

Electrifying Transportation:

A Strategic Policy Guide for Improving Public Access to Electric Vehicle Charging Infrastructure in Rhode Island

December 2021



STATE OF RHODE ISLAND
**OFFICE OF
ENERGY RESOURCES**



With the support of:



To: The Honorable Daniel McKee, Governor

December 31, 2021

The Honorable Dominick J. Ruggerio, President of the Rhode Island Senate

The Honorable K. Joseph Shekarchi, Speaker of the Rhode Island House of Representatives

On behalf of the Rhode Island Office of Energy Resources (OER), Department of Transportation (DOT), Department of Environmental Management (DEM), and Division of Motor Vehicles (DMV), we are pleased to present you with the report **Electrifying Transportation: A Strategic Policy Guide for Improving Public Access to Electric Vehicle Charging Infrastructure in Rhode Island** in response to S-0994 and H-5031, which directed our agencies to develop a plan to improve access to electric vehicle charging stations across the state.

Climate change – and its numerous consequences – is an urgent crisis facing Rhode Island residents and businesses. In 2021, the General Assembly passed, and Governor McKee signed into law, the historic 2021 Act on Climate (S-0078A, H-5445A), which sets enforceable, economy-wide greenhouse gas emissions reduction mandates that culminate in net-zero by 2050.

Accounting for roughly one-third of Rhode Island’s greenhouse gas emissions, decarbonization of the transportation sector is vital if our state is to meet these mandates. Transitioning from internal combustion engines that use fossil fuels to electric vehicles – while simultaneously decarbonizing our electricity resources – is one key strategy to reducing greenhouse gas emissions from transportation. Our Strategic Policy Guide considers electrification in depth, but notes that it is one of many necessary strategies to decarbonize and improve mobility.

The science has also proven direct relationships between transportation pollution and local public health impacts. Historic and systemic inequities have led to these negative public health impacts being disproportionately borne by low-income communities and communities comprised of people of color. Transitioning to electric vehicles – which have zero tailpipe emissions – will improve local air quality and, therefore, public health in these overburdened communities. However, as discussed further in this Strategic Policy Guide, we must prioritize electric transportation and charging infrastructure both within those communities and for the medium- and heavy-duty vehicles that contribute the most pollution, including transit vehicles, school buses, and trucks.

Through the federal Infrastructure Investment and Jobs Act, signed into law in November 2021, Rhode Island is anticipated to receive substantial funding to support clean transportation infrastructure and transit services. This Strategic Policy Guide is a foundational first step to understanding how Rhode Islanders want to prioritize investments. The federal government is anticipated to issue guidance for how these monies can be used in February 2022 and, with this Guide in hand, Rhode Island can hit the ground running. We recommend – and are ready to lead – development of an investment strategy that includes opportunities for public participation and review, while enabling programmatic investment by the third quarter of 2022.

The intent of this Strategic Policy Guide is threefold: First, the Project Team reviews the status quo of electric vehicles and their charging infrastructure, as well as current and prior programming. The purpose of this review is to establish where Rhode Island is with vehicle electrification as we look ahead to 2022. Second, the Project Team distills needs and recommendations heard from three months of public comment, three public listening sessions, and over two dozen one-on-one meetings with agencies and external stakeholder organizations. The purpose of this is to prioritize what we heard as the most critical

items to integrate into future policies and programs. Third, the Strategic Policy Guide will be a working document from which agencies – and stakeholders – can coalesce around priorities and coordinate action in the years to come.

We have discerned the following key priorities for our work in the coming years:

- Reinvest in **incentive programs** for electric vehicles and charging infrastructure;
- **Refine electric vehicle and charging infrastructure programs** to align with priorities and to center equity such that benefits accrue to underserved and overburdened communities;
- Demonstrate progress in **electrifying transit**, school buses, and medium- and heavy-duty vehicles in order to reduce harmful emissions and improve public health;
- Conduct an analysis to understand **transportation revenue impacts** and develop recommendations for future action to ensure sustainable funding streams;
- Support a **100% Renewable Energy Standard** to ensure electric transportation is truly decarbonized;
- Develop a clean transportation **dashboard** to track progress; and
- **Demonstrate action** through state agency commitments and accountability.

The Project Team and other partner agencies represented by the Executive Climate Change Coordinating Council (EC4) view the publication of this Strategic Policy Guide not as an end to our work, but as the start of our coordinated actions to improve public access to – and benefits from – the transition to a decarbonized transportation sector. Each agency has identified and committed to a specific priority action in 2022. All actions are described within the Strategic Policy Guide in the context of addressing priority needs. Agencies will be held accountable through routine report-outs to the EC4 at public meetings, and progress will be tracked via a public clean transportation dashboard.

We also identify a number of considerations in which the General Assembly may be interested. We describe the potential for legislative action throughout the Strategic Policy Guide, as well as summarize legislative considerations at the end.

In sum, we present this Strategic Policy Guide as the coordinating document for our efforts to electrify transportation. By definition, this Strategic Policy Guide will be added to and will evolve as electric vehicle adoption grows, progress is made, and new priorities are identified.

We look forward to coordinating with the General Assembly and the Governor on this important work, and to bringing the benefits of electric transportation to *all* Rhode Islanders.

Sincerely,



Nicholas S. Ucci, Commissioner
Office of Energy Resources



Walter R. Craddock, Administrator
Division of Motor Vehicles



Peter Alviti, Director
Department of Transportation
Walter Craddock, Administrator

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Executive Summary

Our Directive

During the 2021 legislative session, the General Assembly directed the Rhode Island Office of Energy Resources (OER), Department of Transportation (DOT), and Division of Motor Vehicles (DMV) to develop “a plan for a statewide electric vehicle charging station infrastructure in order to make such electric vehicle charging stations more accessible to the public.” In response, DOT, DMV, and OER, along with representatives from the Department of Environmental Management (DEM) and Department of Health (DOH) – collectively, the Project Team – present this Strategic Policy Guide with the aim of identifying priorities and coordinating action over the coming years.

Why this Work Matters



Electrifying transportation is vital to meeting Act on Climate mandates



Electrifying transportation improves local air quality and public health outcomes for historically overburdened frontline communities



This Strategic Policy Guide is a foundation for strategically deploying federal funding made available to support electric vehicle charging infrastructure

Priorities for 2022



Reinvest in and refine incentive programs for electric vehicles and charging infrastructure

Incentive programs have demonstrated impact. Programs should be refined to prioritize incentives for charging infrastructure serving multi-unit dwellings, including for parking on nearby streets and lots with 24/7 public access, among other locations. *Agency Action: OER, in coordination with DOT and DEM and with public participation, will develop an investment strategy for federal funding in line with this Guide.*



Demonstrate progress in electrifying transit, school buses, and medium- and heavy-duty transit

These investments ensure benefits of electrifying transportation flow to frontline communities. Prioritize electrification of transit and school buses, especially those that serve or frequent frontline communities, and encourage electrification for medium- and heavy-duty vehicles that travel near frontline communities. *Agency Action: RIPTA will develop a roadmap to fully electrify their fleet.*



Conduct an analysis to understand transportation revenue impacts

While electric vehicles account for only 1% of light-duty registrations today, Rhode Island should be prepared to maintain revenue for transportation infrastructure currently supported by taxes on gas. *Agency Action: DOT will conduct a study and develop recommendations.*



Support a 100% Renewable Energy Standard

Electrifying transportation now delivers immediate environmental and public health benefits. However, Rhode Island should ensure electric vehicles are fully decarbonized through increasing the Renewable Energy Standard to meet Act on Climate mandates.



Demonstrate action through commitments and accountability

All member agencies of the Executive Climate Change Coordinating Council (EC4) have committed to a priority action for 2022 and assigned a senior staff lead. Agencies will be held accountable through report-outs at EC4 meetings and a public clean transportation dashboard.

This Strategic Policy Guide contains numerous other recommendations and priorities, including a full listing of priority equity recommendations, agency actions, and considerations for the General Assembly. The Project Team thanks all members of the public and stakeholder organizations that participated in the development of this Guide.

Introduction

In their 2021 legislative session, the General Assembly directed the Rhode Island Office of Energy Resources (OER), Department of Transportation (DOT), and Division of Motor Vehicles (DMV) to develop “a plan for a statewide electric vehicle charging station infrastructure in order to make such electric vehicle charging stations more accessible to the public”.¹ In response, DOT, DMV, and OER, along with representatives from the Department of Environmental Management (DEM) and Department of Health (DOH) – collectively, the Project Team – present this Strategic Policy Guide.

The Guide is also presented within the context of the 2021 Act on Climate.² Enacted in April 2021 thanks to the strong leadership of the General Assembly and Governor Dan McKee, the Act on Climate establishes mandatory, enforceable, economy-wide emissions reduction targets culminating in net-zero emissions by 2050. Decarbonization of our transportation system, which represented 35.5 percent of Rhode Island’s greenhouse gas emissions in 2017, is vitally important to our state’s ability to meet this charge. While this Guide is only focused on one piece of the transportation sector, the strategies embedded within will help build a strong foundation for Rhode Island to transform the way we commute to and from work and school, accelerate market development, and support consumer adoption of sustainable transportation solutions.

Purpose and Objectives of the Guide

The Project Team recognizes that deploying accessible electric vehicle charging infrastructure across the state is only one of several aspects of a decarbonized, affordable,

reliable, and resilient mobility system. Furthermore, the desired outcome – ‘improve accessibility’ – can mean different things for different people. Therefore, this Guide takes a big picture look at how Rhode Island can catalyze the transition to electric vehicles, including priority recommendations for actions and commitments across the Administration to make progress.

In developing this Guide, the Project Team met one-on-one with two dozen agencies and organizations, solicited public comment online for three months, and held a series of three public listening sessions. Additional description of public engagement is included in the Appendix. We are grateful for this valuable stakeholder engagement and thank everyone who provided comments, guidance, or even just listened to our public discussions. This interaction also bolsters this Guide by providing a qualitative foundation for priorities that state policies and programs should advance. We include actual quotes from comments throughout this Guide to connect its contents to questions, concerns, and suggestions we heard.

The Project Team sets forth five primary objectives for this Guide:

1. Develop a deployment strategy rather than a master plan
2. Identify strategies to increase utilization of charging stations and adoption of electric vehicles
3. Ensure physical access
4. Promote equitable deployment
5. Ensure continued level of support for transportation infrastructure

First, we seek to develop a **strategy to guide how we deploy charging infrastructure**, rather than a centralized master plan that dictates what

¹ [H-5031](#), [S-0994](#)

² [S-0078A](#), [H-5445A](#)

technology is deployed by whom at what locations and when. While the Administration can and should develop a strategy for charging infrastructure located on State properties, directing private investment is outside of our scope. However, this does not mean the Administration should take a hands-off approach – on the contrary, it is incumbent upon us to facilitate investment particularly in prioritized locations via incentives, market signals, rules and regulations, etc. Our aim is to help catalyze a budding market, track progress, and adjust course with nudges from programs as needed. This Guide proposes strategies to do so based on priorities we heard from the public.

Second, this Guide **underscores the relationship between charging stations and electric vehicle penetration**. The widespread adoption of more sustainable transportation solutions, such as electric vehicles, is absolutely vital to the achievement of Rhode Island’s climate change goals, including the Act on Climate. The purpose of charging infrastructure is to power electric vehicles (EVs) – without EVs to use them, even the most accessible charging stations will be underutilized, resulting in suboptimal transportation investments. Therefore, we identify needs and propose opportunities to promote *both* charging stations and electric vehicles.

Third, we need to ensure that future charging stations can be **as easy to use as other types of refueling stations and made accessible to all**. In a practical sense, we identify opportunities to implement best practices for physical accessibility of charging station infrastructure. This includes both technological considerations like plug type, payment options, and turnover, as well as charging station design, including compliance with the Americans with Disabilities Act, signage and wayfinding, safety, and amenities.

Fourth, not only must the infrastructure be physically accessible, but it also must be **accessible across all communities and the benefits of the charging infrastructure must be equitably distributed**. The Project Team emphasizes the need to defer to communities who know best about what charging infrastructure is needed and where it needs to be sited. In order for charging infrastructure – and the whole of our clean transportation transformation – to be accessible, we need to partner with communities to understand their desired outcomes and ensure there is an avenue through which those outcomes can be realized. In this Guide, we consider systemic inequities, financial burdens, localized health impacts, and other facets of inequity raised in listening sessions and public comments to center priorities for equitable access to and benefits from electric transportation.

Fifth, Rhode Island’s successful transition to clean transportation requires **continued investment in physical transportation infrastructure**, like roads and bridges, and transit services, such as bus fleets and commuter rail services. These investments are currently funded through taxes on gasoline, so declining reliance on gasoline also reduces our ability to invest. Therefore, we identify needs to balance a transition to clean transportation with a steady revenue stream that can be reinvested to support the holistic transportation system.

All in all, the Project Team presents this report as a Strategic Policy Guide that can inform legislative and programmatic development, support coordination, and foster an all-hands-on-deck effort to electrify transportation.

Why this Guide Matters

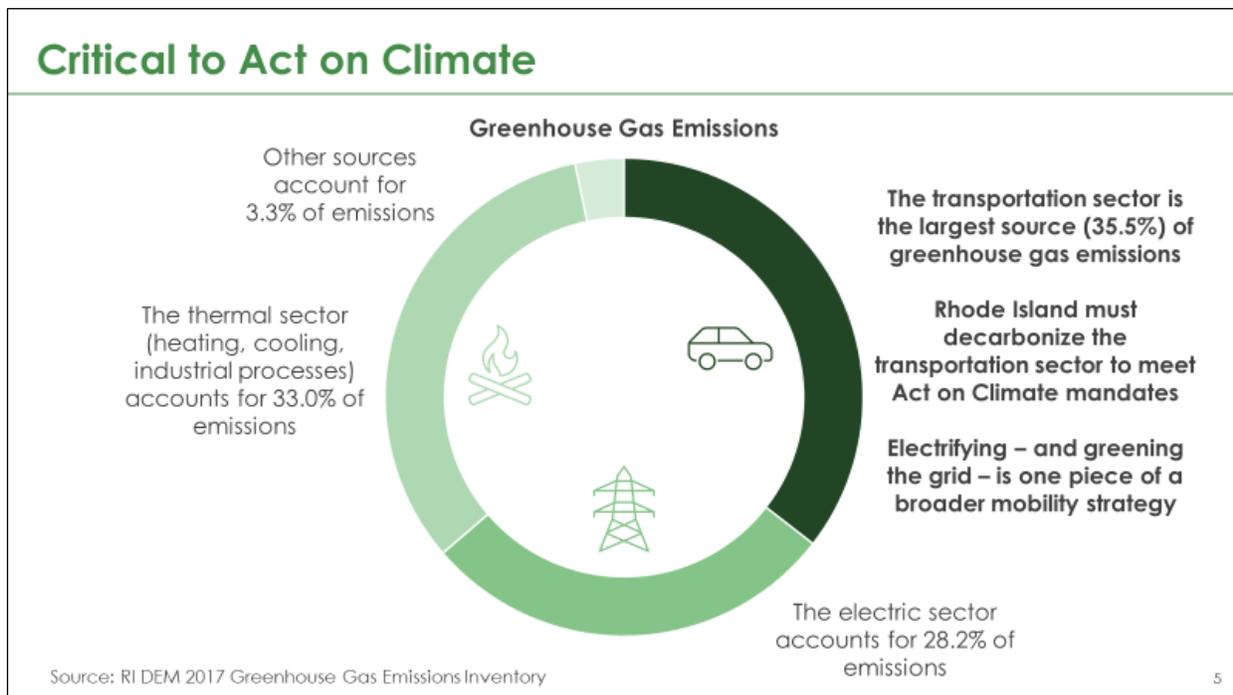
This Guide is critical for meeting Rhode Island's greenhouse gas emissions reduction mandates, alleviating adverse public health impacts for historically overburdened frontline communities, and building a foundation from which to strategically and meaningfully deploy future investments.

First, as a coastal state, Rhode Island's infrastructure, public health, and economy are particularly threatened by a changing climate. We've recognized this risk for years and have been working hard to mitigate climate change by reducing our greenhouse gas emissions, as well as adapt to climate change by bolstering the resilience of our infrastructure and communities.

The landmark 2021 Act on Climate mandates Rhode Island reach net-zero greenhouse gas emissions economy-wide by 2050. In other words, every bit of energy we consume in-state must either be generated by renewable energy resources or be offset by removing emissions from the atmosphere. The transportation sector

accounts for roughly a third of Rhode Island's current greenhouse gas emissions. Therefore, reducing emissions from the transportation sector is imperative for us to meet our climate goals.

One proven way to reduce emissions from the transportation sector is to switch from gasoline-fueled vehicles to vehicles powered by electricity. The carbon footprint of our electric vehicles is not only immediately reduced, but will then become smaller as we increase the amount of electricity on our grid that is produced by renewable energy systems. Other carbon-free transportation technologies – including hydrogen fuel cell vehicles, strategies to reduce vehicle miles traveled, micro-mobility, and walking and biking – are also critical to reducing transportation sector emissions. We discuss some alternative fuel vehicles in this report, but focus on electric vehicles in particular because the technology is mature and the vehicles occupy a larger market share relative to other alternative fuel vehicles.



Second, we know that pollution from transportation corridors reduces local air quality and leads to disproportionate adverse health outcomes for nearby neighborhoods. Because of historic and systemic inequities, these neighborhoods are more likely to have residents that are people of color and families with lower incomes. Electric vehicles do not produce tailpipe emissions like internal combustion engine vehicles, so electrifying our transportation network is a key strategy to improve public health outcomes in underserved and overburdened communities.

Finally, Rhode Island will soon receive federal funding from the Infrastructure Investment and Jobs Act, enacted by President Biden in November 2021. Federal guidance on allowable uses of funding is anticipated in February 2022. This Guide sets the stage for understanding priority investments so that Rhode Island can hit the ground running with program development once guidance is available. Development of a detailed investment strategy with specific budgets, program rules, and timelines will be underway once federal guidance is available – the program development process will include opportunities for public participation to ensure investments are aligned with priorities and resulting benefits are likely to be realized equitably by all Rhode Islanders.

As the General Assembly insightfully noted, a successful transition to a clean transportation system with electric vehicles relies on ensuring the right infrastructure is in place. Rhode Island has already made great progress in deploying electric vehicle charging stations across the

state. For instance, as of December 2021, Rhode Island is home to 235 public charging stations with over 500 ports.³ Indeed, OER deployed over \$1.4 million in funding since 2017 to support the construction of over 125 charging stations. Also, OER has worked with other state agencies to install 63 new charging stations with 122 ports across State government facilities, including 18 charging stations with 32 ports that support DOT. DEM has been a leader in Rhode Island’s participation in the Mobility Innovation Working Group, regional policy discussions, and transportation-related air quality data monitoring and greenhouse gas emissions inventorying.⁴ By working together, this Guide proposes a strategy that leverages our existing efforts and builds on our successes.

How to Read this Guide

In Section 1, we first set the stage about clean transportation technology – including a primer on types of electric vehicle charging technology and alternative fuel vehicles – and describe the current landscape of electric vehicle use and charging infrastructure in our state. We also describe our existing programs and policies, as well as transportation infrastructure funding sources. A description of initiatives from other states is included in the Appendix.

Section 2 identifies needs and challenges for electrifying transportation, organized in thematic chapters. Needs and challenges were directly informed by stakeholder discussions and public comments. For each need, we identify a number of opportunities to address that need. Some opportunities are actions we can take right now, while others may require longer-term work or be

³ Note that this figure represents only publicly accessible Level 2 and DCFC charging; it does not include privately-owned charging infrastructure or Level 1 charging access.

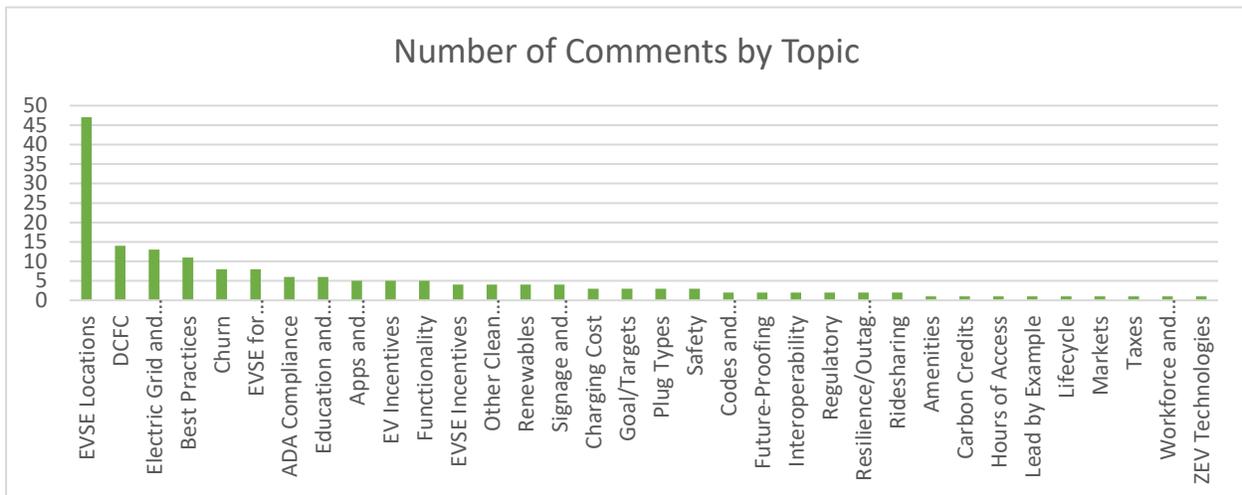
⁴ DEM led Rhode Island’s participation in the Transportation and Climate Initiative (TCI), a regional cap-and-invest policy proposal: <https://www.transportationandclimate.org/> In December 2021, neighboring states Connecticut and Massachusetts paused their participation in this effort. As this effort depends upon the involvement of at least three jurisdictions, Rhode Island cannot move forward with TCI at this time.

contingent on resource availability. Our goal is for this Guide to be an actionable framework for future efforts that can continue to be referenced and refined as we transition to a clean transportation system. To assist in easily referencing recommendations, we compile key recommendations into three separate lists. First, while we integrate recommendations related to equity throughout all chapters, we reiterate and centralize these recommendations into their own summary chapter. Second, we offer meaningful next step action items for all agencies within the Executive Climate Change Coordinating Council to make progress on the year ahead. Third, we compile considerations for the General Assembly.

How we Developed this Guide

In developing this Guide, the Project Team held three public listening sessions and collected public comments, resulting in over 175 comments on nearly three dozen topics (see figure below). The comments we received exhibited practical first-hand knowledge of the challenges and opportunities before us and demonstrated true concern for the ability of all Rhode Islanders to take part in and benefit from a transition to clean transportation. These comments – along with two dozen one-on-one discussions with state agencies, community groups, and representative organizations – comprise the basis of the needs, opportunities, and recommendations presented in Section 2. The Project Team extends sincere gratitude to everyone who shared their stories and suggestions with us!

Figure 1: Topics raised in public comment



SECTION 1

State of Electric Vehicles & Charging Infrastructure



The Technology

Electric vehicles (EVs for short) are vehicles that use a system of batteries charged by electricity to run. This operating system is in contrast to vehicles with internal combustion engines (ICEs) that require a combustible fuel, such as gasoline.

Electric vehicle models include battery electric vehicles (BEVs), which are powered completely by a rechargeable battery, plug-in hybrid electric vehicles (PHEVs), which use a combination of a rechargeable battery and gasoline, and hybrid vehicles, which charge an internal battery using the mechanics of the vehicle. In 2012, there were 13 BEV and PHEV models available in the United States. The number of electrified models available is projected to reach 64 by the end of 2021 and 82 by the end of 2022 (Figure 3).

Based on the announcements of these models to date, as well as longer-term commitments and investment plans, many manufacturers have taken stances in support of an electric vehicle future. Notably, 18 of the 20 largest original equipment manufacturers (OEMs) based on 2020 vehicle sales (which combined account for 90 percent of all worldwide new car registrations in 2020) have announced intentions to increase

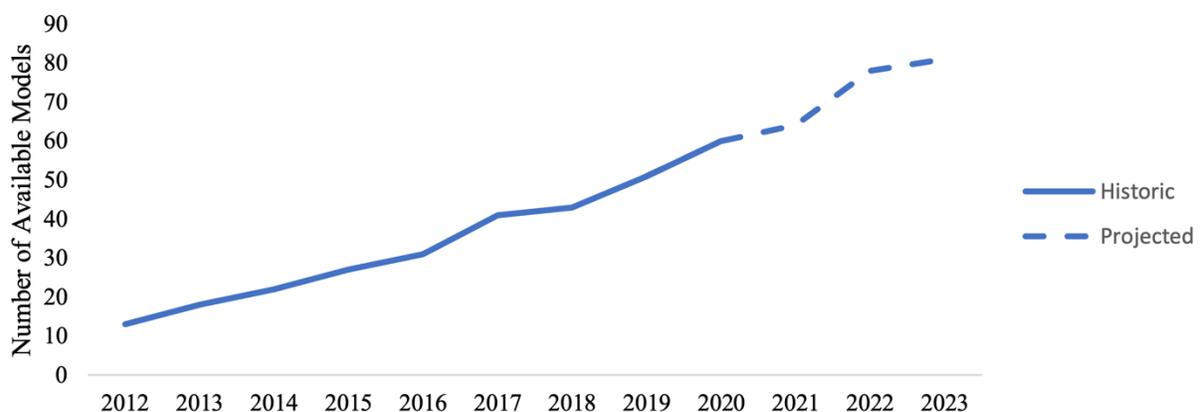
the number of available models and boost production of electric light-duty vehicles (LDVs). In total, carmakers worldwide anticipate spending more than \$185 billion through 2030 developing new electric models.

Electric vehicles are not limited to passenger cars. A growing number of models include SUVs, trucks, vans, motorcycles, and other light-duty vehicles. Manufacturers are also starting to enter the medium-duty vehicle (MDV) and heavy-duty vehicle (HDV) markets.

Some electric vehicles and their charging equipment also have the ability to allow the vehicles to discharge their batteries either to the electric grid (called Vehicle-to-Grid services, or V2G for short) or to a home or business (called Vehicle-to-Home services, or V2H for short).

V2G capabilities can support electric grid resilience and reduce costs by discharging electricity to the electric grid. For example, school buses that are not in use during summer months can ‘plug in’ to the electric grid and discharge electricity during times of peak demand. It is plausible that future utility programs may pay electric vehicle owners for

Figure 2: Growth of electric vehicle models for sale in the United States



Source: 2012-2019, <https://insideevs.com/monthly-plug-in-sales-scorecard/>, 2021-2022 models listed in the Appendix and previous MJB&A EV Market Reports.

Figure 3: OEM announcements from the first trimester of 2021

Volvo Cars to be fully electric by 2030

FORD EUROPE GOES ALL-IN ON EVS ON ROAD TO SUSTAINABLE PROFITABILITY; COLOGNE SITE BEGINS \$1 BILLION TRANSFORMATION

Stellantis intends to become the market leader in low emission vehicles (LEV), targeting over 70% of sales in Europe and over 40% in the United States to be LEV by 2030.

General Motors, the Largest U.S. Automaker, Plans to be Carbon Neutral by 2040

- › Further acceleration of e-campaign: all-electric vehicles expected to exceed 70 percent of European and 50 percent of Chinese and US sales volumes by 2030

the V2G support and resulting benefits they provide.

V2H allows vehicles to provide backup power to buildings during a power outage. The all-electric Ford F-150 Lightning truck is an example of a vehicle with this capability – it's advertised to take the place of a backup home generator.

Electric Vehicle Charging Infrastructure

Electric vehicles rely on batteries that need to be routinely charged. Similar to your cell phone or laptop, electric vehicle drivers might top off their batteries every night when the vehicle is parked at home or everyday while the vehicle is parked at a workplace.

To charge an electric vehicle, a driver plugs a power source into their vehicle, just like you plug a charging cord into your cell phone to deliver power from the wall outlet. There are three categories of power source defined by the amount of power that can flow to the vehicle. Level 1 charging stations use 120-volt outlets, like those found commonly in home wall sockets. Level 2 charging stations use 240-volt outlets, like the special outlets designed for some home clothes dryers. Level 1 and Level 2 charging stations can be found at home, at workplaces, and as public chargers. Level 3 charging stations – also called Direct Current Fast Charging stations, or DCFC for short – use high-voltage connections up to 480 volts or more. The higher the voltage, the faster the electric vehicle's batteries can charge. Each

charging station may have one or more ports, which are the plugs that deliver the power to the vehicle.

While several models of plugs existed in years past, the market has organically standardized to three available plug types. The plug type required depends on both the vehicle make (i.e., Tesla or not) and the level of charging (i.e., a Level 1, Level 2, or DCFC). Every North American electric vehicle besides Tesla uses what's called an SAE J1772 plug – or J-Plug for short – for Level 1 and Level 2 charging. For DCFC, non-Tesla vehicles use a Combined Charging System (CCS) plug, which adds high-speed charging pins to the J-Plug. Using the CCS plug for DCFC charging is the accepted

standard in North America. Tesla uses their own proprietary plug connector for all levels of charging station. Tesla also has a network of proprietary DCFC charging stations called Superchargers – only Tesla vehicles can use these charging stations.

The cost and effort required to install a new charging station depends on the location of the station and its level of charging. A Level 1 charger installed at home may not require any additional electrical work – your electric vehicle will come with the equipment needed to plug the car into a standard outlet. Because Level 2 and DCFC charging stations require more voltage, the vendor or electrician must determine whether there is sufficient capacity in the

Figure 4. Types of Charging Stations

LEVEL 1

Range: 2-5 mil/hr

Power: 120V

Location: Home, work, public



LEVEL 2

Range: 10-25 mil/hr

Power: 240V

Location: Home, work, public



J1772



Tesla

LEVEL 3 (DCFC)

Range: 90 mi/30 min

Power: 480V

Location: Commercial, highway, rest stops



CCS/SAE
American/European



CHAdeMO
Nissan

electrical panel to accommodate the charging station, and sometimes this means upgrading an electrical panel or adding an additional electrical panel to gain the necessary capacity. For homes and businesses, the charging station is likely to be located near to where the vehicle is typically parked – and the distance from the electrical panel to the charging station drives some of the cost of installation.

For standalone charging stations, like those in parking lots or on streets, additional work to bury electric lines may be needed. All of the work that goes into getting a space ready to install a charging station is commonly referred to as “make-ready” work. The rough cost for make-ready work for a Level 2 charging station ranges from \$7,000 per port to \$14,000 per station with two ports, and roughly \$45,000-\$50,000 per port for DCFC charging stations. However, there are charging station technologies that may not require as much make-ready work. For example, some manufacturers have designed charging stations that can be connected directly to lampposts. Since burying power lines is not needed for this technology, the make-ready work can be less expensive.

Ownership models

Various ownership models have emerged for charging infrastructure. Some charging station companies prefer to retain ownership of the charging stations and are responsible for maintenance over the lifetime of the charging stations. Other companies sell their stations but enter into long-term operations and maintenance contracts with the owners. Some companies completely exit the relationship with the customer after selling the charging stations.

Electric vehicles are only one type of clean transportation technology and one piece of a larger mobility portfolio

Electric vehicles are only one type of clean transportation technology. Some vehicles have an internal combustion engine that runs on decarbonized fuels, like biofuel refined from used cooking oil, rather than gasoline. Other vehicles rely on fuel cells that convert hydrogen to power. An example of a hydrogen fuel cell vehicle is the Toyota Mirai – this vehicle requires a special fueling station to refill the liquid hydrogen needed for the fuel cell. Hydrogen can be produced using renewable energy resources, making the hydrogen fuel cell vehicle a zero-emissions vehicle.

Even more broadly speaking, transitioning to zero-emission vehicle technology is one piece of a broader portfolio of strategies needed to improve mobility and decarbonize our transportation sector. Other mobility strategies include increasing use of public transit services, exploring micro-mobility technologies, and expanding bicycle networks, among others. We refer interested readers to the Mobility Innovation Working Group Report for more information.¹

“The statewide plan must encompass all types of electric vehicles, not just battery electric vehicles (BEV), and should include action items for the expanded adoption of fuel cell powered vehicles that power zero emission vehicle (ZEV) electric motors ... Specific plans need to be included for fuel cell technology infrastructure and re-fueling locations. Otherwise, Rhode Island risks missing future opportunities.”

Current State

Electric vehicles and charging infrastructure

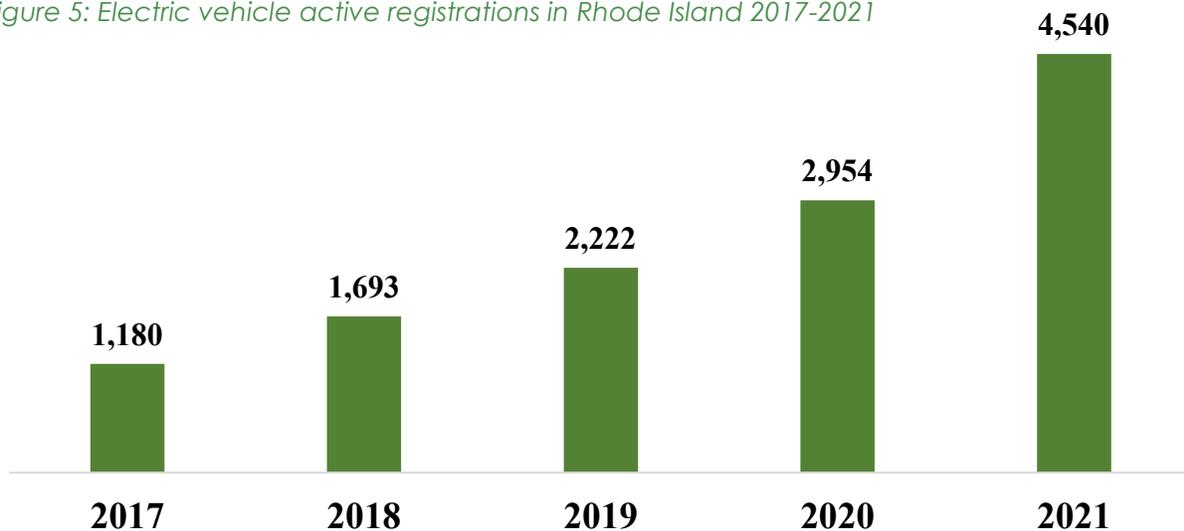
As of December 3, 2021, 4,540 electric vehicles were registered in Rhode Island.⁵ The number of electric vehicles has accelerated in recent years; the availability of new models, long-range driving capabilities, and national attention has facilitated the adoption of electric vehicles for businesses and consumers. 51 percent of electric vehicles registered in Rhode Island are battery electric vehicles (BEVs) and 49 percent are plug-in hybrid electric vehicles (PHEVs). Combined, BEVs and PHEVs comprise less than 1 percent of total light-duty vehicles registered in Rhode Island.

In 2017, Rhode Island had only 1,180 electric vehicles registered on its roads. Rhode Island has experienced a 285 percent increase in

registrations between December 2017 and December 2021. Sales of new electric vehicles in Rhode Island have roughly doubled from 1.4 percent of new light-duty vehicles sales in 2020 to 3.1 percent in 2021.⁶ Rhode Island is not unique in experiencing this trend. However, Rhode Island does lag neighbors Massachusetts and Connecticut in electric vehicle sales, in both of which electric vehicles represent greater than four percent share of light-duty vehicle sales. One explanatory factor is the absence of a sustained electric vehicle incentive program in Rhode Island.⁷

While there are 0 electric medium-duty vehicles and 3 electric heavy-duty vehicles registered in Rhode Island as of December 3, 2021, these numbers are likely to increase as models become available and prices become more attractive for businesses. These figures include a growing

Figure 5: Electric vehicle active registrations in Rhode Island 2017-2021



Notes: Historical registration data is provided by the Rhode Island Department of Motor Vehicles. 2017, 2018, 2019, and 2020 represent active electric vehicle registrations as of December 31st. 2021 represents active electric vehicle registrations as of December 3, 2021.

⁵ RI Division of Motor Vehicles

⁶ IHS Markit / Polk

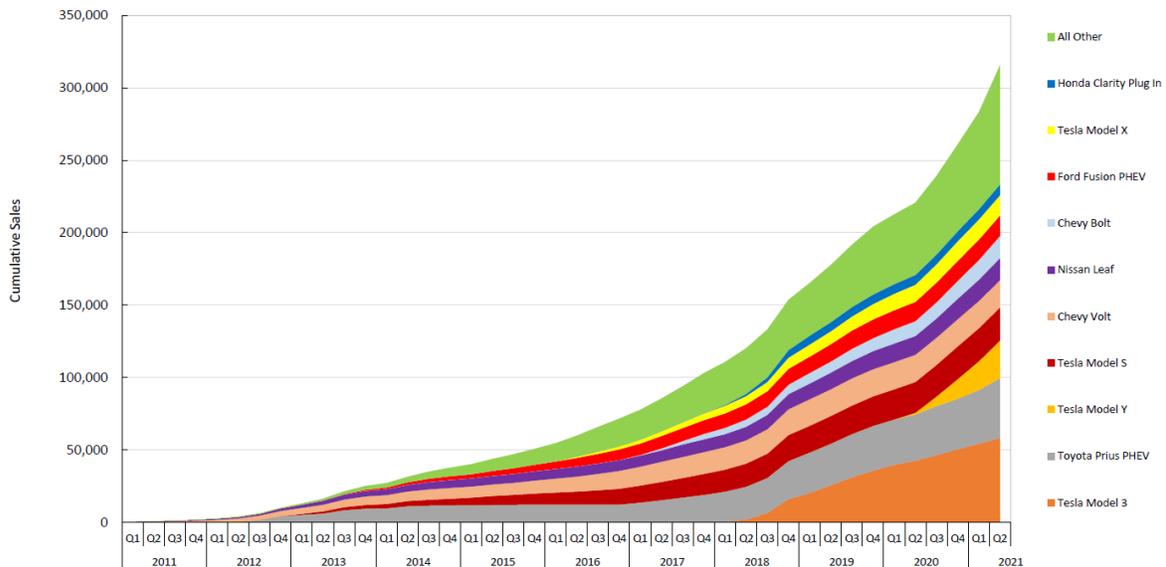
⁷ More information about Rhode Island's prior electric vehicle incentive program is included in the body of this report; details about programs in Massachusetts and Connecticut are included in the Appendix.

number of electric buses owned and operated by the Rhode Island Public Transit Authority (RIPTA).

Under the Clean Air Act of 1970, the federal government gave California the authority to set emission standards that are more rigorous than federal standards.⁸ Section 177 of the Clean Air Act authorizes states to adopt California’s stringent air quality standards instead of the federal requirements. States that choose to adopt California’s standards are known as Section 177 States. There are thirteen Section 177 States: Colorado, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington.⁹

Through Section 177 of the Clean Air Act, Rhode Island requires light-duty vehicle auto manufacturers to participate in a regulatory credits program to deliver clean vehicles for sale in Rhode Island. Auto manufacturers are required to deliver clean vehicles to dealerships dependent on the number of internal combustion engine vehicles delivered for sale in Rhode Island. Credits are given to clean vehicles based on the vehicle’s battery range. The Zero-Emissions Vehicle (ZEV) credit system ensures that consumers looking to purchase a new vehicle will have the opportunity to consider an electric vehicle (or hydrogen fuel cell vehicle) when purchasing a new car. Indeed, data suggests year-over-year sales are accelerating.

Figure 6. Cumulative sales in Section 177 states



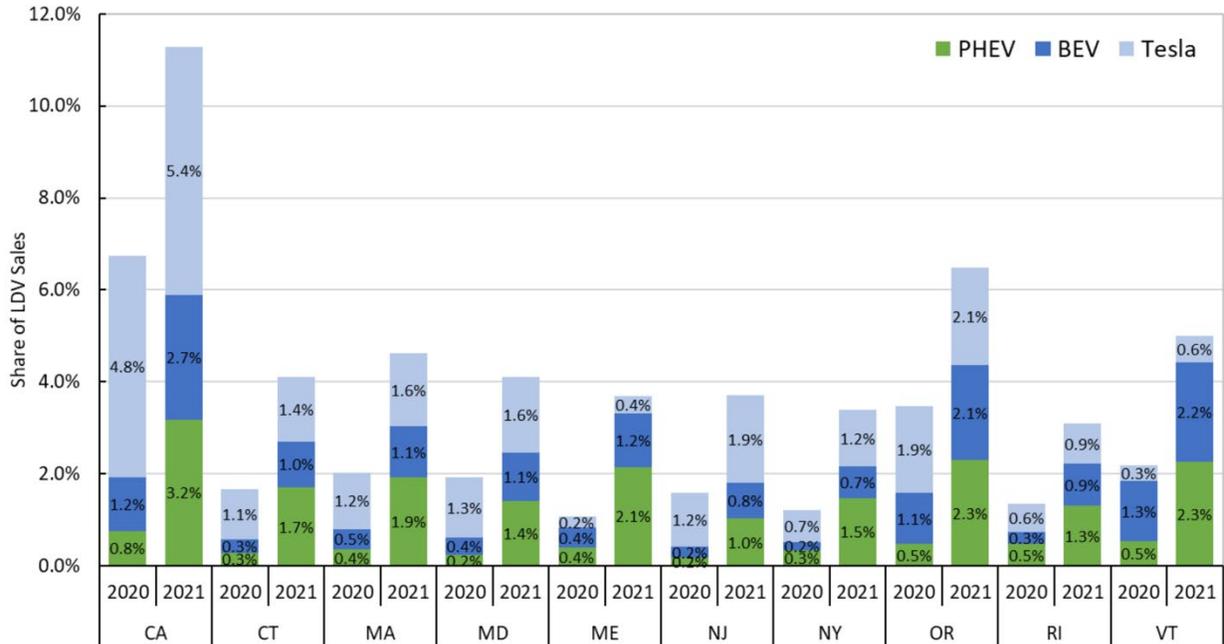
The cumulative sales data does not account for vehicle retirements and therefore may differ slightly from the number of PEVs on the road.

Notes: Cumulative electric vehicle sales in Section 177 States by popular make and model. This graphic does not account for vehicle retirements and may differ from the number of electric vehicles on the road. NESCAUM created the graphic for states to reference. Source data is provided by IHS Markit / Polk.

⁸ [US EPA Summary of the Clean Air Act of 1970](#)

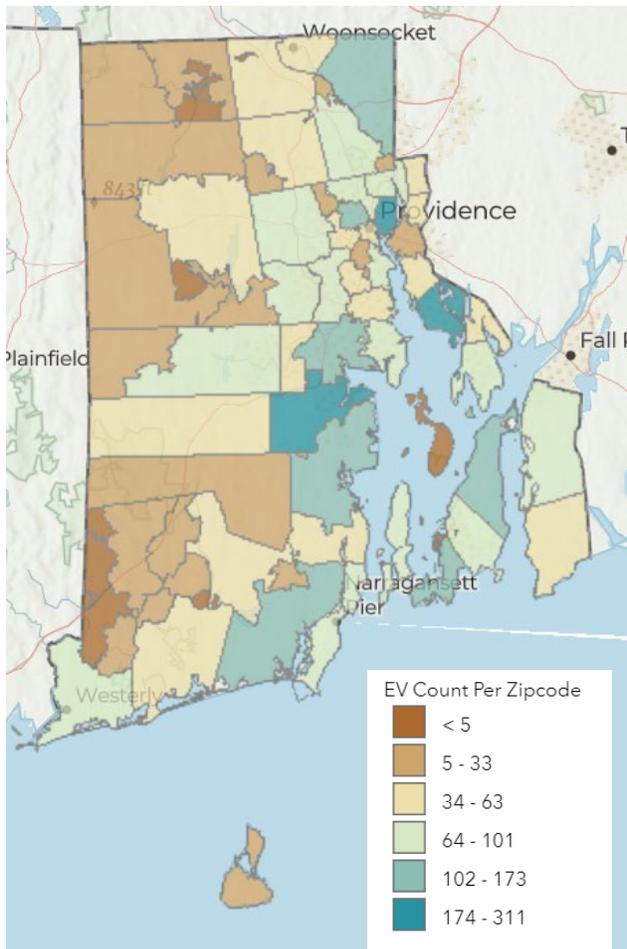
⁹ [Section 177 States](#)

Figure 7. Comparison of electric vehicle market share across states



Notes: The figure shows electric vehicle sales as a percent of new light duty vehicle sales comparing the first six months of 2020 and the first six months of 2021. Tesla vehicles are reported separately from battery electric vehicles and plug-in hybrid electric vehicles because of their large market share. Tesla manufactures battery electric vehicles exclusively. NESCAUM created the graphic for states to reference. Source data is provided by IHS Markit / Polk.

Figure 8: Electric vehicle registrations by zip code



Notes: The electric vehicle concentration map is created by Rhode Island Department of Environmental Management using October 2021 registration data from the Division of Motor Vehicles. [Electric Vehicles by Zip Code Map](#)

The highest concentration of electric vehicles in Rhode Island are located in Barrington (02806), East Greenwich (02818), and the East Side of Providence (02906). These zip codes all rank among the highest in household income and tend to be within relatively closer proximity to existing charging stations. Rural communities tend to have the lowest concentration of electric vehicles, as well as the lowest concentration of charging stations.

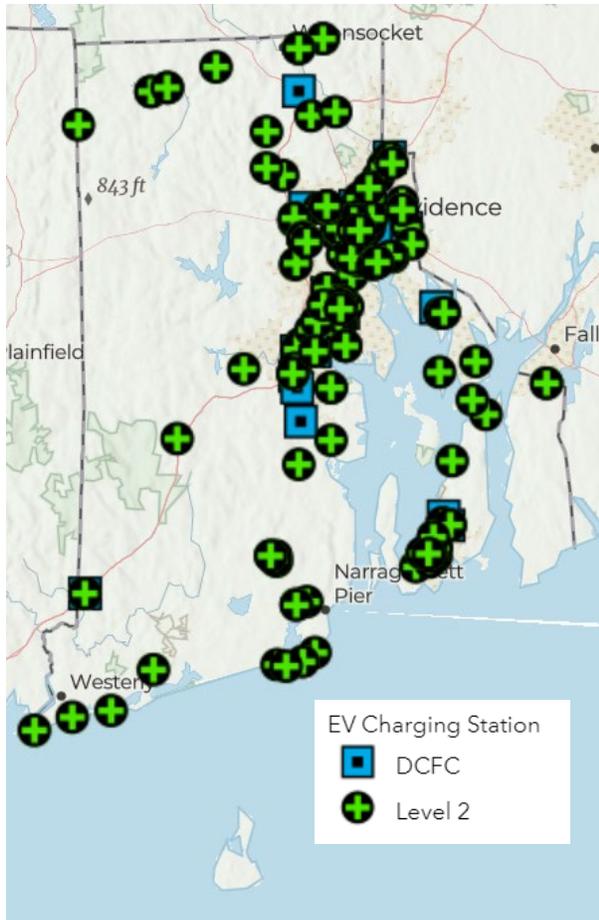
One key factor driving the adoption of electric vehicles is the expansion of public electric vehicle charging infrastructure. While over 80 percent of charging takes place at home,¹⁰ public charging infrastructure is a visible signal of our expanding charging network – thereby alleviating some anxiety of potential future electric vehicle drivers over range – and allows current electric vehicle drivers to charge at convenient locations. As of December 3, 2021, Rhode Island has 235 fully operational public charging stations with 512 unique charging ports. There are 209 public Level 2 charging stations and 26 public DCFC stations.¹¹ These statistics do not count any private charging stations. As of December 2021, Rhode Island was ranked among the top ten states in the nation for charging ports per capital.¹²

¹⁰ [NRDC Electric Vehicles 101](#)

¹¹ [US DOE Alternative Fuels Data Center](#)

¹² ICF, Supporting the U.S. DOE’s Alternative Fuels Data Center, by email 12-3-21. Data as of Q1 2021.

Figure 9. Electric vehicles charging stations across Rhode Island



Notes: The map shows locations of charging stations, where a green cross indicates a publicly accessible Level 2 charging station, and a blue square indicates a direct current fast charging station. Level 1 and not-publicly accessible charging stations are omitted from this map. Rhode Island Department of Environmental Management: [Electric Vehicles by Zip Code Map](#)

Funding for RI's Transportation Infrastructure and Services

The transition to electric vehicles both statewide and nationally will have a significant impact on funding for infrastructure in the coming decades, as of right now the gas tax and other fees are the primary sources of capital funding on both those levels.

Rhode Island's transportation infrastructure and services are administered by DOT, the Rhode Island Public Transit Authority (RIPTA), the Rhode Island Bridge and Turnpike Authority (RIBTA), and the Rhode Island Division of Statewide Planning (RIDSP) which provides long-range transportation planning services and is the State Metropolitan Planning Organization (MPO) for Rhode Island. Collectively, Rhode Island's transportation ecosystem is supported through both federal and state funding, which is primarily derived from motor fuel taxes (e.g. a tax on gasoline and diesel), user fees (e.g. tolls), bonds, and capital project funds.

Understanding the current landscape of transportation funding is important because a transition to non-gasoline vehicles and potential

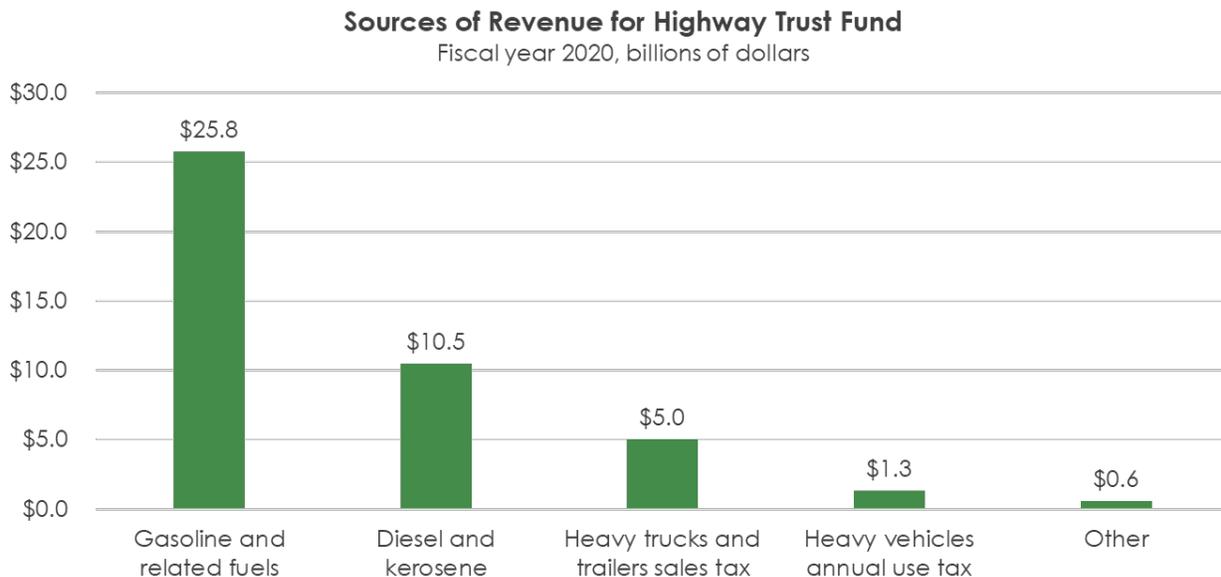
changes in transportation patterns (e.g. reducing vehicle miles traveled) may impact the level of support provided by these funding sources. For example, most of the federal funding for Rhode Island's transportation system comes from the Highway Trust Fund (HTF), which is heavily reliant on motor fuel taxes as its primary revenue source. State funding is divided more evenly between motor fuel taxes, user fees, and capital funds, but the state tax on gasoline and diesel supplies is critical operating revenue for state transportation agencies. More than 60% of the total funding can be attributed in aggregate to the state and federal gas tax.

Federal Revenue Sources

Motor Fuel Taxes

Every purchase of gasoline or diesel fuel includes two taxes – one federal and one state – that are directed towards road construction, other surface transportation projects, and mass transit. Federal fuel taxes are currently 18.4 cents per gallon on gasoline, and 24.4 cents per gallon on diesel fuel. 0.1 cents of each tax is directed to

Figure 10. Gas and fuel taxes are a major source of revenue for the Highway Trust Fund



Source: Congressional Budget Office, *The Budget and Economic Outlook: 2020 to 2030*, January 2020

the Leaking Underground Storage Tank Fund, but the remainder is deposited into The Highway Trust Fund (HTF).

The HTF is heavily reliant on the federal fuel taxes, which have remained the same since 1993. As a result, the Congressional Budget Office projects that the HTF will be insolvent by 2022 without an increase in fuel taxes, institution of new taxes, or a transfer from the General Fund. In federal fiscal year 2019, 82% of deposits into the HTF were derived from gasoline or diesel excise taxes.

Revenues from the HTF are predominately distributed to states by formula through two accounts: (1) the Highway Account, which primarily funds construction and maintenance of roads and bridges, and (2) the Mass Transit Account, which supports capital improvements on buses and other modes of public transit.

Additional funds from the HTF are made available through competitive discretionary grant programs and other revenue vehicles. The Infrastructure for Rebuilding America (INFRA) program is one of the largest competitive discretionary programs supported by the HTF.

In a typical year, 85-90% of HTF deposits are paid by highway users through the federal fuel taxes. Distributions from the HTF often have “match requirements” mandating that state or local governments provide funding to “match” federal dollars. The most common federal participation rate is 80%. A project costing \$1 million with a federal share of 80% would be funded by \$800,000 in federal funds and \$200,000 in state funds.

In 2019, Rhode Island ranked third among HTF recipients in rate of return on HTF contributions, receiving \$3.09 in federal highway funding for every dollar contributed. In Rhode Island, the Department of Transportation (RIDOT) is the primary recipient of highway funds, while the

Rhode Island Public Transit Authority (RIPTA) is the primary recipient of mass transit funds. In federal fiscal year 2021, RIDOT received approximately \$239 million in federal formula funding, while RIPTA received approximately \$48 million.

User Fees

Some user fees are collected through federal taxes to support the HTF. These include sales and use taxes on heavy trucks, taxes on some trailers, and taxes on tires and tread rubber. Some additional fees and interest on investments held in the HTF make up the remainder of its revenue streams.

Bonds

Rhode Island has made use of Grant Anticipation Revenue Vehicles (GARVEEs), debt instruments which advance funding to states in the form of bonds that will be reimbursed using Title 23-eligible federal aid funding (which is provided to states in annual apportionments from the HTF). RIDOT has utilized GARVEE bonds to advance \$500 million to support major projects since 2016.

Capital Project Funds

Congress makes additional funding available to states through annual appropriations processes that function independently of HTF distributions. Some funds are appropriated directly to address ongoing challenges, such as bridge safety and sufficiency. Other funds are made available for competitive applications. Recent examples of competitive programs have included TIGER, BUILD, and RAISE, all of which have made funding available to support infrastructure investment across modes.

Capital project funds typically have a federal share of 80%, so while competitive programs can provide additional funding to states in need of additional revenue to support key projects,

they also create a demand for additional state revenue to match the federal money coming in.

State Revenue Sources

Motor Fuel Taxes

The State of Rhode Island assesses a tax of 34 cents per gallon on gasoline and diesel fuel purchases above and beyond federal taxes, plus an additional 1 cent environmental management fee. Due to a 2014 state law, codified in Rhode Island General Laws §31-36.7(b), the motor fuel tax rate will be adjusted for inflation every other year, but shall never be less than 32 cents per gallon. The distribution of state revenue collected from motor fuel excise taxes is governed by Rhode Island General Laws §31-36.20, which specifies set-aside amounts for the Rhode Island Turnpike and Bridge Authority (RITBA), reporting requirements, and other rules.

With few exceptions, gas taxes are used to support operating expenses for RIDOT, RIPTA, and RITBA. For RIDOT, gas tax revenues are the primary source of funding to support maintenance operations and snow removal, two of the agency's most critical functions. In state fiscal year 2019, the Office of Revenue Analysis estimated that gas tax receipts totaled \$163 million, but a decrease in vehicle miles traveled due to COVID-19 reduced gas tax receipts to \$142 million in state fiscal year 2020.

User Fees

User fees supporting state transportation spending generally fall into three categories: (1) DMV fees, (2) tolls, and (3) passenger fares. Rhode Island General Laws §39-18.1 outlines the creation and financing of the Rhode Island Highway Maintenance Account (RIHMA), and intermodal surface transportation fund supported by surcharges on vehicle registrations and license plates. RIDOT receives the majority of RIHMA funds, which are used to support

operations and provide required state match funds to accompany federal dollars.

Tolls to support transportation investment are collected in two ways in Rhode Island: (1) tolls on all vehicles crossing the Newport Pell Bridge, which support maintenance on RITBA-owned structures, and (2) tolls assessed on heavy trucks through the RhodeWorks All-Electronic Tolling Program, which are used to support maintenance and construction of RIDOT-owned and operated bridges around the state. The RhodeWorks bridge tolling program is a unique approach to repairing bridges by tolling only specific types of tractor trailers. The tolls collected at each location in Rhode Island will go to repair the bridge or bridge group associated with that toll location. The tolling program is part of the RhodeWorks legislation which became law in February of 2016 as a way to rebuild Rhode Island's infrastructure. RhodeWorks provides for the planning, execution, management and funding to bring the state's roads and bridges into a state of good repair by 2025.

Passenger fares are an important revenue stream for RIPTA, which offers a variety of options for bus users. Tickets for other forms of transit in the state, such as rail travel on MBTA or Amtrak, are paid directly to those operators.

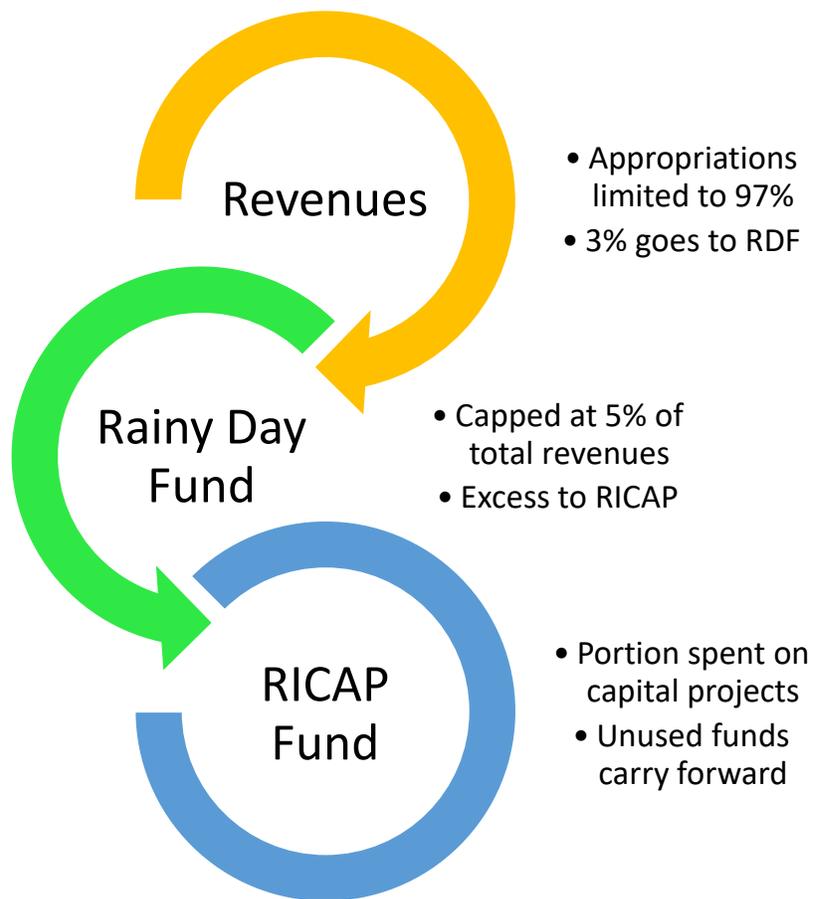
Bonds

State transportation agencies in Rhode Island may make use of state bonds, which are often proposed to support a defined purpose or need. Article IV §16 of the Rhode Island Constitution requires all bonds backed by the general obligation of the state to be approved by both the General Assembly and a majority of voters through a referendum. Recent transportation-related bonds included a 2021 bond for \$71.7 million to provide state match for federal discretionary funds.

Capital Project Funds

Rhode Island maintains a Capital Plan Fund, commonly known as RICAP, to support investments in capital projects around the state. RICAP availability fluctuates based on several factors. The RICAP fund is effectively overflow from the state's Rainy Day Fund (RDF). Each year, budget appropriations are limited to 97% of collected general revenues, while the remaining 3% is directed to the RDF. When the RDF reaches 5% of total revenues, any excess funding is deposited into the RICAP fund. For transportation agencies, RICAP funds are most commonly used as a source of state match to accompany federal dollars.

Figure 11. Flow of revenues to fund capital projects



Clean Transportation Programs

Rhode Island has a history of impactful planning and programming. This section reviews some of the work we have already done that may comprise the framework for future action.

Mobility Innovation Working Group

In January, 2021, the Rhode Island Mobility Innovation Working Group issued its detailed [“Clean Transportation and Mobility Innovation Report: Rhode Island’s Roadmap to a Clean Transportation Future.”](#) The report presented a strategy and vision for the state’s transition from traditional transportation networks to a cleaner and healthier system with a focus on creating a more equitable and economically vibrant state.

The mobility strategy builds on a comprehensive portfolio of clean transportation policies, regulations and initiatives that have already been implemented statewide that include recommended initiatives to reduce greenhouse gas emissions and maximize clean mobility options for all Rhode Islanders.

Goals addressed in the Plan include:

1. Create a healthier environment for all Rhode Islanders with specific benefits for residents of our most overburdened and underserved communities
2. Establish Rhode Island as a national leader in bold transportation and climate commitments
3. Modernize, expand, and invest in state transit and transportation assets to more effectively move people and improve accessibility
4. Improve air quality by taking steps to electrify the transportation sector
5. Create a 21st century mobility infrastructure that capitalizes on the emerging changes in transportation technology

6. Unlock economic opportunity, promote green job creation, and support business and supply chain industries

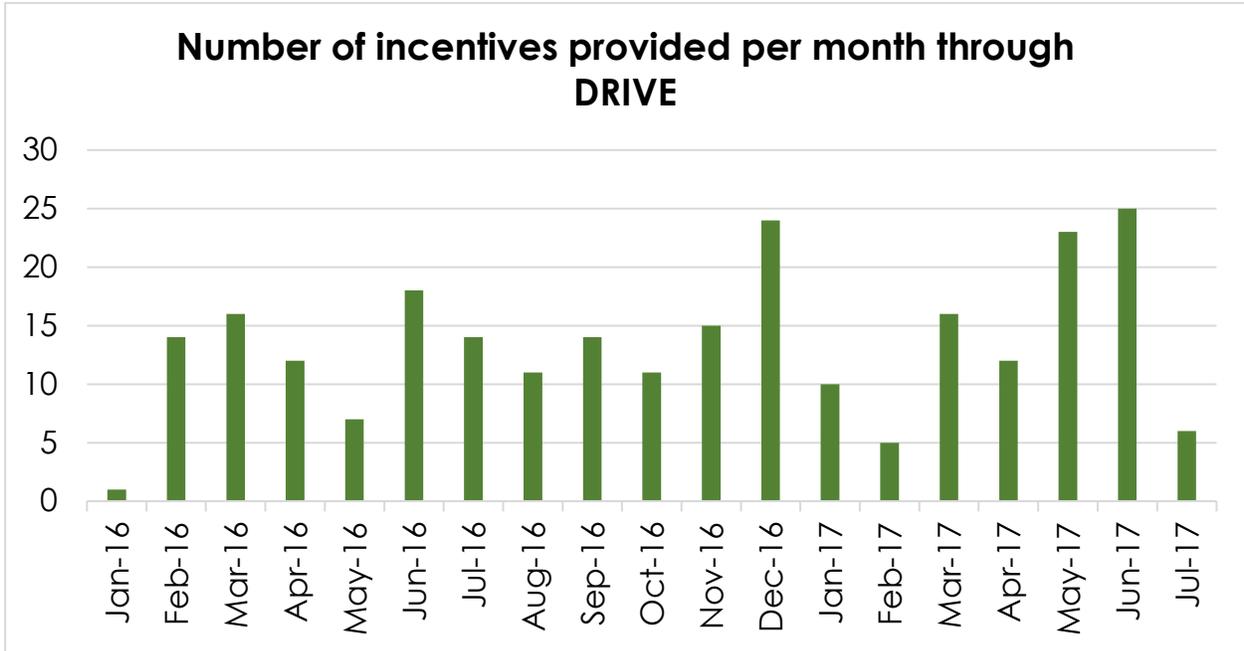
Among the recommendations listed in the Report are advocating for no less than 35 percent of potential future revenue streams from transportation policies and programs to benefit overburdened and underserved communities and consider establishing a goal that by 2040 all new cars, light-duty trucks, and buses sold in Rhode Island be electric or emissions-neutral. No formal policy actions to adopt the Report’s recommendations have been made.

DRIVE

Driving Rhode Island to Vehicle Electrification (DRIVE) was a rebate program funded by the Office of the Attorney General and the Office of Energy Resources (OER). This program was administered by OER to incentivize adoption of electric vehicles. Qualified Rhode Island residents interested in purchasing or leasing an electric vehicle were able to apply for a rebate of up to \$2,500, based on vehicle battery capacity. Modeled closely on rebate programs offered in other states, DRIVE offered the potential to increase the total number of electric vehicles on Rhode Island roadways by 20-35%. DRIVE was open from January 2016 to July 2017, ending because program funding was fully exhausted.

The program issued rebates for 254 electric vehicles in RI, expending a total of \$575,000 in the year and a half the program was active. Electric vehicles using the DRIVE incentive were purchased at fifteen different car dealerships across Rhode Island. These purchases generated over \$300,000 in sales tax revenue for the state.

Figure 12: Number of incentives provided per month through DRIVE



Source: Office of Energy Resources.

Electrify RI

Electrify RI was an electric vehicle charging station incentive program, administered by the Office of Energy Resources (OER), that sought to make more charging stations accessible to Rhode Island drivers.

This \$1.4 million incentive program helped fund the installation of new electric vehicle charging stations – including Level 2 and DCFC charging stations – at Rhode Island workplaces, multi-unit dwellings (e.g. apartment buildings), state and local government properties, and publicly-accessible locations. Incentives were offered on a first-come, first-served basis. Funded with one-time proceeds from the Volkswagen

Settlement, Electrify RI ran from October 2019 to July 2021.

As of December 21, 2021, Electrify RI has installed 66 Level 2 charging stations with 132 ports, and 14 DCFC charging stations with 14 ports throughout the state of Rhode Island.¹³

¹³ Prior to Electrify RI, OER administered an incentive program called ChargeUp!, which supported the installation of electric vehicle charging infrastructure at public locations and came to a close in 2019. This program provided applicants with incentives to support the purchase and installation of electric vehicle charging stations (Level 2 or higher) at publicly accessible locations. In addition, applicants that installed at least one charging station through this program could also qualify for incentives to support the purchase or lease of a new electric vehicle as part of their public sector fleet. Through ChargeUp!, OER supported the installation of 49 dual charging stations and the purchase of 9 electric vehicles.

National Grid's Electric Transportation Initiative

Since 2017, National Grid – Rhode Island’s electric and gas distribution utility serving over 95% of customers in the state – has offered a suite of electric transportation programs.

- The electric vehicle “make-ready” program defrays the cost to install charging stations by funding 100% of the electrical infrastructure for approved charging stations. Program managers from National Grid and OER worked closely to help Rhode Island’s businesses braid support for “make-ready” services with *Electrify RI* incentives for charging station equipment.
- Fleet advisory services assist organizations with fleets in understanding which electric options are viable substitutes and in understanding the pros and cons of transitioning their fleets to electric.
- The off-peak charging rebate pilot rewards participating customers for not charging their vehicles during times when electricity is in highest demand, most costly, and most fossil-fuel intensive.
- Some large customers who install DCFC charging stations could enroll in a tariff that mitigates increases to the demand charges on their utility bills.



Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) requires public entities and organizations providing public services to ensure access to and benefits from public programs, transit, and infrastructure for people with disabilities.

According to the United States Department of Energy, “when designing ADA-compliant electric vehicle charging stations, consider accessibility, ease of use, and safety for drivers with disabilities, including those using wheelchairs or other assistive equipment. Key considerations include ensuring adequate space for exiting and entering the vehicle, unobstructed access to the charging station, free movement around the charging station and connection point on the vehicle, as well as clear paths and close proximity to any building entrances.” Additional considerations may include the design and placement of buttons, screens, labels, instructions, cords, and other facets of the charging station equipment.

As a public program funded with public monies, Electrify RI required several design specifications to ensure charging stations would be publicly accessible:

- The accessible electric vehicle charging spaces must be in addition to any ADA-required accessible parking spaces.
- A parking facility with 20 electric vehicle charging spaces or fewer requires at least one accessible electric vehicle charging space. A parking facility with 21 to 40 electric vehicle charging spaces requires at least two accessible electric vehicle charging spaces.
- Accessible electric vehicle charging spaces can share the existing access aisle with existing “van- accessible” designated parking spaces within the parking lot.
- Accessible electric vehicle charging spaces may be used by anyone and do not have to be reserved for persons with disabilities.
- Accessible electric vehicle charging stations require an accessible route on both sides of the vehicle space that connects to the charging station for easier access. There must be a sufficient path of travel to the electric vehicle charging station so that someone can exit their vehicle, access the electric vehicle charging station, return to their vehicle and get to their destination. Accessible electric vehicle charging spaces must include a parking space and striped access aisle(s) with a combined minimum width of 16’.

Figure 13. Design of Parking Spots with Electric Vehicle Charging Stations

<i>Accessible EV Charging Space Examples</i>			
<i>Left Aisle Width</i>	<i>EV Charging Space</i>	<i>Right Aisle Width</i>	<i>Total Width</i>
3’	10’	3’	16’
3’	13’	3’	19’
5’	11’	0’	16’
0’	11’	5’	16’
8’	8’	0’	16’
0’	8’	8’	16’

Ocean State Clean Cities Coalition

The [Ocean State Clean Cities Coalition](#) (OSCCC) is a federally funded education and outreach program administered by the Office of Energy Resources. Designated as a Clean Cities Coalition in September 1998, OSCCC is one of the U.S. Department of Energy's nearly 100 Clean Cities Coalitions.

The Coalitions serve as the foundation of the Clean Cities Program by working on transportation projects in communities across the country. Clean Cities Coalitions, including OSCCC, are public-private partnerships that educate and assist fleets and individuals in adopting the use of clean fuels and vehicles.

OSCCC's mission is to foster the economic, environmental, and energy security of the United States by building partnerships, and working locally to advance affordable domestic transportation fuels, energy efficient mobility systems, and other fuel-saving technologies and practices.

Lead-by-Example

The Lead-by-Example Program, managed by the Office of Energy Resources as directed by Executive Order 15-17, works with State agencies and universities, quasi-public agencies, and municipalities to reduce greenhouse gas emissions and reduce energy costs across Rhode Island through investments in energy efficiency, renewable energy, and clean transportation.

Among a set of clean energy goals, the State is working to ensure a minimum of 25% of new light-duty State fleet purchases and leases be zero-emission vehicles by 2025 and installing electric vehicle charging stations at State facilities.

As of October 2021, the State purchased or leased 54 zero-emissions vehicles (14.4% of the

light-duty fleet) and installed 62 electric vehicle charging stations with 120 ports across state properties.

RIPTA Electric Buses

The Rhode Island Public Transit Authority (RIPTA) is charged with meeting numerous interrelated federal, state, and local requirements for congestion mitigation, air quality improvement, and transit service reliability. Converting its fleet to zero or near-zero emission vehicles has the potential to help RIPTA meet these obligations while supporting various state and local sustainability commitments. RIPTA has made several clean transportation investments consistent with RIPTA's [Sustainable Fleet Transition Plan](#). Notably, RIPTA's Zero Emissions Vehicle Program Pilot provided valuable insights from three leased electric buses. RIPTA has plans to purchase and deploy 16-20 electric buses as permanent additions to its fleet by 2023. Funding support for electric buses and their charging infrastructure has come from Volkswagen Settlement funds and competitive federal grants.

What are other states doing?

In addition to federal tax credits for qualified plug-in electric vehicles,¹⁴ several states offer additional rebates and incentives for electric vehicles and charging infrastructure. We review specific programs offered in California, Connecticut, and Massachusetts in the Appendix. Programs generally include rebates for electric vehicles for residents, businesses, and public entities; rewards for early retirement of vehicles with internal combustion engines; and incentives to support the installation of charging infrastructure. Incentive amounts vary depending on type of vehicle and income level of residents. Carveouts for priority charging station locations also guide funding, such as for workplaces and multi-unit dwellings.

Figure 14. One of RIPTA's electric buses



Notes: This electric bus was leased in RIPTA's Zero Emissions Vehicle Program Pilot. The bus has a larger battery system that is designed to be charged slowly overnight when the bus is not in use.

¹⁴ Tax credits range from \$2,500-\$7,500 for qualifying vehicles ([US DOE Alternative Fuels Data Center](#))

How other states are maintaining revenue streams

As many states face declining gas tax revenue, policymakers are considering other ways to pay for the nation's transportation infrastructure. Mechanisms include registration charges and annual fees (e.g., Colorado, Hawaii, Washington), and road-user charges and miles-based user fees (e.g., Oregon, Utah, Virginia).

These fees come in addition to standard motor vehicle registration fees, and proponents support the fees to bring equity among drivers by ensuring all drivers pay for using roadways. However, most of these programs are still under pilot consideration and studies are currently underway by many different State DOTs and the Transportation Research Board (TRB).

Section 13002 of the federal Infrastructure Investment and Jobs Act also includes a national pilot program for a vehicle mileage tax. The voluntary three-year pilot program aims to test the design, acceptance, implementation, and financial sustainability of a national motor vehicle per-mile user fee; to address the need for additional revenue for surface transportation infrastructure and a national motor vehicle per-mile user fee; and to provide recommendations relating to the adoption and implementation of a national motor vehicle per-mile user fee.



SECTION 2

Needs, Opportunities & Recommendations



This half of the Strategic Policy Guide summarizes recommendations for improving locational and physical access to charging stations and their utilization and functionality, realizing public health benefits of electrifying our transportation network, stabilizing revenue streams for transportation infrastructure, mitigating electric grid impacts, developing workforce, and tracking progress. These recommendations are based on needs, concerns, and challenges identified by the public, stakeholder organizations, and agencies. This Strategic Policy Guide synthesizes opportunities for action and recommends next steps.

Several priorities rose to the top. We preview these priorities below, along with one related agency action or consideration for the General Assembly for each. We encourage readers to review the entire Guide for additional explanation, a complete listing of agency actions, and more considerations for the General Assembly. Furthermore, recommendations to ensure benefits of the clean transportation transition are realized by communities who have historically been underserved and overburdened are integrated throughout this Guide. We give salience to these recommendations by reiterating them in the following centralized chapter.

Reinvest in and refine incentive programs for electric vehicles and charging infrastructure

Incentive programs have demonstrated impact. Programs should be refined to prioritize incentives for charging infrastructure serving multi-unit dwellings, including for parking on nearby streets and lots with 24/7 public access, among other locations. *Agency Action: OER, in coordination with DOT and DEM and with public participation, will develop an investment strategy for federal funding in line with this Guide.*

Demonstrate progress in electrifying transit, school buses, and medium- and heavy-duty transit

These investments ensure benefits of electrifying transportation flow to frontline communities. Prioritize electrification of transit and school buses, especially those that serve or frequent frontline communities, and encourage electrification for medium- and heavy-duty vehicles that travel near frontline communities. *Agency Action: RIPTA will develop a roadmap to fully electrify their fleet.*

Conduct an analysis to understand transportation revenue impacts

While electric vehicles account for only 1% of light-duty registrations today, Rhode Island should be prepared to maintain revenue for transportation infrastructure currently supported by taxes on gas. *Agency Action: DOT will conduct a study and develop recommendations.*

Support a 100% Renewable Energy Standard

Electrifying transportation now delivers immediate environmental and public health benefits. However, Rhode Island should ensure electric vehicles are fully decarbonized through increasing the Renewable Energy Standard to align with Act on Climate mandates.

Demonstrate action through commitments and accountability

This work is urgent and critical for our climate, health, and equity. All EC4 agencies have committed to a priority action for 2022 and assigned a senior staff lead. Agencies will be held accountable through report-outs at EC4 meetings and a public clean transportation dashboard.

Equity Needs & Opportunities

Equity is an essential and central tenant of our transition to a clean transportation system. We are integrating recommendations related to improving equitable outcomes, ensuring a substantial portion of benefits are truly delivered to and realized by communities who have been historically underserved and overburdened, and deferring to communities who know best about their needs to direct future investment. In order to truly give these recommendations the salience they deserve, we reiterate equity considerations here in one central location. These recommendations should not just be given priority but should be considered essential to all future work.

- Design incentive programs for electric vehicles and charging infrastructure that deliver on commitments to frontline communities
- Prioritize charging station incentives to aid drivers without at-home charging capabilities, including at on-street parking spaces, at multi-unit dwellings, and in public garages and parking lots that have 24/7 access near multi-unit dwellings
- Consider rights to charge for Rhode Islanders who rent or lease
- Require 24/7 public access for charging stations that receive public funding
- Require certain design elements for new electric vehicle charging infrastructure that receives public funding, particularly plug type adaptability, no cost or cash payment options, and compliance with the Americans with Disabilities Act
- Include a carveout for frontline communities in future electric vehicle incentive programs, and offer tiered incentives to support those who need it most
- Consider electric vehicle incentives for car sharing, ride sharing, and neighborhood electric vehicles
- Encourage a secondary market and support used electric vehicle sales
- Incentivize electric conversions that deliver the most public health benefits: school buses, transit vehicles, and medium- and heavy-duty trucks
- Consider rights to repair for electric vehicles and charging stations
- Public entities should consider how to ensure procurement processes result in an equitable number of awards going to minority business enterprises
- Develop a clean transportation dashboard that tracks metrics of interest to frontline communities

Locational Access

Accounting for roughly a quarter of all comments received, the most prevalent theme among all comments were those suggesting what types of charging stations should be put in what types of places. Commenters suggested a general rule of thumb that DCFC is preferred. However, DCFC may not be needed in all locations. When the charging station is intended to be used while doing something else, like shopping, working, or being at home, Level 2 or Level 1 charging is preferred. Level 1 charging may also be appropriate for use cases when the vehicle will stay parked for an extended period of time, such as at train stations, bus stations, and airports. There may also be preference for a mix of charging station levels at some locations.

“State investments in EV charging must match up host locations with the correct type of charger, while maintaining public safety standards.”

Furthermore, numerous comments were submitted that insisted that the Guide ensure all Rhode Islanders have equitable access to charging stations. Rhode Islanders who have historically been underserved and overburdened by our transportation system are more likely to rent homes in multi-unit dwellings and less likely to own or lease a passenger vehicle, which means these communities are less likely to have the outdoor space (e.g., garage or driveway) and authority to charge at home using a Level 1 charger, let alone install their own Level 2 charger or have need for at-home charging in the first place. We call particular attention to prioritizing the deployment of charging stations at multi-unit dwellings, on streets, and in public garages and parking lots as one first step to addressing this critical equity concern. A second recommendation is to encourage electric vehicle charging for medium- and heavy-duty vehicles that frequent environmental justice communities,



Locational Access

Reinvest in and refine an electric vehicle charging station incentive program

Design programmatic strategies that deliver on commitments to frontline communities*

Prioritize incentives for charging stations located:

						
Interstates, major roads, rest stops, and park-and-rides	At home: both single family and multi-unit dwellings* Consider rights to charge*	Public street parking, parking garages, and parking lots near multi-unit dwellings*	Retail districts, workplaces, and schools	Hotels, tourism centers, and recreational areas	Brownfields	Evacuation routes, hospitals, and critical facilities

* Indicates a critical equity recommendation

such that the benefits of cleaner air quality accrue directly to those residents regardless of personal vehicle ownership.

In 2016, Rhode Island joined a number of states in setting an electric vehicle emissions reduction target, called the Zero-Emissions Vehicle Memorandum of Understanding (ZEV MOU). Rhode Island's share of the target is electrifying roughly 43,000 vehicles by 2025. Using this target as a basis, the Mobility Innovation Working Group identified the need for 1,008 Level 2 workplace charging ports, 628 public Level 2 charging ports, and 86 public DCFC charging ports to meet projected demand.¹⁵ While Rhode Island has only achieved 1% of the 43,000 electric vehicle target set forth in the ZEV MOU, we are 75% of the way to the public Level 2 charging port target and 41% of the way to the public DCFC charging port target.¹⁶ These statistics indicate a need to prioritize vehicle electrification alongside expansion of charging infrastructure – this is further contemplated in the *Utilization & Functionality* chapter.

We know that our existing incentive programs are effective in encouraging deployment of charging stations and nudging development in key types of locations. Given the availability of additional funding, these program structures are ready to rapidly deploy funding and build charging stations strategically.¹⁷

The Office of Energy Resources, in coordination with the Department of

Transportation and the Department of Environmental Management, should prepare an investment strategy and deploy electric vehicle charging infrastructure funds allocated to Rhode Island through the federal infrastructure bill (signed by President Biden in November 2021). Rhode Island expects to receive \$23 million over five years to support the expansion of an EV charging network under the provisions of the new Infrastructure Investment and Job Act (IIJA). Federal guidance on allowable uses of *Infrastructure Investment and Jobs Act* funding is anticipated in February 2022, and additional standards for charging infrastructure are expected in May 2022.¹⁸ Investment should align with the recommendations of this Guide, advance equity and accessibility, and follow applicable federal guidelines. There will be opportunities for public participation in the development of an investment strategy and program rules.

The Rhode Island Infrastructure Bank should promote deployment of charging stations and electric fleet conversions for private and public entities, with an emphasis on supporting municipal, multi-unit housing, non-profit and commercial properties. The Bank should utilize both existing and new financing and grant programs to accelerate the investment of public and private capital via the Bank's relationships with state, municipal and private sector stakeholders.

¹⁵ 43,000 electric vehicles is the target number agreed to in the Multi-State Zero-Emissions Vehicle Memorandum of Understanding; the number of charging ports demanded was estimated using EVI-Pro Lite; <http://climatechange.ri.gov/documents/mwgc-clean-trans-innovation-report.pdf>.

¹⁶ We do not have data on workplace charging, but recommend a future clean transportation dashboard include this metric.

¹⁷ The recently passed Infrastructure Investment and Jobs Act provides states with federal stimulus funding to invest in a broad range of infrastructure projects, including in support of expanding electric vehicle charging infrastructure. This Guide provides strategic guidance for how such funding may be prioritized and deployed to Rhode Islanders.

¹⁸ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/13/fact-sheet-the-biden-harris-electric-vehicle-charging-action-plan/>

The Division of Capital Asset Management and Maintenance, in collaboration with the Office of Energy Resources, should develop a charging station maintenance strategy for charging infrastructure on State property and an actionable plan to both right-size and electrify the State fleet. The Office of Energy Resources should also continue to work with state agencies to expand the number of charging ports at public facilities as needed.

The Division of Statewide Planning should determine the best way(s) to incorporate vehicle electrification into the State Guide Plan, whether as a separate element or a component of existing elements, and ensure that either this Guide is adopted as a discrete element or that amendments are made to one or more existing State Guide Plan elements. Within comprehensive planning or energy management planning, municipalities may also consider setting a specific deployment goal for availability of charging stations or target distance between charging stations.¹⁹ Such goals can be bolstered by commitments to electrify public fleets, local educational campaigns, and community engagement.²⁰ Several national organizations offer tools and support to conduct data driven analyses to identify locations with relatively little access to charging stations.²¹ The Administration or municipalities may consider using these tools to identify ‘charging station deserts’ based on factors like current and projected trends of electric vehicle registrations.

The Coastal Resources Management Council should assess the extent to which the Council has a role in permitting for electric vehicle charging infrastructure; whether the Council may weigh non-polluting or zero-emissions marine technology in coastal permitting; and, assess ways in which the Council may incentivize zero-emissions transportation activities in the permitting process.

State agencies should continue to coordinate with National Grid’s Electric Transportation Initiative in order to braid support services and maximize programmatic impact.

In the remainder of this sub-section, we highlight specific types of locations called out for future electric vehicle charging station development. **Future investment should prioritize the following locations.**

Interstates, Major Roads, Rest Stops, and Park-and-Rides

Several commenters requested installation or expansion of DCFC electric vehicle charging stations along Rhode Island’s interstates (I-95, I-195, I-295), major roads (Route 1, Route 3, Route 117), and rest stops. DCFC were specifically requested because of the nature of traveling on these roads – drivers typically use the roads to get from point A to point B and want to minimize the time of their trip (for example, interstate commuters or folks traveling

¹⁹ In 2017, the Rhode Island Division of Statewide Planning convened a working group to consider electric vehicle charging design and policy for cities and towns. This report, which includes some model ordinances, may still be a helpful reference for municipalities: http://www.planning.ri.gov/documents/trans/2017/zero-emission_handbook.pdf.

²⁰ For example: Boston has an aspirational goal to have free-to-access electric vehicle charging stations in every neighborhood by 2023: https://www.boston.gov/sites/default/files/file/2020/12/Boston%20ZEV%20Roadmap_1.pdf

²¹ For example: MJ Bradley’s Regional EV Charging Station Location Identification Toolkit: https://www.mjbradley.com/mjb_form/ILIT and Argonne National Lab’s Equity Zones Mapping Tool: <https://ezmt.anl.gov/>.

for tourism purposes). If drivers need to recharge, they prefer quick stops at DCFC.²²

Planning for charging stations along interstates should also be part of a coordinated regional effort to ensure a set of robust electric transportation corridors that extend beyond Rhode Island borders. **The Department of Transportation should coordinate with relevant state and federal agencies in Massachusetts and Connecticut to develop electric vehicle charging corridors.**

Comments also included park-and-rides in their request, but noted that longer durations at park-and-rides means the quickness of DCFC charging is not needed. Instead, Level 2 chargers are preferred for park-and-ride locations. However, longer duration charging leads to slower turnover, which may necessitate the installation of more charging ports to serve

demand. Currently, both Level 2 and DCFC charging stations exist at park-and-rides located in Warwick and Hopkinton.²³ **Agencies having jurisdiction over rest stops and park-and-rides should explore options to install and/or expand charging stations.**

At Home

For commenters who specifically already drive an electric vehicle, many depend on nightly charging at home using either their existing outlet (Level 1) or an at-home Level 2 charger installed in a garage or on the side of the home. A recent study by J.D. Power that examined the home-charging experience of EV owners utilizing Level 1 and Level 2 charging concluded that 88% of electric vehicle owners charge their vehicle at home “often” or “always”.²⁴

Figure 15. Level 2 and DCFC charging stations located at a park-and-ride off Nooseneck Hill Road in Ashaway, Hopkinton



²² A group of automakers recently submitted a letter to the federal government urging the prioritization of ultra-high-speed charging along interstates: <https://insideevs.com/news/554581/automakers-letter-buttigieg-charging-infrastructure/amp/>

²³ [Press Release: RIDOT kicks off pilot project for electric vehicle charging stations at park and ride lots in Warwick and Hopkinton](#)

²⁴ [J.D. Power U.S. Electric Vehicle Experience \(EVX\) Home Charging Study, 2021](#)

For drivers with the ability to charge overnight at home, there is less of an urgent need to find external charging stations. This is an important point for several reasons. First, encouraging at-home charging where possible can reduce the demand for public charging infrastructure, thereby leading to potentially smaller overall investment or more availability for drivers without access to at-home charging. Second, at-home chargers may reduce strain on the electric grid because they draw less power and drivers typically charge overnight when there is already lower demand for electricity. Third, pairing at-home charging with on-site renewable energy (such as rooftop solar PV) can more immediately reduce greenhouse gas emissions.²⁵

Future building codes should consider requirements to ready buildings for electric vehicle adoption.

Multi-unit Dwellings

Residents of multi-unit dwellings – including apartment buildings, condos, and the familiar triple-decker homes – have limited access to outdoor power outlets and garages and limited authority to install charging equipment. Such barriers result in fewer residents owning or leasing personal vehicles and lower adoption of electric vehicles. These residents are more likely to be (though certainly not always) renters with lower incomes in urban neighborhoods, which presents these particular barriers as an issue of equity.

“Outreach to landlords and apartment buildings. We can only install a charging station in our home because we own our house. Folks renting, living in triple-deckers, or living in

large apartment buildings do not have this luxury. Large apartment buildings and landlords would be good people to outreach to.”

“One of the things that I want to make sure is included in the plan is accessibility for people who are living where they might not have an opportunity to charge at home. People that live in apartments for example, there’s a lot of people that may not have a garage at home to plug in to. one of the things that I want to make sure makes EV infrastructure available to everybody so that we can encourage EV utilization across the board even from people of all geographic areas depending on their living situation.”

The General Assembly may consider legislation providing or expanding the ‘right to charge’ for Rhode Islanders who rent or lease.²⁶

This type of legislation would ensure that Rhode Islanders have access to an outdoor outlet for charging their electric vehicle, and that rental and lease contracts can’t prohibit renters from charging their vehicles at home.

Street Charging, Public Garages, and Parking Lots

One proposed solution to improve access to charging stations for drivers without or who do not have the option of at-home charging is to deploy charging stations where there are public parking spaces with 24/7 public access – parking lots, parking garages, and on-street parking. Having walkable access to nearby public charging can be the enabling factor for drivers to switch to electric vehicles:

²⁵ See the *Electric Grid* chapter for more discussion about decarbonizing the electric grid and pairing renewable energy resources with charging infrastructure.

²⁶ For example: Massachusetts has some existing ‘right to charge’ policies specific for condo owners and is exploring how to expand such policies to renters:

https://www.boston.gov/sites/default/files/file/2020/12/Boston%20ZEV%20Roadmap_1.pdf

"I think having the overnight level two charging played into my decision to buy an EV in the sense that I wouldn't have done it if I didn't have the overnight level two charging despite a level three charger within a 10-minute drive from my house."

Municipalities may wish to explore whether adding on-street charging, particularly in areas with multi-unit dwellings, is feasible. Some electric vehicle charging station companies have developed innovative solutions for on-street charging that preserves walkway access for pedestrians, including chargers that can be attached onto lampposts. **Given additional funding, charging infrastructure incentive program administrators may consider launching an on-street charging pilot incentive program in 2022.**²⁷



"WBNA urges this plan to consider how Rhode Island can increase charging access for people who live in cities, rent, only have street parking, or otherwise don't currently have charging access."

The General Assembly may consider legislation requiring a minimum number of public parking spots having charging station access.²⁸

A number of folks requested installation or expansion of charging stations at retail outlets

like grocery stores, shopping centers, main street districts, and other similar locations. The motivation here is that drivers can recharge while running errands as part of their normal day-to-day lives. Commenters suggested DCFC would be the most practical level of charging for these locations so that vehicles could fully recharge within the typical amount of time it takes to get groceries or go to the pharmacy. Level 2 chargers at retail locations would still be beneficial for ‘topping off’ vehicle batteries if needed, though there seemed to be a clear preference for DCFC.

Workplaces and Schools

Commenters noted that charging at workplaces and schools is essential. For drivers who cannot charge at home or who have long commutes, workplace and school charging is critical to enable the switch to electric vehicles. Indeed, the Mobility Innovation Working Group estimated a need for 1,008 workplace Level 2 charging ports to serve the demand from 43,000 electric vehicles.

Commenters suggested they would be amenable to Level 2 or even Level 1 workplace chargers if there were sufficient charging ports for the level of demand. However, commenters raised concerns about charging stations being blocked by vehicles that were finished charging (read more about this in the *Physical Access* chapter). Through its Clean Cities initiative, the U.S. Department of Energy offers a handbook for workplace charging hosts that should be considered a helpful resource.²⁹

Charging infrastructure serving electric school buses is further discussed in the *Public Health* chapter.

²⁷ Indeed, this is a recommendation in Boston as well: [City of Boston Zero-Emissions Vehicle Roadmap 2020](#)

²⁸ In the 2021 legislative session, the General Assembly considered legislation related to motor and other vehicles – parking facilities and privileges, which specified parking spaces for electric vehicle charging stations (H-6253).

²⁹ [US DOE Plug-in Electric Vehicle Charging Handbook for Workplan Charging Hosts](#)

Hotels, Tourism Centers, and Recreational Areas

Several commenters noted the importance of finding charging stations when traveling, specifically calling out hotels, tourism centers, and recreational areas. Rhode Island has a vibrant tourism economy but failing to install charging stations at these locations may negatively impact tourism. **DEM should Lead-by-Example with electric vehicle charging infrastructure at state parks and beaches.**

“On a drive to [North Carolina], I stopped at a self-described green hotel in DC whose parking lot had spaces reserved for overnight charging of EVs. I love road trips and would choose to stay at hotels with dedicated charging stations over hotels merely NEAR charging stations.”

“I think tourism in RI can be negatively impacted by having BEV drivers have a 'bad experience' by not being able to charge when and where they need to, so for tourism and economic development reasons, I'd encourage you to get out ahead of this.”

Brownfields

The U.S. Environmental Protection Agency recently released guidance on revitalizing brownfields – sites that are unused and previously contaminated – into charging station hubs to encourage cleaning up contaminated, unused sites and transforming them into useful properties that strategically meet a needed demand.³⁰ Developing on brownfields is a creative way to expand access for communities that may not have access to charging infrastructure. In addition, the redevelopment of brownfield sites into charging locations can be less expensive than other options, increase the value of neighboring properties, provide charging accessibility close to highways and multi-unit dwellings, and can potentially provide charging for nearby retail customers. Co-locating solar PV systems and battery storage can increase the return on investment while offsetting the property’s clean-up costs.

Urban and Rural Charging Retail Districts

Electric vehicle charging infrastructure often conjures images of urban centers and bustling transportation corridors. However, it is critical to also think of charging station access in rural areas. Strategically locating charging stations in rural communities can not only serve residents of those communities but also their visitors.

³⁰ [US EPA Charging Forward: Revitalizing Brownfield Sites as Electric Vehicle Charging Stations](#)

Evacuation Routes, Hospitals, and Critical Facilities

As is further detailed in the *Electric Grid* chapter, commenters raised concerns about resilience during power outages. Also, suggestions were made to strategically site charging stations along evacuation routes, at hospitals, and at other critical facilities throughout the state. Critical facilities may include police and fire stations, emergency shelters, or other places deemed essential to the community during crises. These charging hubs may serve a dual purpose of supporting recharging for residents' essential technology and medical equipment in the case of a power outage.

As part of its next Evacuation Route study, the Rhode Island Emergency Management Agency should conduct an internal audit related to charging station access during times of emergency. In this audit, EMA will inventory charging stations along evacuation routes, identify needs for additional charging station infrastructure, and assess the need for mobile or other emergency charging services.

Municipalities may consider inventorying charging stations at their critical facilities and pursue strategic deployment of charging station infrastructure with battery backup as needed.

Gas Stations and Convenience Stores



Particularly as charging becomes faster, deployment of DCFC at existing gas stations and convenience stores may provide a vast local network of charging. Gasoline will continue to be needed to serve demand from internal combustion engine vehicles for the foreseeable future. Supplementing gasoline services with DCFC may allow such facilities to continue to serve the same customer base as we transition to electric vehicles. As noted for other priority locations, customer behavior at gas stations and convenience stores likely demands quick charging from DCFC – and future technology iterations – rather than Level 2. Some gas stations and convenience stores may even consider investing in alternative fueling stations, like hydrogen for fuel cell vehicles, to become ‘refueling hubs.’

Readying our Buildings for Electric Vehicle Charging

Building codes are the set of regulations for our buildings to meet minimum standards related to safety, mechanical and electrical systems, and energy efficiency, among others. Base codes represent the minimum standards required. Voluntary stretch codes represent a set of high-performance standards and provide non-binding guidance for designers and builders. Legislative mandates may also be enacted that require high-performance standards beyond base code.

Both residential and commercial buildings must be designed and built to meet the standards set forth in the contemporary version of the Rhode Island Building Code. The newly adopted 2021 RI State Building Code, which will become effective on February 1, 2022, does not contain any provisions requiring buildings to be ready to accommodate charging. The base code does, however, require electric vehicle charging stations that serve the public to be accessible by complying with the Americans with Disabilities Act (see Chapter 11).

[Rhode Island's Stretch Codes](#) – released in 2018 – provide guidance for both residential and commercial buildings to be ready for electric vehicle charging.

For residential buildings:

“Each single-family home, or at least one home in a two-family dwelling, must be constructed with the capability to easily add a Level 2 charging station immediately upon occupancy or at some future time. For multifamily residences falling under the jurisdiction of the Rhode Island Residential Building Code (SBC-2), at least 25%, but never less than one, of the parking spaces must be made EV ready. For compliance with this code, the charging station preparation must include, at a minimum:

- A Raceway (conduit) to accommodate a 240V 40-amp circuit (level 2) which terminates at an electrical circuit panel at one end and in a garage or at an exterior parking location at the other end.
- The installation of an approved electrical enclosure at the future charging station.
- The labeling of a dedicated double pole 40-amp circuit breaker location in the main electrical distribution panel or subpanel.”

For commercial buildings:

“Where parking is provided for a building that has a total building floor area greater than 10,000 square feet (929 m²) and that has a building occupant load greater than 100, at least 5 percent, but not less than two, of the parking spaces provided shall be designated as preferred parking for low emission, hybrid, and electric vehicles. Parking designated for electric vehicles must include charging stations.”

Signed into law in 2009, the Green Buildings Act (R.I.G.L. 37-24) requires all new constructions projects over 5,000 gross square feet, and all renovation projects over 10,000 square feet, constructed by a public agency to be designed and constructed to the LEED certified or equivalent high performance green building standard. The Green Buildings Advisory Committee was formed in 2010 to help implement the Green Buildings Act.

Physical Access

In parallel to promoting charging station deployment in preferred locations, we must also ensure these charging stations are physically accessible by drivers. Commenters discussed several dimensions of physical accessibility, ranging from aspects of technological accessibility to suggestions for charging station design. **The following aspects should be considered in charging infrastructure incentive program design.**

In addition, **OER should publish a best practices guidance document for public and private charging station installations.** Guidance from federal standards expected in May 2022 will support further discussion. **The General Assembly may consider design and functionality standards for electric vehicle charging infrastructure.**

Plug type

Some drivers are concerned about not having the right plug type in order to charge their vehicle. Ensuring access to the right plug type is also a

potential equity issue – as plug types standardize for newer vehicles, drivers of older vehicles with less common plug types may have reduced access to charging infrastructure.

Electric vehicle and charging station manufacturers and developers should ensure plug adapters are available on the market. **Additional programs may be considered to provide low- or no-cost plug adapters for drivers who need them** as an interim measure until the market matures and plug types are truly standardized. Furthermore, any studies examining proximity to charging stations must account for access for drivers with less common plug types.

“The CHAdeMO charging port ... is unfortunately a rarity and are currently hard to find.”

Payment options

Most charging stations only offer in-app-purchasing, which can limit accessibility if the



Physical Access

Programs and policies should consider best practices related to the following design aspects:

 <p>Plug types offered and plug adapters provided*</p>	 <p>Networking and inter-operability</p>	 <p>Driver payment options*</p>	 <p>Strategies to encourage turnover or 'churn' so spaces are available</p>
 <p>ADA compliance*</p>	 <p>Signage and wayfinding</p>	 <p>Safety considerations like proximity to traffic and lighting</p>	 <p>Additional amenities like roofing, internet, and landscaping</p>

* Indicates a critical equity recommendation

app is not functioning correctly, if connectivity between the charging station and the app network is poor, if the driver does not have a smart phone, or if the driver does not have a banking system that allows for online payments.

Program administrators should consider requiring charging station standards, like Open Charge Point Protocol (OCPP), to ensure charging stations are networked – meaning they can be found by drivers via apps – and to simplify payment options for drivers. On-site cellular and wireless networks should be assessed to ensure robust connectivity. Other solutions should also be considered to allow payment in cash or no-cost charging stations at public facilities.

Other design factors can make a charging station usable or not – factors like user interface design, type of credit card reader, and integration with mobile apps are critical to allowing drivers to access the functionality of charging stations.

“[A]n intuitive user interface, so someone doesn't get there and says, ‘What button do I press? I've never used this type of station before, how do I work it?’”

Turnover (“Churn”)

Drivers cannot physically access charging stations if they are being blocked by a vehicle which has finished charging. Encouraging vehicle turnover – sometimes called “churn” – is a key component of instilling smart charging behavior. There are several solutions to encourage turnover, highlighted by the comments below:

- *Group chats: “For workplace charging with limited group of users...one solution I used in the past: Created a group chat, where we asked other*

employees to move if we needed to fully charge to get home.”

- *Apps: “Can an app notify them that they have reached full charge and they have 30 minutes (or so) to move their car?”*
- *Pricing: “There's a lot of different ways that the charging stations can set that up: ... the first four hours you're just paying for the charging component. If you stay for longer than four hours, then they tack on ... a parking fee that you pay”*
- *Enforceability: Setting rules and penalties about time limits may help set expectations and provide a legal basis for enforcing turnover.*

State agencies should implement strategies to encourage vehicle turnover at charging stations on state properties.

Program administrators may also require a strategy to encourage vehicle turnover to receive charging infrastructure incentives.

ADA compliance

Charging stations that are designed to be accessible by drivers with the most specific needs will likely be even more accessible for all drivers on average. Furthermore, any charging station installed using public resources, on public property, or at locations that serve the public must be accessible.³¹ **Program administrators and public officials should ensure that accessibility is required, such as by enacting policies that clarify where charging stations fall within the Americans with Disabilities Act (ADA) or by updating program guidelines and eligibility to ensure compliance with ADA.**

³¹ See Chapter 11 of the Rhode Island Building Code.

“I believe that there will be a need to include ADA compliant (accessible) charging stations at each installation.”

“For me, accessibility means Physical Convenience for those that who are differently-abled.”

OER should consider ADA compliance in its best practices guidance document.³² This guidance may include specifications for spacing between parking spots, design of interactive screens and buttons on the chargers, location of charging ports, size and font of writing, and other characteristics of charging stations. The U.S. Department of Energy’s *Guidance in Complying with Americans with Disabilities Act Requirements* should be considered a helpful resource.³³

The General Assembly may consider standards requiring a minimum percentage of parking spots with charging stations be ADA-compliant.

Signage and wayfinding

Several commenters expressed worry over how to find charging stations. This worry may be alleviated if charging stations are ‘findable’ via several methods. Phone apps that include maps of charging station infrastructure may help some drivers, but only if charging stations are networked and drivers have the ability to navigate an app.³⁴ Charging station hosts and communities should also make charging stations findable via signage and wayfinding. Apps and signage may be most helpful to drivers if

information about hours of operation, availability, payment options, costs, plug types, and charging rates are also clearly provided. State or municipal policy makers may consider providing guidance for appropriate signage and wayfinding. Program administrators may require signage and wayfinding in charging infrastructure incentive programs.

Safety

Safety is a critical factor in enabling access to charging stations. The degree of safety of charging stations may be influenced by factors like lighting, proximity to roadways or hazards, placement of chargers relative to public places, and supervision. Program guidelines for incentive programs should consider aspects of safety and give appropriate guidance. Policy makers may want to additionally issue guidance on best practices for publicly accessible charging stations.

“Another equally valuable consideration is public safety, where placing a charger in an otherwise ideal location may be undesirable if it is placed in a remote unlit parking spot behind a building.”

Amenities

Charging station developers and hosts may consider additional amenities such as roofing, provision of wireless internet, and landscaping when designing charging station locations.

³² For example, the Office of Energy Resources administered the Electrify RI program, which was an incentive program to make charging stations more accessible to Rhode Island drivers. A major requirement for this program was to include an ADA parking spot with access to the charging station, which included step-by-step guidance to follow the ADA requirements (e.g., distance, height, ADA building access etc.) – <http://www.energy.ri.gov/documents/Transportation/PublicGuidance.pdf> pages 11 – 15.

³³ [US DOE Guidance in Complying with Americans with Disabilities Act Requirements](#)

³⁴ Of course, drivers who are actively driving should never reference a phone or app for safety reasons!

Utilization & Functionality

While Rhode Island has gotten a solid start with charging station deployment, there is substantial variability in how often charging stations across the state are used. Utilization is impacted by three main factors. First, electric vehicle adoption may lag charging station deployment, so some charging station infrastructure is underutilized. Second, it takes time for drivers to find the charging stations and incorporate them into their charging behavioral patterns, so an underutilized charging station today may see an uptick in activity in the future, all other things equal. And third, charging stations that are broken or under repair cannot be used by drivers at all.³⁵

Rhode Island should reinvest in an electric vehicle incentive program and refine program design to address priorities described below.

Electric vehicle adoption

While the cost of electric vehicles has decreased and the prevalence of electric options on the market has increased, there is still a need for incentives to help encourage adoption of electric vehicles. Former incentive programs in Rhode Island have been extremely popular, and Rhode Islanders still inquire about when those programs are returning.

“Are [there] still state/federal tax credits for electric vehicle owners, and if so, for how much longer and what are they?”

“One area RI has fallen behind is rebates for purchasing EVs. All surrounding states in [New England] have rebates for \$ thousands, which apply to leases also.”



Utilization and Functionality

Reinvest in and refine an electric vehicle incentive program*

Program design priorities include:

 Carveouts for frontline communities*	 Tiered incentives to support those who need it most*	 Car sharing, ride sharing, neighborhood electric vehicles*	 Encourage a secondary market and support used vehicle sales*
 Maintenance strategy	 Education and outreach	 Networking and interoperability	 Safety considerations like proximity to traffic and lighting

* Indicates a critical equity recommendation

³⁵ Additional factors that may lead to underutilization include having an unpreferred level of charging station or a unpreferred type of location, or if a charging station cannot physically be accessed due to being blocked by another vehicle or other design issue – these factors are covered in the *Physical Access* chapter.

Furthermore, the challenge of covering upfront costs of electric vehicle purchases may also present an equity issue. Without providing incentives to help those who need it most, electric vehicle adoption will be driven by wealthier Rhode Islanders – and the direct local benefits of reduced tailpipe emissions will accrue to wealthy communities rather than communities who have historically been overburdened by pollution, lower air quality, and the resulting public health impacts.

“My concern is that we will start putting in this infrastructure and trying to get people to buy electric cars, but all of those things are going to end up in relatively wealthy areas that are also not as populated and not as impacted by the health issues that come from that pollution.”

The State and General Assembly should re-capitalize electric vehicle incentive programs with a sustainable funding source to continue to drive electric vehicle adoption. Such a funding source may include federal funding or other sustainable funding in the long term if incentives continue to be necessary. Tax credits may be an additional option for continued support.

A carve-out or higher tiered incentive for drivers who need additional support should be considered in program design. In addition, consideration should be given to putting Rhode Island’s incentives on par with neighboring states.

A future incentive program iteration may also consider providing incentives for car-sharing and ride-sharing vehicles.³⁶ Another alternative is to encourage the use of Neighborhood Electric Vehicles (NEVs), which

are BEVs that travel at a maximum speed of 25 mph and can legally be operated on roads where the speed limit is 35 mph or less. NEVs typically cost less than \$10,000 and can have a driving range of more than 50 miles per charge.³⁷

“Many trips made by people in suburban areas are short distance errands. A program such as a ‘Neighborhood Electric Vehicle’ program would allow more people to use low cost electric vehicles. Charging stations are important but supporting NEV use would increase electric vehicle adoption and usage.”

Finally, **incentives to encourage a secondary market for used electric vehicles** may also bring additional lower-cost opportunities to transition to electric for folks who otherwise may not be able to afford a new vehicle.

Through a clean transportation dashboard, the Executive Climate Change Coordinating Council (EC4) should determine and monitor a set of metrics for continual evaluation of equitable electric vehicle adoption.

Promoting electric vehicle adoption in commercial use cases is also critical to optimizing charging station use. Businesses, municipalities, and other fleet managers may consider how partnering to procure vehicles in bulk may reduce costs. **State and municipal lead-by-example projects should showcase best practices for fleet conversion**, which may leverage external funding for support. Fleet sharing is another way to reduce costs by procuring fewer vehicles and sharing charging infrastructure.

³⁶ In Boston, a car share program was recently launched that allows all individuals access to the program regardless of income, but those with a lower income pay a lower rate to use the service:

<https://www.greenbiz.com/article/five-car-sharing-programs-ev-and-equity-twist>.

³⁷ <https://whatis.techtarget.com/definition/neighborhood-electric-vehicle-NEV>

Information and education

Electric vehicle charging stations are arguably less prominent than gas stations – they are smaller, not necessarily branded with large signs, and not in a consistent location relative to buildings and parking lots. For new electric vehicle drivers especially, finding new charging stations may require extra research and trial-and-error. Charging stations that are “networked” are connected to the internet and can provide data to public resources – apps and maps – about charging station locations and availability.

Incentive programs and public procurements should ensure all publicly funded and publicly accessible charging stations are indeed networked, comply with an interoperability standard,³⁸ and that the charging stations developer has completed all necessary steps to link the charging stations to public databases and resources. OER should include these considerations in its best practices guidance document.

“There’s plenty of dumb plugs (they’re called) today – there’s no way for the average driver, myself included, to find a station. If it’s not networked, I can’t find it on a mobile app and I can’t find it on the [Department of Energy] map.”

“A great app to find [electric vehicle] stations is PlugShare. I refer to it as Yelp for [electric vehicle] drivers – very helpful.”

“Since we’re sort of talking about apps and how people find charging stations, one of the things that I think could be helpful ... is ... best practices for the charging infrastructure owners and making sure that people who are responsible for the units that are installed actually take that extra step of putting them up on these websites like PlugShare or

ChargePoint and updating the correct information.”

Easy-to-access tutorials from neutral organizations about the various methods to find charging stations may be one of several prongs of a public education and outreach campaign. Further standardization requiring certain specifications to be provided (e.g., location, price, payment options, availability, hours of operation) by charging stations and apps may help information exchange and reliability of the charging network.

“AmpUp advocates for networked charging stations to be a requirement for Rhode Island stations. Networked chargers are a requirement for many state [electric vehicle supply equipment] rebate and incentive programs (including National Grid) as they guarantee a minimum level of data to be shared with interested stakeholders, such as operators and site hosts, property managers, utilities, and/or regulatory authorities. Networked chargers not only provide the state and utilities with important information on charging activity and load, but can make for a simpler customer experience. Today, [electric vehicle] drivers use networked stations to schedule, authenticate, and pay for their charging sessions in a convenient and familiar way. We cannot understate the importance of this experience as it is critical to increased adoption of electric vehicles. Most importantly, networked stations guarantee energy safety and reliability which is at the heart of long term success in the electric vehicle industry.”

Education and outreach are also needed broadly to help Rhode Islanders make decisions about converting to electric vehicles. Ocean State Clean Cities Coalition, an effort supported by the U.S. Department of Energy and administered

³⁸ Examples of interoperability standards include Open Charge Point Protocol (OCPP), OpenADR, etc.

by state agencies, is one such venue that can be scaled to provide up-to-date information about electric vehicle models, operations and maintenance cost comparisons, information to alleviate range anxiety, and other thoughtful materials like webinars and articles related to electric vehicle conversion. **Ocean State Clean Cities Coalition should play a role in advising coordinated information sharing and outreach across State agencies.** For example, roadway signage from the Department of Transportation may help echo key messages about electric vehicles and may alert drivers to new public charging stations. Other similar educational campaigns, such as from Northeast States for Coordinated Air Use Management (NESCAUM)³⁹, Green Energy Consumers Alliance, and AAA, will also be relied on by drivers making this decision and should stay coordinated to ensure consistent, clear, and current information.

“Green Energy Consumers [Alliance] ... has a great outreach program in terms of what it entails to buy an [electric vehicle], where they can be found, what they cost, ... Check them out if you're interested and have questions – I think they have a really great introduction and guidance for people who are interested in making a switch.”

“Are [there] any plans to incorporate education for constituents about switching to an [electric vehicle] when the infrastructure is operationalized? ... AAA has been doing some education regarding electric vehicles, so we're definitely really excited about infrastructure plans and how we can incorporate that into our community outreach and education to encourage

potential uses for electric vehicles for our members.”

Lastly, education and training for vehicle sales representatives – including at dealerships and used car markets – will help drivers make the best choices for themselves about when to convert to an electric vehicle and which electric vehicle best meets their needs. Upstream incentive programs aimed at encouraging sales, rather than purchases, of electric vehicles may be one tool to catalyze internal dealer education and training.

“Salespeople are usually uneducated about [electric vehicles] and dealers have almost zero interest in pushing them to consumers. There are a number of dealer incentive programs in other states that we should consider.”

Maintenance

Broken charging stations not only result in low utilization, but add to a feeling of range anxiety for drivers. **It is imperative for incentive programs to ensure a maintenance plan is in place for publicly funded charging stations.** Furthermore, additional consideration may be given to encouraging third-party ownership models and developing a market of third-party maintenance providers to ensure a robust network of functioning charging stations.

“I'm hoping that charging station maintenance will be a priority... there's nothing like showing up to a charging station and having it not working. Having an extensive charging station infrastructure is great but keeping the stations running is important also.”

³⁹ NESCAUM's recent outreach campaign – Drive Change. Drive Electric. – is an example of a public outreach campaign coordinated across eight northeast states and auto manufacturers to advance consumer awareness: <https://driveelectricus.com/>

Charging costs

One factor driving the deployment and utilization of charging infrastructure is how charging costs are structured. At one extreme, charging station owners may charge drivers for the full cost of electricity plus whatever is needed to recover the cost of installation, operation, and maintenance – this puts the full costs onto the driver.

At the other extreme, charging station owners can provide free charging to drivers by covering all costs associated with installation, operation, and maintenance. Commercial charging station owners may prefer offering free charging as a strategy to encourage customer traffic, demonstrate environmental commitment, promote brand loyalty, offer employee

incentives, or other outcomes supporting business growth. Public entities that own charging stations may prefer to offer free charging to encourage constituents to switch to electric vehicles or reduce costs of vehicle ownership, among other motivations. However, free charging for drivers shifts costs onto charging station owners, which need to be accounted for in budgets.

Future programs should consider how to best support competing objectives of providing no- or low-cost charging to drivers – especially drivers with higher home energy burdens or who face systemic inequities – with supporting cost recovery strategies for charging station hosts.

Communication and interoperability

“...any plug-in electric vehicle... any electric vehicle charging station...anywhere...anytime.”

Charging networks (e.g. Tesla, Volta, and ChargePoint) are businesses that remotely manage operations and payment collection across their network of charging stations. According to the U.S. Department of Energy, the number of charging networks increased by nearly 50% from 2020 to 2021. Drivers likely charge their electric vehicles using a variety of charging networks.

Interoperability is the capability of a product or system to interact and function with other systems. Interoperable electric vehicles can interact with a range of charging networks. Interoperable charging stations can interact with each other, with other charging management systems, and can seamlessly process payments across charging networks. When there are certain network interoperability communication protocols in place, a driver can more easily charge and pay for charging across networks.

With charging stations that are connected to the internet or via cellular service, charging networks can offer cloud-based services that benefit the site host and customer. Examples of these services include power management software, telematics and asset management systems, real-time charging station status reports/dashboards, offering diverse payment options, and more.

Stakeholders should continue to discuss interoperability and communication protocols to identify best practices for Rhode Island’s charging infrastructure. We refer interested readers to [MJB&A’s Issue Brief on Electric Vehicle Charging Interoperability](#) for a primer on this topic.

Public Health

Pollution from transportation is a leading cause of poor health outcomes. Children, seniors, and those living with cardiovascular and respiratory diseases are particularly vulnerable. Reducing the number of gasoline-powered cars and replacing them with electric models will reduce particle pollution, nitrous oxide (NO_x), and volatile organic compounds (VOCs), all of which can damage health. Low income and frontline communities of color are exposed to higher levels of air pollution and particulate matter, specifically PM 2.5.⁴⁰ These communities also have a higher burden of environmental risk overall, and show higher rates of asthma, especially among children. Individuals who identify as black are 41-59 percent more likely to die based on air quality depending on where they live, and Black youth in particular are 34-40 percent more likely to

suffer from asthma due to rising temperatures from climate change.⁴¹

In Rhode Island, the burden of transportation pollution falls mostly on those communities that are closest to highways, bus routes, and the Port of Providence. A recent study estimates that in 2016, there were 119 premature deaths in Rhode Island that could be attributed to vehicle emissions.⁴² According to research from the American Lung Association, a move to electric vehicles that are powered by clean sources of power could yield up to \$178 million in avoided health costs in Rhode Island in the year 2050.⁴³

Vehicle electrification delivers the largest public health benefits when we reduce emissions and pollution in areas that have historically poor air quality and associated public health costs. These are areas that are nearby roads with frequent



Public Health



Prioritize investments that deliver public health benefits



Transit and School Buses*

Prioritize electrification of transit and school buses, especially those that serve or frequent frontline communities



Medium- and Heavy-Duty Vehicles*

Encourage electrification for medium- and heavy-duty vehicles in industrial centers and that travel near frontline communities

* Indicates a critical equity recommendation

⁴⁰ PM 2.5 is fine particulate matter; [US EPA Particulate Matter \(PM\) Basics](#)

⁴¹ US EPA, 2021 Climate Change and Social Vulnerability in the United States

⁴² Arter et al, 2021, Mortality-based damages per ton due to the on-road mobile sector in the Northeastern and Mid-Atlantic U.S. by region, vehicle class and precursor. Environmental Research Letters, Volume 16, Number 6

⁴³ American Lung Association, 2021, *The Road to Clean Air*

traffic congestion, major transportation corridors, and routes commonly used by diesel vehicles like trucks and buses. These areas are also highly correlated with neighborhoods with lower income, more rented multi-unit dwellings, and lower rates of vehicle ownership. In addition to suggestions above for promoting strategic charging station deployment for drivers without access to at-home charging, we should center public health benefits in our strategy to improve access to charging stations statewide by supporting electrification of public transit services, school buses, and the trucking sector.

The Department of Health should quantify health benefits of clean transportation investments and identify opportunities to leverage health-based funding streams (e.g., via partnerships with health insurers or providers) to promote electrification of vehicles and mobility equipment in underserved and overburdened communities.

Transit Services

RIPTA owns and operates a fleet of medium-duty vehicles and heavy-duty buses that connect riders across the state. There are several critical connections between RIPTA's transit services and not only improving access but ensuring benefits are derived equitably from the transition to clean transportation. Environmental justice neighborhoods – communities with historically poor air quality – are often located nearby transportation corridors and have residents who are less likely to own their own vehicles. Therefore, electrifying the transit vehicles that serve those neighborhoods not only provide access to electric transportation for residents, but meaningfully deliver benefits to residents in the form of reduced pollution, improved air quality, and the better public health outcomes.

Figure 16: Proximity to traffic based on EPA EJScreen data

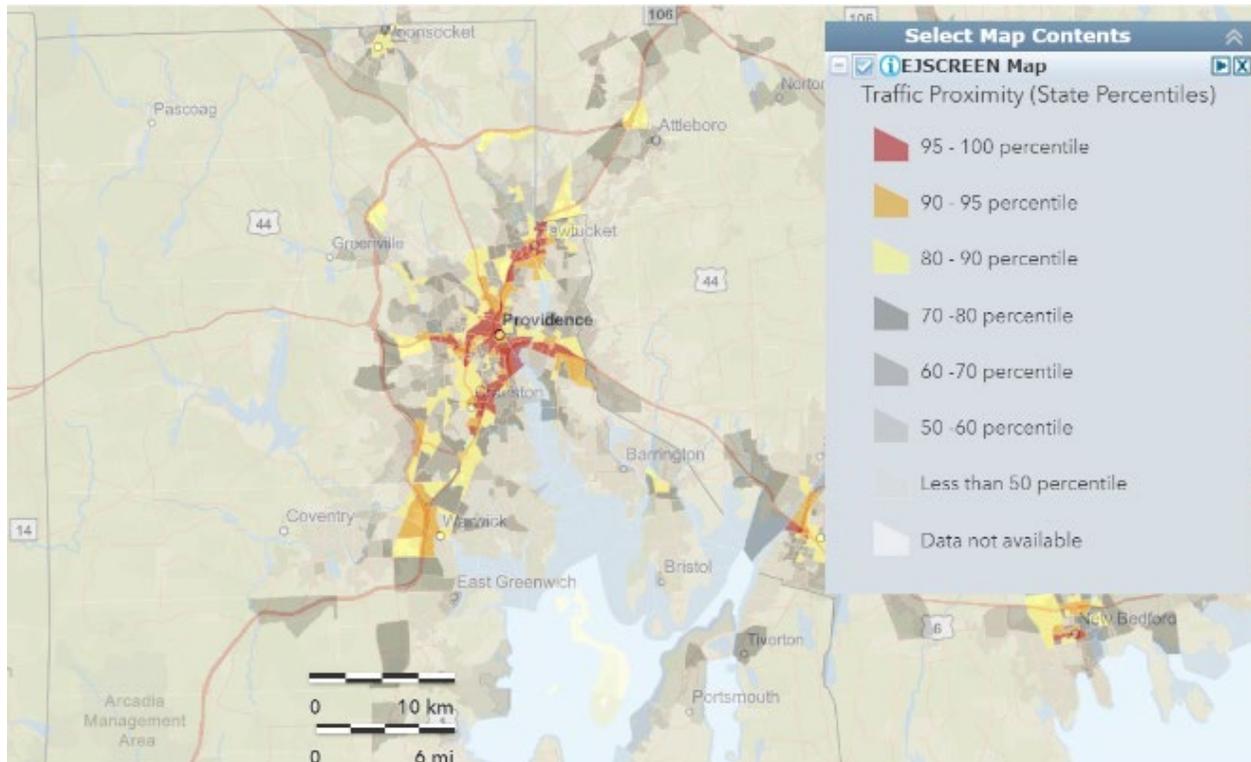
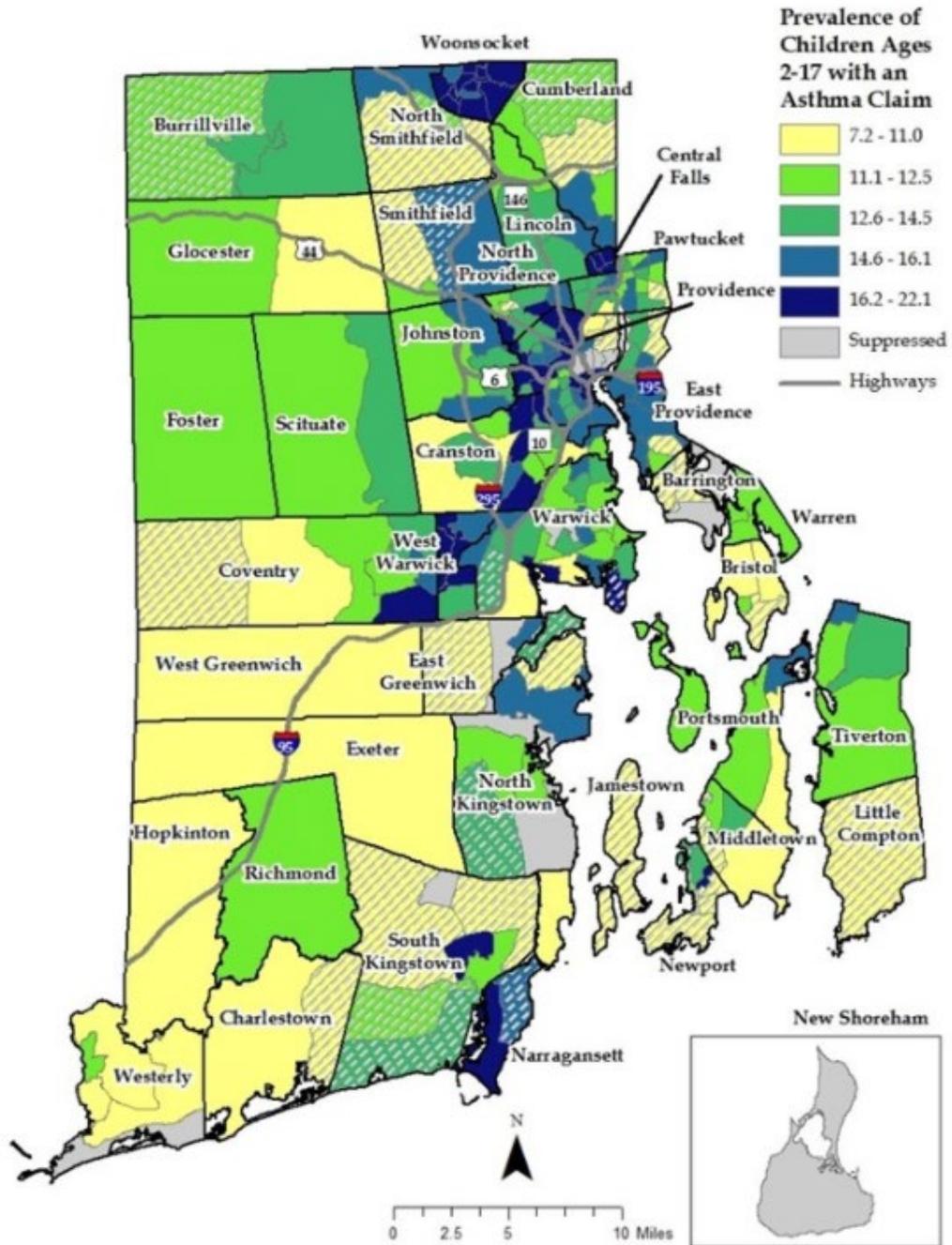


Figure 17: Asthma prevalence among children enrolled in Medicaid in Rhode Island (2013-2017)



Rhode Island Asthma State Plan



RIPTA should develop a detailed strategy to fully electrify the public bus fleet, including any necessary modifications to RIPTA’s infrastructure, workforce, route planning, or other core aspects of operating a successful public transit fleet. RIPTA should consider prioritizing electrification for transit services that either serve or run through environmental justice neighborhoods.

“The other piece to it is ... electrify the bus fleet ... By doing so would you then subsequently help the people who are living ... where the buses are all there all the time, polluting the air and making those health benefits or making those health detriments.”

“We know that medium and heavy-duty vehicles, specifically the diesel burning ones, are the worst contributors to air pollution in part because the pollutants that warm our climate are different from the ones that harm our health, even though they come from the same source ... for folks that don't drive but do experience the health-harming pollution coming from those really big vehicles, electrifying those will actually be the greatest improvement to the air quality, particularly in the city of Providence.”

- **Planning:** Transitioning to electric buses is much more complex than simply switching out diesel buses for electric ones. As discussed in RIPTA’s [Sustainable Fleet Transition Plan](#), electric buses also require a whole new network of charging stations and new considerations in route planning. RIPTA’s [Zero-Emissions Vehicle Program](#) represents a foundational first step, but additional planning will be needed to develop a road map to fully electrify the transit system.
- **Medium-Duty Vehicles:** While there are many electric alternatives for light-

duty vehicles and some electric options for buses, there are few electric alternatives for medium-duty vehicles like those used in RIPTA’s paratransit services. Federal resources should support national R&D to develop and deploy electric medium-duty vehicles.

- **Coordination:** There may be economies of scale and cost-savings if public fleets are able to coordinate. Fleets may choose to share charging vehicle infrastructure, or purchase fleet vehicles and equipment in bulk. Coordination may also result in lower strain on the electric grid and therefore lower costs for Rhode Islanders.

“The underserved communities are most impacted by the NOx and [greenhouse gas] emissions from [medium- and heavy-duty] vehicles. As you look at the planning and what this means, I think you really should not just limit it to light-duty vehicles – I think you want to have a plan in place to consider medium- and heavy-duty.”

The agencies within the Executive Office of Health and Human Services also have fleet vehicles that serve a number of purposes. Since this subset of the State’s fleet tends to frequent frontline communities, these vehicles should be prioritized for electrification so that the benefits of reduced tailpipe emissions can accrue more directly to the residents of those frontline communities. In collaboration with other relevant state agencies, **the Executive Office of Health and Human Services should inventory state owned fleet vehicles designated for use by the Departments within the EOHHS structure, in cooperation with the State’s plan to transition to electric vehicles.**

School buses

Transit services connecting students to schools should not be overlooked. There is both federal grant funding for electric school buses and utility programs to support installing the charging infrastructure, yet few school buses have been electrified.⁴⁴

School buses may be owned and operated by the school district (or local education authority, LEA), by the state (i.e. out-of-district routes for LEAs who choose to participate), or by private third party service providers contracted by the LEA (e.g. First Student, Ocean State Transit, and Durham School Services).

The ownership model determines what options are available to encourage electrification. Grant funding should be explored by all school bus owners and should be braided with additional incentives if available.

The Rhode Island Department of Education (RIDE) should conduct a study to understand the potential for electrifying school buses that provide out-of-district services for participating LEAs. RIDE operates a fleet of 276 vehicles to provide these services. 90 percent of these vehicles average fewer than 100 miles per day, while the remaining vehicles average up to 200 miles per day. Following a fleet conversion study, RIDE should determine how to best integrate electrification into future procurements of fleet vehicles and contracts for services.

School associations can also raise awareness of their desire to electrify school buses and school districts can request services provided by electric buses in procurement and contracts. Both actions may send helpful signals to private

companies about the importance of this transition.

- **RIPTA's Student Transportation Services:** In Providence, RIPTA helps transport students to schools through special arrangements for bus passes. As funding becomes available for supporting electrification of school buses, such as through grant programs offered by federal agencies, those programs should broaden eligibility requirements to allow transit vehicles who transport students to qualify for financial support.

"Would love to see every dirty diesel school bus converted to electric - perfect model with limited time of use each day."

Trucking

Charging stations that are strategically located at destinations and along transit routes can enable the heaviest polluters – medium- and heavy-duty vehicles – to switch to electric and thereby both substantially reduce greenhouse gas emissions while simultaneously improving air quality along their frequently travelled routes.

Industrial centers like the Port of Providence, Quonset, and others may be key locations for charging stations and doing so may have environmental and public health benefits that reach beyond those boundaries. For example, the Rhode Island Division of Statewide Planning is already part of a federally supported multi-year ad hoc working group that is evaluating the trucking needs of businesses in the Port of Providence and identifying potential solutions to

⁴⁴ Notably, Westerly just received funding for two electric school buses and school transit service provider First Student for one electric school bus, both from EPA's Diesel Emissions Reduction Act funding. New Shoreham is also planning to convert to an electric school bus.

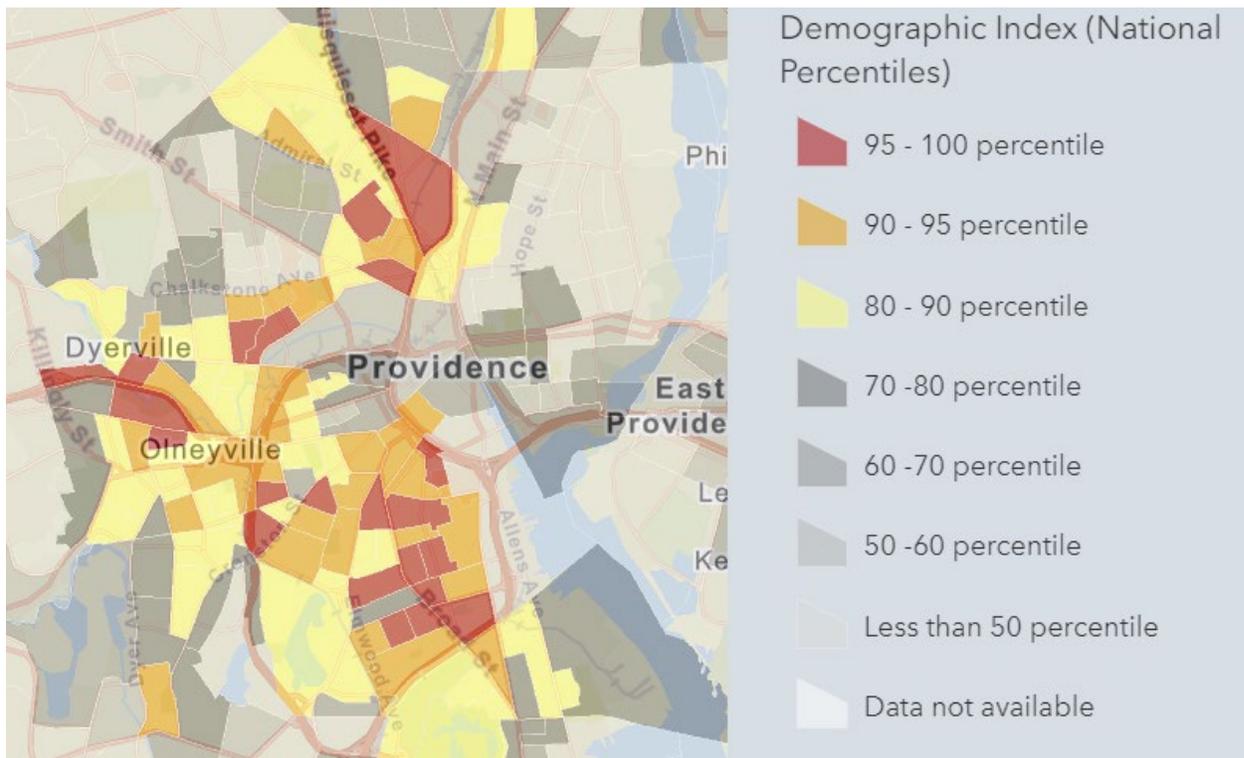
support improving environmental quality and public health outcomes for residents.⁴⁵

Incentive programs should prioritize electrification for medium- and heavy-duty vehicles.

“There needs to be a direct effort to include chargers that are designed for [medium- and heavy-duty] vehicles. There are many electric charging ports out there, and having a variety of plugs available in the heavily trafficked areas would make it easier for these large trucks to electrify their fleets. Please consider installing them close to the port, near truck stops, near

[medium- and heavy-duty] repair facilities, and along the 95 corridor. By installing them near the areas where these trucks are waiting or loading their goods, this will greatly reduce emissions and idling. I would recommend reaching out to fleet owners and the RI Trucking Association to learn how to accommodate their needs for them to electrify their vehicles.”

Figure 18: Environmental justice communities near and within the Port of Providence



⁴⁵ See for example: <https://www.epa.gov/community-port-collaboration/providence-community-port-collaboration-pilot-project> and <http://www.planning.ri.gov/planning-areas/transportation/port.php>

Revenue for Transportation Infrastructure

The rising market share of electric and alternative fuel vehicles and the improved fuel efficiency of internal combustion engine vehicles are expected to have a negative impact on revenues collected from fuel taxes both at the national and state level. As technology improves and electric vehicle pricing becomes more competitive with traditional internal combustion engine vehicles, the adoption rate of electric vehicles will continue to grow, and the trend of declining federal and state fuel tax revenues will accelerate.

Federal taxes on gasoline and diesel fuel have been in place since 1932, but the rates have not been adjusted since 1993, with all but 4.3 cents of the per-gallon federal tax on motor fuels scheduled to expire on September 30, 2022.⁴⁶ The Congressional Business Office projects that if those taxes were extended at their current rates, revenues from gasoline and diesel taxes would decline at a rate of about 1 percent per

year over the next 10 years. Factors contributing to that projected decline include the rising fuel economy of vehicles and the slow rate of growth of the total number of miles traveled by vehicles.

With Rhode Island deriving more than 60 percent of total funding by aggregate from the state and federal gas tax – close to 70 percent if bonds and grants are not taken into consideration – it is imperative that a deeper analysis of the impact of the lost fuel tax revenue is conducted and additional mitigation strategies and options are identified.

As the impact on every state is different, **DOT in conjunction with the Department of Revenue’s Office of Management and Budget should initiate a study on the impact of reduced fuel tax revenues and potential mitigation options that can be implemented the State of Rhode Island. The Office of Energy Resources and Department of**



Revenue for Transportation Infrastructure

Initiate a study in coordination with the Department of Revenue’s Office of Management and Budget, Office of Energy Resources, and Department of Environmental Management that will:

-  Estimate the magnitude of impacts to gas tax revenues over time as electric vehicle penetration increases
-  Review actions proposed by other states and federally
-  Deliver a recommendation to the Administration and General Assembly for sustaining transportation infrastructure funding

* Indicates a critical equity recommendation

⁴⁶ Reauthorizing Federal Highway Programs: Issues and Options | Congressional Budget Office (cbo.gov) <https://www.cbo.gov/publication/56373>

Environmental Management should provide support for modeling electric vehicle conversion within such a study.

In addition to the loss of revenue from declining fuel taxes due to electric vehicle adoption, the study should provide a comprehensive analysis of state transportation revenues, which will include other internal and external forces that are influencing these revenues and develop new strategies to mitigate such losses.

The study will also provide an opportunity to discuss in more depth gradual implementation of measures to counteract the magnitude of the losses and to develop new strategies to fill gaps as both electric vehicle penetration increases and gasoline usage decreases with the retirement and replacement of older internal combustion engine vehicles with electric vehicles.

Other elements to be addressed in the study are alternative revenue generation methods across states and at the federal level, and how to build revenue streams from charging stations at state facilities.

To counteract the potential loss of revenue, some states have enacted additional registration fees on electric and hybrid vehicles. The level of these additional fees could however act against the efforts to encourage the adoption of electric vehicles and would counteract efforts to accelerate adoption.

While peripheral to the overall loss of fuel tax revenues at both the federal and state levels, the study should also discuss implications at the state and municipal levels due to declining revenues at gas stations.



Electric Grid

Building out an electric transportation system will require additional decarbonized electric supply, upgrades to the electric grid, innovation in electricity programs, and planning to ensure resilience during power outages. Near full electrification of our light-duty, medium-duty, and heavy-duty vehicles will require roughly 6,000 GWh of electricity on an annual basis – for reference, that’s equivalent to about three-quarters of our current annual electricity consumption.⁴⁷ Not only will our electric grid need to be built out to deliver this much electricity, but we will need to onboard additional renewable energy systems to generate this electricity if we are to meet our net-zero greenhouse gas emissions mandates by 2050.⁴⁸

The Division of Public Utilities and Carriers should evaluate the costs and benefits of

proposals that create an integrated strategy in Rhode Island to support the state’s clean transportation goals with a framework that will consider electric rate impacts, ensure transportation decarbonization benefits, and enable a competitive market and private investment, as well as grid integration.

Identify impacts

First, we need to understand the impacts of electric transportation on the electric grid so we can strategically address them. Indeed, current electric grid planning processes account for expected load growth due to electrification on both the distribution and transmission systems.⁴⁹ However, as recommended in the technical and economic analysis [The Road to 100% Renewable Electricity by 2030 in Rhode Island](#), **utilities and stakeholders should explore the**

Prioritize the following efforts:

- Support a 100% Renewable Energy Standard
- Pair renewable energy resources with charging stations
- Use battery energy storage to support resilient charging infrastructure
- Allow price signals to reflect the varying costs of electricity over time

* Indicates a critical equity recommendation

⁴⁷ See the 2050 load projection in [The Road to 100% Renewable Electricity by 2030 in Rhode Island](#) (Jan 2021)

⁴⁸ Set forth by the 2021 Act on Climate: <http://climatechange.ri.gov/aoc/>.

⁴⁹ For example, National Grid’s electric forecast and resulting infrastructure investment proposal (called the “Electric Infrastructure, Safety, and Reliability Plan”) is reviewed and approved on an annual basis by regulators. ISO-NE, the independent system operator for New England’s transportation system, also conducts annual electrification forecasts.

concept of integrated grid planning. This concept considers key drivers of electricity system needs, such as projections for transportation electrification using local knowledge and expectations, over longer timescales to better understand and plan for changing future system needs.

Mitigating grid strain

Electric vehicle charging causes strain on the electric grid primarily when vehicles are charged at the same time as peak demand – when Rhode Islanders are using the most electricity at the same time during the course of the year. Peak demand occurs on a daily basis in the afternoon and evening hours, and on an annual basis in the hot summer months.⁵⁰ Therefore, **we should continue programs and policies that incentivize charging vehicles during off-peak hours** to help alleviate strain on the electric grid. There is further potential for the future technology to not only reduce grid strain but provide grid benefits through vehicle-to-grid services. Examples include:

- **At-home charging:** Simply encouraging and enabling at-home charging may help to reduce grid strain due to the lower voltage of the charger. However, at-home charging should be supplemented with clear price and information signals about the true costs of electricity throughout the day.
- **Off-peak charging incentive programs:** Such programs give drivers a reward based on their charging behavior. National Grid has piloted an off-peak charging rebate pilot program

since 2018 – this program has shown real decreases in peak charging in return for nominal incentives and informational feedback about charging behavior.

- **Demand response programs:** These programs pay customers to reduce electricity consumption during hours of peak electricity demand. Electricity use may be ramped down either manually or automatically depending on the capabilities of technology. A growing number of electric vehicles and chargers are capable of accepting signals about peak periods and responding by pausing charging.
- **Time-varying rates:** Electricity rates for the majority of Rhode Islanders are ‘flat rates,’ where the cost of electricity is the same regardless of the time at which that electricity is used. In contrast, time-varying rates allow prices to differ throughout the day and the year, thus sending more accurate signals about the true cost of electricity. A prerequisite for time-varying rates is deploying advanced metering infrastructure that can record electricity consumption at various intervals throughout the day.⁵¹
- **Demand charges:** Another common type of rate structure charges an additional price based on how much electricity is demanded at any instance. DCFC charge vehicles quickly because they are capable of transferring large amounts of electricity, and therefore

⁵⁰ As we electrify transportation and heating, the annual peak will shift from summer months to winter months.

⁵¹ For reference, residential customers of National Grid have meters that continuously add up the amount of electricity used. Monthly electricity use is derived from the difference between the electric meter reading at the beginning and end of the month – this reading is collected by a fleet of trucks as those trucks drive past nearby meters. National Grid submitted a proposal to invest in advanced metering in 2021, but this proposal is stayed due to a proposed transaction of assets to PPL.

have high demand. Demand charges provide a signal to incentivize DCFC to ramp down charging rates during times of peak demand. Indeed, at least one company's DCFC comes standard with technology that can automatically ramp down charging rates to avoid demand charges.

- **Vehicle-to-grid services:** Future vehicle technology may be able to provide vehicle-to-grid services that benefit the electric grid and reduce system costs. These technological capabilities should continue to be monitored and, when they enter the market, may be incentivized through strategically designed pay-for-performance programs.
- **Energy efficiency:** Increases in electricity demand and consumption can be offset by foundational investments in energy efficiency, which is our least-cost resource. Utility energy efficiency programs are required by Least-Cost Procurement statute, and it is imperative to continue these programs as we electrify.
- **System utilization:** While time-varying rates and demand charges are responsive to system-wide price dynamics, optimizing system utilization is responsive to the dynamics of the local electric grid. Consistent with concepts presented in [Power Sector Transformation](#), Rhode Island may consider statutory, regulatory, or programmatic changes to the utility business model to incentivize the utility to promote electrification and charging

that makes better use of the wires and substations that make up our electric grid. In fact, using the electric grid more consistently throughout the day and the year can actually put downward pressure on electricity rates, which would create a positive feedback loop to further encourage electrification.⁵²

- **Grid Modernization:** Modernizing our electric grid involves not just replacing or repairing equipment at the end of its life, but making proactive investments that result in cost-effective benefits to customers. Those benefits may come in the form of easier or less costly integration of electric vehicle charging infrastructure and distributed energy resources, improved reliability and customer service, and avoided costs to operate and maintain the electric grid.

“And I have to say it -- time of use rates for electricity! I am concerned everyone will plug in while they are at work - and further tax the electric system in the afternoons when it's already at its peak. Let's give folks an incentive to plug in at night/evening -- and the infrastructure to do it!”

Access and capacity

Information about the ease and cost of hooking up new electric vehicle charging stations to the electric grid should be readily available and up to date so developers and customers can make decisions with full knowledge. National Grid hosts the [RI System Data Portal](#), which provides information about how heavily loaded sections of the electric grid are. To improve use of this system for identifying economic areas for

⁵² As a rough analogy, the reader can compare the electric grid to our roadways. Unlike our roadways, the electric grid is built to handle Thanksgiving Day levels of traffic, and this means that for the rest of the year, our electric grid is bigger than we need. Increasing use of the electric grid throughout the year – but not during peak periods – means that the total cost of the electric grid can be spread over higher volumes of sales, resulting in lower rates.

charging station deployment, **National Grid should update data as frequently as practical and, to the extent possible, connect the dots between loading data and ability to add electric vehicle charging stations.**

Furthermore, businesses with fleets may consider partnerships that optimize use of electric vehicle charging infrastructure and thereby reduce upfront and ongoing costs. Coordination among fleets and with the electric grid can also improve system utilization. The utility or third party may provide value as a sort of matchmaker between businesses to share charging station infrastructure and locate the infrastructure appropriately on the electric grid.

“[M]y company ... integrates storage in our DC fast charging units to reduce that strain that’s created on local utility grids ... [and] also leveraging that storage to charge the battery at the charging unit overnight and then being able to charge the vehicles directly from the battery during the day so you’re capturing that off peak energy making sure that you’re lowering your operational expenses for the site host and then you’re also making it less costly for the drivers to charge their vehicle.”

Decarbonization

The transition to electric vehicles immediately reduces greenhouse gas emissions relative to internal combustion engines fueled by gasoline, and provides immediate public health benefits. However, the transition to electric vehicles only reduces greenhouse gas emissions to the levels required by the Act on Climate if our electricity demand is met by renewable energy resources. Rhode Island’s current mechanism to decarbonize electricity supply – the [Renewable](#)

[Energy Standard](#) – only requires a minimum of 38.5% renewable electricity by 2035. **The General Assembly should consider an amendment to strengthen the Renewable Energy Standard or other legislative mechanism to ensure we fully decarbonize our electric supply.** Furthermore, people and businesses who have electric vehicle charging may consider installing on-site renewable energy to ensure their additional electricity use is decarbonized.⁵³

“I love when I go someplace, and I see a parking lot with a canopy over it with solar-sourced electricity to charge the vehicles. I would love to see something like this more widely utilized here in Rhode Island.”

“The one thing that I would really love to see is more push ... [to] require or incentivize having solar over existing parking lots or over any parking lot for that matter. It puts that all that impervious cover to good use, and it would provide a direct source of energy right there where the charging station is.”

Resilience

As climate change causes more frequent and extreme weather conditions, risk of power outages may increase if not mitigated. Therefore, the transition to vehicles that run on electricity also comes with the risk of not being able to charge those vehicles during power outages. Note that gas stations are also impacted by power outages and must rely on backup generation (either a generator or microgrid) to pump gas. While gas stations have generally had decades to build up resilience investments, resilience should be a consideration at the outset

⁵³ Several commenters voiced concern over rules limiting on-site solar PV to no more than 100% of annual average electricity consumption. This limitation may result in undersized PV systems relative to actual electric consumption if the resident adds an electric vehicle or electrifies other home systems. Further discussion may be warranted between utilities, regulators, and stakeholders to determine how to address these concerns.

for electric vehicle charging stations.⁵⁴ This risk can be mitigated in several ways:

First, on-site backup power, such as a battery energy storage system, can provide continued ability to charge during a power outage.

Second, some public charging stations may be designated as resilience hubs – an integrated combination of electric vehicle charging stations, renewable energy, and battery energy storage – and may be available for charging even when the electric grid is down. Such resilience hubs may be strategically located throughout the state and in proximity to evacuation routes and transportation corridors.

Third, mobile charging units – essentially battery energy systems on trucks – may be deployed to meet drivers where they and their vehicles are.⁵⁵ The State may consider exploring a public-private partnership to offer no-cost roadside assistance specifically for electric vehicle drivers.

Building out resilience in our transportation system broadly, and deploying a network of resilient charging capability specifically, should be further considered, integrated into other statewide and emergency planning exercises via

coordination with the Division of Statewide Planning and the Emergency Management Agency (EMA), and allocated funding to catalyze demonstration projects in the near-term and statewide deployment in the long-term.

As part of its next Evacuation Route study, EMA should conduct an internal audit related to charging station access during times of emergency. In this audit, EMA should inventory charging stations along evacuation routes, identify needs for additional charging station infrastructure, and assess the need for mobile or other emergency charging services.

“Are plans established to deal with EVs ... in the case of natural disasters that may render electrical charging infrastructure disabled?”

“I think the plan should include [Emergency Management Agency] considerations - how do we deal with power outages or storms? Today people rush to fill gas tanks - will people all plug in at the same time and how will that work?”

⁵⁴ Entities also have the ability to store gas reserves for extended periods of time, whereas storing electricity comes with a different set of challenges. The State should consider critical electric vehicle charging infrastructure in the same manner as critical gas station infrastructure in a subsequent version of the State Energy Assurance Plan.

⁵⁵ Indeed, at least one national vehicle service provider does offer mobile charging to assist drivers who run out of charge on the road (akin to bringing a gallon of gas to stranded vehicles that run out of gas mid-trip).

Workforce

Installing and maintaining electric vehicle charging infrastructure requires a set of skills related to electrical trades, fluency with software and information technology, and construction methods. As we accelerate deployment of charging stations in Rhode Island, we must ensure we are developing the workforce to meet a growing volume of demand. Increased adoption of electric vehicles and slow phase out of internal combustion engines will require the full supply chain of vehicle sales, mechanic services, and recyclers to broaden their expertise to electric vehicles. In parallel, potential reductions in need for gas stations and intake of fossil fuel deliveries at ports will necessitate careful planning and deliberate upskilling of workers to ensure a just transition. Finally, we must ensure that the benefits of electrifying our transportation sector – including contracts of companies and jobs for Rhode Islanders – are realized by those who have been historically underserved, in particular by black, indigenous, and people of color.

“... [M]ake sure that electricians that are doing the work installing charging stations are properly trained in Rhode Island and that we take full advantage of the job creating opportunities. I want to make sure we have the right number of people trained so that the amount of work is commensurate to the number of people that are qualified. I think that it’s a really great opportunity for Rhode Island to create some clean energy sector jobs and just love to see recommendations about how that liaisoning can happen between the multiple departments.”

There are several secondary school programs in Rhode Island accredited by the National Institute of Automotive Service Excellent that offer automotive technology, autobody, and diesel mechanic training. The National Automobile Dealers Association provides curriculum through the Automotive Youth Educational Systems, which is a partnership between manufacturers, dealers, and secondary school programs. Participating dealerships fill entry-



Workforce

Advance progress along three fronts:



Workforce Development

The Department of Labor and Training will hold industry convenings to understand and respond to needs

- Charging station developers
- Auto mechanics
- Electricians



Right to Repair*

Consider rights to repair for electric vehicles and charging stations



Equitable Hiring*

Public entities should consider how to ensure procurement processes result in an equitable number of awards going to minority business enterprises

* Indicates a critical equity recommendation



level positions from these partnerships and manufacturers use them to recruit students to automotive careers. Post-secondary training is available at New England Institute of Technology and other regional schools. This training is often sponsored by specific manufacturers and relates to specific technologies.

Becoming an electrician in Rhode Island requires 576 hours of classroom time and 8,000 hours of on-the-job training through an apprenticeship program with a licensed electrician. Passing the journeyman exam allows an electrician to become licensed and start their own business. There is one union electrical Joint Apprenticeship and Training Committee associated with the International Brotherhood of Electrical Workers local 99 in Cranston. Accepted apprentices can expect to spend five years completing a program. There is also a non-union apprenticeship program associated with the Rhode Island chapter of the Associated Builders and Contractors of Rhode Island. Classroom time can also be gained through several career and technical programs in Rhode Island.

The Bureau of Labor Statistics reports that in May 2017 there were 2,370 auto service technicians, 690 automotive body repair technicians, and 550 truck mechanics working in Rhode Island. Many auto service technicians are trained by and are working at dealerships on specific makes and models of cars. Others are employed at small auto mechanics throughout the state and may not have as much access to training on specific new technologies. In 2018, there were 2,530 employed electricians in Rhode Island. There are also electrician apprentices working with licensed electricians.

The Rhode Island Department of Labor and Training should hold industry convenings with electric vehicle charging station

developers, auto mechanics, and electricians to understand projected needs and challenges as electric vehicle adoption increases, and to identify potential future training and development opportunities.

Automotive training programs may need to maintain or expand their partnerships with manufacturers to access current and new technology. Retraining of those currently in the workforce, especially those who do not work at a dealership will need to be supported. Some jobs may be lost as electric car models need fewer repairs and their repair is limited by technology.

The General Assembly may choose to explore right-to-repair laws as an important part of supporting local auto mechanics who would otherwise not be able to make repairs. Such legislation would require automobile manufacturers to provide the same information to independent repair shops as they do for repair shops at auto dealers. It is important for small local shops to have access to the technology to repair these vehicles, otherwise only dealers will be able to service electric vehicles (other than changing tires and brakes). Right-to-repair legislation would promote a level playing field for who can service a car.

More electricians may need to be trained and opportunities for electrician apprenticeships will need to be expanded. There will need to be a pipeline for minority students to enter the trades and join unions. Some opportunities that may be explored include youth skills programs, grant funding to support workforce development, public-private partnerships to expand training access, and regional coordination. Lastly, incentive programs and workforce development programs should consider how to support workers in fossil fuel-driven industries, like gas stations, oil service stations, and others.

Public entities should also consider their procurement practices for electric vehicle charging infrastructure vendors as some procurement choices may affect the abilities of minority businesses enterprises from winning contract bids. Entities may examine the scale at which procurements occur, and whether procurements are done for individual projects in parallel or in series. If procurement of services for electric vehicle charging equipment is parsed into smaller projects, more small local businesses could potentially bid on those contracts. If a set of projects or services go out to bid separately but in parallel, the procuring

body may be better able to meet a minimum target of minority business enterprises in their portfolio of selected vendors. Carefully considering vendors both for individual projects and as a whole portfolio will ensure a minimum number of jobs and the economic benefits of vehicle electrification will be delivered to communities historically underserved and overburdened by our transportation and procurement system.

Data Tracking & Reporting

Data is required not only to track progress towards electrification and greenhouse gas reduction targets in Rhode Island, but to continually evaluate metrics related to an equitable clean transportation transition and advancement of community-prioritized transportation outcomes. Data collection will guide the strategic planning of charging infrastructure development, electric vehicle incentives, public transportation, and more. The goal of data collection is to promote equitable adoption of electric vehicles, expand charging infrastructure efficiently, and understand the demographics of electric vehicle owners and potential barriers to entry.

The Executive Climate Change Coordinating Council, in coordination with the Division of Motor Vehicles, Office of Energy Resources, and Department of Transportation, should develop and maintain a clean transportation dashboard.

Transportation metrics such as vehicle miles traveled (VMT), the makes and models of electric vehicles registered in Rhode Island, the

average time spent charging, and popular charging locations are valuable opportunities for Rhode Island to improve data collection.

- VMT can be used to estimate on-road transportation emissions and driving trends. VMT is estimated by the Department of Transportation and is submitted annually to the Federal Highway Administration (FHWA). County and street-level VMT data can provide insight to traffic patterns, potential charging infrastructure locations, and air quality near high volume traffic corridors.
- The makes and models of electric vehicles registered in Rhode Island shows what vehicles are in high demand. For instance, are PHEVs more popular than BEVs? Are electric SUVs and trucks purchased at a similar proportion as gasoline SUVs and trucks? Are high-end luxury electric vehicles being purchased at a higher rate than affordable electric vehicle models?



Data Tracking and Reporting

Develop a public clean transportation dashboard:

 <h4>Electrification</h4> <ul style="list-style-type: none">• Electric vehicle adoption• Medium- and heavy-duty electrification• Charging infrastructure• Market characteristics	 <h4>Macroeconomics*</h4> <ul style="list-style-type: none">• Jobs• Local businesses• Economic activity	 <h4>Public Health*</h4> <ul style="list-style-type: none">• Air quality• Asthma rates• Related costs/savings	 <h4>Equity*</h4> <ul style="list-style-type: none">• Partner with frontline communities to identify priority outcomes and associated metrics of interest
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* Indicates a critical equity recommendation



- Understanding public charging station usage is critical to the efficient buildout of charging infrastructure. If stations are always in use, more stations can be added nearby to satisfy the demand for charging. Conversely, if a charging station sees low amounts of traffic, additional stations can be prioritized in other areas.

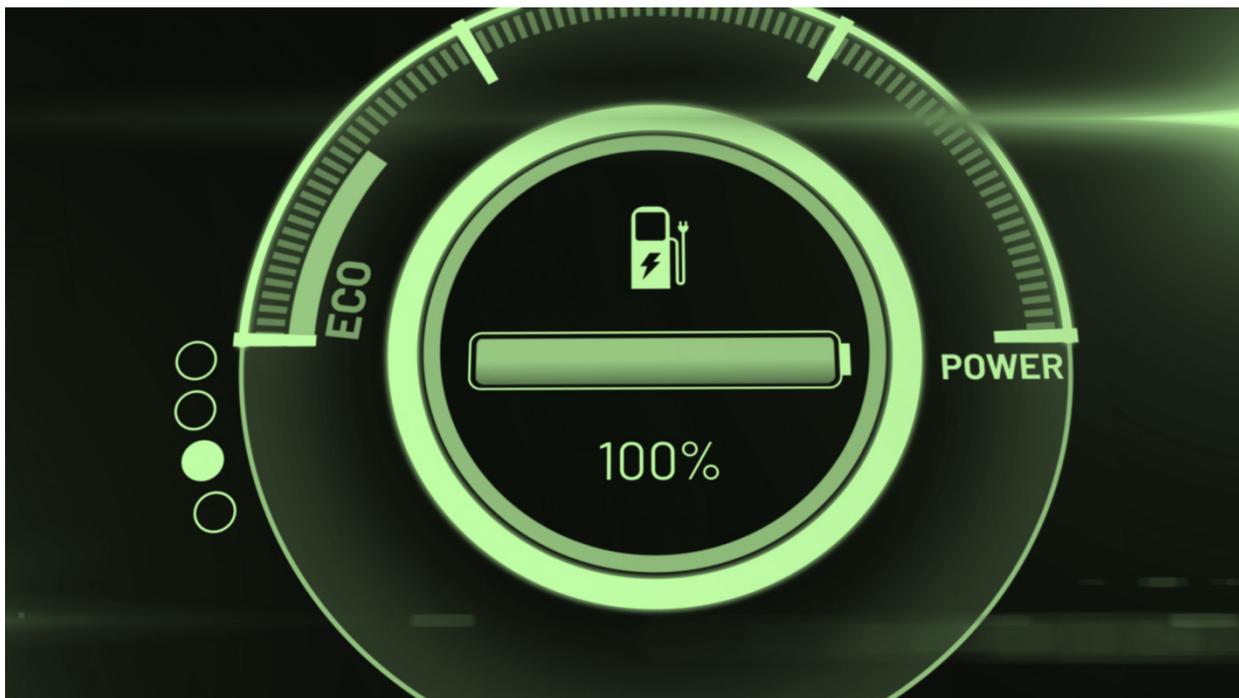
While the State of Rhode Island is in the beginning stages of transportation data collection, progress has been made to collect active electric vehicle registrations on a quarterly basis, identify county level transportation patterns and vehicle counts, and determine other avenues for future data collection.

Data collection is a cross-agency effort requiring collaboration between the Department of Transportation, the Division of Motor Vehicles, the Department of Environmental Management, and the Office of Energy Resources. The

collaboration includes brainstorming, reviewing data requests, and determining what data is available at each agency.

Methodologies to improve data collection are always considered; one recent development uses an electric vehicle VIN decoder to determine the number of electric vehicles registered in Rhode Island. The electric vehicle VIN decoder includes VIN strings from all BEV and PHEV vehicles sold in the United States. The Division of Motor Vehicles matches each electric vehicle VIN string to active registration data to determine how many electric vehicles are registered in Rhode Island. The registration data is used to create a map highlighting the concentrations of electric vehicles by zip code in Rhode Island.

Other transportation data collection efforts underway include historical electric vehicle counts, the average age of vehicles by zip code, and information on the secondary market for electric vehicles in Rhode Island.



Electric vehicle data, transportation trends, and demographic data can be compiled into a clean transportation dashboard for public use. Some states have dashboards already; a good example is the [EValue Dashboard](#) created by Atlas Public Policy for New York and Colorado. Other New England states are also pursuing this particular dashboard software for tracking their data.⁵⁶ A dashboard puts transportation data in one place for the public and state agencies to review. Considerations as to where the dashboard will be online, what data it will include, and how often it will be updated should be further discussed and coordinated among agencies and with public input.

In addition to tracking vehicle data, state agencies should also track data related to vehicle electrification's impact on macroeconomic factors (e.g. jobs and businesses) as well as public health metrics (e.g. environmental quality and incidence of asthma). Doing so may require additional coordination with the Department of

Labor and Training and the Department of Health.

Understanding the demographics of people who purchase electric vehicles is important to ensure equitable electric vehicle adoption and provide access to resources. Who are the main buyers of electric vehicles? What age group is buying electric vehicles most frequently? What level of income is most likely to purchase an EV? Are EVs being purchased by homeowners and apartment dwellers equally? Where are these EVs being sold in Rhode Island? Answers to these questions will be helpful to determine a logical pathway forward for Rhode Island's charging infrastructure buildout and electric vehicle incentive opportunities. **State agencies should work with communities to understand their priority outcomes and metrics needed to track progress toward those outcomes.**

⁵⁶ The United States Climate Alliance has a funding opportunity for states interested in developing a dashboard with Atlas Public Policy. New England states pursuing this opportunity include Maine, Connecticut, and Vermont.

2022 Priority Actions for EC4 Agencies

This section prioritizes a specific meaningful action item for all agencies represented by the Executive Climate Change Coordinating Council (EC4). By including these priority action items in this Guide, agencies – and the specific points of contact listed within those agencies – have committed to advancing these actions in 2022. Agencies will be held accountable via routine report outs on progress at public EC4 meetings.

Executive Climate Change Coordinating Council

- Coordinate **quarterly report outs** from agencies on progress and, in coordination with the Division of Motor Vehicles, Office of Energy Resources, and Department of Transportation, develop and maintain a **clean transportation dashboard**.
 - Point of Contact: EC4 Chairperson

Department of Environmental Management

- **Lead-by-Example** with electric vehicle charging infrastructure at state parks and beaches.
 - Point of Contact: Administrator, Office of Air Resources

Office of Energy Resources

- The Office of Energy Resources, in coordination with the Department of Transportation and the Department of Environmental Management, will prepare an **investment strategy** and deploy electric vehicle charging infrastructure funds allocated to Rhode Island through the federal infrastructure bill (signed by President Biden in November 2021). Investment will align with the recommendations of this Plan, advance equity and accessibility, and follow applicable federal guidelines. In addition, OER will publish a **guideline of best practices** for public and private charging station installations and continue to work with state agencies to **expand the number of electric vehicle ports at public facilities**.
 - Point of Contact: Commissioner

Department of Transportation

- Conduct a **study on state revenue streams** for transportation infrastructure. This study should include a review of alternative revenue generation mechanisms and, in coordination with the Office of Energy Resources and Department of Environmental Management, model changes in revenue based on forecasted adoption of electric vehicles.
 - Point of Contact: Assistant Director

Department of Health

- **Quantify health benefits** of clean transportation investments and identify opportunities to leverage health-based funding streams (e.g., via partnerships with health insurers or providers) to promote electrification of vehicles and mobility equipment in underserved and overburdened communities.
 - Point of Contact: Climate Change Health Program Manager

Emergency Management Agency

- As part of its next Evacuation Route study, RI EMA will conduct an **internal audit related to charging station access** during times of emergency. In this audit, EMA will inventory charging stations along evacuation routes, identify needs for additional charging station infrastructure, and assess the need for mobile or other emergency charging services.
 - Point of Contact: Mitigation Planning Supervisor

Department of Labor and Training

- **Hold industry convenings** with electric vehicle charging station developers, auto mechanics, and electricians to understand projected needs and challenges as electric vehicle adoption increases, and to identify potential future training and development opportunities.
 - Point of Contact: Chief Operating Officer

Rhode Island Public Transit Authority

- Develop a **detailed strategy to fully electrify** the public bus fleet, including any necessary modifications to RIPTA's infrastructure, workforce, route planning, or other core aspects of operating a successful public transit fleet.
 - Point of Contact: Chief of Strategic Advancement

Department of Administration

- The Division of Capital Asset Management and Maintenance, in collaboration with the Office of Energy Resources, to develop a charging station **maintenance strategy** for charging infrastructure on State property and an **actionable plan** to both right-size and electrify the State fleet.
 - Point of Contact: Director, Division of Capital Asset Management and Maintenance

Division of Public Utilities and Carriers

- **Evaluate the costs and benefits of proposals** that create an integrated strategy in Rhode Island to support the state's clean transportation goals with a framework that will consider electric rate impacts, ensure transportation decarbonization benefits, and enable a competitive market and private investment, as well as grid integration.
 - Point of Contact: Administrator

Division of Statewide Planning

- Determine the best way(s) to incorporate vehicle electrification into the **State Guide Plan**, whether as a separate element or a component of existing elements, and ensure that either this Strategic Policy Guide is adopted as a discrete element or that amendments are made to one or more existing State Guide Plan elements.
 - Point of Contact: Associate Director

Executive Office of Health and Human Services

- In collaboration with other relevant state agencies, **inventory state owned fleet vehicles** designated for use by the Departments within the EOHHS structure, in cooperation with the State's plan to transition to electric vehicles.
 - Point of Contact: Director of Legislative and Constituent Affairs

Commerce RI

- **Convene business community representatives** and coordinate next steps pertaining to fleet electrification and charging station installation for new and expanding businesses, such as through existing or new programs and support services and targeted outreach.
 - Point of Contact: Executive Vice President of Business Development

Rhode Island Infrastructure Bank

- Promote deployment of charging stations and electric fleet conversions for private and public entities, with an emphasis on **supporting municipal, multi-unit housing, non-profit and commercial** properties. RIIB will utilize both existing and new financing and grant programs to accelerate the investment of public and private capital via the Bank's relationships with state, municipal and private sector stakeholders.
 - Point of Contact: Managing Director

Coastal Resources Management Council

- Assess the extent to which the CRMC has a role in permitting for electric vehicle charging infrastructure; whether the CRMC may weigh non-polluting or zero-emissions marine technology in coastal permitting; and, **assess ways in which the CRMC may incentivize** zero-emissions transportation activities in the permitting process.
 - Point of Contact: Executive Director

Considerations for the General Assembly

This Plan proposes a number of next steps the General Assembly may consider in future legislative sessions. These considerations are compiled here for easy reference. The Project Team would welcome continued discussion about any of these ideas and looks forward to further guidance and direction from the General Assembly.

- Enact a 100% Renewable Energy Standard to enable transportation sector decarbonization.
- Direct DOT and OER in consultation with DEM to strategically deploy federal Infrastructure Investment and Jobs Act stimulus funding according the priorities herein and in compliance with federal guidance.
- Identify funding to support (and sustain) incentive programs to encourage electric vehicle adoption.
- Consider rights to charge for Rhode Islanders who rent or lease.
- Consider rights to repair electric vehicles and charging stations.
- Consider legislation requiring a minimum number of public parking spots having charging station access.
- Consider passing design and functionality standards for electric vehicle charging infrastructure.
- Consider requirements to advance building codes to ready buildings for electric vehicle adoption.
- Provide guidance on sustainable revenue mechanisms to support transportation infrastructure and transit services in an electric transportation paradigm.

Conclusion

In developing this Guide, we heard from Rhode Islanders that addressing climate change, alleviating public health burdens, and improving equity are critical and urgent priorities. Electrifying transportation is one strategy within a portfolio of broader mobility solutions that takes immediate action to address all three of these priorities.

This Strategic Policy Guide synthesizes eight categories of needs identified by the public and by stakeholder organizations. For each need, the Project Team has distilled priorities that should guide future programs, policies, actions, and potential legislation. Within these priorities, we integrate equity by considering how our collective action can connect historically underrepresented and overburdened frontline communities with the energy, economic, and environmental benefits of decarbonization. In addition to integrating these priorities throughout, we also compile these priorities at the outset of our recommendations – these priorities are essential for an equitable strategy to improve access to electric transportation.

Furthermore, the Project Team heard loud and clear that we need to demonstrate action and progress, not just planning. In response, we worked with every state agency represented on the Executive Climate Change Coordinating Council (EC4) to identify a specific action to undertake in 2022 that advances the priority recommendations laid out in this Guide, as well as a specific senior-level point person to lead each action. Agencies will be held accountable through Administration discussion and report-outs at public EC4 meetings, and progress will be tracked as part of a clean transportation dashboard developed and maintained by the EC4.

The Project Team also respectfully identifies some potential topics members of the General Assembly may wish to consider for future legislative action. These topics include revising the Renewable Energy Standard to require 100% renewable energy, directing federal funding to support incentive programs, ensuring rights to charge at home for Rhode Islanders who rent or lease, and providing guidance for sustainable transportation infrastructure revenue streams, among others.

Acknowledging that we have substantial work to do and that our ongoing work will need to evolve as electric vehicle penetration increases, the Project Team considers this Strategic Policy Guide as the beginning of our work rather than the completion of a deliverable. Our intent is for this Strategic Policy Guide to be a working document that will continue to coordinate action in the years to come. Along with the opportunities presented within this Guide, robust investments in renewable energy, clean thermal technologies, and community resilience will also be vital. Working together, we remain confident that Rhode Island will meet the challenges ahead, while creating new economic investment and job growth opportunities for the 21st century.

APPENDIX I

Public Participation & Stakeholder Engagement



Appendix

Public Participation and Stakeholder Engagement

Public Participation



Online Public
Comment Portal

Live 9/8-12/7



Public Listening
Sessions

Held 9/29-9/30



One-on-One
Discussions

September-
October



Draft Plan
Public Review

11/22-12/7



Presentations
at Public
Meetings

EC4 9/30
EC4AB 12/8
EC4 12/16

The Project Team extends its sincere gratitude to everyone who helped inform this Plan. We include several comments from the public throughout the Plan to underscore needs, opportunities, and recommendations. Inclusion of these comments and identification of stakeholders is intended to be illustrative of the process and does not imply their endorsement of this Plan.

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Public participation was critical to the development of this Strategic Policy Guide. The Project Team relied on five strategies to engage with stakeholders: an online public comment portal, three public listening sessions, over two dozen one-on-one discussions, public review of draft material, and presentations at public meetings.

Online Public Comment Portal

- Live 9/8-12/7
- Link to public comment portal along with project information and materials housed on project webpage
 - www.energy.ri.gov/evplan
- Of commenters who provided an address, most live in urban and coastal areas



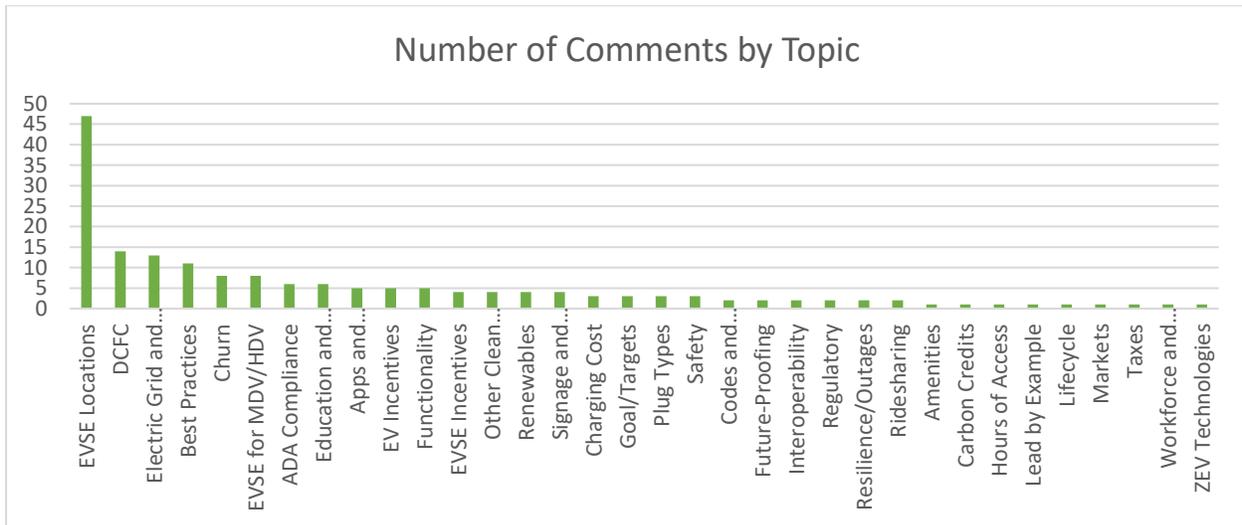
The online comment portal and project webpage containing information and materials went live on September 8, 2021 – www.energy.ri.gov/evplan. The Project Team used a software platform called SmartComment to host the comment portal, intake comments, and categorize comment topics for further analysis and response. We thank SmartComment and the Division of Statewide Planning for their support and coordination.

Public Listening Sessions

- Listening Session #1: Wednesday 9/29 @ noon
 - Focus on health-transportation nexus
 - 65 participants
- Listening Session #2: Wednesday 9/29 @ 6pm
 - 23 participants
- Listening Session #3: Thursday 9/30 @ noon
 - 49 participants
- Some Pre-/Post-Survey Results
 - Representation from state government (30%), residents/businesses (19%), environmental organizations (13%), and others (38%); (N=47 respondents)
 - 30% respondents drive a vehicle fueled by gasoline, 31% drive an electric vehicle, 4% don't drive (N=48 respondents)
 - People of color were under-represented (90% of respondents identified as white; N=48 respondents)
 - 100% of respondents thought there was sufficient opportunity to share their thoughts (N=19 respondents)



The Project Team hosted three well-attended public listening sessions using remote participation via Zoom. The first of the three listening sessions focused on the health-transportation nexus while the other two were more generalized. All listening sessions began with a brief overview, which included the directive for this work given by the General Assembly, a high-level workplan, and guidance for how to participate using Zoom. The majority of time was allotted to attendees to provide their thoughts and guidance for this work. As needed, listening session facilitators offered discussion prompts, such as “what does ‘access’ mean to you?”, “tell us about your experience driving and charging an electric vehicle”, and “what are you hoping we include in this plan?”. All listening sessions were recorded such that the sessions could be transcribed, and comments entered into SmartComment for further analysis and response.



Comments through the online portal and the listening sessions were categorized by topic. In the period leading up to the release of the draft document, we received 177 comments from 62 unique comments on 34 topics. The most commented topic was about locations for charging stations, including specific locations (e.g. “There is a huge gap in South County along Rt. 1”) as well as types of locations (e.g. major highways, public facilities, environmental justice communities). These comments directly informed the contents of the Strategic Policy Guide.

We have reason to believe the comments received through the online comment portal and at the public listening sessions underrepresented voices from environmental justice communities specifically and voices from people of color generally. Pre-session surveys suggest⁵⁷ roughly nine-in-ten attendees identified as white, while less than five percent identified as people of color. Of 47 survey respondents, no one identified as Hispanic or Latino. The Project Team recognizes the lack of diversity in participation and holds itself accountable for improving engagement with frontline communities and people of color.

⁵⁷ When referencing pre- and post-session survey findings, we use the word “suggest” to indicate that the results may point to those findings but that they should not be considered conclusive. This is because survey response rates were too low to be considered statistically representative of the total population of participants. That said, these suggestive findings are still helpful in understanding potential participation trends.

What is your Race?

Response options	Count	Percentage	48 Responses
White or Caucasian	43	90%	
Black or African American	1	2%	
Asian or Asian American	0	0%	
American Indian or Alaska Native	0	0%	
Native Hawaiian or other Pacific Islander	0	0%	
Two or more races	1	2%	
Prefer not to say	3	6%	

We heard from one-on-one discussions with representatives from the Providence Racial and Environmental Justice Committee and RI Office of Diversity, Equity, and Opportunity that – one – residents of frontline communities were less likely to own personal vehicles and were therefore unsure how to participate in this work which was perceived to be focus on personal vehicles and – two – frontline communities and people of color have not seen compelling evidence that the benefits from the State’s climate efforts have accrued to them and therefore did not believe any advantage would come from further discussions. The Project Team has incorporated this feedback in the Strategic Policy Guide, with a focus on encouraging electrification of vehicles that frequent environmental justice communities, commitment to designing programs such that investment advances equity, and accountability of delivering benefits equitably through a public dashboard. We are also committed to building relationships with frontline communities and building trust with all Rhode Islanders – we continue to invite further conversation and are willing to attend existing meetings for community-based organizations.⁵⁸

Pre-session surveys suggest roughly one-third of listening session attendees were representatives of state and municipal governments, one-fifth were representatives of industry and utility stakeholders, one-fifth were residential or business customers, and one-tenth were representatives of environmental organizations. This was supported by nearly nine out of ten respondents identifying as either familiar or expert with electric vehicles (of 48 respondents). Of the attendees who responded to the post-session survey, all nineteen said there was a sufficient opportunity to share their thoughts, opinions, and ideas.

⁵⁸ Please contact Project Team Coordinator Carrie Gill at carrie.gill@energy.ri.gov.

What sector are you representing?

Response options	Count	Percentage	47 Responses
State Government	14	30%	
Municipal Government	2	4%	
Industry, including vendors, developers, and energy consultants	4	9%	
Environmental Organizations	6	13%	
Utility	4	9%	
Residential/Business Customer	9	19%	
Other	8	17%	

Was a sufficient opportunity given to share your thoughts/opinions/ideas?

Response options	Count	Percentage	19 Responses
Yes	19	100%	
No	0	0%	

One-on-One Discussions

- Conducted by members of the Project Team over September through October
- Connected with 22 stakeholder groups:
 - Rhode Island State Agencies and Offices
 - Quasi-Public Agencies
 - RI Division of the Federal Highway Administration
 - Electric Distribution Utilities
 - Rhode Island League of Cities and Towns; City of Providence
 - Racial and Environmental Justice Committee of Providence
 - Environment Council of Rhode Island; Green Energy Consumers Alliance; Healthy Homes Alliance



Throughout the project, the Project Team held two dozen one-on-one conversations with stakeholders. These stakeholders included Rhode Island Office of Healthy Aging; Disability and Health Program; Office of Diversity, Equity, and Opportunity; Commerce RI; Division of Public Utilities and Carriers; Public Utilities Commission; Office of the Attorney General; Building Code Commissioner; Rhode Island Public Turnpike Authority; Quonset Development Corporation; Rhode Island Infrastructure Bank; RI Division of the Federal Highway Administration; National Grid; Pascoag Utility District; Block Island Utility District; Rhode Island League of Cities and Towns; City of Providence; Racial and Environmental Justice Committee of Providence; Environment Council of Rhode Island; Green Energy Consumers Alliance; Acadia Center; and Healthy Homes Alliance. These discussions also directly informed the development of the Strategic Policy Guide but are not reflected in the comment analysis above.

Draft Plan Public Review

- Draft Plan online 11/22-12/7
- 22 commenters submitted suggestions for improvement
 - The primary call was to make the Plan more actionable, with roles, responsibilities, budgets, and timelines
 - Other comments focused on interoperability, incentives, electricity sources and distributed energy resources, regulatory questions, specific locations and charging levels, broad mobility solutions, and others
- The Project Team is working to address all comments in the final version – thank you!



The Project Team released the drafted document on November 22, 2021 for a two-week public comment period. Twenty-two commenters submitted feedback and suggestions for improvement, including representatives from Green Energy Consumers Alliance, Acadia Center, National Grid, RI Division of Statewide Planning, Conservation Law Foundation, AmpUp, Freewire, and others. The Project Team sincerely thanks everyone for taking the time to read a draft document over sixty pages in length. All comments were reviewed by the Project Team and informed a series of revisions to improve the final Strategic Policy Guide. We describe the three most substantive critiques of the draft document and how the Project Team addressed them, below.

The primary and most critical concern we heard from comments was the need for a specific action plan with roles, responsibilities, deliverables, and timeline. We thank commenters for this encouragement. The Project Team addressed this concern by partnering with all agencies represented by the Executive Climate Change Coordinating Council (EC4) to identify a specific priority action that will advance the priorities outlined in the Strategic Policy Guide. Every agency has committed to making meaningful progress on these priority actions in 2022 and has identified a specific senior-level point person to lead this work. Furthermore, agencies will be held accountable through routine report-outs on progress at public EC4 meetings and via a public clean transportation dashboard.

Another substantial concern was the confusion over the use of the word “plan”, which was used in the title of the draft document. Comments indicated that the word “plan” may be perceived to mean different things to different people. We heard from some commenters that they expected a plan akin to a master plan of where and when to locate which types of charging infrastructure. While this sort of master plan is within scope for expanding charging infrastructure on State properties, it is out of scope for the roll of the Administration. Therefore, we revised the title of this project from “plan” to “strategic policy guide”

which we think more accurately reflects the contents of this coordinating document. In this sense, this Strategic Policy Guide is a plan for state agency action over the coming years.

Lastly, we heard from commenters that the needs and recommendations seemed overly vague with unclear or unspecified guidance for future action. We revised the Strategic Policy Guide both in content and formatting to elucidate our recommendations for actions. At the same time, we acknowledge that we don't have all the answers to the challenges identified. Our proposed actions are therefore not comprehensive by definition – we hope this Strategic Policy Guide can be a working document so we can evolve our strategy as we learn more and as market conditions change.

The Project Team acknowledges and is grateful for the remainder of the comments not described above as well. We made every effort to address all comments, including at times speaking directly with commenters and providing additional resources and connections for further discussion. The Project Team continues to be open to receiving comments and critiques – the publishing of this Strategic Policy Guide represents a start to discussions rather than the end.

Presentations at Public Meetings

- EC4 Council Meeting 9/30
- EC4 Advisory Board Meeting 12/8
- EC4 Council Meeting 12/16

- Announced at Energy Efficiency and Resource Management Council Meeting 9/23
- Announced at Green Buildings Advisory Committee Meeting 10/19 and 11/16
- Planned but postponed: State Planning Council Transportation Advisory Committee 10/28 (meeting was canceled)
- Announced at State Planning Technical Committee Meeting 12/3



This work was presented at various stages throughout its development. Engagement at public meetings included presentations at meetings of the Executive Climate Change Coordinating Council (EC4; September 30, 2021 and December 16, 2021), the EC4 Advisory Board (December 8, 2021), and announcements or updates at meetings of the Energy Efficiency and Resource Management Council (September 23, 2021), the Green Buildings Advisory Committee (October 19, 2021, November 16, 2021, and December 14, 2021), and the State Planning Technical Committee (December 3, 2021). Public comments were also provided at the December 8 meeting of the EC4 Advisory Board and the December 16 meeting of the EC4. Thank you to all members and attendees!

APPENDIX II

Overview of Activities in Select States



States such as California, Connecticut, and Massachusetts have made significant progress to encourage the transition to electric vehicles. Understanding how incentive programs operate will help Rhode Island assist with the rapid deployment of electric vehicles. Incentive programs include rebates for new and used electric vehicles, increased incentives for low to moderate income buyers, and incentives to install public charging stations. A combination of incentives will provide the greatest level of benefits to Rhode Island to ensure equity and efficiency as the state transitions away from internal combustion engine vehicles.

California

The California Clean Fuel Reward is a monetary reward for consumers purchasing or leasing a new BEV or PHEV from a participating automotive retailer.⁵⁹ Eligible vehicles are required to have a battery capacity of 5 kWh or greater and up to \$1,500 is offered depending on the battery size. This reward is deducted from the final price of the vehicle and can be combined with other federal, state, and local incentives.

The Clean Vehicle Rebate Project (CVRP) offers up to \$7,000 in rebates for the purchase or lease of a new BEV, PHEV, zero-emission motorcycle, or hydrogen fuel cell vehicle.¹⁸ Consumers must choose a vehicle from the eligible vehicle list and operate the vehicle in California for at least 30 months. The value of the CVRP rebate depends on the vehicle type and where the vehicle is located. Increased incentives are available for vehicles purchased in disadvantaged or low-income communities designated by CalEPA.¹⁹

Figure 1A. California's Clean Vehicle Rebate Project Incentives

Vehicle Type	Standard Amount	Increased Amount
Fuel cell electric	\$4,500	\$7,000
Battery electric	\$2,000	\$4,500
Plug-in hybrid electric	\$1,000	\$3,500
Zero-emission motorcycles	\$750	n/a

Notes: Standard rebate amount for eligible vehicles. An increased rebate is available for vehicles purchased in disadvantaged or low-income communities designated by CalEPA.¹⁸

California fleets and businesses can also receive CVRP rebates for the purchase of eligible vehicles.¹⁸ California public fleets can receive up to \$7,000 for the purchase or lease of eligible vehicles with up to 30 rebates per year. Car sharing and rental fleets can receive up to \$4,500 for the purchase or lease of

⁵⁹ <https://cleanfuelreward.com/california-ev-rebate-program>

¹⁸ <https://cleanvehiclerebate.org/eng>

eligible vehicles with up to 20 vehicles per year. Businesses, nonprofits, tribal communities, and federal entities may receive \$4,500 for the purchase or lease of eligible vehicles with only 1 vehicle per lifetime.

The Vehicle Retirement Consumer Assistance Program provides residents with vehicle retirement options to improve California's air quality by reducing motor vehicle emissions from older vehicles that are still in service.⁶⁰ Residents with low to moderate household incomes (equal to or less than 225% of the federal poverty level) may receive \$1,500 to retire their operational vehicle and residents with household incomes exceeding the income eligibility threshold may receive \$1,000 to retire their operational vehicle.

California's Electric Vehicle Infrastructure Project (CALeVIP) provides incentives to install electric vehicle charging infrastructure.⁶¹ The funding for projects depends on the location of the charger and the infrastructure that is to be installed. About \$6,000-\$7,000 is offered per level two charger, and up to \$80,000 is offered for DCFC. Localized funding from air districts and utilities will stack with CALeVIP incentives.

Connecticut

Connecticut's Hydrogen and Electric Automobile Purchase Rebate (CHEAPR) offers up to \$9,500 in incentives for residents who purchase or lease an eligible BEV, PHEV, or hydrogen fuel cell vehicle.⁶² Residents must purchase a vehicle from the eligible vehicle list and from an approved dealer. Standard rebate amounts are \$7,500 for a new fuel cell vehicle, \$2,250 for a new BEV, and \$750 for a new PHEV.

Additional rebates are available in Connecticut for residents who participate in a qualified state or federal income program. Income-eligible residents can receive up to \$9,500 for a new fuel cell vehicle, \$4,250 for a new BEV, and \$2,250 for a new PHEV.⁶³ Income qualified residents can also receive incentives for used vehicles: \$7,500 for a fuel cell vehicle, \$3,000 for a BEV, and \$1,125 for a PHEV.

Massachusetts

The Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program provides residents with incentives up to \$2,500 for the purchase or lease of a new BEV or fuel cell vehicle and up to \$1,500 for the purchase or lease of a PHEV.⁶⁴ A vehicle must be less than \$50,000 to be eligible for this incentive. The rebate is available within 3 months of purchasing a vehicle and a rebate application must be submitted. Since June 2014, Massachusetts has provided over \$30 million to incentivize the purchase of over 15,000 electric vehicles.

Many incentives for charging infrastructure are available in Massachusetts. These incentives help install charging infrastructure in the workplace, in publicly accessible locations, at educational campuses, and at multi-unit dwellings such as apartment complexes. Massachusetts's infrastructure grants provide funds for charging locations that will be necessary for the mass adoption of electric vehicles.

⁶⁰ https://www.bar.ca.gov/Consumer/Consumer_Assistance_Program/Vehicle_Retirement_FAQ

⁶¹ <https://calevip.org/about-calevip>

⁶² <https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/CHEAPR---Home>

⁶³ <https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/CHEAPR---Rebate-Plus>

⁶⁴ <https://mor-ev.org/eligible-vehicles>

Massachusetts Workplace and Fleet Charging Program provides incentives for employers to install level two charging stations.⁶⁵ Applicants must have 15 or more employees in non-residential places of business to be eligible. The grant program provides up to 60% of the funding per street address for hardware and installation costs with a value capped at \$50,000 per location.

Incentives exist in Massachusetts for DCFC. The charging infrastructure must be located on publicly accessible parking found at a government owned location, an educational campus, or at a non-government owned location. Government owned locations may receive funds up to 100% of the hardware and installation costs to a maximum of \$50,000 per charging station. Non-government owned locations may receive funds up to 80% of the hardware and installation costs to a maximum of \$50,000 per charging station. Educational campuses may receive funds up to 60% of the hardware and installation costs to a maximum of \$50,000 per charging station.

Multi-unit dwelling and educational campus charging incentives are available to property owners with five or more residential units and educational campuses with at least 15 students on site. Incentives will cover costs of up to 60% for level two charging stations with a maximum of \$50,000 per street address.

Grant opportunities are available for public access charging in non-residential locations. Government owned locations may receive up to 100% of the costs to install a level two charging station with a maximum of \$50,000 per street address. All other locations may receive up to 80% of the costs to install a level two charging station with a maximum of \$50,000 per street address.

California's Electric Vehicle Charging Station Assessment

In response to California legislation AB 2127 and subsequent Executive Order N-79-20, California developed and updated an assessment of electric vehicle charging stations needed to be installed in order to meet their updated goal of 8 million ZEVs on the road in 2030.⁶⁶ California projects nearly 1.2 million public chargers will be needed to satisfy the 8 million ZEVs in 2030. Their detailed analysis further breaks down the types of locations for these electric vehicle chargers (e.g. workplace, public, multi-unit dwellings) and types of chargers (Level 2 and DCFC). This strategy includes additional recommendations about continued funding, alternative fuel vehicles, and aligning charging with renewable energy generation. Identified actions include:

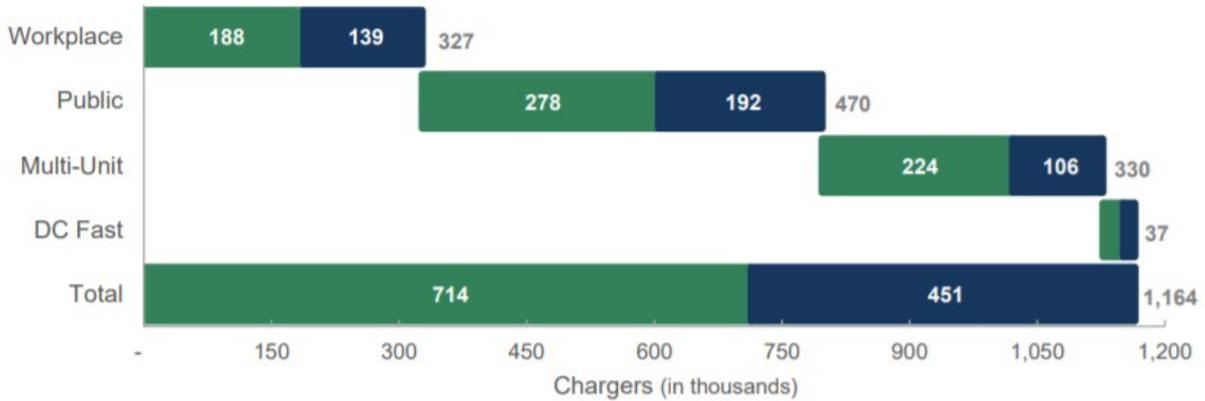
- Continue public support for charger deployment, using public funds to leverage private funds, and eventually transition to a self-sustaining private market.
- Continue modeling efforts to project the quantities, locations, and load curves of chargers needed to meet statewide travel demand.
- Support innovative charging solutions and financing mechanisms.
- Support local efforts to prepare for transportation electrification.
- Ensure equitable distribution of charger deployment throughout the state.
- Align charging with renewable generation and grid needs.

⁶⁵ <https://www.mass.gov/how-to/apply-for-massevip-workplace-fleet-charging-incentives>

⁶⁶ <https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127>

- Prioritize standardized charger connectors and, for networked charging, prioritize hardware capable of standardized communications protocols.

Figure 2A. Projected Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles in California by 2030



Notes: California’s projected number of chargers necessary to satisfy the goal of 5 million zero emission vehicles on the road in 2030. Executive Order N-79-20 updated California’s 2030 zero emission vehicle goal from 5 million to 8 million zero emission vehicles on its roads.²⁷ Green bars indicate the number of chargers necessary to support 5 million light-duty zero emission vehicles and the blue bars indicate the additional chargers necessary to support 8 million light-duty zero emission vehicles. Level one chargers and privately owned residential chargers are not included in this projection.