A Roadmap for Reducing North Carolina's Greenhouse Gas Emissions From Transportation: Recommendations on Governor Cooper's Executive Order 80

September 2019

Submitted by

Sierra Club
Environmental Defense Fund
Appalachian Voices
Clean Air Carolina
North Carolina Conservation Network
North Carolina Interfaith Power and Light
North Carolina League of Conservation Voters
The Nature Conservancy, North Carolina Chapter

Table of Contents

Appendices:

List of Figures

List of Tables

Glossary

AFV:	Alternative Fuel Vehicle
BAU:	Business-As-Usual
BNEF:	Bloomberg New Energy Finance
CNG:	Compressed Natural Gas
CO_2e:	Carbon Dioxide Equivalent
DCFC:	Direct Current Fast Chargers
EIA:	United States Energy Information Administration
EPA:	Environmental Protection Agency
EPAct:	Energy Policy Act
EO 80:	North Carolina Executive Order No. 80
EV:	Electric Vehicle
EVI-Pro:	Oak Ridge National Laboratory's Electric Vehicle Infrastructure Projection Tool
EVSE:	Electric Vehicle Supply Equipment
GHG:	Greenhouse Gas
HDV:	Heavy-Duty Vehicle
HEV:	Hybrid Electric Vehicle
ICE:	Internal Combustion Engine
IPCC:	Intergovernmental Panel on Climate Change
LDV:	Light-Duty Vehicle
MDV:	Medium-Duty Vehicle
MMT:	Million Metric Tons
VMT:	Vehicle Miles Traveled
ZEB:	Zero-Emission Bus
ZEV:	Zero-Emission Vehicle

Executive Summary

Climate change poses a grave and imminent threat to North Carolina, its businesses, its economy, and its hardworking families. This threat is compounded with each year that North Carolina fails to react swiftly and forcefully to the threat of climate change and continues to pump more greenhouse gases ("GHGs") into the atmosphere. Some of North Carolina's most important industries, such as agriculture and tourism, are at the greatest risk.

In contrast, by responding to climate change and reducing fossil fuel use, North Carolina can grow and strengthen its economy and profit handsomely. North Carolina has virtually no in-state fossil fuel reserves, and no fossil fuel extraction, production, nor refinery industry. Whenever North Carolina uses fossil fuels, it ships its hard earned money out of state to purchase that fuel. Keeping money in the state's economy, in its businesses, and in the pockets of its hardworking families by rapidly shifting away from a fossil fuel-powered economy is in all North Carolinians' interests.

On October 29, 2018, North Carolina Governor Roy Cooper issued Executive Order No. 80 ("EO 80"), which laid out a framework of three goals:

1. Reduce statewide GHG emissions to 40% below 2005 levels by 2025;
2. Increase registered, zero-emission vehicles ("ZEVs") to at least 80,000 by 2025; and
3. Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels.

EO 80 instructs North Carolina agencies to evaluate the impacts of climate change on their respective programs and operations. Agencies are required to integrate climate change mitigation and adaptation practices into their programs and operations, which include reducing air emissions from the energy and transportation sectors through the utilization of ascendant clean technologies. Agencies tasked with implementing EO 80 have welcomed recommendations from the public on means to advance the goals of EO 80.

Beyond 2025, the International Panel on Climate Change ("IPCC") has concluded that globally, we must achieve a 45% reduction from 2010 levels in carbon emissions by 2030, and a net 100% reduction in carbon emissions by 2050 to avoid catastrophic changes to our climate. Meeting this challenge will require rapidly moving away from fossil fuels as a source of energy, to the benefit of North Carolina's welfare and economic well-being.

The undersigned organizations applaud the Governor for setting an ambitious climate target of a 40% reduction in carbon emissions economy-wide by 2025. In response to the agencies' invitations, we submit the following recommendations, focused largely on transportation electrification, as a way to advance the 40% goal. Moving to rapidly advance transportation electrification will not only help achieve the 40% goal, it will help meet longer term, steeper goals for 2030 and 2050.

The recommendations herein are grounded in successful policies advanced by other states, and are based on modeling future North Carolina transportation sector scenarios. In addition to

modeling conducted by third parties, we also conducted extensive modeling using the EV-REDI model developed by Synapse Energy Economics, Inc., the Argonne National Laboratory's AFLEET model, and the Oak Ridge National Laboratory's Electric Vehicle Infrastructure Projection Tool ("EVI-Pro").

Conclusions:

1. EO 80's goal of 80,000 ZEVs in North Carolina by 2025 would fall below the business-as-usual projections for the North Carolina EV market share in 2025 as determined by both the United States Energy Information Administration ("EIA") and Bloomberg New Energy Finance ("BNEF").

2. A stock of 80,000 ZEVs on North Carolina's roads in 2025 would do little to advance the 40% economy wide CO_2 reduction goal established by the Order, and would not position North Carolina to achieve the deeper carbon emission reductions required to meet the 2030 or 2050 goals established by the IPCC in 2018.

3. North Carolina should adopt a 2025 goal of a 15% LDV EV sales rate. This would result in approximately 184,000 LDV EVs on the road in 2025 (*see* Section IV). This goal is eminently reasonable, and will help secure the 2025 goal of a 40% GHG emissions reduction as well as later 2030 and 2050 goals.

4. North Carolina should adopt policies that can accelerate EV adoption by helping to resolve the three speed bumps that are slowing EV adoption rates:
    a. higher comparative purchase prices for EVs (and limited EV models on the market);
    b. dearth of sufficient charging infrastructure; and
    c. the lack of public awareness of EVs.

    Adopting such policies and accelerating EV adoption will prove a strong economic boon to North Carolina as it no longer spends billions of dollars out of state every year to purchase gasoline and diesel.

5. A goal of 80,000 EVs on the road in 2025 misses a great opportunity for North Carolina to help keep money in the state economy and in North Carolina's families' finances that will otherwise be spent on fuel from out of state. These policies can and should lead to the expansion of new jobs in the state.

Policy recommendations:

1. Center transportation electrification around equity at the outset to ensure that benefits accrue to all, including overburdened and disadvantaged communities;

2. Adopt mandates, targets, and incentives for EV adoption:
    a. Strengthen and enforce an EV purchase mandate for the state vehicle fleet with an increasingly stringent trajectory that mirrors the increasing types of EVs on

the market and their rapidly declining costs;

b. Adopt policies that encourage and support political subdivisions such as counties, cities, and school districts and private fleets, to purchase EVs rather than internal combustion engines ("ICEs");

c. Set a state-wide target and corresponding incentives for transit agencies to fully electrify their bus fleets by 2035 or 2040;

d. Adopt an EV rebate or tax credit like many other states to create financial incentives to adopt electric vehicles;

e. Revisit non-financial policies to incentivize EV adoption;

f. Join the ranks of the states that follow California's "177 clean car program" and the Zero-Emission Vehicle Program, which require manufacturers to meet certain targets for ZEV sales as a percentage of their statewide vehicle sales;

3. Encourage and support the buildout of charging infrastructure

a. Adopt a 2025 goal for installed EV charging infrastructure;

b. Encourage and approve sound utility programs for investment in EV charging infrastructure (EV supply equipment, or "EVSE") that meet clear criteria to ensure that programs are prudent, that benefits accrue to non-participant ratepayers and EV owners alike, and that charging is done in a way that maximizes the integration of renewable energy on the grid and the reduction in GHG emissions.

i. This should include approving Duke Energy Carolinas and Duke Energy Progress's (collectively "Duke Energy's") EV pilot program currently pending before the North Carolina Utility Commission, though with revisions to address important issues including overburdened and disadvantaged communities, among other things. As results of the pilots become available, the Commission should require Duke Energy to develop an expanded program, informed by the results, so there is no unnecessary gap in EVSE development.

c. Utilize the $92 million in Volkswagen mitigation funds fully to advance transportation electrification, including the 15% carve out for EVSE and investment in electrification of transit, school bus, and corporate fleets.

While not the focus of these recommendations, the undersigned organizations note that meeting EO 80's goal of a 40% reduction of economy-wide carbon emissions by 2025 will also

require rapid retirement of the remaining coal plants in North Carolina. As numerous studies have shown, the majority of Duke Energy's coal fired generating units are uneconomic. In states with competitive markets, such plants have already been retired, saving ratepayers money. North Carolina should follow suit, clean its air, and improve its economy in the process. Moreover, reducing the GHG intensity of the grid will magnify the carbon reductions available from the electrification of transportation in North Carolina.

I. Climate Change Poses a Great Threat to North Carolina, Its Businesses, Its Economy, and Its Families—Responding to the Threat of Climate Change By Reducing Fossil Fuel Use and Using In-State Resources Can Grow and Strengthen North Carolina's Businesses, Economy, and Families.

Climate change poses a very real threat to North Carolina and North Carolina's economy. North Carolina has 3,375 miles of coastal shoreline.[1] Coastal areas are at great flooding risk from sea level rise, storm surges, and high river and lake waters as storms become more frequent and powerful and rivers cannot effectively drain to the ocean.[2] Among other things, this poses a direct and significant threat to North Carolina's tourism industry, which in 2016 directly and indirectly supported 429,102, or 9.3%, of North Carolina's jobs, and generated $29.5 billion in economic activity.[3]

Likewise, climate change will drive changing climate conditions and increases in extreme weather, pests, and pathogens, which are direct and significant threats to agriculture.[4] North Carolina's agricultural and agribusiness industry contributed $76 billion of value to North Carolina's economy—16 cents of every dollar—and directly and indirectly supported 633,000 jobs in North Carolina in 2013.[5]

As Hurricane Florence demonstrated in 2018, residences and other commercial establishments are similarly at-risk from direct flood and wind damage and indirect damage due to impacts to the economy resulting from extreme weather events. Indeed, Hurricane Florence and the damage it caused to North Carolina starkly illustrated the risks of climate change to the state. Corelogic, a business information and risk management firm, estimates that 487,000 North Carolina residential properties and 38,000 North Carolina commercial properties suffered $22

---

[1] NOAA Office for Coastal Management, Shoreline Mileage of the United States, 2, https://coast.noaa.gov/data/docs/states/shorelines.pdf (last visited June 19, 2019).
[2] U.S. Climate Resilience Toolkit, Sea Level Rise, (2018), https://toolkit.climate.gov/topics/coastal/sea-level-rise; U.S. Climate Resilience Toolkit, Storm Surge (2017), https://toolkit.climate.gov/topics/coastal/storm-surge.
[3] U.S. Travel Association, The Economic Impact of Tourism in North Carolina, 2 (2016), https://partners.visitnc.com/files/files/tsa/2016-NC-TSA.pdf.
[4] Melillo, Jerry M., Terese Richmond, and Gary W. Yohe, Eds., U.S. Global Change Research Program, Climate Change Impacts in the United States: Third National Climate Assessment (2014), available at https://nca2014.globalchange.gov/highlights/report-findings/agriculture#intro-section-2.
[5] North Carolina State University, Economic Contribution of North Carolina Agriculture and Agribusiness, 1-4 (2015), https://www.ces.ncsu.edu/wp-content/uploads/2017/01/NC-Agriculture-Economic-Pocket-Guide_NC-State-CALS.pdf?fwd=no.

billion from wind and flood damage alone from Hurricane Florence.[6] Impacts to agriculture were estimated at $1.1 billion.[7] These damages do not include all of the indirect and direct loses North Carolina suffered from Hurricane Florence.

In contrast, responding to the threat of climate change by reducing fossil fuel use presents North Carolina with a unique opportunity to grow and strengthen its economy. Moving rapidly away from fossil fuels will allow North Carolina to keep money in state and reinforce the finances of North Carolina's families and businesses.

North Carolina has:

1. No crude oil reserves;
2. No oil production;
3. No oil refineries;
4. No gas reserves;
5. No fracked gas production or gas production of any type;
6. No coal production—and very little economically recoverable coal.[8]

As a result, North Carolina sends a vast amount of money out of the state economy to purchase the fossil fuels it has become reliant upon. More specifically, North Carolina bought from out of state:

1. 1.4 billion gallons of fuel oil, of which 1.1 billion was for on road vehicle use (2017)[9] —North Carolina spent $10.961 billion on motor gasoline in 2017;[10]
2. 14 million tons of coal, primarily for the utility sector (2017)[11]—North Carolina spent $1.05 billion on coal in 2017;[12]
3. 502 billion cubic feet of gas, also primarily for the utility sector (2017)[13]—North Carolina spent $3.1 billion on gas in 2017.[14]

---

[6] CoreLogic, The Aftermath of Hurricane Florence (2018), https://www.corelogic.com/news/the-aftermath-of-hurricane-florence-is-estimated-to-have-caused-between-20-billion-and-30-billion-in-flood-and-wind-losses-cor.aspx.

[7] Richard Stradling, *Agriculture Losses from Hurricane Florence Will Top $1.1 Billion, and That's Just In NC*, The News and Observer (Raleigh) (Sept. 26, 2018), https://www.newsobserver.com/news/local/article219064110.html.

[8] United States Energy Information Administration, North Carolina State Energy Profile (2018), https://www.eia.gov/state/print.php?sid=NC.

[9] United States Energy Information Administration, North Carolina Adjusted Sales of Distillate Fuel Oil by End Use (2019), https://www.eia.gov/dnav/pet/pet_cons_821dsta_dcu_SNC_a.htm.

[10] United States Energy Information Administration, Motor gasoline consumption, prices, and expenditures, State Energy Data Systems (2019), https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US#Petroleum.

[11] United States Energy Information Administration, Coal Consumption Estimates and Imports and Exports of Coal Coke, 2017 (2019), https://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_use_cl.pdf.

[12] United States Energy Information Administration, Coal Price and Expenditure Estimates and Imports and Exports of Coal Coke, 2017 (2019), https://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_pr_cl.pdf.

[13] United States Energy Information Administration, Natural Gas Consumption Estimates, 2017 (2019), https://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_use_ng.pdf.

[14] United States Energy Information Administration, Natural Gas Price and Expenditure Estimates, 2017, (2019), https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_fuel/html/fuel_pr_ng.html&sid=US.

In sharp contrast, North Carolina has abundant in-state clean energy resources that it can tap. This includes solar energy across the state,[15] and wind energy in the eastern portion of the state.[16] The clean energy industry in North Carolina is an important, and growing, part of the state's economy. According to the North Carolina Sustainable Energy Association, in 2018 North Carolina's clean energy industry was responsible for:

1. 1,717 clean energy firms in state;
2. 43,238 clean energy jobs;
3. $14.2 billion in revenue, an increase of 124% compared to 2016.[17]

Moreover, the North Carolina clean energy industry is generating jobs across the state, in rural areas as well as suburban and urban areas.[18]

Governor Cooper's EO 80 lays out a critical set of initial goals to begin addressing North Carolina's contribution to climate change and averting the adverse impacts that climate change will otherwise have on the state and the state's economy. Moreover, EO 80's goals also provide a means to begin addressing North Carolina consumers' significant expenditures on fossil fuels from out of state.

What follows are the signatories' recommendations on the State's transportation goals, structured to achieve EO 80's climate goals and beyond, as well as energize North Carolina's economy.

[15] Nicholas Gilroy, National Renewable Energy Laboratory, Direct Normal Solar Resource of North Carolina (2017), https://www.nrel.gov/gis/images/state-level-resource-maps/dni/North-Carolina-DNI-2017-01.jpg.
[16] U.S. Department of Energy Wind Technologies Office, Wind Energy in North Carolina (2018), https://windexchange.energy.gov/states/nc.
[17] North Carolina Sustainable Energy Association, 2018 North Carolina Clean Energy Industry Census, p. 10 (2019), https://energync.org/wp-content/uploads/2019/06/2018_NC_Clean_Energy_Industry_Census_Web-1.pdf.
[18] North Carolina Sustainable Energy Association, Installed Renewable Energy Systems (2019), https://energync.org/maps/.

II. Executive Order 80's Goal of 80,000 EVs By 2025 Is At Or Below Business-As-Usual Projections for EV Adoption and Does Not Seize the Opportunity That Transportation Electrification Holds for North Carolina's Economy Or the Climate.[19]

As noted above, EO 80 sets a goal of 80,000 ZEVs on North Carolina's roads by 2025. EIA provides both regional and national projections for EV adoption under business-as-usual ("BAU") scenarios, BNEF provides a national projection for EV adoption under BAU conditions, and Synapse Energy Economics, Inc. has developed a proprietary EV-REDI model that can provide a state specific adoption scenario based on past consumer adoption curves of other disruptive technologies. According to EV-REDI's modeling, EO 80's goal of 80,000 ZEVs on the road by 2025 would result in a light-duty vehicle ("LDV") EV sales rate of 4.5% in North Carolina in 2025.

As reflected in the distilled information below, and in greater detail in Appendix B, these projections of BAU EV adoption rates, when extrapolated for North Carolina, exceed the EO 80 goals for 2025 (LDV EV sales rates for each projection can be seen in Table 1).

EIA's national projection puts the LDV EV sales rate at 6.3% in 2025.[20] Moreover, EIA provides a regional projection for EV adoption rates in the South Atlantic region, which includes North Carolina and covers Maryland, Delaware, West Virginia, Virginia, North Carolina, South Carolina, Georgia, and Florida. EIA projects a steadily increasing BAU rate of EV adoption in the region, resulting in an annual EV sales rate of 6.2% and 194,600 EV sales in the eight South Atlantic regional states in 2025.[21] This is all the more remarkable as EIA's projections of new energy/clean energy consistently underestimate real world experience.[22]

BNEF's projections of EV adoption rates in 2025 similarly exceed EO 80's goals. BNEF's 2018 projections were that in 2025 the national EV sales rate will be 9.0% of all LDV sales, 1,576,900 EVs will be sold, and there will be 5,966,707 EVs on the country's roads.[23] Extrapolated to North

---

[19] The terms "battery electric vehicles" ("BEVs"), "electric vehicle" ("EVs"), and "zero-emission vehicles" ("ZEVs") are used interchangeably throughout this report and are considered vehicles that are entirely electric and without an internal combustion engine. "Plug-in hybrid electric vehicles" ("PHEVs") and "hybrid electric vehicles" ("HEVs") are specified as distinct whenever relevant.

[20] United States Energy Information Administration, Annual Energy Outlook 2019, Light-Duty Vehicle Sales by Technology Types, United States, Region: South Atlantic (2019), https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2019&region=1-5&cases=ref2019.

[21] United States Energy Information Administration, Annual Energy Outlook 2019, Light-Duty Vehicle Sales by Technology Types, Region: South Atlantic (2019), https://www.eia.gov/outlooks/aeo/data/browser/#/?id=48-AEO2019&region=1-5&cases=ref2019.

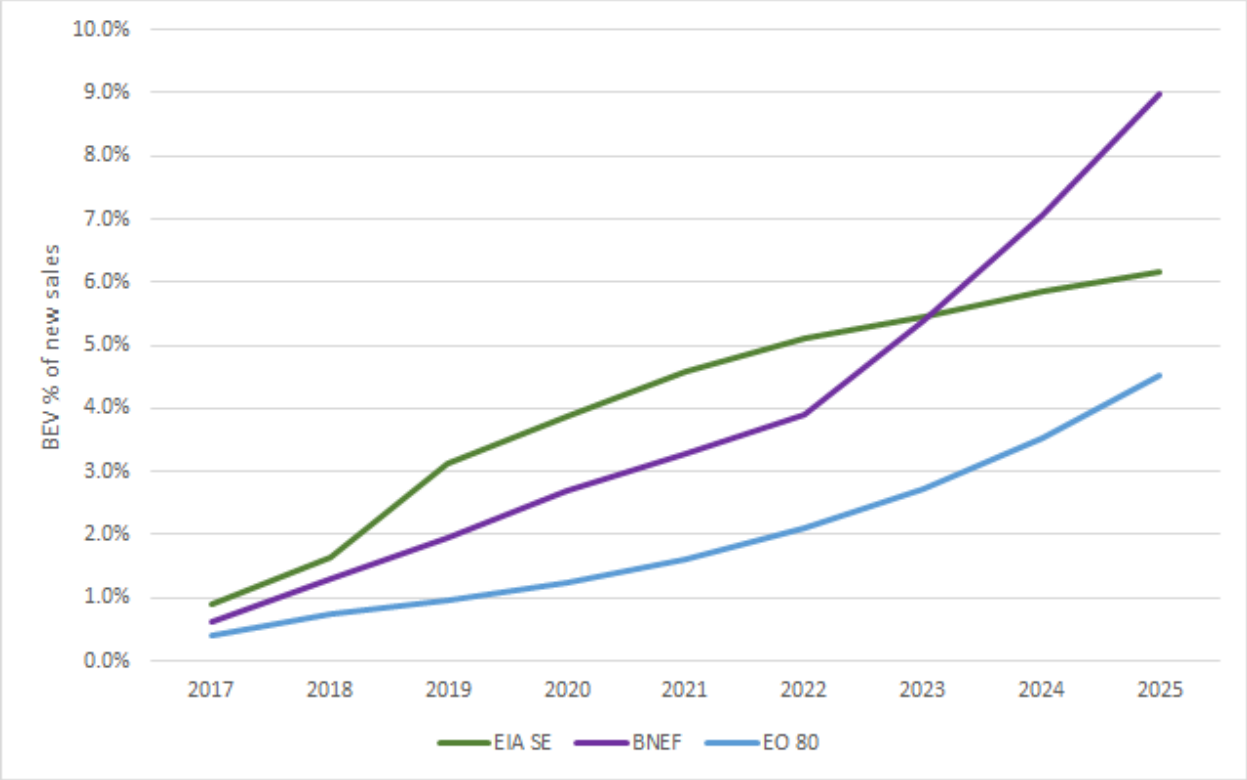
[22] Kevin Stark, *EIA Outlook 2019: The 'Extremely Conservative' Case for Renewables Growth*, Green Technology Media (2019), https://www.greentechmedia.com/articles/read/eia-outlook-conservative-renewables#gs.f5f6cn; Michael J. Coren, The US government keeps spectacularly underestimating solar energy installation, Quartz (2017), https://qz.com/1103874/the-us-government-underestimated-solar-energy-installation-in-the-us-by-4813-along-with-renewable-wind-and-solar-generation/. *See generally* Appendix E, North Carolina Energy Resources. Michael Grunwald, Why are the government's energy forecasts so bad?, Politico (2015), https://www.politico.com/agenda/story/2015/06/why-are-the-federal-governments-energy-forecasts-so-bad-000111.

[23] Salim Morsey, et al., Long-Term Electric Vehicle Outlook 2018, Bloomberg New Energy Finance (2018).

Carolina on a pro-rata basis[24] and using BNEF's national average of an EV sales rate of 9.0% of total vehicle sales in 2025, there would be 50,462 EVs sold in North Carolina in 2025, and 190,700 EVs in total on North Carolina's roads in 2025, compared to EO 80's goal of 80,000 EVs in 2025.

While EO 80 does not provide annual EV sales percentage goals, or goals for annual numbers of total EV sales or total EV stock on the road, one can use the EV-REDI model to develop what rate of annual EV sales would lead to EO 80's 2025 goal of 80,000 EVs in North Carolina. Using EV-REDI, EO 80's 2025 goal of 80,000 ZEVs on the road translates to an LDV EV adoption rate of 4.5% in 2025, with 23,273 EVs sold in 2025.[25] [26] A comparison of EIA Southeast 2025 projections, BNEF's 2025 projections, and EO 80's goals modeled through EV-REDI are reflected in Figure 1 and Table 1 below.

Figure 1: BEV Market Share Projections of EIA Southeast vs. BNEF vs. EO 80



NB: the Y-axis is not 100%.

[24] According to the Federal Highway Administration, North Carolina accounts for 3.2% of all cars in the U.S.
[25] EO 80 did not specify between LDVs and HDVs; this model reflects an estimate of 78,000 LDVs and 2,000 HDVs.
[26] EIA and BNEF only have LDV projections for EVs.

Table 1: Annual LDV BEV Percentage Sales Under EIA Southeast, BNEF 2018 Projects, and EO 80 Goals

	Scope	2018	2019	2020	2021	2022	2023	2024	2025
EIA SE	LDV EV Sales %	1.6%	3.1%	3.9%	4.6%	5.1%	5.4%	5.9%	6.2%
BNEF	LDV EV Sales %	1.3%	2.0%	2.7%	3.3%	3.9%	5.4%	7.1%	9.0%
EO 80	LDV EV Sales %	0.7%	1.0%	1.2%	1.6%	2.1%	2.7%	3.5%	4.5%

III. North Carolina Is Not On Track to Achieve EO 80's Goal of a 40% Reduction In Greenhouse Gas Emissions: North Carolina Will Need to Rapidly Accelerate Transportation Electrification, Sharply Curtail Coal Fired Electricity Generation By 2025, and Arrest New Gas Build.

One of the initial steps required by EO 80 was to establish a baseline GHG Inventory ("Inventory") for North Carolina's historic GHG emissions, and a projected level of emissions going forward to 2030 under a business-as-usual ("BAU") approach. While North Carolina has achieved significant reductions in its 2017 GHG emissions compared to a 2005 baseline, the Inventory makes evident that North Carolina is not on a trajectory to achieve EO 80's goal of a 40% reduction in GHG emissions by 2025 under a BAU approach.

Much of North Carolina's GHG emissions reductions to date have come from the electric sector as North Carolina has moved away from coal fired generation of electricity. However, meeting EO 80's 2025 goal, meeting post-2025 emissions reductions critical for avoiding catastrophic climate change, and fully seizing North Carolina's economic opportunities presented by a transition off fossil fuels will necessitate rapid electrification of North Carolina's transportation sector.

2005 Emissions: According to North Carolina's 2019 Inventory, North Carolina's 2005 statewide net annual emissions from electricity generation, residential/commercial/industrial combustion, transportation, agriculture, waste management, industrial processes, and natural gas/oil systems were 152.08 million metric tons ("MMT") of carbon dioxide equivalent ("CO_2e").[27] [28] Transportation accounted for 55.19 MMT CO_2e of these emissions, or 36.3% of the state's total net GHG emissions.[29]

[27] North Carolina Department of Environmental Quality, North Carolina Greenhouse Gas Inventory (1990-2030), 5, Table 1-1 (2019), https://files.nc.gov/ncdeq/climate-change/ghg-inventory/GHG-Inventory-Report-FINAL.pdf.
[28] CO_2 equivalent (CO_2e) and greenhouse gases (GHG) are used interchangeably in this report. Any use of CO_2 specifically is an intentional one. Additionally, emissions goals are considered in terms of "net emissions"

2017 Emissions: North Carolina's net CO_2e emissions in 2017 were 116.06 MMT, marking a 23.7% decrease in net CO_2e emissions as compared to 2005, attributed mostly to the decrease in coal usage in North Carolina's electric sector.[30] The transportation sector's percentage of the state's net GHG emissions was 32.5% in 2017.[31]

Business-as-usual emissions in 2025: The Inventory estimates that a business-as-usual approach will fall well short of the economy-wide GHG reduction goals set out in EO 80. According to the report, business-as-usual policies will result in a 31.5% decrease in net CO_2e emissions compared to 2005 levels[32]—significantly short of EO 80's 40% reduction goal for the state. The Inventory estimates a 48.9% decrease from 2005 in CO_2e from electricity use and a 25.7% decrease from transportation.[33] North Carolina's transportation sector is projected to emit 41.00 MMT CO_2e in 2025, representing 39.3% of the state's total net emissions.[34]

In short, the Inventory projects that there will be an 8.5% gap (13.0 MMT CO_2e in 2025) between DEQ's business-as-usual 2025 projection and EO 80's goal of a 40% reduction in statewide GHG emissions by 2025.

Pathways to Achieving EO 80's Economy Wide Goal Of 40% reduction by 2025: Any approach to reducing North Carolina's GHG emissions must start by addressing the two largest sources of GHG emissions in the state: electricity generation and transportation. While electricity sector emissions will be addressed in greater detail in recommendations filed under separate cover, and the recommendations herein are otherwise focused on transportation sector emissions, emissions from the electricity generation sector, and coal fired generation specifically, must be addressed at least briefly in these recommendations.

A. North Carolina's Transportation Sector Emissions.

North Carolina's transportation sector accounted for 48.72 MMT CO_2e in 2017, with an overall decrease in transportation sector emissions of 11.7% from 2005 to 2017. This reflects an absolute decrease in CO_2e emissions from the state's transportation sector between 2005 and 2012, at which point the trend in absolute emissions from the transportation sector started to increase between 2012 and 2017.[35]

---

whenever possible, which the Inventory calculates by subtracting net carbon sinks from the aggregate sector gross emissions.

[29] North Carolina Department of Environmental Quality, North Carolina Greenhouse Gas Inventory (1990-2030), 5, Table 1-1 (2019), https://files.nc.gov/ncdeq/climate-change/ghg-inventory/GHG-Inventory-Report-FINAL.pdf. The North Carolina GHG Inventory notes both gross and net emissions for state/sector wide emissions. For sector specific emissions, the Inventory notes only gross emissions. Net emissions are calculated by taking into account carbon sinks of land use and forestry.

[30] North Carolina Department of Environmental Quality, North Carolina Greenhouse Gas Inventory (1990-2030), 6 (2019), https://files.nc.gov/ncdeq/climate-change/ghg-inventory/GHG-Inventory-Report-FINAL.pdf.

[31] *Id.* at 5, Table 1-1.

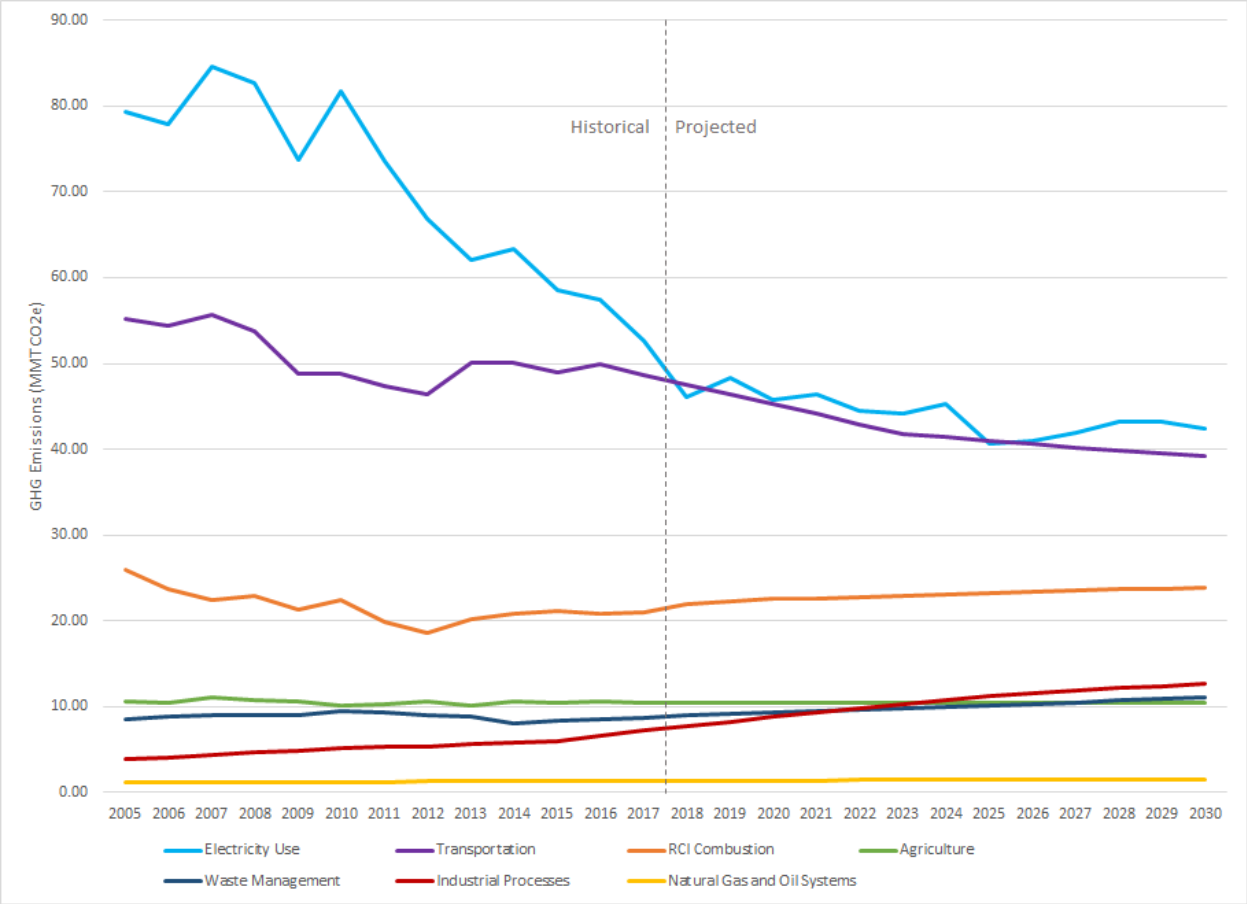
[32] *Id.*

[33] *Id.*

[34] *Id.*

[35] *Id.*

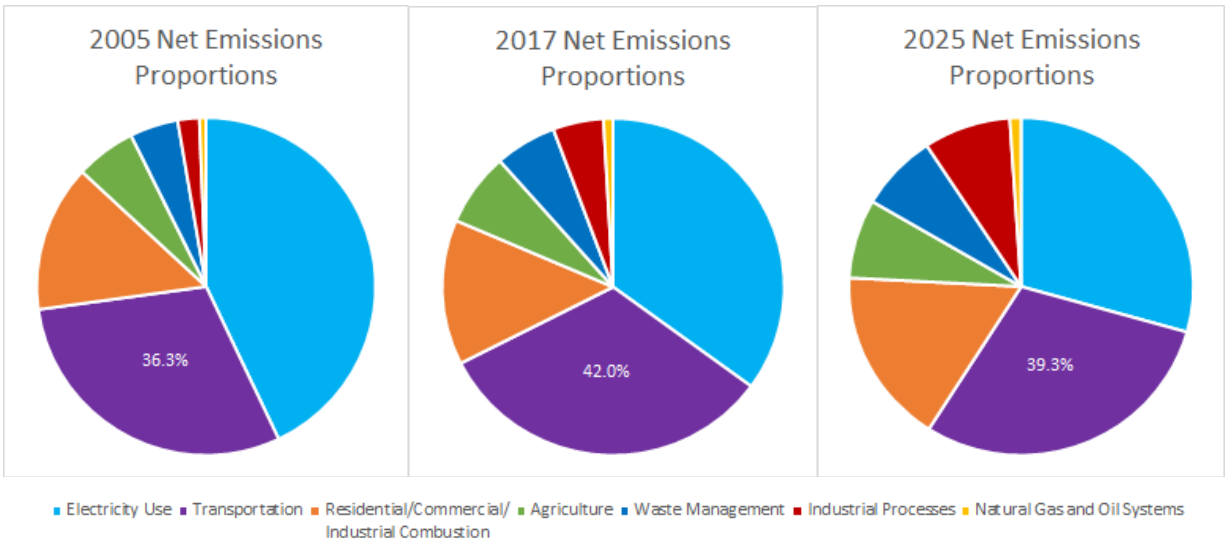
Figure 2: North Carolina's Greenhouse Gas Emissions, Historical and Projected by DEQ's GHG Inventory



Nonetheless, given the larger economy-wide reduction in North Carolina's GHG emissions, the transportation sector's percentage of the state's overall GHG emissions has grown to 42.0%. Moreover, while North Carolina's GHG Inventory indicates small reductions in GHG emissions from transportation from 2017 through 2025, these are the result of federal clean car standards that the current administration is proposing to reverse or undermine to a significant degree.

Stated another way: while the absolute quantity of CO_2e emissions from the transportation sector dropped between 2005 and 2017, transportation sharply increased as an overall share of North Carolina's economy wide CO_2e emissions. Moreover, should the Environmental Protection Agency and the National Highway Transportation Administration revoke current clean car standards, oil used for transportation and transportation emissions would be expected to increase in North Carolina. It is therefore in North Carolina's environmental and economic best interest to enact state based goals and policies to accelerate the state's transition away from oil based transportation.

Figure 3: North Carolina's Net GHG Emissions Proportions Per Sector



B. North Carolina's Electricity Sector Emissions.

The Inventory makes clear that moving away from coal fired generation has been the largest contributor to in-state GHG emissions reductions in North Carolina to date. Continuing this trend—rapidly moving away from North Carolina's remaining coal fired generation by 2025 and replacing coal energy with carbon free resources (while not adding any further fracked gas generation)—will therefore be one key part of achieving the Order's 40% reduction in GHG emissions by 2025.

Coal fired generation not already slated for retirement emitted over 24.24 million metric tons of carbon in 2018.[36] The vast majority, if not all, of the remaining coal fired generation units in North Carolina are old, inefficient, and uneconomic: G.G. Allen (1960, 1961), Marshall (1965, 1966, 1969, 1970), Cliffside (1972), Mayo (1983), Roxboro (1966, 1968, 1973, 1980), and Belews Creek (1974, 1975).[37] Numerous studies, such as the recent Bloomberg New Energy Finance study, have documented just how uneconomic Duke Energy's North Carolina coal units are.[38]

In non-regulated states, where coal fired generation units must compete directly in the market with other resources, similar units are rapidly retiring. Retiring Duke Energy's uneconomic coal plants would save North Carolina ratepayers money. Replacing them with carbon free resources, and ensuring that other fossil fuels are not pushed in to replace them, would go a long way to achieving EO 80's 2025 goal and the IPCC's 2030 and 2050 goals.

---

[36] S&P Global Market Intelligence, SNL Energy Data, (last accessed May 30, 2019).
[37] *Id.*
[38] William Nelson & Sophia Liu, Half Of U.S. Coal Fleet On Shaky Economic Footing, BloombergNEF, (2018); *see also* Appendix E, Coal Resources.

IV. North Carolina Should Set a 2025 15% LDV EV Sales Target and a 5% MDV-HDV EV Sales Target—Ensuring Climate and Economic Benefits Will Accrue to All North Carolinians.

Given that the EO 80's goal of 80,000 EVs on the road is likely below what will happen under a business-as-usual scenario, the signatories encourage North Carolina to set and work towards a higher goal. More specifically, the signatories recommend that the Governor set an EV target of 15% of LDV sales in 2025, and 5% of medium-duty vehicle ("MDV") and heavy-duty vehicle ("HDV") sales. These are ambitious but reasonable goals. Moreover, a 15% EV sales rate in 2025 would help position North Carolina to achieve EO 80's 2025 40% GHG emission reduction goal, as well as the IPCC's 2030 45% GHG emission reduction goal and its 2050 100% net GHG emission reduction goal.

In addition, a 15% LDV EV sales goal by 2025 will put North Carolina on a course to grow and strengthen its economy by keeping money in the state and in the state's businesses. It will also help reduce the financial burden on North Carolina's families from reliance on out of state oil.

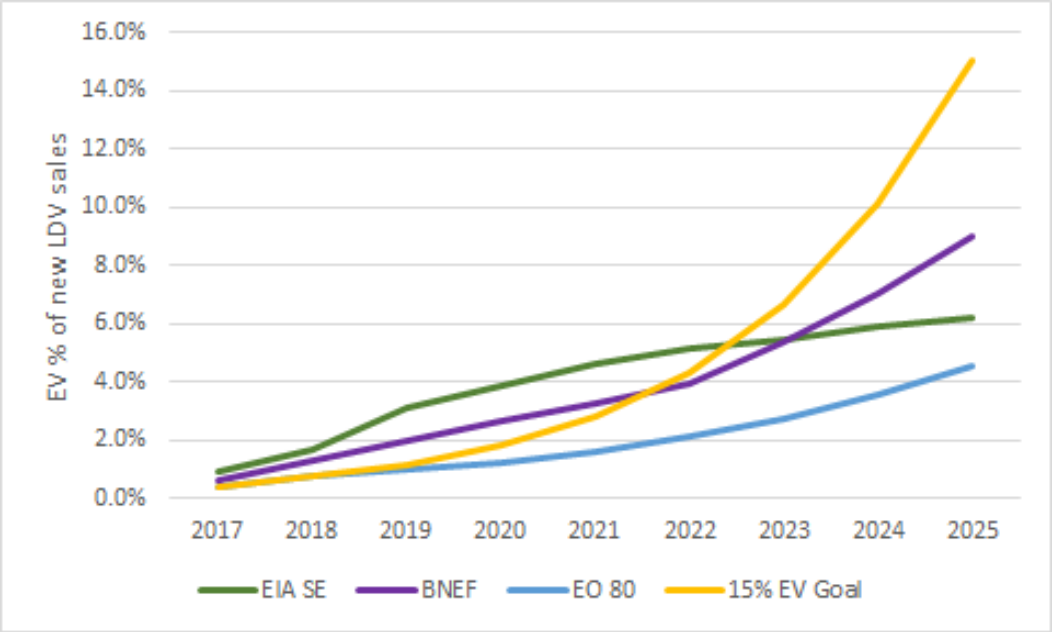
A. A 2025 15% LDV EV Sales Target and a 5% MDV-HDV EV Sales Target Represents a Reasonable Acceleration of the EV Adoption Rate Over Business-As-Usual Scenarios.

Figures 4 and 5, below, depict adoption curves and results from a 2025 LDV EV sales rate of 15% using the EV-REDI tool, and overlay the 2025 15% LDV EV rate on top of the BAU scenarios from BNEF and EIA.[39] As can be seen in Table 2, this goal would result in a 2025 LDV EV stock of approximately 184,000, which is below the pro rata estimate for BNEF's stock projection of 190,000 LDV EVs.

A 15% target represents a reasonable acceleration above BAU scenarios for several reasons. First, a 15% LDV EV sales rate is only 1.67 times BNEF's projection of a 9.0% LDV EV sales rate under a BAU scenario. Second, given BNEF's slightly more robust curve in EV sales rates in early years, the total number of EVs on the road in 2025 is not all that different, though the EV-REDI curve has a steeper acceleration going forward thereafter.

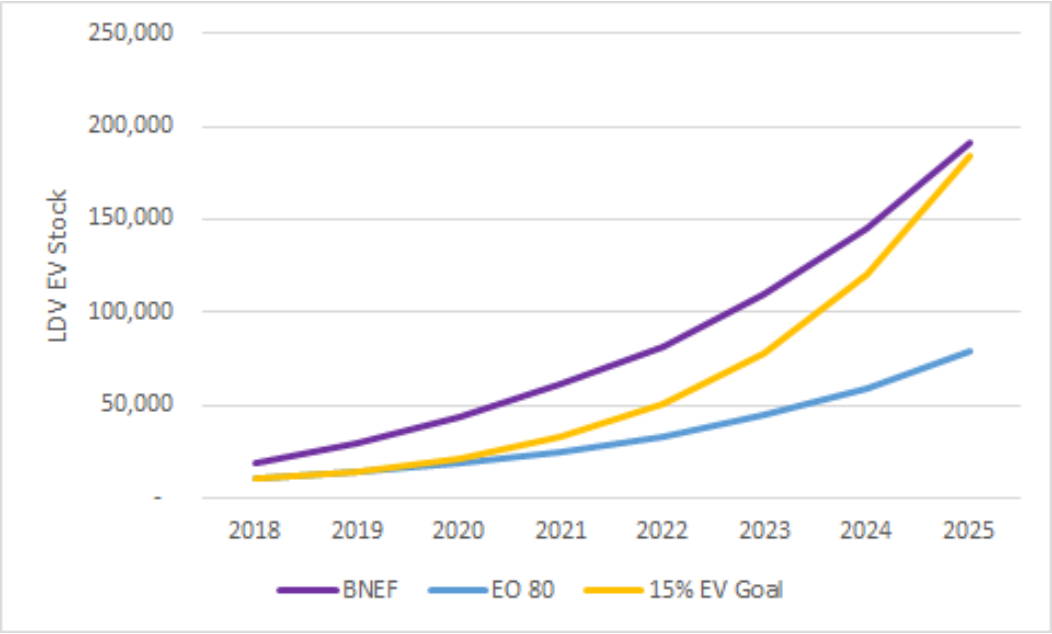
[39] EIA's Southeast regional EV sales projections are available at https://www.eia.gov/outlooks/aeo/tables_ref.php. EIA, Dataset: "39.5 Light-Duty Vehicle Sales by Technology Type, South Atlantic." When comparing these projections to Sierra Club's modeling of North Carolina's EV adoption scenarios, EV percent sales is used, since gross sales numbers projections are not available at state level. See Appendix B for additional information.

Figure 4: EV Market Share Projections Under a 15% by 2025 Scenario



NB: the Y-axis is not 100%.

Figure 5: Number (Stock) Of LDV EVs On the Road Under a 15% Sales by 2025 Scenario[40]



[40] The BNEF stock numbers projection was calculated on a pro rata basis to obtain a North Carolina-specific projection. According to the Federal Highway Administration, North Carolina makes up 3.2% of all LDV stock in the US. Therefore, the BNEF North Carolina stock projection was calculated by multiplying BNEF's national stock projections by 3.2%. EIA was not included in this graph because EIA does not have EV stock projections.

Table 2: Number of LDV EVs On The Road, Comparing EO 80, BNEF, and a 2025 15% LDV EV Sales Rate Scenario

	Metric	2018	2019	2020	2021	2022	2023	2024	2025
EO 80	LDV Stock	10,339	13,935	18,738	25,148	33,613	44,784	59,468	78,664
BNEF	LDV Stock	19,355	29,641	43,849	61,260	82,054	109,860	145,301	190,700
15% Goal	LDV Stock	10,339	14,698	21,716	32,936	50,620	78,228	120,683	184,613

A third indication that a 2025 15% LDV EV sales rate is a reasonable target is the fact that so many states have either adopted similar targets or are already on their way to achieving the target. Ten states already follow California's ZEV program framework that requires a certain percentage of LDV sales be EVs/ZEVs by 2025.[41] While the exact percentage of sales/number of EVs required by the ZEV program will depend upon a complex set of regulatory provisions, the EV mandate has been characterized by vehicle manufacturers as requiring 15.4% of vehicle sales be EVs by 2025.[42]

Moreover, 17 states—red, blue, and purple—have already exceeded the necessary sales rate BNEF projected in 2018 to achieve its 9.0% LDV EV sales rate by 2025. As of 2018, these include, in approximate order from highest to lowest LDV EV sales rate:[43] California (7.84%), Washington (4.28%), Oregon (3.41%), DC (3.34%), Colorado (2.61%), Hawaii (2.59%), Massachusetts (2.53%), Connecticut (2.02%), Vermont (1.92%), Maryland (1.91%), Arizona (1.84%), Virginia (1.67%), Nevada (1.62%), Utah (1.60%), New Jersey (1.59%), and New York (1.56%).

A 5% MDV/HDV sales rate in 2025 is equally attainable. While neither BNEF nor EIA breaks out MDV and HDVs separately, the EV-REDI tool can address MDVs and HDVs separately. Addressing them separately can be helpful as they represent a very different market segment and duty cycle than LDVs. According to EV-REDI, a 5% sales rate would represent 4,086 vehicles on the road in 2025.[44] The global MDV and HDV market is on the cusp of experiencing a burst of growth over the next few years, and many manufacturers have already entered into the market. Volvo, Daimler, Tesla, and BYD have announced a variety of freight and hauling cabs,

[41] Center for Climate and Energy Solutions, U.S. State Clean Vehicle Policies and Incentives (2019), https://www.c2es.org/document/us-state-clean-vehicle-policies-and-incentives/.
[42] Alliance of Automobile Manufacturers, State Electric Vehicle Mandate, https://autoalliance.org/energy-environment/state-electric-vehicle-mandate/ (last visited June 19, 2019).
[43] EVAdoption, EV Market Share by State (2018), https://evadoption.com/ev-market-share/ev-market-share-state/.
[44] As noted, this report assumes that since EO 80 did not specify vehicle type, of the stock of 80,000 ZEVs established EO 80's 2025 goal, 78,000 would be LDVs and 2,000 would be HDVs.

vans, and transport trucks for production and/or distribution in North America in the next three years.[45] Meanwhile, many states and municipalities have committed to electrifying public fleet vehicles, particularly transit buses.[46]

B. A 2025 15% LDV EV Sales Target and a 5% MDV-HDV EV Sales Target Would Help Secure EO 80's GHG Emissions Reduction Goals and Is Critical to Positioning North Carolina for IPCC Targets In Later Years.

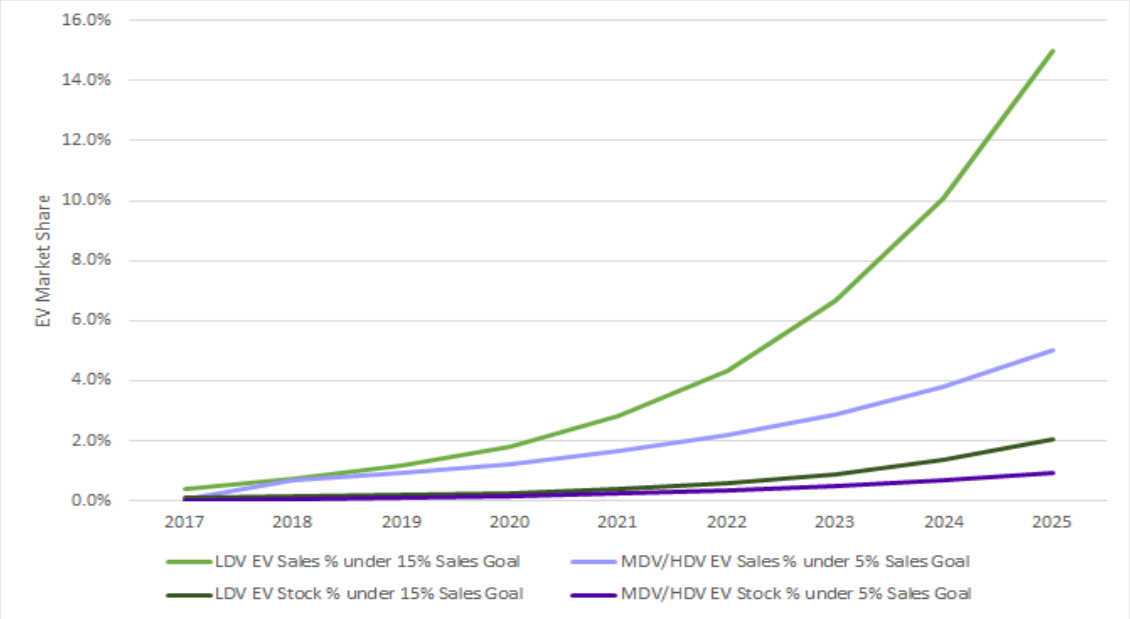
Setting North Carolina on a trajectory for 15% LDV EV sales by 2025 allows the transportation sector to make material contributions towards EO 80's goal of a 40% reduction in GHG emissions by 2025. More specifically, as reflected in the EV-REDI modeling outputs below, doing so would lead to a 1 million metric ton ("MMT") reduction in GHG emissions in 2025.

Equally important, a 2025 15% LDV EV sales rate is critical to putting North Carolina on solid footing to meet the increasingly stringent GHG emissions reductions that are required in 2030 and later years to avoid catastrophic climate change. This is because there is a long lag time between when EV adoption accelerates and when the actual vehicle stock on the road transitions to EVs: LDVs have a long lifespan—approximately 15 years on average—so internal combustion engine vehicles ("ICEs") sold today will continue to be a part of the overall vehicle stock on the road for well over a decade.[47] For example, as reflected in Figure 7 below, even when North Carolina achieves a 15% LDV EV sales rate in 2025, only 2% of the LDV vehicle stock actually on North Carolina's roads will be EVs.

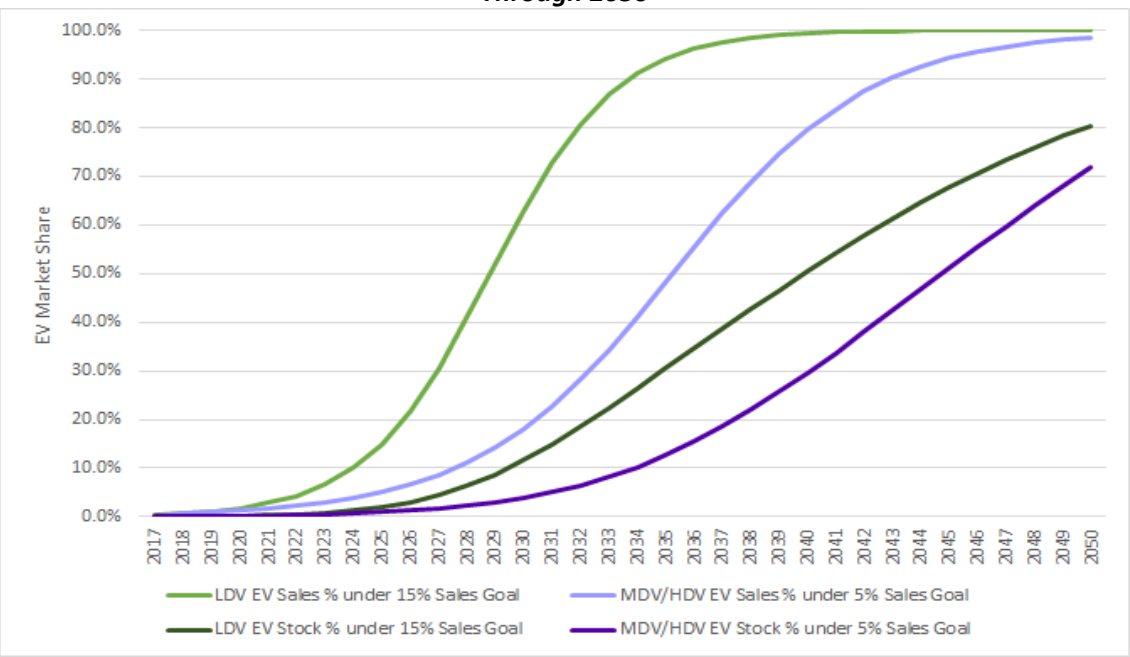
[45] *See* Appendix C, MDV and HDV Models.
[46] *See infra* Section VI-C, p. 38.
[47] Ben Haley, et al., Passenger Transportation Innovation Study, Risky Business, 8 (2016), http://riskybusiness.org/site/assets/uploads/sites/5/2016/10/Case-Study_-Passenger-Transportation-Innovation.pdf.

Figures 6 and 7: LDV EV market share versus LDV EV Stock under a 2025 15% sales goal and MDV-HDV EV Market Share versus MDV-HDV EV Stock under a 2025 5% sales goal, through 2025 and 2050.

Through 2025



Through 2050

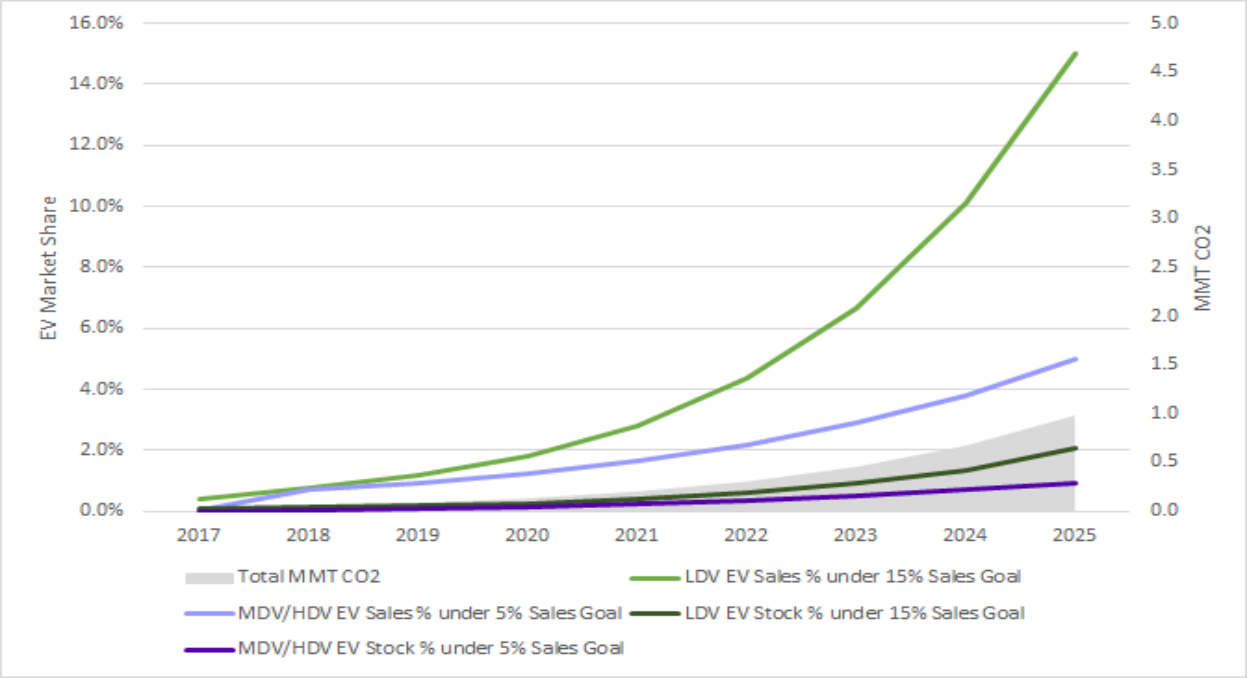


Naturally, given this lag in vehicle stock turnover, the percentage of GHG emission reductions from the transportation sector similarly lags behind the LDV EV sales rate. This is reflected in Figures 8 and 9 below, the EV-REDI model's comparison of: a) a 2025 15% LDV EV and 5% MDV/HDV EV sales rate scenario in North Carolina, versus; b) the percentage of EVs in the on-

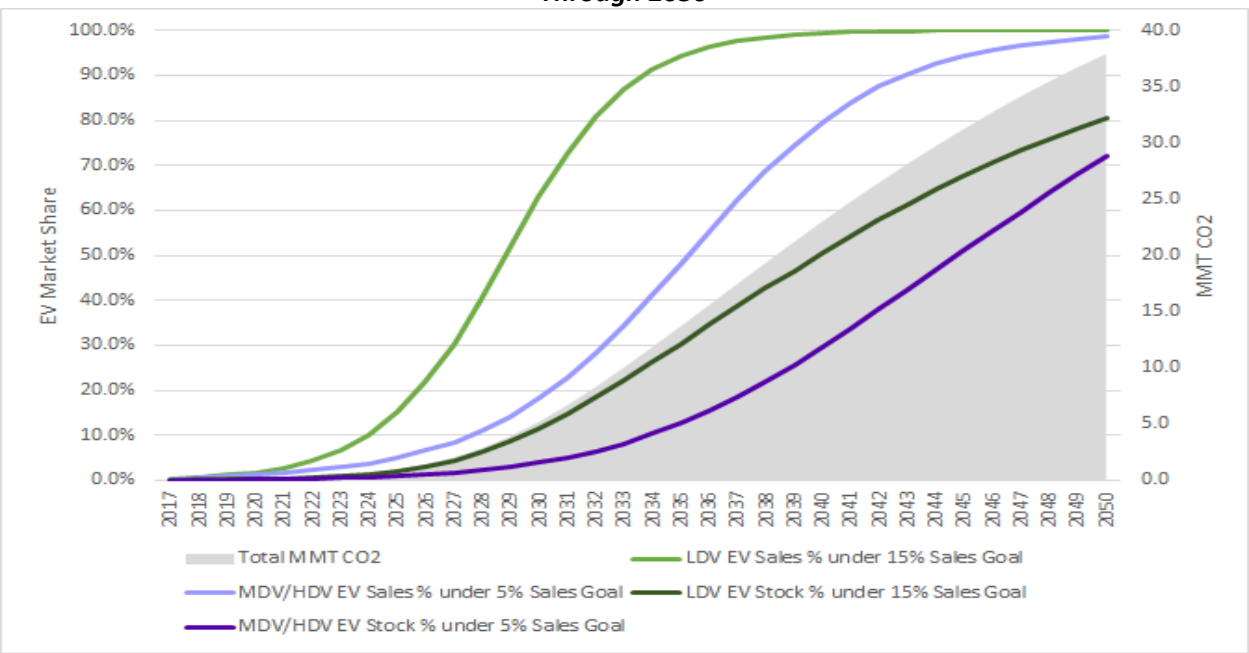
road vehicle stock in 2025 under that scenario, versus; c) GHG emissions reductions from electrification in 2025 under that scenario.

Figures 8 and 9: EV Stock and Sales Market Share for LDVs under a 15% sales goals and MDV/HDVs under a 5% sales goal by 2025, plotted against avoided CO_2 from these EV adoptions, through 2025 and 2050

Through 2025



Through 2050



NB: differences in Y-axes for Figure 8 and Figure 9.

There is an 8.5% gap – 13.0 MMT – between North Carolina's statewide business-as-usual 2025 GHG projections and EO 80's 40% GHG reduction goal by 2025. A 15% LDV EV sales goal and 5% MDV/HDV sales goal by 2025 would result in 0.98 MMT of avoided CO_2 in 2025.[48]

Figures 8 and 9 above demonstrate avoided CO_2 per year as a result of a 2025 15% LDV EV sales goal and 5% MDV/HDV sales goal. Cumulatively, realizing these targets would put North Carolina on a trajectory to achieve GHG emissions avoidances of 2.83 MMT from 2019 to 2025, 18.34 MMT through 2030, 165.56 MMT through 2040, and 482.98 MMT through 2050.

C. A 2025 15% LDV EV Sales Target and a 5% MDV-HDV EV Sales Target Would Keep Significant Amounts of North Carolina's Money In State Instead of Being Spent On Out of State Oil, Boosting North Carolina's Economy.

As noted above, North Carolina has no petroleum reserves, no petroleum extraction industry, and no petroleum refinery industry.[49] Spending North Carolina's money on oil—gasoline and diesel—is tantamount to handing it away to other states.

North Carolina consumers currently spend billions of dollars a year on gasoline that comes from out of state. In 2017, North Carolina's transportation sector consumed 108.4 million barrels of motor gasoline.[50] This translates to approximately $10.96 billion of motor gasoline expenditures by the transportation sector in 2017.[51]

Transportation electrification presents North Carolina with the opportunity to keep most of those funds in the state's economy, its businesses, and the pockets of its families. This is especially true as North Carolina's electricity grid decarbonizes and relies increasingly on in-state renewable resources. To be sure, the GHG Inventory reflects slightly declining transportation GHG emissions in the future (reflecting slightly declining oil use), but those projected declines are at great risk of being reversed as the U.S. Environmental Protection Agency ("EPA") and the National Highway Traffic Safety Administration work to roll back the existing fuel efficiency standards.

Meanwhile, vehicle miles traveled ("VMT") in North Carolina have been steadily increasing over recent decades, with 119 billion miles traveled in 2017 alone, which puts upwards pressure on oil use.[52] See Figure 11. Continued reliance on oil for transportation therefore presents North Carolina with a bleak future in which it continues to hand out tens of billions of dollars to other states for their oil.

---

[48] Calculation: According to EV-REDI's modeling, a 15% LDV EV sales goal and 5% MDV/HDV EV sales goal by 2025 would result in 0.98 MMT of avoided CO_2 in 2025. As established in previous sections, there is a gap of 13 MMT between North Carolina's statewide BAU GHG projections and the Order's 40% goal in 2025. (0.98 MMT/13.00 MMT)*100% = 7.5%

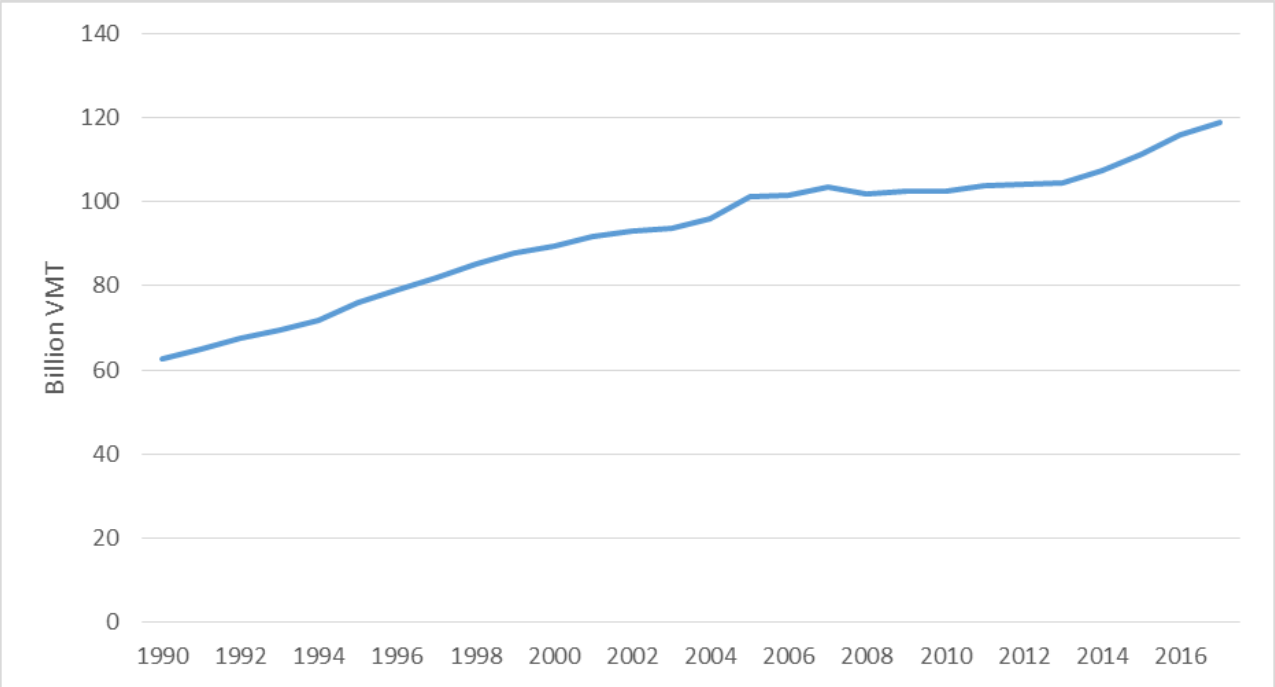
[49] United States Energy Information Administration, North Carolina State Energy Profile (2018), https://www.eia.gov/state/print.php?sid=NC.

[50] United States Energy Information Administration, State Energy Data System, Motor gasoline consumption, prices, and expenditures (2019), https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US#Petroleum.

[51] *Id.*

[52] Federal Highway Administration, Highway Statistics 2016: Annual Vehicle-Miles of Travel (2017), https://www.fhwa.dot.gov/policyinformation/statistics/2016/vm202.cfm.

Figure 10: Vehicle Miles Traveled for All Vehicle Types in North Carolina[53]



Adopting a 2025 15% LDV EV sales target—and achieving that target—will reverse what is a financial drain on North Carolina and deliver substantial financial benefits to North Carolina's economy. As the Figures 11 and 12 demonstrate, electrification of North Carolina's on-road transportation fleet (LDV, MDV, and HDV) will result in a tremendous reduction in oil demand—over 100 million gallons of motor fuel in 2025 alone, and nearly 600 million gallons of motor fuel in 2030 alone. These reductions continue to escalate thereafter, and are projected to exceed 2.5 billion gallons in calendar year 2040.[54]

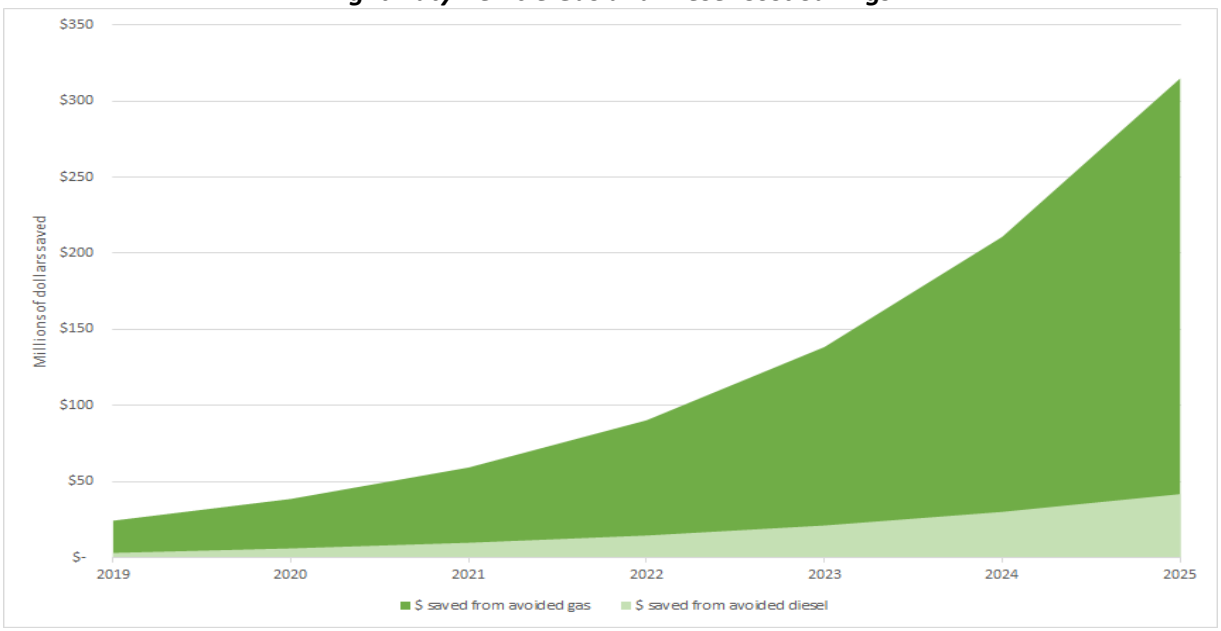
The economic ramifications of electrifying North Carolina's on-road vehicle fleet are massive. If a 15% LDV EV sales rate and 5% MDV/HDV EV sales rate were achieved in 2025, in that year alone, when just 2% of total vehicles (LDV, MDV, HDV) on the road are EVs, EV-REDI projects North Carolina would save $357 million in gasoline and diesel costs (at $3.16 per gallon for gasoline and $3.41 per gallon for diesel, according to EIA's price projections[55]). Cumulatively, between 2019 and 2025, that would amount to just over $1 billion dollars in diesel and gas savings that would not be sent out of state ($876 million from gasoline, $126 million from diesel). By 2040, the savings balloon: $8 billion dollars not being sent out of state to purchase diesel and gas in 2040 alone. Cumulatively, between 2019 and 2040, North Carolina will save

[53] *See id.* (data); graph generated by Sierra Club.
[54] EV-REDI, Avoided Fuel Consumption.
[55] United States Energy Information Administration, Annual Energy Outlook 2019, Components of selected petroleum product prices, Region: South Atlantic (2019), https://www.eia.gov/outlooks/aeo/data/browser/#/?id=70-AEO2019&region=1-5&cases=ref2019.

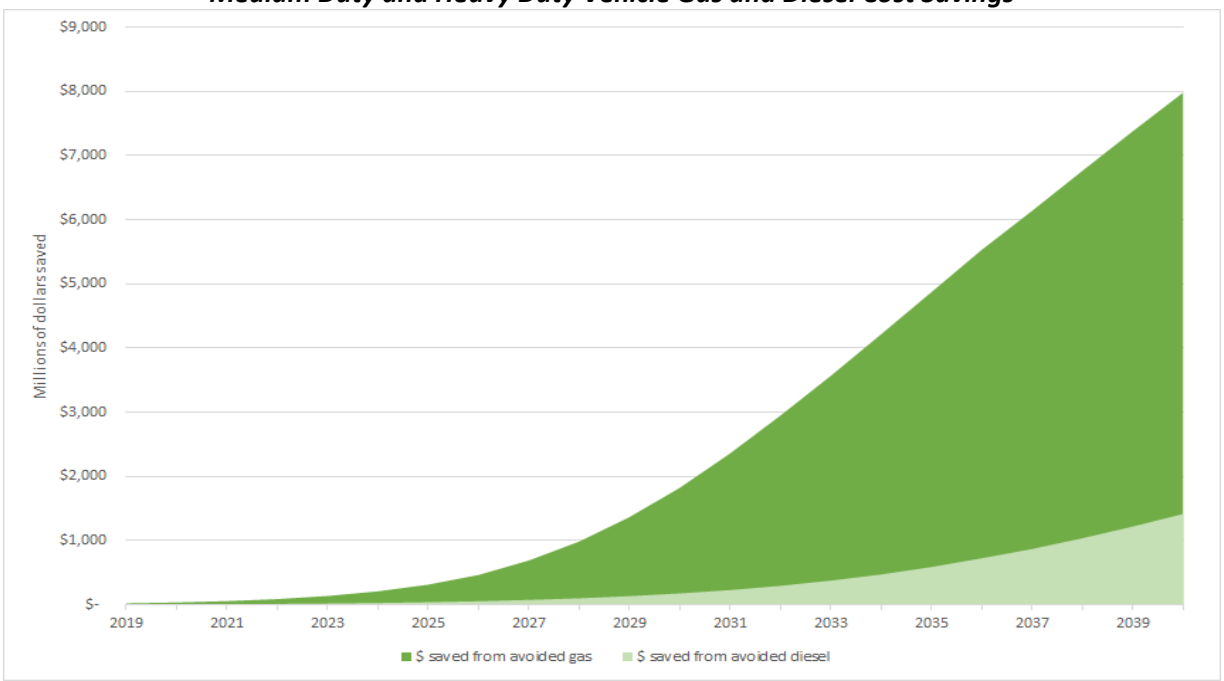
$65,910,082,287 from being spent on out of state gasoline and diesel ($57,988,659,007 gasoline, $7,921,423,280 diesel).

Figures 11 and 12: Millions of dollars saved from avoided gas and diesel under a 2025 15% LDV EV and 5% MDV-HDV EV sales target.

Light Duty Vehicle Gas and Diesel Cost Savings



Medium Duty and Heavy Duty Vehicle Gas and Diesel Cost Savings



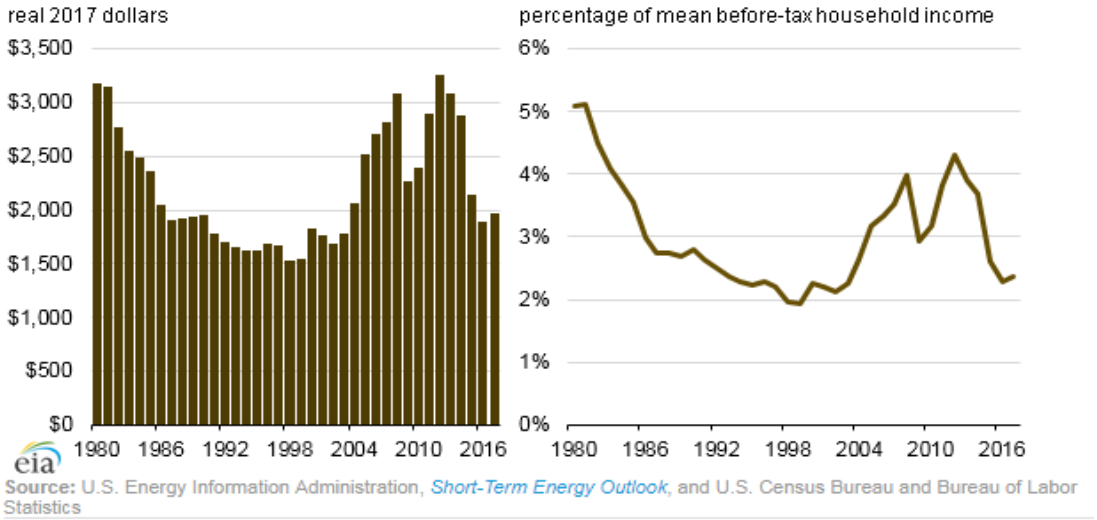
D. A 2025 15% LDV EV Sales Target Promises Fuel Savings and Fuel Price Stability for North Carolina's Families.

North Carolina's families carry a significant financial burden as a result of out-of-pocket expenses for gas and diesel. In 2017, the median household income in North Carolina was $52,752. 81% of North Carolinians drive alone to work, with the average commute approaching 25 minutes.[56] Only 8.9% of people carpool to work and less than 1% of people take public transit to work. [57] The typical family has 2 cars per household, and the average age of a North Carolina vehicle is 12 years,[58] meaning they are less efficient than more recent models.

Nearly one-fifth of the average U.S. household's total family expenditures are on transportation.[59] According to the EIA, in 2017, the average U.S. household expenditure on vehicle fuel was projected to be $1,977, or approximately 2.4% of mean incomes of households, and more recent projections put the expenditure at $1,991 for 2019.[60]

In addition, as reflected in EIA's graph below, the amount a family must spend on fuel is highly volatile. In the last decade, it has recently exceeded $3,000, or 4%, of the average family's budget, using gasoline as a benchmark.

Figure 13: Average household spending on gasoline (1980-2017)



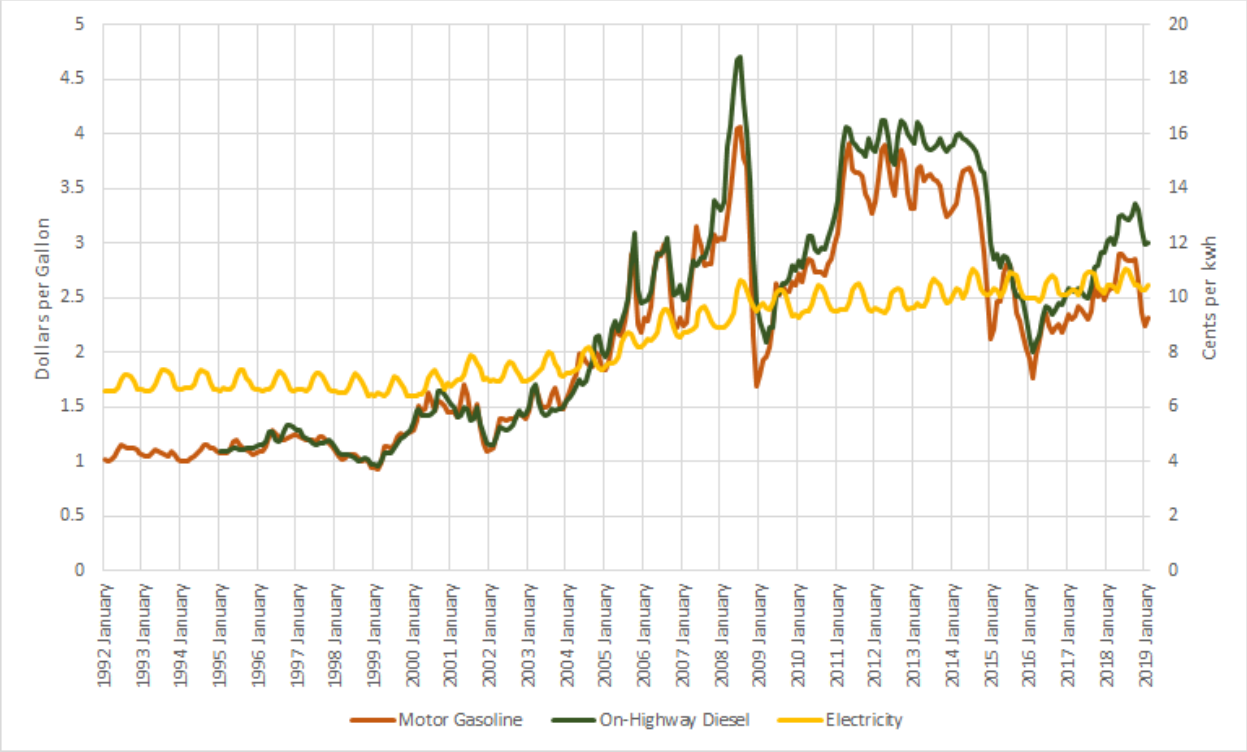
EVs offer North Carolina's families a means to escape this burden. According to the U.S. Department of Energy, on average it costs about half as much to drive an electric vehicle

[56] Data USA, North Carolina State Profile (2017), https://datausa.io/profile/geo/north-carolina.
[57] *Id.*
[58] Auto Alliance, In Your State (2018), https://autoalliance.org/in-your-state/NC/.
[59] U.S. Department of Energy, eGallon: Compare the costs of driving with electricity (2019), https://www.energy.gov/eere/electricvehicles/saving-fuel-and-vehicle-costs.
[60] United States Energy Information Administration, U.S. Household Spending for Gasoline is Expected to Remain Below $2,000 in 2017 (2017), https://www.eia.gov/todayinenergy/detail.php?id=33232; Patrick DeHaan & Dan McTeague, Fuel Price Outlook 2019, Gasbuddy, 7 (2019), https://blog-content.gasbuddy.com/uploads/2018/12/2019fueloutlookvUSvF.pdf.

compared to an ICE vehicle, in terms of charging versus traditional fueling costs.[61] In North Carolina, DOE calculates the cost of an eGallon (the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline) at just $1.06, as compared to $2.63 per gallon for regular gasoline in the state (as of May 18, 2019).[62]

Moreover, electricity prices are not nearly as volatile as the price of gasoline or diesel. As can be seen in Figure 14 below, retail electricity prices fluctuate seasonally within a comparatively stable range, whereas gasoline and diesel prices fluctuate dramatically year to year and vary greatly over decades, thereby making expenditures much less predictable.

Figure 14: National Retail Price Fluctuation: Electricity, Motor Gasoline and On-Highway Diesel



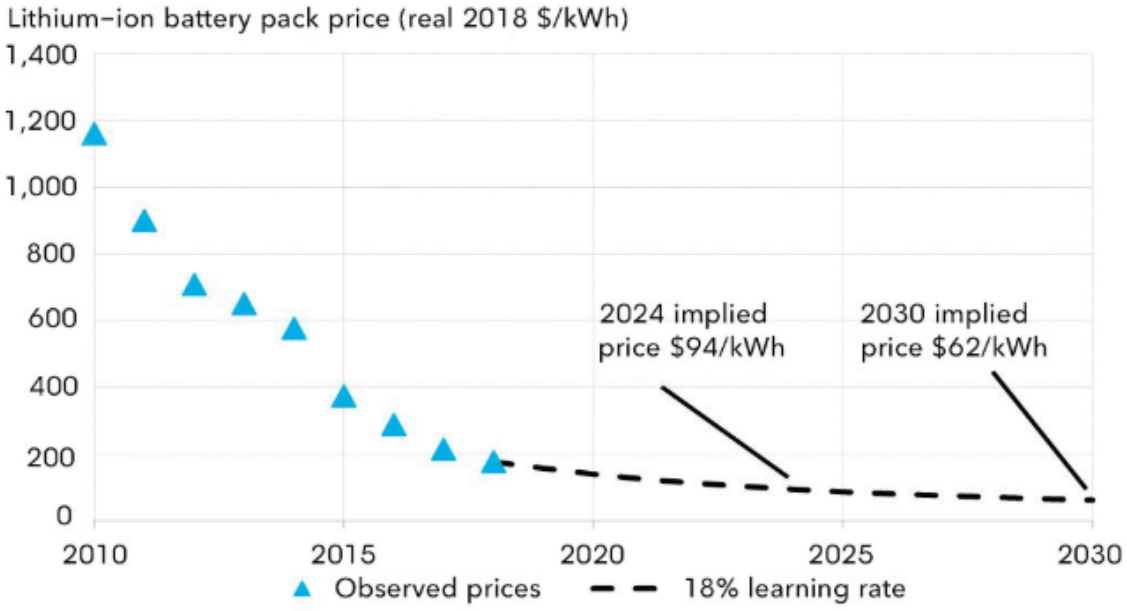
NB: The left Y-axis is dollars per gallon and refers to the retail prices of motor gasoline and on-highway diesel. The right Y-axis is the price of electricity.[63]

Although the up-front cost of EVs are currently higher than that of similar internal combustion engines, federal rebates of up to $7,500 per EV substantially reduce the price premium. As

[61] United States Department of Energy, eGallon: Compare the costs of driving with electricity (2019), https://www.energy.gov/eere/electricvehicles/saving-fuel-and-vehicle-costs.
[62] *Id.*
[63] Table generated from data sourced from the United States Energy Information Administration, Retail Motor Gasoline and On-Highway Diesel Fuel Prices, and Average Retail Prices of Electricity from EIA's Monthly Energy Review, https://www.eia.gov/totalenergy/data/monthly/. Note: difference in Y-axes; prices are not adjusted for inflation; prices include taxes; "Motor Gasoline" refers to EIA's "Regular Motor Gasoline, All Areas;" "Electricity" refers to EIA's "Average Retail Price of Electricity, Total" from all sectors (residential, commercial, industrial, and transportation).

discussed below, North Carolina could also join the long list of states that offer an additional EV purchase incentive rebate to augment the federal EV rebates. And the cost of EV batteries—the cost driver of EVs to date—have been and are expected to continue rapidly declining.

Figure 15: Lithium-ion battery price outlook[64]



Source: BloombergNEF

Up front purchase price parity between EVs and ICEs is expected to be reached when the cost of batteries falls to $100/kwh.[65] While this is expected to occur at some point before 2025 using an industry wide average, far more aggressive price reductions are already being achieved and are projected to be achieved before then.[66]

Moreover, even today, with today's higher upfront costs of EVs, the total cost of ownership for an EV is often below that of an ICE because of lower fuel and maintenance costs, with studies

---

[64] Logan Goldie-Scot, A Behind the Scenes Take on Lithium-ion Battery Prices, BloombergNEF (2019), https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/.

[65] David R. Baker, Electric Vehicles May Challenge Gas Cars Sooner Than Expected, Bloomberg Environment (2018), https://news.bloombergenvironment.com/environment-and-energy/electric-vehicles-may-challenge-gas-cars-sooner-than-expected; *See* Appendix C, Sales, Stock, and Models.
Damien Ma & Neil Thomas, China Is Building the Batteries of the Future, Foreign Policy, (2019), https://foreignpolicy.com/2019/04/02/china-is-building-the-batteries-of-the-future-tesla-li-ion/; Maximillian Holland, $100/kWh Tesla Battery Cells This Year, $100/kWh Tesla Battery Packs In 2020, Clean Technica (2018), https://cleantechnica.com/2018/06/09/100-kwh-tesla-battery-cells-this-year-100-kwh-tesla-battery-packs-in-2020/.

[66] Nathaniel Bullard, Electric Car Price Tag Shrinks Along with Battery Cost, Bloomberg Opinion (2019), https://www.bloomberg.com/opinion/articles/2019-04-12/electric-vehicle-battery-shrinks-and-so-does-the-total-cost; Garreth Roberts, Deloitte Predicts Electric Price Parity by 2024, Fleet News (2019), https://www.fleetnews.co.uk/news/environment/2019/01/21/deloitte-predicts-electric-vehicle-price-parity-by-2024. *See* Appendix C, Sales, Stock, and Models.

showing that the total cost of ownership of EVs is continually falling.[67] Furthermore, significant savings can be gained by strategic "time-of-use" charging, which means choosing to charge an EV during lower-cost, off-peak periods, such as late at night or early in the morning.[68]

V. North Carolina Should Adopt Supportive EV Policies to Encourage EV Automotive Industry Investment in North Carolina.

North Carolina can encourage the emerging EV/energy storage industry to invest in North Carolina and generate in-state jobs and revenue by adopting strong EV targets and supportive policies. North Carolina need look no further than its own renewable energy sector to realize the economic benefits of helping to grow an in-state clean energy industry.

North Carolina has supported the in-state renewable energy industry through supportive policies such as North Carolina's Renewable Energy and Energy Efficiency Portfolio Standards, North Carolina's Public Utility Regulatory Policies Act, tax credits for solar investments, the recent 2017 solar leasing legislation, and other strong state policy and regulatory support. As a result, North Carolina has seen the clean energy industry emerge as a strong and growing part of its economy. This is clearly demonstrated by North Carolina's Solar Energy Association March 2019 Report's statistics on the industry's in-state strength and growth:

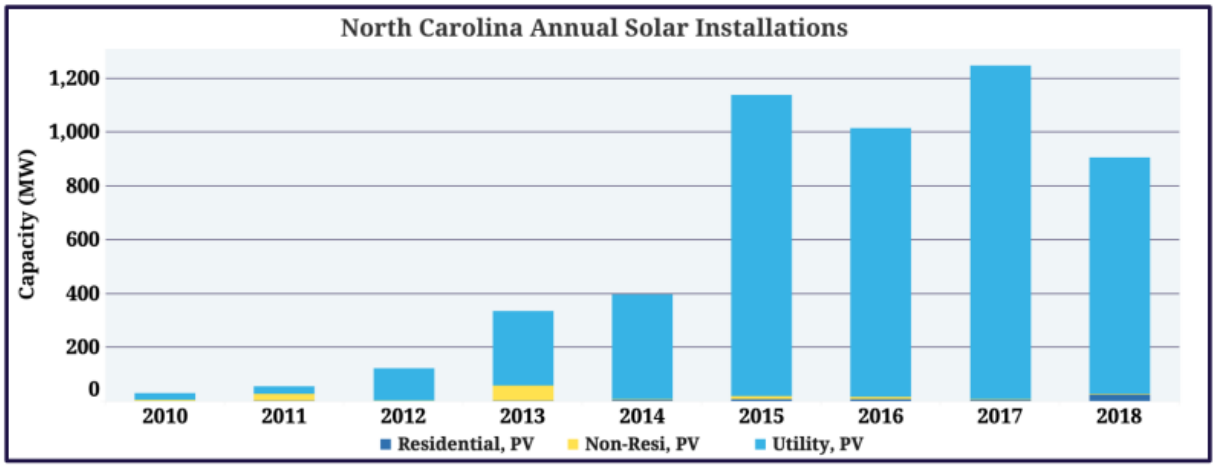
- Solar Installed: 5,260.6 MW (906.9 MW in 2018)
- Enough Solar Installed to Power: 635,000 homes
- National Ranking: 3rd in 2018
- Percentage of State's Electricity from Solar: 5.37%
- Solar Jobs and Ranking: 6,719 (9th in 2018)
- NC Solar Companies: 287 companies, 45 Manufacturers, 129 Installers, 113 Others
- Total Solar Investment in State: $7.75 billion ($967.45 million in 2018)
- Price Declines: 47% over the last 5 years
- Growth Projections and Ranking: 3,939 MW over the next 5 years (ranks 4th)[69]

Moreover, while the renewable energy industry's growth in North Carolina ebbs and flows, it has seen a strong and overall positive growth over time.

---

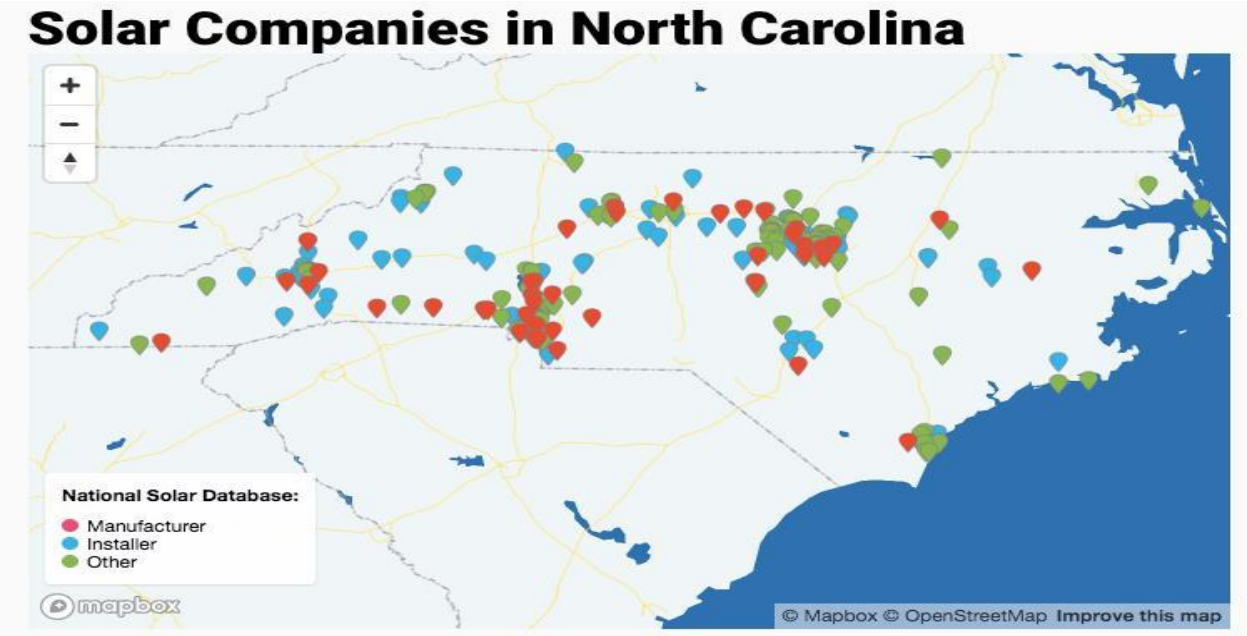
[67] Kate Palmer, Total cost of ownership and market share for hybrid and electric vehicles in the UK, US and Japan, Applied Energy, 108-119 (2018), https://www.sciencedirect.com/science/article/pii/S030626191731526X?via%3Dihub.
[68] Union of Concerned Scientists, Going from Pump to Plug (2017), https://www.ucsusa.org/sites/default/files/attach/2017/11/cv-report-ev-savings.pdf.
[69] Solar Energy Industries Association, Solar Spotlight—North Carolina (2019), https://www.seia.org/sites/default/files/2019-03/Federal_2019Q1_North%20Carolina.pdf.

Figure 16: North Carolina Annual Solar Installations[70]



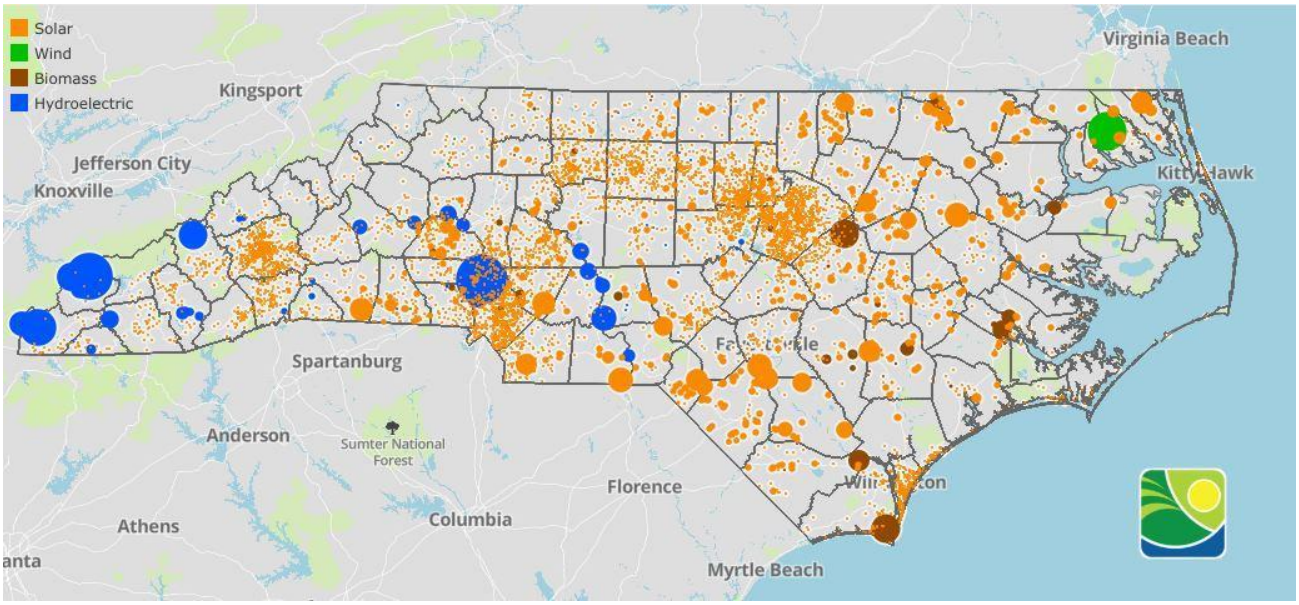
Moreover, the solar industry has invested across the state, in rural and urban/suburban areas.

Figure 17: Solar Companies in North Carolina[71]



[70] Solar Energy Industries Association, Solar Spotlight—North Carolina (2019), https://www.seia.org/sites/default/files/2019-03/Federal_2019Q1_North%20Carolina.pdf.
[71] *Id.*

Figure 18: Installed Renewable Energy Systems in North Carolina[72]



North Carolina has a similar opportunity to attract the EV/energy storage industry to the state by adopting strong and supportive policies,[73] but it has been hostile to date—with limits on VW expenditures[74] and EV fees—and it is being rapidly outpaced by other Southeastern states. A few recent highlights make clear the significant economic growth that EVs and the broader clean energy economy hold for Southeastern states:

- In Tennessee, Volkswagen is investing $800 million in factories to build EVs in Chattanooga and adding 1,000 jobs;[75]
- In Georgia, SK Innovation has committed to investing $1.67 billion dollars to build an EV battery plant that is expected to employ 2,000 workers (quoting SK Group Executive Vice Chairman Jaewon Chey as stating "Georgia will be the center of the

[72] North Carolina Sustainable Energy Association, Custom Maps (2019), https://energync.org/maps/.
[73] Gavin Bade, 10 trends shaping the electric power sector in 201", Utility Dive (2019), https://www.utilitydive.com/news/10-trends-shaping-the-electric-power-sector-in-2019/545119/; James Ellsmoor, 6 Renewable Energy Trends To Watch In 2019, Forbes (2018), https://www.forbes.com/sites/jamesellsmoor/2018/12/30/6-renewable-energy-trends-to-watch-in-2019/#403e37e44a1f; Loren McDonald, Forecast: 2019 US EV Sales Growth Will Drop To ~12%, Clean Technica, (2019), https://cleantechnica.com/2019/01/20/forecast-2019-us-ev-sales-growth-will-drop-to-12/.
[74] In 2016 and 2017, EPA and Volkswagen signed three partial consent decrees after EPA discovered that VW had secretly installed device defeaters designed to thwart emissions regulations by changing vehicle performance in order to pass emissions tests. The consent decrees established a $2.925 billion Environmental Mitigation Trust, of which approximately $92 million was allocated to North Carolina, to counter the excess emissions.
[75] Volkswagen, Press Release, Volkswagen Chooses Chattanooga for U.S. Electric-Vehicle Production (2019), https://media.vw.com/releases/1117; Larry Vellequette, VW plans $800 million EV plant in Tenn.; will add 1,000 jobs, Automotive News (2019), https://www.autonews.com/manufacturing/vw-plans-800-million-ev-plant-tenn-will-add-1000-jobs.

battery industry for electric vehicles")[76]—and SK Innovation is now considering a massive expansion in Georgia to over $5 billion;[77]

- Georgia is also home to Blue Bird, a bus manufacturer that is now developing electric school buses ("We are excited to see Blue Bird develop this new technology here in Georgia," said Gov. Deal);[78]
- Florida is drawing high-tech battery production and distribution;[79]
- South Carolina's BMW factory was producing EVs even in 2017, and BMW plans to continue expanding beyond 2019;[80]
- South Carolina is also home to Proterra, a leading electric bus manufacturer;[81]
- Virginia has added "green" battery manufacturing capacity;[82]
- Alabama is benefitting from Mercedes-Benz's $1 billion investment to build an electric SUV at its Tuscaloosa plant,[83] and Toyota and Mazda recently committed to a massive new EV factory, which North Carolina competed for but lost.[84]

Unfortunately, North Carolina has been almost entirely absent from this new EV/energy storage boom. As shown above, states like Georgia, Tennessee, South Carolina, and Alabama have been successfully courting auto-manufacturers and luring EV manufacturing capacity to their states. North Carolina should fully embrace the electrification of transportation if it wants to remain

---

[76] Scott Trubey, Jobs coming to Georgia as massive battery factory breaks *ground*, Atlanta Journal-Constitution (Mar. 19, 2019), https://www.ajc.com/news/georgia-breaks-ground-biggest-economic-development-deal-decade/z7K1nC1N0PdF3ZjfEcyS5I/; Steve Hanley, SK Innovation Commits To Battery Manufacturing Plant In Georgia, Clean Technica, (Dec. 6, 2018), https://cleantechnica.com/2018/12/06/sk-innovation-commits-to-battery-manufacturing-plant-in-georgia/.

[77] Megan Reed, *Another $5 billion on the table from SK Innovation in Jackson County*, Gainesville Times, (Jan. 4, 2019), https://www.gainesvilletimes.com/news/another-5-billion-table-after-sk-innovation-announced-move-jackson-county/.

[78] Blue Bird, Press Release, Blue Bird Awarded $4.4 Million to Develop Electric School Bus (2017), https://www.blue-bird.com/about-us/press-releases/138-blue-bird-awarded-4-4-million-to-develop-electric-school-bus.

[79] Richard Danielson, *Battery maker to move headquarters from Alabama to Tampa*, Tampa Bay Times, (May 17, 2018). https://www.tampabay.com/news/business/corporate/Battery-maker-to-move-headquarters-from-Alabama-to-Tampa_168329039; RP News Wires, Saft breaks ground for lithium-ion battery plant in Florida, Reliable Plant (2011), https://www.reliableplant.com/Read/23586/Saft-battery-plant-Florida.

[80] Anna Mitchell, *BMW electric vehicles hit 100,000 mark*, Greenville News, (Dec. 19, 2017), https://www.greenvilleonline.com/story/money/2017/12/19/bmw-electric-vehicles-hit-100-000-mark/964060001/; Associated Press, *BMW says no change in South Carolina expansion plans*, Boston Globe Media, (July 12, 2018), https://www.boston.com/cars/car-news/2018/07/12/bmw-south-carolina-expansion-plans.

[81] Proterra, Proterra Locations, https://www.proterra.com/our-story/our-locations/ (last visited June 19, 2019).

[82] Stacy Parker, '*Green' battery maker to buy Owl's Creek Golf course land and receive $1.8M from Virginia Beach*, The Virginian Pilot (Dec. 19, 2017), https://pilotonline.com/business/jobs/article_b8d16899-46a4-56db-870e-16180ac4e67c.html.

[83] Daimler, Global Electric Offensive: Mercedes-Benz invests $1 billion in Tuscaloosa, creates 600 jobs, https://www.daimler.com/company/locations/tuscaloosa/ (last visited June 19, 2019).

[84] Rob Stumpf, Mazda and Toyota's $1.6 Billion Manufacturing Plant to be Built in Alabama: Report ,The Drive, (Jan. 11, 2018), http://www.thedrive.com/sheetmetal/17539/mazda-and-toyotas-1-6-billion-manufacturing-plant-to-be-built-in-alabama-reportl; Craig Jarvis, *North Carolina offered $1.5 billion. Toyota-Mazda said no thanks*, News and Observer (Jan. 10, 2018), https://www.newsobserver.com/news/business/article194037469.html.

competitive in this emerging industry in the twenty-first century. All signs point to a future with fundamentally different sources of energy and transportation power. North Carolina should be seizing this unique moment and capitalizing on opportunities to build EVs and their necessary components in-state by adopting policies favorable to EVs.

VI. North Carolina Needs to Develop Strongly Supportive EV Policies to Lower Its Carbon Emissions and Seize a Unique Opportunity to Expand the State's Economy and Its Citizens' Finances.

North Carolina can and should adopt policies that will accelerate the transition to EVs and the environmental and economic dividends it will deliver. Successful policies will address the most significant remaining speed bumps to rapid EV adoption. The first speed bump is the higher upfront purchase price for EVs (and the resulting limited, though expanding, types of EV models available). The higher upfront cost can be reduced through policies that: a) immediately reduce the costs of EVs such as rebates and tax credits; and b) drive long term price reductions by accelerating sales and achieving economies of scale earlier, such as government fleet mandates, purchase incentives, and following California's Zero Emissions Vehicle ("ZEV") program. The second speed bump is the dearth of charging infrastructure, which can be addressed through policies that encourage investment in the infrastructure. The third speed bump is simply the lack of public awareness of EVs and their benefits, which can be addressed through policies that expand the number of EVs on the road, as well as specifically targeted public education efforts.

States across the country are adopting policies to address these speed bumps and accelerate transportation electrification. These policies include, but are not limited to, establishing state vehicle fleet EV purchase mandates; encouraging political subdivisions to similarly prioritize EV purchases; adopting policies that increase the convenience of EVs such as allowing EV use of HOV lanes or parking benefits; adopting the California fuel efficiency standards;[85] adopting EV purchase incentive rebates and tax credits and a zero tax policy on used EVs; allocating VW funds to advance electrification; encouraging and supporting prudent utility investment in charging infrastructure; and creating a high level team within an administration or state agency to provide advice to public and private entities on how to cost-effectively electrify their fleets.

The success of these policies requires they be centered on equity and ensure that those communities disproportionately impacted by environmental and economic impacts be the first to see those impacts mitigated, and the first to start seeing the environmental and economic dividends from the clean energy transition. As discussed in subsection A below, incorporating

[85] The Clean Air Act gives California a waiver to implement stricter air quality standards than those imposed by the federal government. In 2008, the EPA granted California a waiver of Clean Air Act preemption for GHG emissions. Other states may follow California emission standards or the federal limits. U.S. EPA, California Greenhouse Gas Waiver Request (2018), https://www.epa.gov/regulations-emissions-vehicles-and-engines/california-greenhouse-gas-waiver-request.

equity elements at the outset is easy to do and will drive real, lasting benefits to communities that are currently underserved and overburdened.

A. North Carolina Should Center Transportation Electrification/GHG Emission Reduction Policies Around Equitable Principles to Secure Public Health Pollutant Reductions, and Economic Opportunities, In Disadvantaged and Overburdened Environmental Justice Communities.

All of North Carolina will benefit from the transition to a clean energy economy and an electrified transportation sector. Ensuring that those benefits accrue at the outset to those communities most burdened by pollution will ensure that overburdened communities are no longer overlooked. Similarly, ensuring at the outset that economic benefits flow to disadvantaged communities will ensure that they share in the economic dividends the clean energy transition will bring.

Disadvantaged communities are those most burdened by pollution from multiple sources and most vulnerable to its effects, taking into account socioeconomic characteristics and underlying health status. As a first step toward developing and implementing equitable policies for transportation electrification and greenhouse gas reduction, North Carolina's Department of Environmental Quality could use its Community Mapping System along with EJ Screen, an EPA mapping tool,[86] to produce maps that provide transparency regarding their geographic locations.[87] North Carolina should consider as a model the definition of disadvantaged communities applied by the California Environmental Protection Agency, which screens all communities by census tract for multiple indicators and designates as disadvantaged those that scored at or above the 75th percentile.

To assure that overburdened and disadvantaged communities are recognized and supported as active participants in the development of mobility policies that include electrification of transportation, North Carolina should apply the Mobility Equity Framework in consultation with the NC DEQ Environmental Justice and Equity Advisory Board.[88] The process begins with a community needs assessment to ensure that implementation of the state's energy policies for transportation incorporate the views and voices of communiteis affected by environmental injustice from the beginning. The Mobility Equity Framework also outlines a dozen equity indicators in the categories of access to mobility, reduction of air pollution, and enhancement of economic opportunity. North Carolina can use these indicators to assess policy options in the

[86] U.S. Environmental Protection Agency, EJ Screen. https://www.epa.gov/ejscreen (last visited August 19, 2019).
[87] NC Department of Environmental Quality, Community Mapping System. https://deq.nc.gov/outreach-education/environmental-justice/deq-north-carolina-community-mapping-system (last visited August 19, 2019).
[88] NC Department of Environmental Quality, Environmental Justice and Equity Advisory Board. https://deq.nc.gov/outreach-education/environmental-justice/secretarys-environmental-justice-and-equity-board (last visited August 19, 2019).
Greenlining Institute, Mobility Equity Framework, 2018. http://greenlining.org/wp-content/uploads/2018/03/Mobility-Equity-Framework-Final.pdf (last visited August 19, 2019)

implementation of EO 80 at a community level in direct consultation with overburdened and disadvantaged communities.

To center transportation electrification around equity, North Carolina should prioritize support for the electrification of public transit busses and school bus routes. As discussed in Section VI(D) below, public transit buses provide one of the most cost effective emission reduction opportunities in the state's economy. It has long been recognized that school bus fleets expose children to levels of pollution that affect their cognitive development.[89] Cleaning up pollution from public fleets is an important way to both lead by example and ensure that communities facing the greatest environmental hazards benefit first from investments in clean transportation. The upfront purchase cost for electric buses is a pervasive barrier for municipal agencies and school districts responsible for managing transit bus fleets and school bus fleets, and this is especially true in disadvantaged communities. Following the recent announcement by Dominion Energy and Virginia Governor Ralph Northam, establishing a Dominion program for the utility to cover the up-front price difference between electric school buses and those with internal combustion engines, North Carolina should work with utilities to make investments through inclusive financing solutions that do not add to the debt burden of agencies that serve disadvantaged communities.[90]

The state should also seek opportunities to locate public charging stations in disadvantaged communities. Ensuring that public charging stations will be available in disadvantaged communities will clear a key barrier to adoption, which will result in better local air quality and public health in these neighborhoods. The public charging stations will also enhance awareness of EVs, and increase the likelihood that North Carolinians without a dedicated off-street parking spot would purchase an EV, knowing that it could be charged locally.

Additionally, as new jobs are created in the field of electrifying the transportation sector, investing in workforce development in these communities is important. North Carolina should assess the training programs that are already available to residents of communities identified for priority attention through the NC's Community Mapping System, and develop a plan to expand those avenues to economic opportunity.

Similarly, in developing EV rebates, North Carolina could look to Oregon's model of taxpayer-funded rebates of $1,250 - $2,500 for low- and moderate-income households buying or leasing new or used ZEVs, provided the households voluntarily retire or scrap vehicles that are at least twenty years old.[91] The emerging secondary market for essentially the first generation of used EVs provides states like North Carolina with the opportunity to incentivize moderate-to-lower income prospective car buyers to purchase a used EV rather than a used ICE vehicle, or to trade

[89] Environment and Human Health, Inc. Children's Exposure to Diesel Exhaust on School Buses. 2002. https://www.ehhi.org/reports/diesel/dieselintro.pdf (last accessed on August 19, 2019)
[90] Betsy Lillian, Dominion Energy Virginia Launches Electric School Bus Program, NGT News (Aug. 30, 2019) https://ngtnews.com/dominion-energy-virginia-launches-electric-school-bus-program (last visited Sept. 3, 2019).
[91] State of Oregon, Requirements for Charge Ahead Applicants, https://www.oregon.gov/deq/aq/programs/Pages/Charge-Ahead-Rebate.aspx (last visited June 19, 2019).

in an older model ICE vehicle for a used EV. Like Oregon, Washington is in the process of rolling out a program aimed at low-income residents and recently authorized a pilot program to provide incentives for low-income communities, determine appropriate eligibility requirements, and provide grant funding to successful models.[92] California, Washington, and Oregon are developing shared mobility options for these communities as well.[93] While this is not an exhaustive list of ways to center the clean energy transition around equitable principles, it nonetheless provides a useful set of starting points for North Carolina's policy considerations. Use of the Mobility Equity Framework will ensure that members of disadvantaged communities are both at the table and on the forefront as new policies are developed.

B. North Carolina's Executive Branch Should Clarify, Strengthen, and Enforce Mandates That State Government Agencies Electrify Their Fleets to Reduce Emissions, Save Money, and Keep Money In North Carolina.

North Carolina's state government can use its purchasing power to begin saving money and reducing GHG and other emissions by mandating that state government agencies purchase EVs unless there are no equivalent EV models on the market. North Carolina already has an Alternative Fuel Vehicle ("AFV") Acquisition Goal in place. In 2004, North Carolina established a goal that at least 75% of new or replacement state government light-duty cars and trucks with a gross vehicle weight rating of 8,500 pounds or less be AFVs or low emission vehicles.[94] This is similar to Rhode Island's Executive Order 05-13, which requires at least 75% of state motor vehicles to be AFVs, and the remaining 25% must be hybrid electric vehicles ("HEVs") to the greatest extent possible.[95] Moreover, by 2025, Rhode Island's Executive Order 15-17 requires that 25% of new state light-duty motor vehicles must be ZEVs.[96] Likewise, Massachusetts requires newly purchased state fleet vehicles to consist of HEVs or AFVs to the maximum extent feasible: HEVs and AFVs must be acquired at a rate of at least 5% annually for all new motor vehicle purchases so that not less than 50% of state vehicles will be HEVs or AFVs by 2018.[97]

However, North Carolina has not succeeded in meeting its statutory goals. Despite North Carolina's 2004-era acquisition goal of at least 75% of new or replacement state government light-duty vehicles, North Carolina has failed to achieve a significant reduction of gasoline powered vehicles in the government fleet. All told, North Carolina's vehicle fleet has nearly 7,000 vehicles, but only 14 are EVs and 4 are gas/electric hybrids. The remaining vehicles are

[92] Washington State H.B. 2042, Sec. 17 (2019), http://lawfilesext.leg.wa.gov/biennium/2019-20/Pdf/Bills/House%20Bills/2042-S2.E.pdf#page=1.
[93] U.S. Department of Transportation: Federal Highway Administration, Shared Mobility: Current Practices and Guiding Principles, https://ops.fhwa.dot.gov/publications/fhwahop16022/ch5.htm (last visited June 19, 2019).
[94] North Carolina Stat. § 143-215.107C (2017).
[95] Governor Gina Raimondo, Rhode Island Exec. Order No. 15-17, State Agencies to Lead by Example in Energy Efficiency and Clean Energy (2015), http://www.energy.ri.gov/documents/leadbyexample/ExecOrder15-17.pdf.
[96] Governor Donald Carcieri, Rhode Island Exec. Order No. 05-13, Green and Clean State Vehicles, Gov., (2005), https://afdc.energy.gov/files/pdfs/Exec_order_5_13_green_clean_vehicles.pdf.
[97] Commonwealth of Massachusetts Gen. Laws ch. 7 § 9A, https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter7/Section9A; Governor William Weld, Massachusetts Executive Order 388, Clean Alternative Fuel for the Massachusetts Fleet (1996), https://www.mass.gov/files/documents/2016/08/xx/eo388.txt.

gasoline fueled.[98] Notably, the majority of these vehicle purchases were since 2014, when numerous hybrids and EVs were on the market.[99]

North Carolina should strengthen these goals, specifically target EVs, and establish clear mandates. In order to meet its EV adoption goals, North Carolina should *require* that all new light-duty vehicle purchases in state government fleets be fully electric, with a narrow exception limited to instances when there are no comparable EV models on the market yet, and the exceptions should be capped at a low percentage of the total fleet purchases, such as 15% of annual purchases. Similarly, North Carolina should require state agencies to update their petroleum displacement plans, as required by the Alternative Fuel Use and Fuel-Efficient Vehicle requirements. More specifically, state-owned vehicle fleet managers should be required to implement petroleum displacement plans that incorporate the increased use of EVs.

Taking steps to require North Carolina's state-owned fleet to electrify will pay financial dividends back to the state and its taxpayers. Governments that are electrifying their fleet are reaping large emissions reduction benefits and saving money. For example, earlier this year New York City released a report documenting large savings on maintenance on its EVs compared to its internal combustion or hybrid vehicles, reaching into the thousands of dollars per year per vehicle at times.[100] This is reflected in the following table, and notably does not incorporate fuel savings.

Table 3: NYC Fleet - Saving Maintenance Costs with Electric Vehicles

NYC Fleet
Saving Maintenance Costs with Electric Vehicles

Vehicle Model	System	Number	2018 Maintenance Cost
Bolt	All electric BEV	93	$204.86
Focus	Gas	11	$1,805.24
Focus Electric	All electric BEV	7	$386.31
Fusion	Gas	62	$1,621.34
Fusion Energi	Hybrid Gas/Electric Plug in	154	$496.73
Fusion hybrid	Hybrid Gas/Electric	205	$1,310.89
Leaf	All electric BEV	149	$344.14
Prius	Hybrid Gas/Electric	1,131	$893.31
Taurus	Gas	38	$922.67
Volt	Hybrid Gas/Electric Plug in	43	$1,210.40

Data from DCAS Client Program, CY2018

North Carolina can likewise reap these savings, particularly if it acts quickly and avails itself of the $7,500 federal tax credit.

[98] Statistics provided to Sierra Club by the North Carolina Department of Administration.
[99] *Id.*
[100] New York City, NYC Department of Citywide Administrative Services, Reducing Maintenance Costs with Electric Vehicles (2019), https://www1.nyc.gov/assets/dcas/downloads/pdf/fleet/NYC-Fleet-Newsletter-255-March-8-2019-Reducing-Maintenance-Costs-With-Electric-Vehicles.pdf.

C. North Carolina's Executive Branch Should Adopt Policies to Incentivize Political Subdivisions and Private Entities to Electrify Transportation Fleets, Reduce Emissions, Save Money, and Keep Money In North Carolina.

North Carolina's executive branch should fully implement existing policies, and adopt new policies, to incentivize political subdivision—counties, cities, and school districts—and private companies to electrify their fleets as well. While some policies are already in place in North Carolina, such as the Alternative Fuel Revolving Fund, there are many others that states are implementing that are discussed further below.

North Carolina already has an Alternative Fuel Revolving Fund that it could use to incentivize electrification as follows: the North Carolina State Energy Office administers the Energy Policy Act ("EPAct") Credit Banking and Selling Program, which enables the state to generate funds from the sale of EPAct 1992 credits.[101] The funds that EPAct credit sales generate are deposited into the Alternative Fuel Revolving Fund for state agencies to offset the incremental costs of purchasing, among other things, alternative fueling infrastructure, AFVs, and HEVs. Funds are distributed to state departments, institutions, and agencies in proportion to the number of EPAct credits generated by each.[102] North Carolina could use these mechanisms to target electrification.

D. North Carolina Should Set a State-Wide Target and Corresponding Incentives for Transit Agencies to Fully Electrify Their Bus Fleets by 2035 or 2040.

Some models of medium- and heavy-duty EVs can already save fleet owners money on a total cost of ownership basis. This is most evident today in transit buses and other heavy-duty vehicles with high annual miles and low fuel efficiency. In addition to having a strong business case, the pollution benefits of local air pollution are significant, especially for residents who depend on public transit in communities overburdened by multiple sources of pollution. Leadership commitment to both fiscal responsibility and equity makes electrifying public transit bus fleets a priority for attention.

Transit agencies across the country already have hundreds of all-electric transit buses (463 to be exact) on the road reducing emissions and saving United States transit agencies money, and transit agencies have commitments for another 15,538 EV bus purchases ("zero-emission buses" or "ZEBs") going forward.[103] In North Carolina, this includes Greensboro, which added ten new electric buses into their fleet in February, with six more to be added by the end of 2019.[104] Additionally, Asheville recently purchased five buses for their fleet.[105] Outside North

[101] North Carolina Gen. Stat. § 143-58.4 (2015).
[102] Department of Energy, Alternative Fuel and Alternative Fuel Vehicle (AFV) Fund, https://afdc.energy.gov/laws/5986 (last visited June 19, 2019).
[103] Sierra Club, Zero Emissions Buses in the U.S. (2019). Data compiled from the American Public Transportation Association (APTA) Public Transit Vehicle Database, transit agencies, electric bus manufacturer reports, and press releases concerning developments in the electric bus sector.
[104] John Hammer, *Don't Tell Anyone, But Electric Buses Will Be Here Next Week*, Rhino Times (Jan. 24, 2019), http://www.rhinotimes.com/news/dont-tell-anyone-but-electric-buses-will-be-here-next-week/.

Carolina, this includes New York City's Metropolitan Transit Agency's commitment to purchase 5,700 ZEBs by 2040;[106] Miami/Dade County's commitment to 400 ZEBs by 2035;[107] Portland, Oregon's commitment to convert its transit bus fleet to all ZEBs by 2040;[108] Seattle/King County's commitment to purchase 120 electric buses by 2020;[109] and California's commitment to a 100% zero-emission public bus fleet by 2040.[110]

North Carolinians support transitioning to all electric transit fleets. In a 2016 bond referendum in Greensboro, voters approved $4.5 million to be used as the local match in federal grants to replace diesel buses with ZEBs.[111]

To achieve full fleet electrification by 2035 without standed assets from early retirement of diesel buses, all North Carolina transit agencies would need to end the purchase of any fossil-fueled buses within five years. The first step is providing support to every transit agency in the state to develop a plan for full fleet electrification by 2021. For reference, California's policy for transitioning all transit bus fleets to 100% zero emission vehicles also starts with a more immediate deadline for developing a plan for full fleet decarbonization, and those are due in 2020. Transition plans include an assessment of the age and type of every bus in a fleet in order to conduct a technical and financial analysis to understand the replacement equipment and the capital requirements for both the electric buses and the infrastructure to charge them. Analysis based on national lab modeling tools tailored to North Carolina's conditions already indicate that the financial analysis for the buses will be positive, which will help focus attention on financing and infrastructure planning to support implementation.

Despite their greater initial purchase price, Argonne National Laboratory's AFLEET Model demonstrates that ZEBs in North Carolina have a total cost of ownership 19% lower than new diesel buses. Maintenance costs for electric buses are between 70% and 79% lower than for compressed natural gas ("CNG") and new diesel buses respectively, contributing to significant cost savings over the lifetime of a bus. Based on the AFLEET data, and as can be seen in Figure

---

[105] Polly McDaniel, The City of Asheville, *City of Asheville to purchase zero-emission, electric transit buses* (Jan. 10, 2018), https://www.ashevillenc.gov/news/asheville-to-purchase-zero-emission-electric-transit-buses/.https://www.ashevillenc.gov/departments/transit/zero_emission_electric_buses.htm.

[106] Phil McKenna, *New York City Aims for All-Electric Bus Fleet by 2040,* Inside Climate News, (Apr. 26, 2018), https://insideclimatenews.org/news/26042018/nyc-air-pollution-electric-bus-public-transportation-mta-clean-technology.

[107] Environment Florida Research & Policy Center, Local Leaders #ActOnClimate, https://environmentflorida.org/sites/environment/files/resources/Local%20Solutions%20and%20Challenges%20FL_0.pdf (last visited June 19, 2019).

[108] Andrew Theen, *TriMet's first electric bus is officially in service as agency inches toward 2040 goal to ditch diesel*, The Oregonian (Apr. 16, 2019), https://www.oregonlive.com/commuting/2019/04/trimets-first-electric-bus-is-officially-in-service-as-agency-inches-toward-2040-diesel-goal.html.

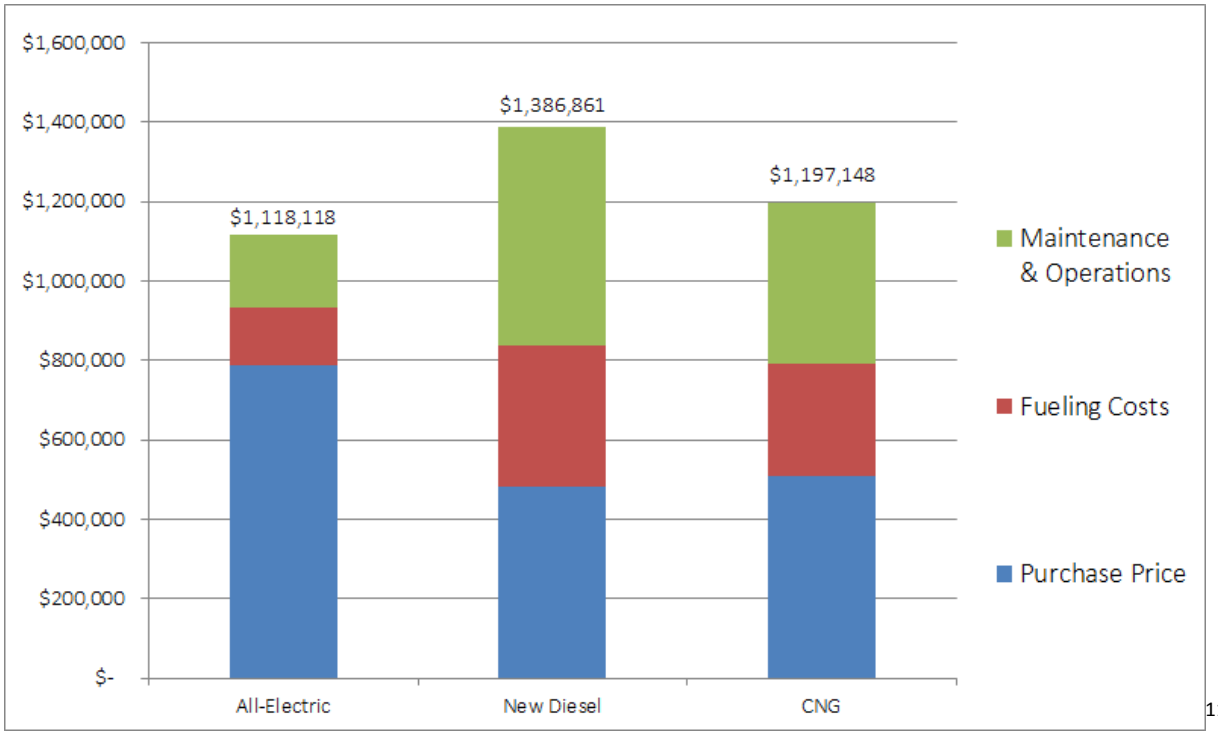
[109] Josh Kelety, *King County Rolls on With Its Electric Bus Fleet Plans*, Seattle Weekly (July 20, 2018), https://www.seattleweekly.com/news/king-county-rolls-on-with-its-electric-bus-fleet-plans/.

[110] Mark Kane, *California Mandates Electric Buses Only by 2040*, Inside EVs (Dec.17, 2018), https://insideevs.com/news/341620/california-mandates-electric-buses-only-by-2040/.

[111] Taft Wireback, *Wanting to have an all-electric fleet, GTA aims to buy 6 more buses*, News & Record, (Feb. 27. 2019), https://www.greensboro.com/news/state/wanting-to-have-an-all-electric-fleet-gta-aims-to/article_1a25d446-e09f-53d8-bbbe-846a7efd55fa.html; Greensboro North Carolina, Transportation Bonds (2016), https://www.greensboro-nc.gov/government/2016-bond-referendum-approved/transportation-bonds.

19 below, an all-electric bus will save North Carolina's transit agencies over $250,000 per bus compared to a new diesel bus purchase. Data compiled by the California Air Resources Board in 2016 shows that hybrid diesel-electric buses have a total cost of ownership of around $1.5 million, roughly $200,000 greater than ZEBs.[112] Further, their data suggested this gap would continue to widen, with projections showing ZEBs would cost nearly $400,000 less in 2020.

Figure 19: Total Cost of Ownership of Transit Buses
(fuel and electricity costs adjusted for Wake County, North Carolina)



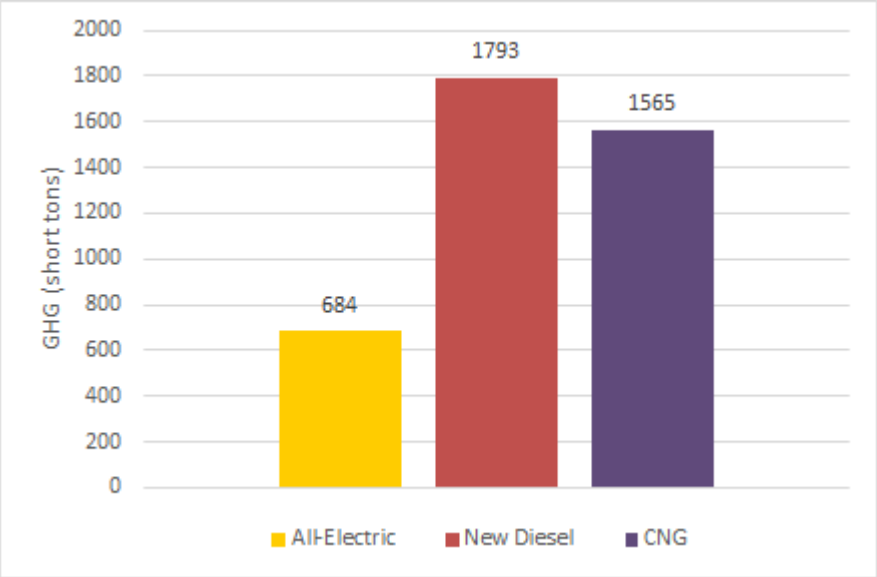
[113]

Moreover, transitioning to electric transit buses is the most cost effective way on a dollar per pound basis of reducing GHG and NOx emissions from transit buses: EV buses reduce NOx emissions at a rate of 0.0087 lbs/$, versus CNG at 0.0081 lbs/$ and new diesel at 0.006 lbs/$.

And there is no competition when comparing lifetime well-to-wheel GHG emissions. AFLEET models electric transit buses as emitting 62% less GHG than diesel and 56% less than CNG, as can be seen in Figure 20 below.

[112] California Air Resources Board, Total Cost of Ownership to Advance Clean Transit (2016), https://www.arb.ca.gov/msprog/bus/4thactwgmtng_costs.pdf.
[113] Argonne National Laboratory, AFLEET Model (2017). Fuel and electricity costs are adjusted for Wake County, North Carolina.

Figure 20: Lifetime GHG Emissions of Transit Buses[114]



North Carolina should set a target for transit agencies to electrify their bus fleets, and provide incentives to encourage meeting those goals. These incentives could be provided at least in part by VW Mitigation funds. Indeed, the NC DEQ Volkswagen Mitigation Plan found significant savings per ton of NOx reduced when comparing EV and diesel buses, even though they were conservative in their analysis, as shown in Table 4 below. And transit electrification results in greater benefits per dollar when one considers GHG emissions reductions as well.

Table 4: Estimated NOx Emissions Reductions for Transit Buses[115]

Transit Bus Type	Estimated Cost (per vehicle)	# of Buses	Estimated Lifetime NOx Emission Reductions (tons per vehicle)	Lifetime Effectiveness ($/ton NOx reduced)
Diesel	$500,000	1	0.351	$1,424,501
Electric	$800,000	1	0.725	$1,103,448

As electric bus technology continues to develop, ZEB up-front capital costs will continue to drop, particularly as the price of battery technology falls, whereas CNG and diesel bus capital cost trends are continually increasing.[116] With this convergence of price trends, there will be an

[114] See Appendix A for the methodology and inputs behind the AFLEET modeling.
[115] North Carolina Department of Environmental Quality, State of N.C. Volkswagen Mitigation Plan (2018), https://files.nc.gov/ncdeq/Air+Quality/motor/grants/files/VW/NC_Final_VW_Mitigation_Plan_082018.pdf.
[116] California Air Resources Board, Total Cost of Ownership to Advance Clean Transit, Presentation Prepared for the 4th Meeting of the Advanced Clean Transit Working Group (2016), https://www.arb.ca.gov/msprog/bus/4thactwgmtng_costs.pdf.

inflection point in the near future when ZEBs are cheaper on a purchase price basis than any other type of transit bus, with huge implications for reductions in diesel usage.[117]

Until then, transit agencies will face an upfront cost barrier that can strain capital budgets to improve and expand service while paying for new electric buses. Because the electric buses are cost effective over their operating life, financing solutions can overcome the upfront cost barrier, though many transit agencies face constraints when adding to their long term liabilities with loans and leases. For that reason, most transit agencies to date have sought grants.

Every electric bus purchased in North Carolina to date has been funded in part with a grant, which remains the primary strategy for cities nationwide seeking to buy their first electric bus. However, the scale of federal and state grant funding available will not likely grow within five years to cover every transit bus bought by every North Carolina city every year. Therefore, North Carolina's statewide target for achieving zero emission transit bus fleets should be accompanied by active engagement with utilities on the use of tariffed on-bill investment for cost effective clean energy solutions as discussed in Section I below.

E. North Carolina Should Adopt An EV Purchase Incentive Rebate or an EV Tax Credit.

Another powerful policy North Carolina can put in place to drive EV adoption is a rebate or tax credit for the purchase of EVs, and it can be set to sunset over time. Tens of states have similar rebate policies. Moreover, as noted above, North Carolina can structure programs specifically for low-income and disadvantaged communities, as Oregon and Washington have done.

Furthermore, Connecticut implemented the Hydrogen and Electric Automobile Purchase Rebate Program, which offers rebates up to $5,000 for the purchase or lease of a fuel cell electric vehicle, $3,000 for battery electric vehicle, and a $300 dealer incentive; Massachusetts provides rebates of up to $2,500 for the purchase or lease of an EV; Oregon provides rebates ranging from $750-$2,500 for purchases of new EVs, scaled to the capacity of the vehicle's battery; Colorado gives tax credits for purchase, lease, and conversion of light-, medium-, and heavy-duty EVs; and New Jersey grants a sales-tax exemption for purchase or lease of EVs. Studies have found a significant increase in EV sales with the implementation of these rebates among low- and moderate-income households.[118]

[117] Joe Romm, *The bus wars are over. Electricity — and China — won*, Think Progress (May 24, 2019), https://thinkprogress.org/electric-buses-outsell-diesel-china/.

[118] Scott Hardman, *The effectiveness of financial purchase incentives for battery electric vehicles*, 80 Renewable and Sustainable Energy Reviews 1110 (2017), https://phev.ucdavis.edu/wp-content/uploads/2017/09/purchase-incentives-literature-review.pdf.

F. North Carolina Should Revisit Non-Financial Incentives to Purchase EVs.

North Carolina should prevent its HOV lane exemption for EVs from expiring.[119] Currently, qualified plug-in electric vehicles, dedicated natural gas vehicles, and fuel cell electric vehicles may use North Carolina HOV lanes, regardless of the number of occupants. This exemption expires September 30, 2019 and should be renewed.[120]

North Carolina should eliminate or at least significantly reduce its Special Vehicle Registration Fee on EVs. N.C. Gen. Stat. §20-87(13) and S.B. 402 (2013) require electric vehicle owners to pay an annual registration fee of $100. H.B. 97 (2015) increased the electric vehicle registration fee to $130. The North Carolina legislature has proposed to raise this registration fee once again to $275 by 2022.[121] This fee acts as a disincentive to adopt EVs; the Governor should work to change the political conversation around these fees, and if necessary, veto any legislation proposed to raise it. Moreover, these fees are punitive when compared to the gas taxes that internal combustion engine vehicles pay. Indeed, many other states such as Virginia have instead adopted far lower fees,[122] or committed to revisiting the issue only after EVs reach a critical market threshold.[123]

North Carolina should continue its current Vehicle Inspection Exemption for qualified plug-in EVs and fuel cell electric vehicles, which are exempt from state emissions inspection requirements.

G. North Carolina Should Adopt California's Zero Emission Vehicle Program.

North Carolina should adopt the California's automobile emissions standards, including the ZEV program, which, in essence, requires a certain percentage of vehicles sold in a given state be EVs by 2025. Nine states and California already have adopted this ZEV mandate (Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont). Others, including Colorado, Minnesota, Nevada and Illinois, are considering doing so.

Joining the ZEV mandate helps reduce GHG and public health pollutant emissions; keeps money in the state economy; and broadens consumer choice, as joining the California ZEV program results in more models of EVs being offered by in-state dealerships. As analyses by EVAdoption

---

[119] Kristy Hartman, & Emily Dowd, National Conference of State Legislatures, State Efforts to Promote Hybrid and Electric Vehicles (Sept. 26, 2017), http://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx.

[120] Department of Energy, High Occupancy Vehicle (HOV) Lane Exception, https://afdc.energy.gov/laws/9353 (last visited June 19, 2019).

[121] Darren Botelho, *Hybrid, electric vehicle owners in N.C. face possible fee increases*, News 13 WLOS, (Apr. 11, 2019), https://wlos.com/news/local/hybrid-electric-vehicle-owners-in-nc-face-possible-fee-increases.

[122] *See* State of Virginia, Department of Motor Vehicles, https://www.dmv.virginia.gov/vehicles/alternative_vehicles.html (last visited June 19, 2019) (noting a $64 annual registration fee for EVs in Virginia).

[123] Vermont Agency of Transportation, Sec. 15. 2016 Plug-In Hybrid and Electric Vehicle Registration Fees, 3, 27 (2016).

reflect, there is a clear correlation between a state joining the ZEV Regulation Program, the number of EV models available to purchase in state, and EV adoption rates.[124]

States can join California's ZEV program through legislative action or executive action, depending upon state law. North Carolina law currently authorizes the state's Environmental Management Commission "to adopt motor vehicle emission standards." NC Gen. Stat. 143-215.107(a)(6). This provision, enacted in 1999, gives the Environmental Management Commission the authority to adopt auto emission standards consistent with federal Clean Air Act standards. However, in 2011 North Carolina enacted N.C. Gen. Stat. Ann. § 150B-19.3, entitled, "Limitation on Certain Environmental Rules," which provides in relevant part:

> An agency authorized to implement and enforce State and federal environmental laws may not adopt a rule for the protection of the environment or natural resources that imposes a more restrictive standard, limitation, or requirement than those imposed by federal law or rule, unless adoption of the rule is required by one of the subdivisions of this subsection.

Subsection (b)(2) specifically lists the Environmental Management Commission as "an agency authorized to implement and enforce State and federal environmental laws" under subsection (a).[125] The subdivisions that list circumstances under which the Environmental Management Commission could unilaterally adopt the California's ZEV program include, in relevant part:

> (1) A serious and unforeseen threat to the public health, safety, or welfare.
>
> (2) An act of the General Assembly or United States Congress that expressly requires the agency to adopt rules. . . .
>
> (5) A court order.[126]

There is no legitimate question that climate change is a "serious . . . threat to the public health, safety, or welfare."[127] In theory, the pace and severity of climate change, and the abject failure of the federal government to address the issue, including the unprecedented rollback of the clean car standards, could be argued to constitute an "unforeseen threat to the public health, safety, or welfare."[128] Indeed, there are any number of scholarly articles and government reports that conclude that the pace and severity of climate change is beyond expectations.[129]

---

[124] EV Adoption, States With Greater Availability of EV Models Average 10 Times Higher Share of Sales, (May 31, 2019), https://evadoption.com/states-with-greater-availability-of-ev-models-average-10-times-higher-share-of-sales/.

[125] N.C. Gen. Stat. Ann. § 150B-19.3(b)(2).

[126] N.C. Gen. Stat. Ann. § 150B-19.3(a).

[127] *See* N.C. Gen. Stat. Ann. § 150B-19.3(a)(1) (emphasis added); Intergovernmental Panel on Climate Change, Summary for Policymakers of IPCC Special Report of 1.5°C Approved by Governments (2018), https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/.

[128] N.C. Gen. Stat. Ann. § 150B-19.3(a)(1) (emphasis added).

[129] Yangyang Xu, *Global warming will happen faster than we think*, Nature (Dec. 5, 2018), https://www.nature.com/articles/d41586-018-07586-5; IPCC, Summary for Policymakers (2018) https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf.

Moreover, the Trump Administration's attacks on existing federal actions to address climate change to date—moving to roll back the clean car standards and eliminate the existing California waiver that authorizes the ZEV mandate—are unprecedented and thus were unforeseeable in 2011 when the statute was passed.

Furthermore, it could be argued that action by states to reduce GHG emissions from transportation is "required" to address the threat of climate change. The transportation sector is now the largest source of GHG emissions in the United States.[130] The federal government is not only not acting to reduce GHG emissions, but to the contrary, is taking action to increase those emissions as it works to roll back the Obama Administration's clean car standards. Thus, actions by states are arguably required to reduce GHG emissions from transportation, and while under federal law North Carolina cannot adopt its own GHG emission limits or fuel efficiency standards for vehicles, it can adopt California's standards.

Alternatively, the Environmental Management Commission could act unilaterally if there were a court order requiring adoption of California's ZEV program.

In short, North Carolina can move to adopt California's ZEV program through Executive Branch action by the Environmental Management Commission, but doing so carries the risk that the action will be challenged in court. It is unclear whether the courts would decide that adopting a ZEV mandate constitutes a "rule" that is "required" to address a "serious and unforeseen threat to the public health, safety, or welfare." Alternatively, North Carolina's legislature could work with the Executive branch to authorize and adopt California's ZEV program.

H. North Carolina Should Adopt a Goal for EV Charging Infrastructure Sufficient to Meet 2025 Goals.

As noted above, another key to advancing EVs is ensuring that there is adequate charging infrastructure—also known as electric vehicle supply equipment ("EVSE"). Indeed, the lack of charging infrastructure has frequently been cited as an impediment to a more rapid transition to EVs.[131]

As discussed above, the signatories encourage North Carolina to adopt a goal of 15% of all new light-duty vehicle sales be electric by 2025. The signatories likewise encourage North Carolina to adopt an explicit goal for supporting charging infrastructure of 4,000 public level 2 chargers by 2025 and providing rebates for up to 6,000 workplace or home level 2 chargers.

The Department of Energy's Oak Ridge National Laboratory has developed a model for calculating the type and density of public facing charging infrastructure needed to support a given number of LDV EVs, called the Electric Vehicle Infrastructure Projection Tool ("EVI-

[130] U.S. Environmental Protection Agency, Sources of Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions (last visited June 19, 2019).
[131] *E.g.*, Mark Singer, National Renewable Energy Laboratory, Consumer Views on Plug-in Electric Vehicles–National Benchmark Report (2016), http://www.afdc.energy.gov/uploads/publication/consumer_views_pev_benchmark.pdf.

Pro").[132] As EV adoption continues to grow, the amount of (and accessibility to) EVSE needs to grow rapidly as well.

According to EV-REDI, a sales market share of 15% LDV EVs in North Carolina would translate to approximately 184,000 LDV EVs on the road in 2025. According to the EVI-Pro tool, to support roughly 184,000 LDV EVs, North Carolina's public facing charging infrastructure would require at a minimum 6,643 workplace level 2 charging plugs; 4,295 public level 2 charging plugs; and 7,802 public DC fast charging plugs. This does not include the massive deployment of home Level 2 chargers that will also be needed. There are currently only 1,125 public level 2 charging plugs and 238 public DC fast charging plugs in the state. As the Department of Energy explains: "Establishing fast charging networks that enable long-distance travel, serve as charging safety nets, and providing charging for drivers without home charging is critical to support all-electric vehicles that have no other alternative for quickly extending their driving range."[133]

Duke Energy likewise emphasizes EVSE deployment in its Proposed Electric Transportation Pilot. According to its March 2019 filing, Duke is proposing the following subprograms:[134]

1. Residential EV Charging Program: 800 customers will receive a $1,000 rebate for participation. Customers must purchase/own a company-approved Level 2 EVSE.
2. Fleet EV Charging Program: 900 EVSE rebates of $2,500/EVSE. Level 2 EVSE. Customer may be public or private entity.
3. School Bus EV Charging Program: 85 buses provided, along with associated EVSE. Up to $215,000 funded per bus.
4. EV Transit Charging Station Program: 105 charging stations. Duke installs, owns, and operates EVSE. $75,000/EVSB procured.
5. Multi-Family Dwelling Charging Station Program: 160 Level 2 charging stations. Each station to include minimum of 2 outlets. Publicly available. Charging Fee to be consistent with the Kilowatt-Hour Charge of the Company's first block energy rate of the current Small General Service Schedule, plus $0.02/kWh.
6. Public Level 2 Charging Station Program: 200 L2 EVSE stations. Publicly available. Charging Fee to be consistent with the Kilowatt-Hour Charge of the Company's first block energy rate of the current Small General Service Schedule, plus $0.02/kWh.
7. Public Fast Charging Program: 116 DCFC EVSE stations. "Fast Charge Fee consistent with statewide average."

[132] See Appendix A for EVI-Pro methodology and inputs. This modeling conservatively estimates that 50% of North Carolina residents would have access to home charging and there would be a 50%-50% split between 100-mile and 250-mile range EVs in 2025.
[133] EVI-Pro, How Much Electric Vehicle Charging Do I Need in My Area? (2019), https://afdc.energy.gov/evi-pro-lite.
[134] Duke Energy Carolinas and Duke Energy Progress, Application for Approval of Proposed Electric Transportation Pilot Docket Nos. E-2, Sub 1197 and E-7, Sub 1195, (Mar. 29, 2019), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=991a74b5-15ed-46ca-9706-aac6d45897a7.

I. North Carolina Should Encourage Utility Engagement to Build Out Charging Infrastructure and Related Investments.

Duke Energy's proposed pilot program, pending approval of the North Carolina Utility Commission ("the Commission"), entails $76 million for building out charging infrastructure. Duke's proposal is prudent, innovative, and ties into the expenditure of VW mitigation fund to synergistically leverage both sources of funding at the same time. The Commission should:

- Approve Duke Energy's pending EVSE program with strengthened environmental justice elements;
- Require Duke to start the development of a larger, non-pilot proposal in two years, informed by the results of the pilot proposal;
- Ensure that a prudent, robust program can be approved and ready to go in three years when the pilot program lapses, ensuring there are no gaps.

A properly structured utility EVSE program will result in direct benefits to EV drivers using the charging infrastructure, as well as to North Carolina utility customers that do not use EVs. This is because the additional volume of electricity sold to charge vehicles drives down the overall cost of electricity for all utility customers as the cost of the grid is spread over the larger volume of electricity sales.[135] Moreover, such a program can also help resolve market failures and accelerate the development of a robust, competitive third party charging market—it need not lead to the utility's dominance in the EVSE charging arena.

The general principles that underlay a prudent and equitable utility EVSE program are well established and broadly agreed upon as reflected in the Transportation Electrification Accord.[136] [137] Programs can and should include LDV charging infrastructure (including slower "Level 2" chargers and faster direct current fast chargers ("DCFC")); MDV and HDV fleet infrastructure for public and private fleets, including transit buses, school buses, and refuse trucks as these models become increasingly available; and school bus batteries as grid assets. The program must be structured to foster third party market competition; deliver real benefits and services to environmental justice, minority, and disadvantaged communities; and deliver benefits to EV drivers (including fuel cost savings) and nonparticipant customers alike through well-structured off peak charging programs, among other things. Duke's pending proposal

---

[135] MJ Bradley & Associates, Plug-in Electric Vehicle Cost-Benefit Analysis: North Carolina, 9 (2018), https://mjbradley.com/sites/default/files/NC%20PEV%20CB%20Analysis%20FINAL.pdf;
Jason Frost, Melissa Whited, and Avi Allison, Synapse Energy, Electric Vehicles are Driving Electric Rates Down, 3 (2019) (concluding that in the two utility service areas with the most EVs in the U.S., increased EV adoption resulted in "downward pressure on electric rates for EV-owners and non-EV owners alike"), https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf.

[136] Advanced Energy Economy, The Transportation Electrification Accord, https://www.theevaccord.com/ (last visited June 19, 2019).

[137] Transportation Electrification Accord signatories include charging companies such as Greenlots and Sema Connect; charging equipment manufacturers such as Siemens and EVBox; vehicle manufacturers such as Proterra, BYD, GM and Honda; utilities such as AEP, Exelon, PECO, PEPCO, SDGE, PGE; rate payer and consumer advocates such as Illinois CUB, Consumer Federation Of America and Consumers Union; Labor groups such as IBEW; and public interest advocates such as EEI, Sierra Club, SACE, VPIRG and NRDC. https://www.theevaccord.com/.

before the Commission does many of these things, although its environmental justice elements need to be strengthened.[138]

At this point, utility EVSE programs are becoming bread and butter work for public utility commissions. Twenty states across the country—again, red, blue, and purple—have approved 60 utility programs by 40 utilities totaling well over $1 billion to advance the building of EV charging infrastructure and related equipment.[139] This translates to 1,994 DC fast charging stations and 45,110 Level 2 charging stations. States with approved filings include: Alaska, Hawaii, Washington, Oregon, Nevada, California, Kansas, Missouri, Minnesota, Wisconsin, Michigan, Indiana, Kentucky, Ohio, Pennsylvania, Maryland, New York, Massachusetts, Florida, and DC.[140]

Meanwhile, there are 29 pending filings by 22 utilities in 20 states for utility EVSE investment programs.[141] The total sum of these pending filings amounts to $1,540,209,526 in investment, 776 DC fast charging stations, and 115,780 Level 2 charging stations. States with pending filings include: Alaska, Oregon, California, Arizona, Texas, Minnesota, Wisconsin, Michigan, Ohio, Georgia, North Carolina, South Carolina, Pennsylvania, New York, Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, and DC.

Great examples of utility EVSE programs can be found right in the Southeastern United States. In Florida, for example, Duke Energy's Electric Vehicle Charging Station Pilot Program, which was approved in November 2017, resulted in $8 million of investment, 500 Level 2 charging stations (325 of which are to be in multi-unit dwellings, 100 in workplaces, and 75 in public

[138] North Carolina's "found revenue" clause may, under certain circumstances, limit utilities' ability to encourage load growth (for, by example, investing in EVSE) while also promoting energy conservation measures, with the result being slower than ideal utility investment in EVSE. North Carolina should clarify the conditions under which regulated utilities in the state can recover costs for investments in EVSE.

[139] Atlas EV Hub, Utility Filings, https://www.atlasevhub.com/materials/electric-utility-filings/ (last accessed June 4, 2019).

[140] A recent example in Missouri need not discourage utility investments in EVSE in North Carolina. In 2016, two regulated electric utilities in Missouri—Ameren Missouri and Kansas City Power & Light ("KCP&L")—separately filed EV programs with the Missouri Public Service Commission ("MO PSC"). In its review of both applications, the MO PSC determined that EV charging stations did not fit the state's definition of "electric plant," and therefore decided that the investments could not be considered a regulated utility service. That decision was appealed. In August 2018, the Missouri Court of Appeals for the Western District reversed the MO PSC's decision, noting that its decision "does not leave the Commission without remedy; to the contrary, it provides a basis for the Commission to exercise its full range of regulatory authorities with respect to those stations." *Kansas City Power & Light CO.'s Request for Authority to Implement a Generate Rate Increase for Electric Service v. Missouri Public Service Commission* at 12, 557 S.W.3d 460 (Mo. Ct. App. 2018). The Commission subsequently exercised that authority, approving a $4M EV infrastructure program for Ameren Missouri in February 2019 and inviting additional proposals from KCP&L and its other regulated entities. *See* Report and Order at 23, ET-2018-0132, Missouri Public Service Commission (Feb. 6, 2019) (finding that "EV Charging Corridor Sub-Program is just and reasonable, reasonable as a business practice, economically feasible and compensatory, and reasonably calculated to benefit both the utility and its customers.").

[141] Atlas EV Hub, Utility Filings, https://www.atlasevhub.com/materials/electric-utility-filings/ (last accessed June 4, 2019).

locations), and 30 DC fast charging stations (to be placed at charging depots).[142] Duke established dedicated program funding for market education and outreach, to be capped at 5% of the total $8 million. Maryland had four transportation electrification filings approved at the beginning of 2019, one each from Baltimore Gas and Electric Company, Delmarva Power, Potomac Edison, and Potomac Electric Power Company.[143]

Most of these programs are structured as ratepayer expenditures administered by the utility. In order to achieve the scale of investment required to meet the goals of EO 80, North Carolina should build on experience with tariffed on-bill investment programs, in which a utility makes a site-specific investment with site-specific cost recovery. By capitalizing the upfront cost of batteries and the charging equipment that connect them to the grid, a utility can reduce barriers to participation and accelerate deployment for electric vehicles, starting with transit. (*See* Section VI.D.) This approach, called PAYS® for Clean Transport, has already been endorsed by the Global Innovation Lab for Climate Finance.[144]

First, the utility regulator must approve the utility's ability to invest and recover capital through a service agreement defined in a tariff, assuring that the terms are cost-based, non-discriminatory, reasonable, and fair. Once approved, any customer in the eligible customer class may use it to advance their electrification plans by engaging their utility to make a tariffed on-bill investment. Analysis conducted for a transit agency in North Carolina in the Duke Energy service area showed that tariffed on-bill investment would triple the impact of grant funds they might receive through the VW mitigation fund, and with barely $1.5 million, they would be able to increase the number of electric buses they could buy from three to more than 50 over the next five years.[145]

J. North Carolina Should Allocate VW Mitigation Funds Towards Transportation Electrification.

North Carolina was allocated about $92 million dollars to use towards the reduction of diesel emissions as a result of the VW diesel emissions scandal. North Carolina should use those funds to accelerate the electrification of transportation, as many other states have done. Doing so will ensure permanent, cost effective, NOx, PM, and GHG reductions.

---

[142] Duke Energy, Duke Energy Florida launches Park and Plug EV charging station pilot to encourage clean transportation, (Oct. 3, 2018), https://news.duke-energy.com/releases/duke-energy-florida-launches-park-and-plug-ev-charging-station-pilot-to-encourage-clean-transportation.

[143] Colin Campbell, *Maryland Public Service Commission authorizes utilities to install 5,000 electric vehicle charging stations statewide*, Baltimore Sun, (Jan. 14, 2019), https://www.baltimoresun.com/news/environment/bs-md-electric-vehicle-charging-stations-20190114-story.html.

[144] Global Innovation Lab for Climate Finance. PAYS for Clean Transport, https://www.climatefinancelab.org/project/pay-save-clean-transport/ (last visited August 19, 2020).

[145] Cadmus, Financial Analysis for Electrification of Lake City's Transit Bus Fleet, 2019, https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=7b4b9f4c-a0e3-4744-8204-b7b943ea9e97 (last visited August 19, 2020).

As the North Carolina Electric Vehicle Working Group explained in its recommendations to North Carolina on how to use the VW funds, the state should:[146]

- Allocate the maximum amount of funds (15%) towards EVSE buildout, which the majority of states have done;
- Allocate funds to accelerate public and private MDV and HDV fleet electrification, including in particular public transit buses and school buses and trash trucks.

Moreover, North Carolina should prioritize public transit bus and school bus fleets in those communities that have been overburdened by pollution, historically. (*See* Section VI (A).)

Although the North Carolina Legislature's actions in the 2018 session complicated North Carolina's ability to receive and disburse VW funds, the Legislature can address that in the upcoming legislative session by approving the use of VW funds for projects consistent with the terms of the VW settlement. One approach could be to identify ex ante specific types of projects that the legislature approves for VW funds that are consistent with the settlement, which the Cooper Administration could then execute, such as funding transit and school bus fleets, light-duty charging infrastructure, and corporate delivery fleets. As discussed above, North Carolinians and the North Carolina economy will benefit from transportation electrification, even if the equipment and vehicles used are not always made in North Carolina.

Numerous red, blue, and purple states are allocating VW funds to advance transportation electrification. The following are some highlights of how they are spending their share of the $2.5 billion VW mitigation fund to advance EVs:[147]

- 35 states, including North Carolina, have committed to the full 15% funding allocation for EVSE, either in their draft or final plan, which translates to $271.3 million.[148]
- 26% of all funding in states' mitigation plans are dedicated to ZEV (either vehicle electrification or EVSE).[149]
- Below are some examples of states prioritizing electrification and environmental justice in their VW mitigation plans and allocations:[150]
    - Alaska: Full 15% for EVSE; substantial bus allocation; environmental justice prioritization (AK will ensure that projects will prioritize communities that are disproportionately affected by pollution and are low-income, minority, and Native American);

[146] North Carolina Electric Vehicle Working Group, "Comments on North Carolina's Beneficiary Mitigation Plan under the Volkswagen (VW) settlement", https://content.sierraclub.org/evguide/sites/content.sierraclub.org.evguide/files/North%20Carolina%20Coalition%20VW%20Comments.pdf?scv=1522261409244 (last visited June 19, 2019).
[147] Atlas EV Hub, Utility Filings, https://www.atlasevhub.com/materials/electric-utility-filings/ (last accessed June 4, 2019).
[148] *Id.*
[149] *Id.*
[150] State specific figures are on file with Sierra Club.

- California: Carve out for zero-emission electric technologies, and at least 35% of the funds must benefit low-income or disadvantaged communities that are disproportionately impacted by air pollution;
- Georgia: 100% of funding allocated to near-zero or zero-emission electric transit buses in Atlanta;
- Illinois: Allocates up to 10% ($10 million) to an all-electric school bus project; specifies "environmental justice areas"; original draft plan included no EVSE funding but the final plan allocates 10% and cited public input as the reason why;
- Massachusetts: Electric transit bus funding in environmental justice communities;
- New Jersey: Dispersing $16 million for the deployment of electric heavy-duty garbage trucks, school buses, and port-related vehicles, with an emphasis on improving air quality in environmental justice communities that are disproportionately affected by air pollution. “These projects also will demonstrate the viability of using electric heavy-duty vehicles to improve air quality in urban areas and throughout the state,” Commissioner Catherine McCabe said;[151]
- Ohio: The Central Ohio Transit Authority will get partial funding of $1,013,253 to help replace five diesel-powered transit buses with electric ones;
- Rhode Island: Allocates 3/4 of the funding to replace 20 diesel-powered transit buses with all-electric ZEVs, and will be considering environmental justice principles when deciding on the location of this investment;
- Washington: Lists a priority to "Maximize air quality co-benefits beyond nitrogen oxide reductions" and allocated 45% towards upgrading transit buses, with electrification prioritized.

VII. Conclusion

North Carolina is well positioned to become a national leader in EV adoption while realizing substantial climate, public health, and economic benefits for its citizens. North Carolina maintains approximately 800,000 miles of roads, making it the second largest state-maintained highway system in the U.S. Transportation accounts for the largest percentage of North Carolina’s GHG emissions, and it offers the state a valuable opportunity to achieve meaningful emissions reductions at a crucial moment in the fight against climate disruption.

Our organizations applaud Governor Cooper’s forward-thinking policy objectives embodied in Executive Order 80. The recommendations in this report are designed to help the state meet and exceed these important climate goals by establishing ambitious and achievable targets to rapidly transform North Carolina’s transportation sector from one reliant on fossil fuels to one that ensures all North Carolinians have the opportunity to enjoy a clean transportation future.

[151] State of New Jersey, Department of Environmental Protection, News Release: Second round of Volkswagen Settlement funds to support deployment of heavy-duty electric vehicles, with emphasis on improving air quality in environmental justice communities (June 3, 2019), https://nj.gov/dep/newsrel/2019/19_0045.htm.

We look forward to working with Governor Cooper and state agencies as they begin to formulate plans to implement Executive Order 80. The State is poised to demonstrate real climate leadership, and we believe that it is critically important to ensure that through this process the benefits of transportation electrification are realized by all North Carolinians. We would welcome the opportunity to discuss the conclusions and recommendations in this report as North Carolina charts a new path toward clean and sustainable transportation policies.

Sincerely,

David Rogers
Southeast Deputy Regional Director
Sierra Club Beyond Coal Campaign
david.rogers@sierraclub.org
(919) 599-9966

Dionne Delli-Gatti
Director, Southeast Clean Energy
Environmental Defense Fund

Will Scott
Energy Policy Analyst
North Carolina Conservation Network

June Blotnick, M.ED
Executive Director
Clean Air Carolina

Carrie Clark
Executive Director
North Carolina League of Conservation Voters

Susannah Tuttle, M.Div
Director
NC Interfaith Power & Light

Tiffany Hartung
Climate and Energy Policy Manager
The Nature Conservancy NC Chapter

Rory McIlmoil
Senior Energy Analyst
Appalachian Voices