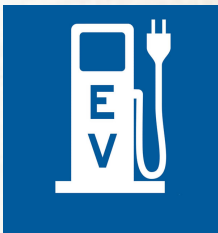




NORTH CAROLINA ZEV PLAN

A Strategic Plan for Accelerating
Electric Vehicle Adoption in
North Carolina

**2022
PROGRESS
UPDATE**



August 1, 2022

*Prepared by the North Carolina Department of Transportation
for the North Carolina Climate Change Interagency Council*

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I. Executive Summary

In 2018, N.C. Governor Roy Cooper signed *Executive Order No. 80, North Carolina's Commitment to Address Greenhouse Gas Emissions and Transition to a Clean Energy Economy (EO 80)*, setting the state on a path to reduce greenhouse gas emissions by 40% from 2005 levels by 2050. The order also set a goal of at least 80,000 registered zero-emission vehicles, or ZEVs, in North Carolina by 2025. In addition to working with other state agencies to achieve the emission reduction goals, EO 80 directed the N.C. Department of Transportation (NCDOT) to lead an effort and work with the N.C. Department of Environmental Quality (NCDEQ) to develop a Zero Emission Vehicle (ZEV) Plan for the state.

In 2019, NCDOT published the [NC ZEV Plan Version 1.0](#), which identifies 20 recommendations encompassing four areas to support ZEV adoption:

- **Education** - Educate across a variety of topics such as pricing and affordability, vehicle range per charge, charging costs and options, and availability of vehicles and charging. Education and marketing efforts will be aimed at reaching the public and will include automobile dealerships and fleet owner/operators.
- **Convenience** - Increase ease of charging and comfort in the overall electric vehicle network to alleviate concerns regarding range per charge and replacement of traditional internal combustion engines.
- **Affordability** - Reduce upfront costs through potential financial incentives and help develop a used-car market to provide a more appealing range of vehicle types at more prices.
- **Policy** - Establish policies that promote electric vehicle adoption and revise or remove those that inhibit adoption. State alliances and coalitions may also encourage continued investment.

Since the original plan was published in 2019, the state has made significant movement forward on many ZEV initiatives. Those advances include:

- A 220 percent increase in the number of registered EVs (Battery and Plug-in Hybrid) in North Carolina from less than 13,000 in 2018 when EO 80 was signed to more than 40,000 in March 2022.
- Investment in six electric school buses, 11 electric transit buses and \$3.4 million in charging infrastructure using the Volkswagen settlement funds. The final tranche of \$67.9 million in Volkswagen funding is scheduled to begin in early 2022 and will prioritize electric vehicle replacements.
- Signing of the Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding on July 13, 2020.
- The addition of 41 ZEVs in the state motor fleet. The state has also ordered over 500 hybrid vehicles in 2021 as part of the [NC Motor Fleet ZEV Plan](#);

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- The announcement in 2021 that the British-based company Arrival had selected Charlotte as the site of its second electric vehicle microfactory in the United States. The company plans to create more than 250 jobs. Arrival also announced it will establish a high voltage battery module assembly plant, adding 150 new jobs.
- Toyota announced plans to build its first North American battery manufacturing plant for a new generation of vehicles in Randolph County, creating at least 1,750 jobs and investing \$1.29 billion.
- The addition of Climate Change Policy advisors in the NCDOT and the North Carolina Governor's office. The advisors will focus on emission reductions in the transportation sector.

This progress report for the 2019 North Carolina ZEV Plan summarizes the status of transportation electrification in North Carolina and sets the stage for the next phase of work. The next phase will involve the development of the North Carolina Clean Transportation Plan (NCCTP), as outlined in Cooper's January 2022 Executive Order No. 246 (EO 246). For context, the phrase economy-wide refers to emissions from all sources. **In addition to instructing NCDOT to develop the NCCTP, EO 246 builds upon EO 80 and outlines two primary goals:**

- Reduce economy-wide greenhouse gas emissions to at least 50% below 2005 levels by 2030 and achieve net-zero emissions no later than 2050.
- Increase the total number of registered zero-emission vehicles in North Carolina to at least 1.25 million by 2030. EO 246 also established a goal that by 2050 zero-emission vehicles will comprise 50% of all in-state vehicle sales.

II. North Carolina Transportation GHG Emission Landscape

The transportation sector represents about 36 percent of all greenhouse gas (GHG) emissions in North Carolina.¹ Emissions estimated for this sector include both “highway mobile” and “non-highway mobile” sources (see Table 1 below). Highway mobile sources are transportation vehicles that operate on public roads, while non-highway mobile sources are vehicles and equipment that perform transportation and other functions in off-road settings. Alternative fuel vehicles are defined separately from other highway mobile sources to identify specific trends in use of non-conventional fuels. All-electric ZEVs have zero tail pipe emissions and are not included in the GHG inventory.

Table 1: Example Vehicle and Equipment Types included in Transportation Sector

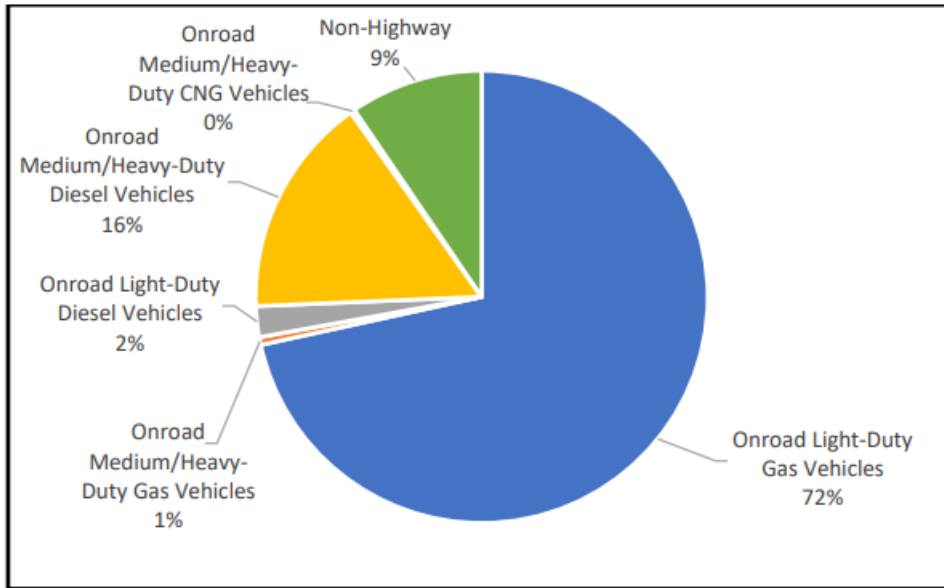
Highway Mobile (~90% of sector emissions)	Non-Highway Mobile (~10% of sector emissions)		Alternative Fuel Vehicles (<1% of sector emissions)
<u>Light-Duty Vehicles:</u> Passenger Cars Passenger Trucks <u>Heavy Duty Vehicles:</u> Buses Commercial Trucks	<u>Off-road Transportation:</u> Airplanes Trains Marine Vessels Recreational Vehicles	<u>Off-road Equipment:</u> Construction Agriculture Logging Recreation	Compressed Natural Gas

Source: North Carolina Greenhouse Gas Inventory, January 2022

According to the 2022 NC Greenhouse Gas Inventory report, emissions from the transportation sector are a function of several parameters: (1) population of each vehicle/engine type; (2) Vehicle Miles Traveled (VMT)/hours of operation; (3) fuel type and consumption; and (4) emissions standards for each fuel/vehicle/engine type. Over 90 percent of transportation emissions in 2018 were from highway mobile vehicles - specifically on-road light-duty gasoline vehicles (72%) and on-road medium/heavy-duty diesel vehicles (16 percent). Non-highway mobile vehicles represent less than 10 percent of sector emissions.

¹ North Carolina Greenhouse Gas Inventory, January 31, 2022, page 6. Note that Transportation sector emissions are significantly higher than estimated in the previous (2019) inventory, reflecting the impact of the new on road vehicle emissions estimation methodology that utilizes EPA’s state-of-the-science emissions modeling system. <https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>

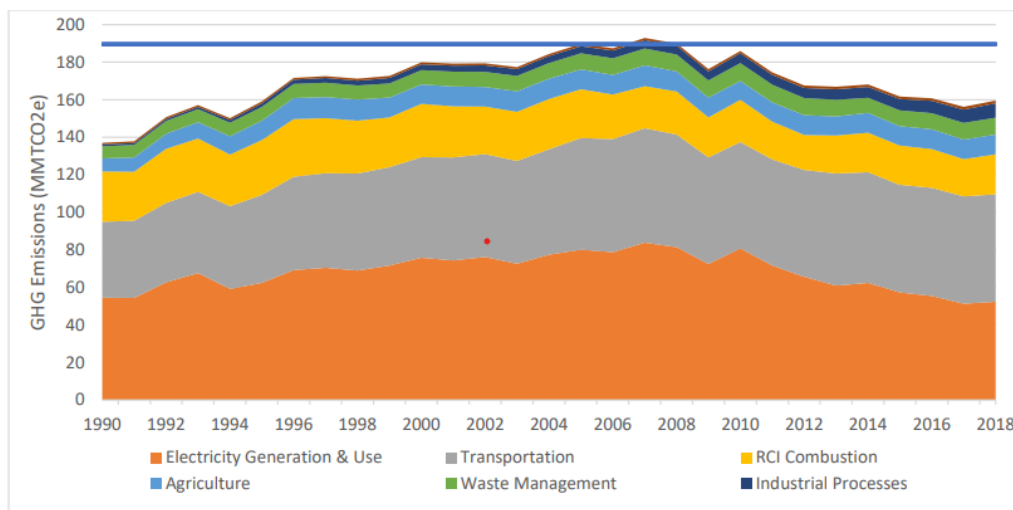
Figure 1: Distribution of 2018 North Carolina Transportation GHG Emissions



Source: North Carolina Greenhouse Gas Inventory, January 2022

Although all-electric ZEVs have zero tail pipe emissions, they are powered by electricity and therefore are not emission free. Gross GHG emissions in North Carolina have declined 16 percent since the 2005 baseline year, primarily due to shifts in the type of fuel used and decreases in the amount of fuel burned by electricity generation (see Figure 2 below). To meet the state’s emission reduction goals outlined in EO 246, the transition to zero emission vehicles must be developed in coordination with reductions in emissions from the electricity sector.

Figure 2: Change in Gross North Carolina GHG emissions from 1990 - 2018



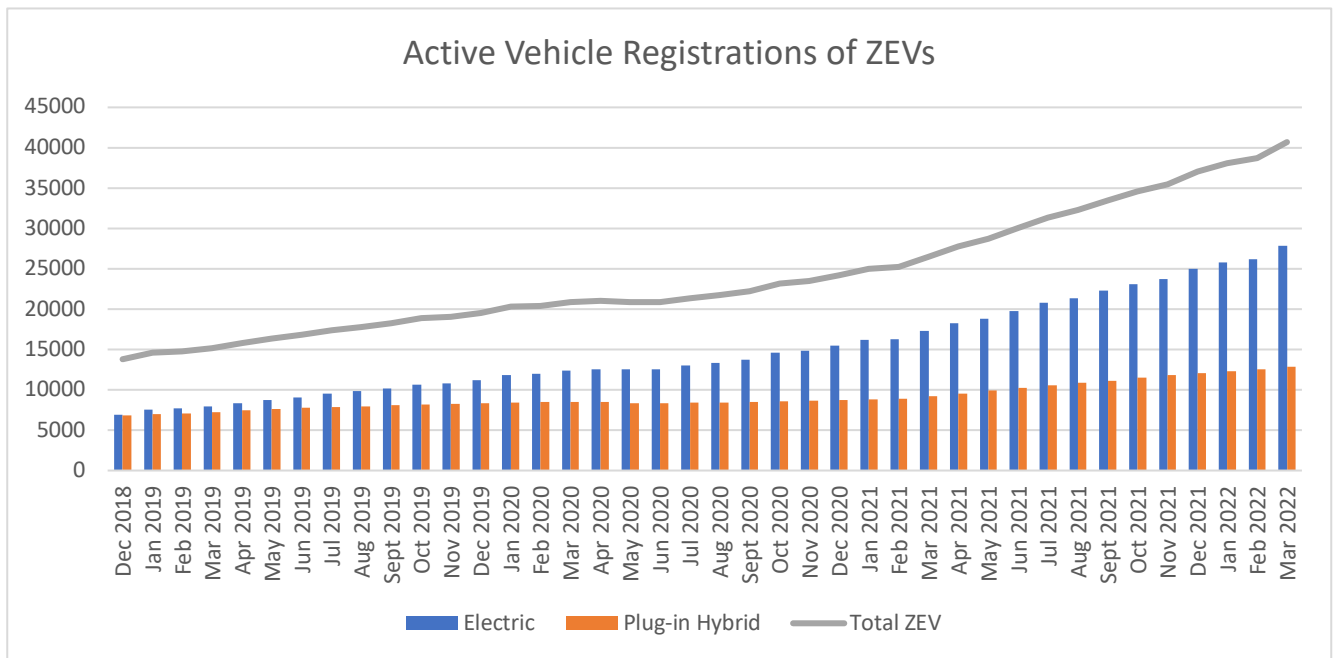
Source: North Carolina Greenhouse Gas Inventory, January 2022

III. Electric Vehicle Growth in North Carolina

The total number of registered light-duty ZEVs in North Carolina grew from 12,715 ZEVs in October 2018 when EO 80 was signed to 40,696 in March 2022. The NC ZEV Plan defines ZEV as Battery Electric Vehicles (BEV) and Plug-In Hybrid Vehicles (PHEV). A recent study of trip length data in North Carolina performed by Smart Growth America reveals that about 25 percent of trips are under one mile, about 50 percent are under three miles, and few trips are greater than 25 miles.² These daily trips are all within the battery range of the BEVs and PHEVs on the market today. Therefore, this plan – as well as the EO 246 and EO 80 ZEV goals – consider both vehicle types to be ZEVs.

Change in registered light-duty ZEVs

Light-duty ZEV (all electric and plug-in hybrid) registrations in North Carolina increased 220 percent from October 2019 to March 2022, representing 40,646 light-duty ZEVs on the road in March 2022. During this same period, the number of light-duty ZEV models available to consumers increased to 34 BEV and 11 PHEV models available in December 2021 with almost 90 ZEV models expected by 2025³. As different ZEV types and price points come to the North Carolina market, the number of registered ZEVs in the state will continue to grow.



Source: NCDOT

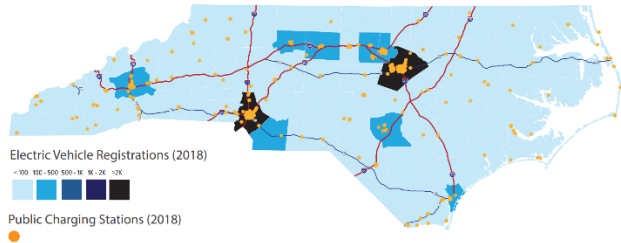
² Smart Growth America and the State Smart Transportation Initiative, “Drivers of VMT and priority reduction strategies: North Carolina,” December 2021.

³ NESCAUM PEV Sales Data, January through September 2021

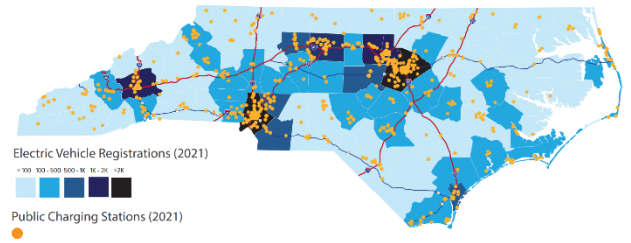
EV Charging Infrastructure

Since EO 80 was signed in October 2018, the number of publicly available charging stations across the state has grown significantly from 400 stations before EO 80 to over 1,000 stations at the end of 2021. These locations include 181 DC Fast Charging stations. This includes infrastructure along priority travel corridors and in North Carolina’s cities, towns and tourist locations.

North Carolina Electric Vehicles & Charging Stations: 2018



North Carolina Electric Vehicles & Charging Stations: 2021



Source: Plug-in NC

Global and National Transportation Electrification Trends

According to Bloomberg New Energy Finance, the global EV outlook continues to improve with passenger ZEV sales increasing 80 percent globally in 2021 to 5.6 million vehicles or 7 percent.

IV. Progress update on the implementation of ZEV Plan 1.0 Strategies

Summary status of recommendations from 2019 NC ZEV Plan

Education Initiatives			
Recommendation	Lead Actor	2022 Status	Notes and next steps
Regularly post NC Vehicle registration data online	NC DOT	Complete	NCDOT ZEV Registration Data
EV Marketing Campaign	NC DEQ NC DOT	In Progress	Assessing options for statewide or regional EV marketing campaign.
Coordinate Ride and Drive events	NC CETC	On-going	Continuing planning events in 2022
Fleet education and outreach	NC CETC	On-going	Sustainable Fleet Technology Conference held 54 webinars in 2020 and 2021.
Guidance document on charging infrastructure installation and management	NC CETC	Complete	Getting North Carolina Ready for Electric Vehicle Charging
Convenience Initiatives			
Recommendation	Lead Actor	2022 Status	Notes and next steps
Facilitate fast charging collaboration	NC DEQ	On-going	Phase I Volkswagen Settlement invested in 31 DC Fast Charger stations. Phase II planned for 2022.
Develop workplace charging programs	NC CETC	To be evaluated in NCCTP	
Charging in rest areas	NC DOT	In Progress	NC HB 329 (2019) exempted EV charging infrastructure from regulation as a public utility. Other state and federal barriers still exist.
Establish consistent wayfinding signage	NC DOT	In Progress	Collaborate with Multi-State group on signage.
Enhance corridor definitions	NC DOT	In Progress	Rounds 1 - 6 of the Alternative Fuel Corridors are available on NCDOT website.

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Affordability Initiatives			
Recommendation	Lead Actor	2022 Status	Notes and next steps
Financial incentives	NCGA NC DOT	In Progress	The 2021 Federal Infrastructure Investment and Jobs Act (IIJA) designates approximately \$109 million for NC EV charging infrastructure over the next five years. There are also opportunities to apply for up to \$2.5 billion in discretionary funds through a competitive process. The Inflation Reduction Act (still in Congress) could provide would provide additional customer incentives, and the state could provide financial incentives through legislation.
Original Equipment Manufacturer (OEM) rebates	Auto manufacturers	To be evaluated in NCCTP	
Green vehicle loans with credit unions	NCCEF	In Progress	The NC Clean Energy Fund is a non-profit green bank established to work with financial institutions to advance clean energy and transportation projects.
Encourage secondary electric vehicle markets	NC DOT NC CETC	To be evaluated in NCCTP	
Policy Initiatives			
Recommendation	Lead Actor	2022 Status	Notes and next steps
Regional Electric Vehicle Initiative	NC DOT NC DEQ	Complete	The Southeast Regional Electric Vehicle Information Exchange (SE-REVI) has been established for State Energy Offices in the Southeast. DOTs are also invited.
Fair Electric Vehicle User Fees	NC First NC DOT NCGA	In Progress	NC First report published in January 2021. The Transit Authority is looking at mileage-based solutions and will pilot a Mileage-Based User Fee (MBUF) solution in 2022.
Update building codes	NC BCC	In Progress	NC Building Code ad hoc committees are in the process of studying the latest national building codes, including the building codes related to EV charging.
Conversion to Electric Transit Fleets	NCDOT	In Progress	NC State’s Institute for Transportation Research and Education (ITRE) will be developing a Zero Emission Transit Fleet transition plan for NCDOT
Motor fleet shift to zero emission vehicles	NC DOA	On-going	Lead by Example: In its 2021 update, NCDOA has procured 41 BEVs for fleet use.
Innovative EV Rate Design	NCUC, Utilities	In Progress	Duke Energy has a rate design collaborative currently underway which includes EV rates.

Education Initiatives

Regularly Post NC Vehicle Registration Data Online [Short-term]

Strategy: Make vehicle registration data available online.

Lead Actors: NCDOT

Key Stakeholders: Municipal and local governments, businesses, NGO's, public.

Description: NCDOT will post vehicle registration data, to show how much progress is being made to achieve the EO 80 goal of having 80,000 registered electric vehicles in North Carolina by 2025. The number of registered electric vehicles, plug-in hybrid vehicles, hybrids and conventional ICE vehicles will be listed by county and zip code. This data will document the progress of EV adoption in the state and provide a valuable reference so that the state can monitor its progress and adjust its strategies, if necessary to achieve its goals. Similarly, local governments, businesses and NGO's will have this data available to help guide their efforts to siting charging infrastructure, applying for grants, or targeting their endeavors.

2022 Update: Complete. Monthly light-duty ZEV registration data by county is available on [NCDOT's website](#). NCDOT is also working to provide more granularity in the data reported, including EV market share for each category of vehicle by zip code.

EV Marketing Campaign [Short-term]

Strategy: Establish a multi-stakeholder marketing campaign directed at consumer segments most likely to purchase EVs.

Lead Actors: NCDEQ, NCDOT

Key Stakeholders: Electric utilities, local dealerships, OEMs, NGOs, community EV groups

Description: Increasing consumer education about EVs will benefit from a coordinated effort by state agencies, local governments, original equipment manufacturers (OEMs), auto dealers, electric utilities and other stakeholders. A statewide marketing campaign should be developed that incorporates all aspects of electric vehicle adoption establishing a consistent message linking all the strategies proposed here.

2022 Update: In progress. The North Carolina Governor's Office, NCDEQ and NCDOT are reviewing state and regional consumer education campaigns being used in other states. This includes the Drive Change, Drive Electric campaign, a collaboration between states and automakers facilitated by Northeast States for Coordinated Air Use Management (NESCAUM). Once a marketing campaign is developed, multiple channels – including the key stakeholders listed above – will extend a coordinated message statewide.

Coordinate Ride & Drive Events [Short-term] Strategy

Strategy: Identify opportunities for drivers to benefit from organizational partnerships with local dealerships to allow the public to drive in the newest and most popular electric vehicles.

Lead Actors: NC Clean Energy and Technology Center (NC CETC), electric utilities.

Key Stakeholders: Local dealerships, NCDOT, state agencies, municipal and county governments, businesses.

Description: Many consumers are interested in owning an EV yet are hesitant to purchase. Ride & Drive events provide consumers an opportunity to learn about and test drive EVs. Ride & Drive events occur periodically across the state. In addition to traditional Ride & Drive events, consumers can benefit from a modified, extended EV demo option. Under this approach, consumers can borrow an EV for up to one week, which allows them to get a better sense for the technology and how they could use a zero emission vehicle. For example, many stakeholder organizations observed that extended Ride & Drives provide consumers with first-hand experience of EV performance during a typical work week.

2022 Update: Ongoing. The NC CETC has been working in partnership with Plug-In NC and SACE to coordinate Ride & Drive events across the state (see partial list below), while adhering to COVID guidelines. These types of events will continue into 2022. Links to these events will be provided on the NCDOT website.

2019 - 2021 Ride and Drive Events

Alternative Vehicle Demonstration Days for Government Workers	October 2019
Virtual Ride and Drive Event	April 2020
Durham Bulls EV Display	August 2021
SACE EV Roadshow	August 2021
NCSU Football Game Alternative Fuel Tailgate	September 2021
NCSU Ride and Drive and EV Showcase	September 2021
NC General Assembly EV Ride and Drive (SACE)	September 2021
Wake Forest Football Game Alternative Fuel Tailgate	October 2021

Fleet Education and Outreach [Short-term]

Strategy: Promote conversion to electric vehicle fleets with key private and government fleet managers.

Lead Actors: NC Clean Energy Technology Center

Key Stakeholders: Private fleet operators, state and local government fleet operators, NCDOT, NCDOA, electric utilities.

Description: Compared to personally owned vehicles, fleets hold potential for quicker, broader electric vehicle adoption. This is because fleet buyers base purchasing decisions off the total cost of vehicle ownership, a metric for which electric vehicles offer several potential benefits.

1. Operating Costs: Typically, the fuel cost per mile is significantly less for electricity compared to gasoline or diesel. Additionally, maintenance costs are significantly lower due to electric motors having fewer moving parts and requiring less overall servicing.

2. Useful Life (miles driven): Given that the upfront cost of a vehicle is fixed over its useful life, the total cost of ownership becomes more favorable the longer the vehicle remains in use. With fewer moving parts, electric vehicles tend to last longer than vehicles with combustion engines.

3. Battery Costs: Batteries typically make 30-40% of manufacturing cost. However, costs are falling quickly. In 2021, battery prices had fallen 89% from 2010 levels.⁴

It is likely that the fleet buyer will favor electric vehicles when the total cost of ownership becomes favorable compared to gasoline vehicles, even if the upfront costs of an electric vehicle are higher. For commercially focused fleet managers a small reduction in total cost of ownership per vehicle can amount to a very large sum across their entire fleet.

2022 Update: Ongoing. The NC CETC hosts a [Sustainable Fleet Technology Conference](#) annually to share fleet industry ideas, trends, strategies, and new technologies to drive efficiency, technology adoption and continuous improvement in fleet operations. In 2020 and 2021, the forum moved to a virtual format with a webinar series that included over 54 webinars. The NCCETC will move back to an in-person format in August 2022 in Durham.

Guidance Document on Charging Infrastructure Installation & Management [Short-term]

Strategy: Establish and regularly update guidance documents to assist government and private sector entities with installation and management of charging infrastructure.

Lead Actors: NC Clean Energy Technology Center, N.C. Department of Insurance

Key Stakeholders: DOA, state agencies, local governments, businesses, NGOs.

Description: Segments of state and local governments as well as businesses are installing an increasing number of charging stations for the public and their employees each year. When installing charging stations, questions often arise around requirements and best practices for installation and operation. A guidance document addressing these questions will facilitate increased deployment of charging infrastructure. Such a document should address topics such as appropriate charging rates, recommended specifications and functionality of charging stations, access to and management of charging data, and treatment of ICE vehicles that park in EV designated spaces. In addition, guidance should provide clarity to local governments, developers, property owners, and EV infrastructure companies by identifying a realistic pathway for installing EV charging stations in compliance with requirements of the Americans with Disabilities Act.

⁴ Bloomberg NEF, “Battery Pack Prices Fall to an Average of \$132/kWh, But Rising Commodity Prices Start to Bite.” November 30, 2021. <https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/>

2022 Update: Complete. NC CETC has drafted a guidance document based on a literature review of existing guides. The [final version](#) is available on the NCDOT website.

Convenience Initiatives

Facilitate Fast Charging Collaboration [Medium-term]

Strategy: Continue to support existing Fast Charging Corridor efforts and collaborate directly on planning and rollout of fast charging networks with industry partners.

Lead Actors: NCDEQ

Key Stakeholders: NCDOT, electric utilities, businesses, and N.C. Utilities Commission.

Description: Fast charging refers to EV charging stations of at least 50kW capacity that allows EV drivers to receive a full charge in minutes, not hours. Current charging technology provides up to 250kW charges, which provides about 250 miles of range in about 30 minutes. Targets for fast charging collaboration efforts include retail centers, rest areas, grocery stores, public parking lots and gas stations. It is important to build fast charging networks for travel between important destinations, such as cities and tourist attractions, and conscientious siting of charging infrastructure can provide equitable access in low-income and rural areas. Funding to expand the state's charging infrastructure network under the Volkswagen Settlement administered by NCDEQ gives priority to projects proposed along designated Fast Charging Corridors.

2022 Update: In progress. [Phase I of the VW settlement](#) awarded \$3.4 million for DC Fast chargers in July of 2020, resulting in 45 DCFC ports at 31 DCFC sites. NCDEQ has issued a request for proposals for [VW Phase 2](#) in 2022. As part of the VW settlement, Electrify America has deployed 58 ultra-fast DCFC ports across 12 sites in North Carolina.

In November 2020, the NC Utilities Commission approved a pilot for Duke Energy to include the deployment of 40 DCFC stations. The utility has applied to the commission for a second phase of the pilot to include additional investment in DCFC stations, with a particular focus on Tier 1 and Tier 2 counties.

The 2021 Federal Infrastructure Investment and Jobs Act (IIJA) designates \$5 billion in federal funding for EV infrastructure investment. The National EV Infrastructure (NEVI) program allocates approximately \$109 million for North Carolina over the next five years. There are also opportunities to apply for up to \$2.5 billion in discretionary funds to invest in additional charging infrastructure through a competitive process and other competitive grant opportunities.

Develop Workplace Charging Programs [Medium-term]

Strategy: Launch workplace charging programs or pilot programs at large employers, such as government and businesses.

Lead Actors: NC Clean Energy Technology Center

Key Stakeholders: Corporations, Industry partners, utilities, municipalities.

Description: Workplace charging programs can provide convenience and assurance to employees with limited charging access at their homes. Municipalities in North Carolina are ideal candidates for workplace charging programs given their influence over early - often expensive and time consuming - steps in deploying these programs, such as working through design and permitting, as well as administering any incentives. Workplace charging programs can facilitate electric vehicle adoption among employees by providing charging stations in facility parking lots, dedicated EV spaces, and on-street parking.

2022 Update: Workplace charging activity has been limited due to pandemic restrictions and funding. A preliminary search of resources and a plan has been generated, but no formal activity has occurred. This initiative will be evaluated through the NC Clean Transportation Plan stakeholder process to determine potential next steps.

Charging in Rest Areas [Long-term]

Strategy: Continue to investigate the feasibility of options to provide DC Fast Charging at Interstate rest areas, reconciling legislative issues as necessary.

Lead Actor: NCDOT

Key Stakeholders: NCDOT, FHWA, utilities, NC General Assembly

Description: Located off major interstates and with attractive amenities, North Carolina's rest areas are well-positioned as potential locations for DC Fast Chargers to enhance North Carolina's EV corridors. However, the following hurdles must first be overcome:

1. Revenue generation on federal rights of way: Federal law prohibits revenue generation at rest areas unless it is used to defray the cost of the service provided.

2. Distribution of power: To distribute power, a FHWA-approved State Utility Accommodation Policy (UAP) must be in place; North Carolina does not have a UAP.

3. Session Law 2012-186: State law states that NCDOT may operate an electric vehicle charging station at state-owned rest areas only if the following conditions are met:

i) The electric vehicle charging state is accessible by the public;

ii) A mechanism is developed to charge the user a fee to recover the costs of electricity consumed, processing the user fee, and operation and maintenance.

4. Electrical infrastructure: Fast charging requires 3-phase power services. North Carolina rest areas do not have 3-phase power. Moreover, estimates to install the infrastructure to provide 3-phase power can be costly. Even as 3-phase power infrastructure becomes more widely available in North Carolina, it will still be necessary to reconcile conflicting state and federal laws.

2022 Update: In Progress. NC HB 329 (2019) exempted EV charging infrastructure from regulation as a public utility, but other state and federal barriers still exist. The Federal Highway Administration recently put out this [FAQ](#) to help provide clarity on existing requirements under the law or agency policies for EV charging along interstate rights of way. NCDOT will continue to investigate potential options.

Establish Consistent Wayfinding Signage [Short-term]

Strategy: Increase deployment of clear, uniform road signage to indicate public charging stations and identify critical areas throughout the state for placement.

Lead Actor: NCDOT

Key Stakeholders: Metropolitan Planning Organizations, local governments, businesses.

Description: North Carolina lacks comprehensive signage for directing residents to public charging stations. Consistent charging signage across all electric vehicle corridors in North Carolina will increase public awareness of charging station availability and may contribute to reduced concerns regarding range. Recent research has shown that universal electric vehicle charging signage is associated with increased consumer interest. North Carolina can adopt the Federal Highway Administration (FHWA) design for uniform charging station signage and continue to gather input into optimal signage placement.

2022 Update: In Progress. NCDOT is required by federal law to follow the Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration. This manual helps ensure consistency with traffic control devices, including general and specific service signs along the highways. The overall purpose of traffic control devices is to notify road users of regulations and provide warnings and guidance to support efficient operation and minimize the occurrences of crashes. In addition to the MUTCD, there are other state and federal statutes concerning signing content. The MUTCD is updated periodically to accommodate the nation's changing transportation needs and in 2021 offered a comment period on a Notice of Proposed Amendments (NPA) for the 11th edition of the MUTCD (the comment period closed in May 2021). Although NCDOT did not provide comments or recommendations, the proposed amendments included clarification on the types of general service signs that could include alternative fuel signage. The final MUTCD revisions have not been published. NCDOT will continue to monitor and update accordingly.

Enhance Corridor Definitions [Short-term]

Strategy: Refine definitions of current FHWA alternative fuel corridors to be more EV focused to encourage investment of charging infrastructure along designated corridors.

Lead Actors: NCDOT, FHWA

Key Stakeholders: State government agencies, Metropolitan/Rural Planning Organizations

Description: In 2016 and 2017, North Carolina designated portions of I-85, I-40, I-26, I-77 and I-95 as Alternative Fuel Corridors as part of the FHWA Alternative Fuels Corridors program. Designation through this program is based on the location of available infrastructure. An enhanced corridor definition will allow the state to determine where to develop future charging infrastructure. To define these enhanced corridors, NCDOT will need to take into consideration factors such as proximity to employment, availability of power, modal connections and right of way ownership. Finally, identifying corridors based on travel behavior indicators such as annual average daily traffic (AADT) and EV ownership per capita, will present strong reasoning for charging stations to be funded, planned and constructed in a manner that provides optimal charging coverage. Establishing these corridors will enable the legislature to more easily provide public funding that will ultimately encourage private investment in fast charging along designated corridors.

2022 Update: In Progress. The U.S. Department of Transportation approved the [5th round](#) of Alternative Fuel Corridors in April 2021 and the [6th round](#) in July 2022.⁵

EV Corridor Ready (Round 5)

I-85: Between the I-85/I-40 interchange in Hillsborough and Henderson

I-87/US-64: Between Raleigh and Rocky Mount

I-485: Entire highway loop

US-70: Between Raleigh and Smithfield

US-74: Between Charlotte and Wadesboro

EV Corridor Pending (Round 5)

I-40: Between Raleigh and Wilmington

I-77: Between the I-77/I-40 interchange in Statesville and the NC/VA border

I-85: Between Henderson and the NC/VA border

US-64: Between Rocky Mount and Manteo

US-70: Between Smithfield and New Bern

US-74: Between Wadesboro and Wilmington

All FHWA designated corridors from the first six rounds can be found in the map below.

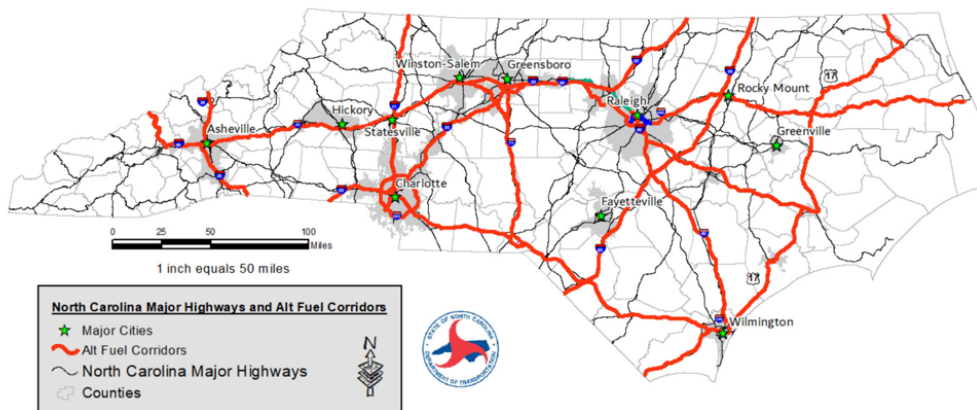


Figure 3: North Carolina FHWA Designated Alternative Fuel Corridors for Electric Vehicles (Rounds 1-6)

Affordability Initiatives

Financial Incentives [Long-term]

Strategy: Provide a state tax credit and other financial incentives to drive EV purchases by reducing up-front costs.

Lead Actors: NC General Assembly, research institutions

Key Stakeholders: NC General Assembly, NCDOT, dealerships, NGOs, electric utilities.

Description: The \$7,500 federal tax credit for EV purchases has improved EV affordability and helped drive adoption over the past several years. That incentive is beginning to phase out for popular models, and there is some discussion about eliminating the federal tax credit altogether. Elimination of the federal tax credit would leave a significant gap in funding, as the average upfront price of an electric vehicle is unlikely to reach parity with comparable gasoline models until approximately 2025. In addition to federal tax credits, state tax credits have proven effective at driving EV adoption. To inform discussions on state tax credits and other financial incentives (e.g., point-of-sale rebate, rebate or credit for installation of charging infrastructure), university researchers and stakeholders could conduct analysis on the impacts of various policy designs. Policy design topics include the level of state tax credit and other financial incentives, qualifying vehicles and owners, duration of the financial incentive, and presence and length of a phase-out period. Important impacts include the effects on vehicle adoption rates, equitable access to incentives, and the costs of providing the incentive.

2022 Update: In Progress. The 2021 Federal Infrastructure Investment and Jobs Act (IIJA) designates \$5 billion in federal funding for EV infrastructure investment. This is approximately \$109 million for North Carolina over the next five years. There are also opportunities to apply for up to \$2.5 billion in discretionary funds to invest in additional charging infrastructure through a competitive process and other competitive grant opportunities. The Inflation Reduction Act (still in Congress) could provide additional incentives for use at the consumer level. The North Carolina General Assembly has not passed state-level financial incentives to encourage EV adoption.

Original Equipment Manufacturer (OEM) Rebates [Long-term]

Strategy: Original manufacturers offer and publicize rebates at the point of sale for an electric vehicle

Lead Actors: Auto manufacturers

Key Stakeholders: Dealerships, EV associations

Description: To increase affordability of EVs, manufacturers such as Nissan, offer customer rebates on EV purchases. In 2019, Nissan offered a \$3,500 rebate for electric coop members in North Carolina to buy a Nissan LEAF and a \$3,000 rebate for members of Plug-In NC. Rebates from additional manufacturers can increase interest in EVs and their affordability for a larger

segment of consumers, including low- and middle-income buyers in rural and urban communities. Manufacturer rebates apply in addition to tax credits and other financial incentives. For example, a Nissan LEAF with an MSRP of \$35,000 would effectively cost \$24,000 after a \$3,500 rebate and \$7,500 federal tax credit. In addition to the reduced purchase price, the vehicle owner would benefit from ongoing savings through reduced operation and maintenance costs.

2022 Update: This initiative will be evaluated in the NC Clean Transportation Plan stakeholder process for the development of an action plan. The potential passage of the Inflation Reduction Act in 2022 would provide incentive opportunities at the federal and state level.

Green Vehicle Loans with Credit Unions [Short-term]

Strategy: Credit unions and commercial banks provide low-interest financing for customers who purchase electric vehicles.

Lead Actors: Credit unions, commercial banks

Key Stakeholders: Local dealerships.

Description: Although EVs are affordable for many consumers today and are declining in cost, they are still out of reach for some consumers. Currently, there are loan programs in North Carolina that exist for electric vehicles and can be used as a baseline to scale a green vehicle loan initiative. ElecTel Cooperative Federal Credit Union, for example, offers special low-interest loans for the purchase of electric vehicles. To maximize the effectiveness of these loans, partnerships can work directly with participating car dealerships. Similar to conventional loans, participating dealerships would be able to process a customer's green vehicle loan application on the lot and determine eligibility.

2022 Update: In Progress. The North Carolina Clean Energy Fund is a non-profit green bank established to help advance clean energy and clean transportation investment in the state, particularly for underserved customers. The fund will work in partnership with local credit unions and banks to establish accessible and low-interest financing programs for all EV consumers.

Encourage Secondary Electric Vehicle Markets [Medium-term]

Strategy: Identify ways to drive a larger and healthier secondary market for electric vehicles, coordinating with manufacturers to develop a pipeline of used vehicles into North Carolina.

Lead Actors: NCDOT, NC Clean Energy Technology Center, Climate Alliance members

Key Stakeholders: State credit unions and local dealerships.

Description: The used market for electric vehicles represents a small but growing portion of overall transactions. Recent studies have highlighted savings that can be realized by opting for a used instead of a new vehicle. A used Nissan LEAF, for example, can be bought for approximately 40% less than new models. These numbers will moderate over time as the

market and technologies mature but are an increasingly viable way to get and keep electric vehicles on the road. Increased access to used EVs is an opportunity for low- and middle-income populations to participate in and benefit from transportation electrification. Encouraging used electric vehicle purchases will require significant enabling efforts around educating consumers about their options as well as how the powertrain in electric vehicles is fundamentally different from gas-powered vehicles. Warranties, while still three years for most major areas of the car, are federally mandated at eight years or 80,000 miles for the battery. In addition, states that have opted into the Zero Emissions Vehicle Memorandum of Understanding (“ZEV States”) have a warranty for the batteries that is extended to 15 years and 150,000 miles.

2022 Update: The secondary market conditions have changed due to vehicle supply constraints in 2021 and early 2022, including the reduced availability of new and used vehicles due to a global chip shortage and the supply chain disruption. The reduced supply of vehicles has caused vehicle prices to climb and puts new and used electric vehicles even further out of reach for many consumers. This initiative will be further evaluated through the NC Clean Transportation Plan stakeholder process.

Policy Initiatives

Regional Electric Vehicle Initiative [Short-term]

Strategy: To establish a regional collaboration that is mutually beneficial to residents and businesses in participating states. The collaboration will promote a seamless cross-state driving experience, increase public awareness of EVs, and facilitate the sharing of best practices for policy development and program implementation.

Lead Actors: Governor’s Office, NCDOT, NCDEQ

Key Stakeholders: EV industry, federal government, local governments, electric utilities

Description: State alliances and coalitions can encourage private industry investment and interstate coordination. The Southeast is home to a strong automotive sector that includes a robust supply chain and manufacturing plants for several major automotive companies that are increasing their investments in electric vehicles. A regional initiative in the Southeast would signal to the auto industry and other EV industry stakeholders that the region wants to increase EV adoption and capture associated economic and job opportunities. In addition, a regional initiative could facilitate installation of charging infrastructure to support the tourism and recreation sectors. It could also facilitate access to charging infrastructure and electric vehicles in small towns and rural or underserved communities.

2022 Update: Complete. Two regional collaborations were established in the Southeast in 2021 to coordinate transportation electrification across the region. The [Southeast Regional Electric Vehicle Information Exchange](#) (SE REVI) has been established for Southeast State Energy Offices. SE REVI is a collaboration of state and territory energy offices from Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, and the U.S. Virgin Islands. The collaboration is focused on sharing information and

best practices and collaborating on EV infrastructure planning, policy development and program implementation.

The [Southeast Regional Transportation Initiative](#) (SETRI) has been established by a coalition of businesses, manufacturers, non-profit organizations, and research institutions to advance transportation electrification throughout the Southeast. SETRI participants intend to work together to promote regional EV market development through education, research and collaboration.

Electric Vehicle User Fees [Long-term]

Strategy: Establish and maintain a fair fee structure for electric vehicles, which may include road usage charges, mileage-based user fees or other mechanisms

Lead Actors: NC FIRST Commission, NCDOT, NC General Assembly

Key Stakeholders: NC residents, universities

Description: The NC FIRST commission was created by Transportation Secretary Jim Trogon in March 2019. It is tasked with evaluating North Carolina’s current and future transportation investment needs and providing recommendations to ensure that critical financial resources are available in the future. The NC First Commission will consider fee structures such as vehicle registration fees, road use charges, and mileage-based user fees to maintain equity of electric vehicle drivers that use roads and infrastructure but do not pay federal and state taxes “at the pump” like conventional vehicles. A fee structure affecting EVs should be established with consideration of implications for EV adoption, revenue generation, environmental consequences, and disadvantaged communities and should not be set at levels that discourage EV adoption. The Commission will send recommendations to the NCDOT Secretary for evaluation and presentation to the General Assembly.

2022 Update: In Progress. The NC First Commission report was submitted to the NCDOT Secretary in January 2021 and included options for addressing the disparity between transportation-related taxes paid by different vehicle types. These options included increasing the EV fee, enacting a new plug-in hybrid fee, and establishing a voluntary pilot program for hybrid and electric vehicle owners to pay a mileage-based user fee in lieu of motor fuel tax or special registration fees. The report was presented to the North Carolina General Assembly’s House Select Committee on Strategic Transportation Planning and Long-Term Funding Solutions in January 2021. No legislative action occurred regarding these three options during the 2021 legislative session, but the report generated significant discussion and support from legislators, the transportation industry, the business community, and local governments.

Update Building Codes [Medium-term]

Strategy: Modify building policies and practices, such as building codes, the state construction manual, and applicable statutes, to help enable EV charging installation.

Lead Actors: NC Building Code Council, Department of Administration or Insurance

Key Stakeholders: NC General Assembly, metropolitan planning organizations, non-profit organizations, trade associations.

Description: Adopting EV-ready building codes is a top priority for North Carolina, given it is much more expensive to retrofit existing buildings for EV accessibility and usage. Outfitting buildings with North Carolina ZEV Plan 30 parking spaces, complete with wiring and appropriate safety equipment can be approximately 65% less expensive than installing these features to the same specifications after full construction. North Carolina will need analyses of existing policies to identify specific changes to the building code and other policies that affect residential (including multi-family residences), commercial, industrial, and government buildings. These changes should balance the interests of increasing availability of charging infrastructure with home affordability and long-term housing and transportation trends.

2022 Update: In Progress. The NC Building Code ad hoc committees are in the process of studying the latest national building codes (2018 and 2021 editions), including the building codes relating to electric vehicle charging.

Conversion to Electric Transit Fleets [Medium-term]

Strategy: Establish a task force to study conversion to electric transit fleets in North Carolina and issue a report that recommends numeric goals and strategies for electrifying transit fleets.

Lead Actor: NCDOT

Key Stakeholders: NCDOT, transit fleet managers, OEMs

Description: Shifting to electric transit fleets in North Carolina can lower transit costs, reduce greenhouse gas emissions, benefit air quality, and improve rider experiences. Increased use of electric buses and other transit vehicles can yield meaningful reductions in transportation sector emissions and move the state toward a 40% reduction in statewide GHG emissions by 2025. The task force's report should include numeric goals for electric transit fleet adoption, such as a number or percentage of conversion by 2025, 2030 and 2040. In addition, the report should include information and recommended strategies for adoption, including a comparison of lifecycle costs among transit vehicle technologies, sources of funding, technical considerations and best practices. In 2019, there were 939 full-size buses and 2,451 light-transit vehicles in North Carolina, which were powered by a combination of diesel, electric power, compressed natural gas, and hybrid power. Conversion of this entire fleet to all electric power could significantly improve life-cycle vehicle costs associated with fleet operations, reduce GHG emissions, and reduce air pollution in urban areas. Fleet and bus electrification provide riders multiple benefits, including a quieter ride and easier entry because of a lower floor design. Shifts in these fleets also provide an opportunity to reduce emissions in low-income communities that have been disproportionately exposed to harmful pollutants.

2022 Update: In Progress. A task force has not been started formally. However, many state and local government transit fleets have started to transition to electric and alternative fuel transit vehicles.

In addition, the Bipartisan Infrastructure Law (BIL), signed by President Biden on Nov. 15, 2021, amended the statutory provisions for the Federal Transit Administration's (FTA)

implementation of the Grants for Buses and Bus Facilities Competitive Program and the Low or No Emission Program. The new provision requires that any application for projects related to zero-emission vehicles include a Zero-Emission Transition Plan. The Institute for Transportation Research and Education (ITRE) will be developing a Zero Emission Transition Plan for NCDOT-controlled vehicles which is expected to be completed in early 2022 and will be included in the NC Clean Transportation Plan.

Motor Fleet Shift to Zero Emission Vehicles [Short-term]

Strategy: Implement the directive in EO 80 that cabinet agencies prioritize purchasing and leasing ZEVs when adding new vehicles and using those vehicles when feasible.

Lead Actors: NCDOA, state cabinet agencies

Key Stakeholders: State and local governments

Description: Section 7 of EO 80 directs cabinet agencies to “prioritize ZEVs in the purchase or lease of new vehicles and shall use ZEVs for agency business travel when feasible.” It then directs the Department of Administration to develop a NC Motor Fleet ZEV Plan (and update it annually) that defines feasibility and includes strategies related to infrastructure, procurement and other key topics for increasing ZEV use in the state motor fleet. NCDOT is in a unique position to assist NCDOA with its statewide fueling and maintenance facilities. The feasibility of placing charging stations at these facilities will be investigated. Ongoing implementation of this provision in the executive order will not only shift the state fleet, it will also increase state employees’ familiarity with ZEVs and increase the visibility of ZEVs on public roads. State purchasing contracts for ZEVs and charging infrastructure allow local governments and public institutions of higher education to purchase those items at lower cost than they can negotiate individually. As implementation of section 7 proceeds, the state will lead by example, showing that public and private fleets across the state also can shift to ZEVs.

2022 Update: Ongoing. The 2021 Motor Fleet ZEV Plan update highlights successes in the state’s adoption of ZEVs and prioritizes action items to support the motor fleet transition, including the construction of adequate charging infrastructure. NCDOA has procured 41 all electric EVs for fleet use and continues to add models to its list of new vehicles.

Innovative EV Rate Design [Medium-term]

Strategy: Offer innovative electricity rates that support EV adoption and encourage vehicle charging when it is beneficial for the grid

Lead Actors: North Carolina Utilities Commission, public utilities, electric cooperatives, municipal electric utilities

Key Stakeholders: Ratepayers, NCDEQ, NC Public Staff

Description: As described in the 2019 N.C. Clean Energy Plan, rate design can effectively encourage drivers to charge EVs at times of the day when it is advantageous to the electric

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grid. A super off-peak rate during overnight hours, for example, can entice drivers to program their vehicles to charge during the middle of the night and avoid contributing to peak electricity demand in the early evening. Rate design also can strategically encourage workplace charging. Beyond supporting the electric grid, these policies can increase the cost-effectiveness of EVs for residential and commercial uses. Current rate design for commercial EV charging site hosts and EV fleet managers can be cost prohibitive. Some state utilities commissions have begun evaluating innovative rate designs for EVs, and different rate designs could support the electric grid and EV adoption in North Carolina as well.

2022 Update: In Progress. As part of a NC Utilities Commission Order in Duke Energy has a rate design collaborative underway and residential and non-residential EV rates are a part of the discussion. The rate design study was provided to the NC Utilities Commission on March 31, 2022.⁵

⁵ Additional information can be found in the Comprehensive Rate Design Study Roadmap, dated 3/31/2022, prepared by Duke Energy, NCUC Docket Nos. E-7, Sub 1214 and E-2, Sub 1219 prepared by ICF on behalf of Duke Energy. NCUC Docket Nos. E-7, Sub 1214 and E-2, Sub 1219. <https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=c4a5ea97-de75-43b7-bb5f-97a219d89d61>

V. Next Steps

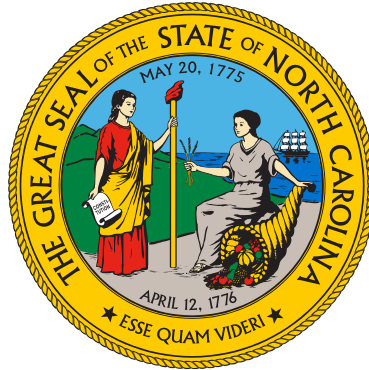
On Jan. 7, 2022, Governor Roy Cooper signed Executive Order No 246 (EO246), *North Carolina's Transformation to a Net-Zero Emission Economy*, setting the course for North Carolina's continued work to reduce economy-wide GHG emissions while creating jobs and economic growth throughout the state. This executive order builds upon prior and ongoing actions on clean energy, climate change and environmental justice, including 2018's Executive Order 80, which established a goal to reduce GHG emissions by 40% and increase ZEV adoption to 80,000 vehicles by 2025. The new executive order outlines two primary goals:

- Reduce economy-wide greenhouse gas emissions to at least 50% below 2005 levels by 2030 and achieve net-zero emissions by 2050; and
- Increase the total number of registered, zero-emission vehicles to at least 1.25 million by 2030 and increase the sale of ZEVs so that 50% of in-state sales of new vehicles are zero-emission by 2050.

The order further instructs the NCDOT to develop a Clean Transportation Plan (NCCTP) within 15 months of the order. The NCCTP will recommend strategies for decarbonizing the transportation sector and shall address:

1. Availability, sales and usage of zero-emission vehicles to levels beyond market projections;
2. Reductions in vehicle miles traveled;
3. Investment in clean transportation infrastructure;
4. Equitable access to clean mobility options;
5. Increased availability of non-vehicle transportation modes;
6. A transition to zero- and low-emission fuels; and
7. Other relevant topics.

Using the 2019 ZEV Plan as a foundation, the NCCTP process resumed in April 2022 and has convened a diverse set of stakeholders to collaboratively develop a list of policy and programmatic efforts to rapidly decarbonize the North Carolina transportation sector in an equitable manner



NORTH CAROLINA ZEV PLAN

A Strategic Plan for Accelerating
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