxes on EVs:** Waived or reduced sales taxes on EVs could be attractive incentives for EV owners.

9. **Section 177 Electric Vehicle Sales Goals:** Several working group participants raised the importance and opportunity of joining peer states in adopting clean car rules and sales goals under Section 177 of the Clean Air Act. These procedures have electric vehicle sales targets. Some electric vehicle models have not been available through Virginia dealers as these are largely routed to these 'clean car' states for sale (commonly, Virginians purchase EVs from Maryland). Others in the workgroup opposed 177 approach and noted that Virginia's registration of electric vehicles, and a manufacturers group advised that a percent of new vehicle sales in Virginia, is stronger than some Section 177 state's and that the commitment and dedication to incentives and other complementary policies will create a more compelling market for electric vehicles.

10. **Infrastructure Planning:** Secretary of Transportation Shannon Valentine, has initiated an effort that will include a stakeholder group to address the issue of "EV Readiness" from a transportation infrastructure perspective. This effort seeks to identify opportunities, from both a policy and infrastructure "build" perspective, to prepare for the increasing numbers of EVs in the Commonwealth's network. A study will collaborate with business and government stakeholders to identify strategies and initiatives to enhance existing platforms and to host the future marketplace, to support a more sustainable transportation system. This effort could also include development of a roadmap for hydrogen fueling stations.

    Infrastructure plans will also need to study funds sources to replace declining fuels tax collections, which represent 13% of VDOT funds. The Highway Use Fee is an example, although the HUF will not provide revenue for EVs driven more than 9,860 miles per year.

11. **State and Local Programs or Rebates:** Incentives could be used to expand EV charging infrastructure for homes, workplaces, and retail locations.

12. **Innovation with Grants and Loan Programs:** Working group members suggested programs to transition from vehicle dependence on imported oil, such as creative

financing vehicle methods, innovative loans for buyers, cash for clunkers trade-in programs, first-responder training, and bulk purchase agreements.

13. **Cash for Clunkers:** A working group member recommended future study for a cash for clean cars program. An EV rebate could support EVs and PHEVs with a vehicle crush and replace program similar to the Cash for Clunkers Program from the 2009 American Recovery and Reinvestment Act. Such a program could maximize emission reduction and health benefits by removing the highest polluting vehicles from service.

14. **Green Dealership Program:** A Green Dealership Program could allow dealerships to earn recognition and result in incentives/awards for salespeople. This could complement and support dealer participation in the EV incentive program.

15. **Electric Scooters and eBikes Incentives:** Providing further support for smaller classes of vehicles and transportation transition technologies.

16. **Transportation Climate Initiative:** Participation in the Transportation Climate Initiative's regional approaches to reducing transportation. Funds generated by TCI activities could be a major support of a rebate program and EV education and outreach.

17. **Low Carbon Fuel Standard:** Some suggested a Low Carbon Fuel Standard that can create additional revenue to support electric vehicle rebates and infrastructure development while also reducing the carbon intensity of fuels on the road.

18. **Education and Experience with Consumers and Fleets for Electric Vehicles:** Education is key to the success of an EV rebate program. Funds should be set aside to reach out to auto dealers and car buyers. Working group members recognized that consumer education would be a key part of the larger incentive
    a. Automobiles are a mass market product. In 2019 alone, over 430,000 new cars and trucks were sold in Virginia. For many Virginians, the purchase of an automobile is one of the largest purchases they make outside of home ownership. Therefore, perceptions are critical because they influence purchase decisions. This is particularly true when it comes to adopting new technologies, like EVs. While general awareness of electric vehicles is at an all-time high (~90%) according to a recent McKinsey study, consideration of and purchase intent for these remains low.
    b. In order to accelerate the adoption of electric vehicles, education should be a key priority for Virginia. For example, in the McKinsey study, concerns about the availability of charging ranked as the top barriers to entry for electric vehicles. In a January 2020 study from AAA, however, researchers concluded that "owning

an electric vehicle is the cure for most consumer concerns". According to surveys by AAA, "prior to owning an electric vehicle, a majority of owners (91%) said that they had at least one concern, e.g. insufficient range, implications for long-distance travel, and finding a place to charge. Post purchase, many of these worries disappeared".

c. This example demonstrates the need for electric vehicle education. Perceptions will play a key role in whether or not the average Virginian will place an electric vehicle on their shopping list. As part of Virginia's electric vehicle incentive program, funds should be budgeted to ensure that education is prioritized and honestly communicates the benefits of "a day in the life" of electric vehicle ownership.

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