



Recommendation: Decarbonize the building and transportation sectors

Strategy 1

Accelerate retrofits of existing buildings to achieve deep energy efficiency and eliminate fossil fuels.

The Commonwealth has over 2.5 million buildings, which are responsible for the largest portion of greenhouse gas (GHG) emissions of any sector when accounting for both thermal energy (heating and cooling) and electricity. For many municipalities in the region, the buildings sector – whether primarily residential or commercial – likewise comprises the greatest level of emissions, above 80 percent for some urban municipalities.

While existing buildings represent a tangible opportunity to tackle the climate crisis, they have also proven very challenging to decarbonize. Many building envelopes, enclosures, mechanicals, lighting, and other components were designed and implemented much less efficiently and cleanly than they could have been, and buildings are typically reliant on fossil fuels. Not only is renovating or replacing these components often very costly and time-consuming, but it could also displace or disrupt existing occupants. However, policy actions that prioritize retrofitting existing buildings to greatly enhance energy efficiency and replace fossil fuels with renewable energy will serve to significantly reduce the carbon footprint of our building stock. There is also the opportunity to align deep energy retrofits with ventilation and other air filtration upgrades needed to achieve healthy homes, an area of increased concern in light of the COVID-19 pandemic (see Action 2.2 in **“Ensure that people of all races and income levels have equal access to affordable housing through homeownership and rental opportunities”**). Further, pursuing complementary nature-based solutions, such as green roofs and tree planting, can maximize carbon capture opportunities and decrease heating and cooling loads, further reducing the carbon intensity of our buildings (see **“Ensure land preservation, conservation, and access to recreational spaces”**). High performance buildings free from fossil fuels also generate myriad public health, safety, wellness, and resilience benefits and result in operational cost savings.

- ▶ **Action 1.1: Increase funding for deep energy efficiency retrofits and building electrification.** We estimate that two million buildings statewide will need to undertake deep energy retrofits and electrification to meet the Commonwealth’s net zero climate goals. Just as the sheer scale of this proposition is expensive, so too is the ad hoc way deep energy efficiency retrofits and building electrification are currently undertaken. No comprehensive programs currently exist to fund or finance deep energy retrofits, which could include weatherization; window, roof, or siding upgrades; major equipment replacement; and electrification.¹ Likewise, insufficient funding programs are available to address the pre-weatherization barriers, such as knob and tube wiring, vermiculite, and other health and safety issues, often needed in very old housing before energy efficiency improvements can be made.

A portfolio of funding and financing mechanisms is needed, ranging from more flexible and lower interest loans and green leasing programs and optimization of performance contracting such as Energy Services Companies (ESCO) or other third-party financing, to the acceleration of the Commercial Property Assessed Clean Energy (CPACE) financing mechanism and expansion to the residential sector. Since the scale of the need is so great - and as cost savings would result from economies of scale, statewide requirements, and standardized services, the Legislature should require the development of a statewide program that funds the systematic overhaul of existing buildings. This program could be based on the 2019-2020 MassCEC Whole-Home Air-Source Heat Pump Pilot program, and expanded to integrate with the Mass Save Whole Buildings program. It should allocate at least \$100 million over ten years initially, and be phased in to reach all building types over the next decade. The program should fully fund upgrades for naturally occurring affordable housing, multifamily housing, and homes located within Environmental Justice block groups, and require that a minimum of 25 percent of all retrofits completed meet these criteria. The Commonwealth should also explore possible opportunities to align deep energy retrofits with other efforts that promote healthy homes, including resources to de-lead homes, in order to maximize public health benefits (see Action 2.2 in the “**Ensure that people of all races and income levels have equal access to affordable housing through homeownership and rental opportunities**” recommendation).

- ▶ **Action 1.2: Set mandatory emissions reduction limits at the individual building level.** The Commonwealth should establish GHG emissions caps per square footage of individual buildings based on different building types, from single-family homes to large commercial buildings and laboratories. Building performance standards set a high-level threshold for a building’s performance, while not prescribing exactly how each building must meet the emissions reductions standard. By focusing the standard on climate mitigation, rather than energy consumption, a GHG emissions cap can more likely avoid conflict with the State Building Code. It can also empower building managers to think about their building systems holistically, accounting not just for emissions from energy systems, but also from

¹ Electrification primarily comprises the transition of fossil-based heating systems, such as gas furnaces and oil boilers, to highly-efficient electric heating, such as cold-climate air-source heat pumps, which can also provide cooling.

industrial processes, if applicable, and potential carbon sinks from green infrastructure and materials with high albedo. This new policy lever could be deployed at the local level, as it is in the Clean Energy DC Omnibus Act (focused on energy efficiency ratings) or in New York City’s Local Law 97 (focused on GHG intensity). Alternatively, it could be deployed statewide similar to the Washington State Clean Buildings Act, which has the added benefit of widespread consistency and scale.

By passing legislation that mandates the establishment of a statewide building performance standard based on specific carbon budgets per square footage for various applications, including building type and potentially location and equity indicators, Massachusetts can set the bounds by which building owners plan renovations and upgrades. The caps should ratchet down over time and include a non-compliance mechanism similar to the Alternative Compliance Payments (ACP) currently made by electricity suppliers that fail to comply with the Massachusetts Renewable Portfolio Standard requirements. Another non-compliance option could be a carbon trading mechanism to help finance low-carbon retrofits undertaken by low- and moderate-income building owners or those serving low- and moderate-income tenants. Any statewide standard should include protections against displacement, particularly focused on naturally occurring affordable housing, and align with additional funding sources such as those proposed in Policy Action 1.1. See “**Expand protections against displacement for low-income communities, communities of color, and renters**” for more details on specific anti-displacement measures that can be pursued.

- ▶ **Action 1.3: Adopt a minimum threshold for the percentage of heating and cooling statewide that will come from renewable energy or clean electric sources.** Regulations to include renewable thermal in the Massachusetts Alternative Energy Portfolio Standard (APS) were completed in 2017, whereby electricity suppliers can meet part of their compliance requirement through the deployment of solar thermal, air-source heat pumps, and ground-source heat pumps. Currently, however, the percentage requirement for Alternative Energy Certificates (AECs) only increases 0.25 percent annually and renewable thermal technologies are only one means to comply; others are technologies such as combined heat and power and efficient steam. To transition away from fossil fuels for heating and cooling, a minimum threshold for solar and heat-pump technologies should be required. Legislation signed into law in Maine in 2019 calls for 100,000 heat pump installations by 2025. Massachusetts should be similarly bold. Regulations should prescribe a minimum mandatory limit of at least 30 percent by 2030 (as deemed feasible in 2014 by the Department of Energy Resources’ (DOER) Commonwealth Accelerated Renewable Thermal Strategy (CARTS) report), increasing to 100 percent, or as high as possible, by 2050.²
- ▶ **Action 1.4: Require building energy use disclosure and reporting, with enforcement and building improvement obligations.** A near-term action to help decarbonize existing building stock is a statewide public disclosure requirement for buildings to report on their energy use annually to local and state officials. Benchmarking efforts are already in effect in Boston,

² Navigant Consulting, “Commonwealth Accelerated Renewable Thermal Strategy,” January 2014, <https://www.mass.gov/doc/renewable-heating-cooling-market-strategy-report/download>.

Cambridge, and other jurisdictions around the country. This requirement would increase transparency and awareness of building energy consumption and provide necessary data to inform related policies, such as a building emissions performance standard and climate action plans. To enable the policy to reduce GHG emissions, the Legislature should pass a statewide building energy use disclosure and reporting law in which compliance with reporting must be actively enforced, as should related requirements to decrease building energy use during each compliance period. While building type or size can be phased in over time, targeted energy reductions in buildings that are in Environmental Justice communities should be prioritized at the start. In conjunction, the Legislature should require that utilities provide building owners with data in an accessible format to aid in the benchmarking process, and include provisions, such as through a rental licensing requirement, to protect low- to moderate-income renters from displacement or from bearing the cost of resultant upgrades. See “[Expand protections against displacement for low-income communities, communities of color, and renters](#)” for more details on these protections.

Strategy 2

Ensure that new buildings and major renovations are constructed to meet ultra-low energy, high-performance standards and support greater adoption of distributed renewable energy resources and energy resiliency.

When it comes to building decarbonization, new buildings allow developers to start from scratch and deploy the energy-saving, low-carbon, high-performance technologies, materials, equipment, and systems from the design phase. The policy landscape currently in place, however, does not prioritize comprehensive and strategic planning, design, engineering, construction, operation, and financing of net-zero compliant buildings. Both public and private institutions have made some progress in encouraging this development, including via market-based certification standards such as Passive House and funding from utilities, MassCEC, the Department of Housing and Community Development, and other bodies to support pilots, charrettes, low-income housing tax credit points, and trainings. Yet, most buildings are still constructed or renovated using standard practices that do little more than meet the State Building Code or respond to perceived market demand.

To achieve the climate goals of our region and beyond, baseline requirements and incentives for better buildings will need to be enhanced significantly. The Next Generation Roadmap bill passed and signed into law in March 2021 makes notable improvements in this area by authorizing DOER to establish by November 2022 a municipal opt-in high performance stretch code that includes a net zero building performance standard, but there is still more work to be done. By raising the floor for climate-smart development, we can succeed in transforming market demand and bolstering the related supply chain. We can also generate benefits not only to reduce GHG emissions, but also to make buildings more resilient to storms, extreme temperatures, and grid outages; more conducive to sheltering in place;

inclusive of strong daylighting features proven to benefit students' learning and public health at large; and better ventilated, more comfortable, and less expensive to operate due to down-sized equipment and reduced energy costs. By 2028, the policies should be applied across all building types so that only 2050-compliant buildings are constructed in Massachusetts.

► **Action 2.1: Integrate a robust net zero building energy code into the statewide stretch code by 2025 and the base building energy code by 2028.**

The State Building Energy Code is a uniform code across the Commonwealth with which all cities and towns must abide. Unlike in some other states, municipalities cannot adopt an alternate building code, except for the Stretch Energy Code, an above-code appendix to the building code first adopted in 2009. Cities and towns can opt in (and rescind adoption) via their local legislative body. One of five criteria required to become designated as a Green Community, the Stretch Energy Code has been adopted by over 80 percent of the 351 Massachusetts cities and towns as of May 2021. The Stretch Code appendix was originally 20 percent more efficient than the base energy code. With only two updates in over ten years, however, and with those changes affecting fewer and fewer buildings, the current stretch code is not a sufficiently strong tool to support the decarbonization needed for new construction and major renovations.

The DOER, in consultation with the Board of Building Regulations and Standards (BBRS), should adopt a regular stretch code pathway that expressly aims to attain net zero-ready building performance and a municipal opt-in specialized stretch code, now enabled by the 2021 Next Generation Roadmap Law, that requires most buildings to fully achieve net zero performance. To have a sizeable impact, this opt-in code must not only attain net zero through robust energy efficiency, particularly of envelope and enclosures, electrification, and non-combustible renewable energy, but it also must be adopted by most municipalities. To ensure that this impact is realized, all participating Stretch Code communities should be included by no later than 2025 and all Massachusetts cities and towns by 2028. This phased-in approach creates an on-ramp for building developers and inspectors to prepare to comply. The Commonwealth should also use this time to ensure that supplemental funding is provided to support state- and municipally-owned, deed-restricted, and naturally occurring affordable housing.

Moreover, a regular code update cycle should be established to guarantee timely improvements in the code. This cycle should have a duration of three years to coincide with the mandated adoption of the International Energy Conservation Code (IECC). The IECC is adopted as the Base Building Energy Code in the state, along with additional more stringent Massachusetts-specific amendments, within a year following the three-year cycle of updates to that national model code. Subsequent updates to the net zero code should be required on that same cycle. Additionally, the net zero code should include measures to minimize embodied carbon, potentially based

on standards from the International Green Construction Code (IGCC) or those under development in the City of Boston.

► **Action 2.2: Align Mass Save programs with the urgency of climate change.**

The 2008 Green Communities Act (GCA) created several important policy and programmatic mechanisms and bodies, such as the Green Communities Division at DOER and Energy Efficiency Advisory Council (EEAC), to accelerate energy efficiency. The law required that the electric and gas utilities consider efficiency their first fuel and that they coordinate around a new energy efficiency plan every three years. The Mass Save program also grew out of the GCA as the coordinated initiative of all investor-owned electric and natural gas utilities and the Cape Light Compact (known jointly as the “program administrators” or “PAs”) to deliver the energy efficiency services detailed in the three-year plans. The offerings identified by the PAs in the three-year energy efficiency plans are approved by the Department of Public Utilities (DPU) before being implemented through Mass Save. By law, the PAs must seek to implement all available cost-effective energy efficiency and demand reduction resources. The cost-effectiveness test, termed the Total Resource Cost Test, therefore becomes the critical threshold for what should be included in the plans and what is deemed too expensive.

The 2021 Next Generation Roadmap Law implemented important changes to how costs are screened and benefits are perceived. The Mass Save programs must now integrate the social cost of carbon into cost-effectiveness calculations, and equity and climate change have been added to the list of priorities within the DPU’s mandate. While critical, these improvements require enhanced vigilance to ensure that the roll-out of the changes comply both with the letter and the spirit of the new law. The DPU should update its Energy Efficiency Guidelines to mandate that the assessment of costs, benefits, and cost-effectiveness be updated to align and comply with Commonwealth’s 2030 and 2050 GHG emissions reductions requirements, including an updated social cost of carbon. The process of updating the Energy Efficiency Guidelines should include robust and meaningful stakeholder engagement. Subsequently, the DPU should ensure transparent and timely communication on the final updates made to the guidelines and how they will be applied in the Mass Save programs. If the proposed Three-Year Plan does not meet these elevated commitments, the DPU should return the plan for revision until they do.

Another strong outcome of the 2021 Next Generation Roadmap Law requires the Secretary of Energy and Environmental Affairs to set a GHG emissions limit for each Three-Year Plan, with the first of such limits released on July 15, 2021. Seemingly aggressive, it remains to be seen the impact the limits will have on phasing out fossil fuel incentives and shifting focus to equitable electrification and weatherization. The urgency of climate change and climate justice will necessitate a sharp transition in budgets, investments, planned savings, and benefits away from business as usual and to a significant focus on weatherization, electrification, non-combustion renewable energy technology, clean energy storage and demand management, pre-weatherization and pre-electrification barrier mitigation,

and workforce development - with all costs covered for low-and moderate-income households and other underserved residents and small businesses.

- ▶ **Action 2.3: Implement a local climate zoning package that leads buildings to reduce their GHG footprint, utilize renewable energy, and integrate robust resiliency measures.** The municipal zoning code can serve as a strong local tool to mandate and encourage building decarbonization. While individual jurisdictions cannot govern building energy use if it conflicts with the building code, they can utilize local levers such as zoning to regulate other uses and functions, including those related to climate. By regulating building GHG emissions through local zoning mandates and incentives, cities and towns can accelerate the pace by which their new building stock – as well as those undergoing major renovations that would trigger zoning compliance – contribute to the community’s climate mitigation goals.

Mandates could include zoning overlays that require GHG emissions building caps or eco-roofs (such as green, cool, solar roofs) for particular areas, such as where new construction is expected. Zoning can also be a strong vehicle for enabling greater deployment of renewable energy through language that encourages climate-smart technologies, equipment, and systems or reduces barriers to their deployment. By enabling climate mitigation building technologies, including air-, water-, and ground-source heat pump equipment; battery energy storage; solar thermal; and additional insulation by-right (i.e., without the need for special permit), the pathway to deployment is streamlined and expedited. By exempting them from height and setback zoning requirements or offering density bonuses, weatherization measures that add to the thickness of the building envelope and equipment such as condensers and switch boxes can be integrated without forcing a developer to sacrifice interior building space. With any of these incentives or allowances, municipalities should ensure that affordable housing protections are enforced and aligned.

Further, multifamily and compact mixed-used development is inherently more efficient than single-use development. Achieving the Commonwealth’s climate and housing goals will require accelerating the production of multifamily and mixed-used development, particularly in transit-oriented locations. See “Accelerate the production of diverse housing types throughout the region, particularly deed-restricted Affordable Housing, with a focus on transit-oriented, climate resilient and other smart growth locations” and “**Reduce vehicle miles traveled and the need for single-occupant vehicle travel through increased development in transit-oriented areas and walkable centers**” for more details on these complementary goals.

Best/emerging practice: The Netherlands initiated **Energiesprong** as a government-funded innovation program intended to cultivate and scale whole-building deep energy efficiency retrofits through a standard build and funding approach. The vision is to generate mass demand and a mass market for economic, high performance, net zero retrofits, anticipating that they would greatly reduce upfront costs over time and enable very low operational costs and improved livability for occupants, as well as decreased fossil fuel GHG emissions and climate change impacts. Since 2013, Energiesprong has retrofitted over 4,500 units of affordable housing to net zero energy with 18,000 more in the pipeline in Europe.⁴ Modeled after Energiesprong, RetrofitNY is a New York State Energy Research and Development Authority (NYSERDA) program that aims to create standardized and scalable deep energy-efficient retrofits for the entire housing industry.

RetrofitNY is a \$30 million program funded over ten years and made available through New York State’s \$5.3 billion Clean Energy Fund (CEF).⁵ Pilot retrofits will be publicly subsidized, but the goal is to build a self-sustaining market, reduce design and manufacturing costs, and streamline the financing and retrofit process. RetrofitNY’s pilot phase is focusing on multifamily affordable housing as a uniform building typology. Early successes demonstrate that knowledge transfer and new channels of demand have begun. Since the market has not yet expanded to meet the anticipated demand, challenges include the current high costs of pre-fabricated building exteriors and high-efficiency electric hot water systems. The program is one to watch, as it transitions projects toward construction and potentially overcomes barriers – actions that could enable a similar program in Massachusetts to adapt more quickly and optimize a growing U.S. market for modular and scalable deep energy building retrofits.

Strategy 3

Dramatically increase the share of personal vehicles and municipal and state fleet vehicles that are all electric or low carbon.

The transportation sector accounts for slightly over 40 percent of all GHG emissions in Massachusetts, and nearly half of these emissions are from passenger vehicles. While it is important that vehicles increasingly become more fuel efficient, we must undergo a widespread transition to electric vehicles to decarbonize the transportation sector. Adoption of electric vehicles (EVs) in Massachusetts is slow – in 2018, only 2.53 percent of new light vehicles sold in the Commonwealth were electric.⁶ However, due to declining costs of EVs, improved battery range, and expanded model availability, projections are forecasting that EV sales will increase. If we are to comply with the GWSA mandates, there must be significant movement toward electrification among personal vehicles, state and municipal fleet vehicles, and private fleets.

³ [Energiesprong Explained](#), Energiesprong.

⁴ [RetrofitNY: What is RetrofitNY](#), NYSERDA.

⁵ [NYSERDA Announces First Contract Awards for \\$30 Million RetrofitNY Initiative](#), NYSERDA, June 2018.

⁶ <https://evadoption.com/ev-market-share/ev-market-share-state/>

- ▶ **Action 3.1: Adopt a low carbon fuel standard for vehicles powered by internal combustion engines (ICE).** To facilitate the transition toward EVs, the Legislature should adopt a low carbon fuel standard (LCFS) that will serve to both decrease carbon dioxide emissions associated with ICE vehicles and accelerate the adoption of EVs. An LCFS program will require manufacturers to produce fuels that are less carbon emitting. Adopting a LCFS will make cleaner fuels available to drivers of ICE vehicles, provide incentives for manufacturers to produce low carbon fuels through a credit and deficit system, and serve as an interim measure prior to mandating that all new vehicle sales in Massachusetts be Zero Emission Vehicles (ZEVs). LCFS programs have been successfully adopted in California, Oregon, Washington, British Columbia, and by the European Union.⁷
- ▶ **Action 3.2: Require all new vehicle sales in Massachusetts be ZEVs by 2032.** The Legislature should establish a mandate that will require all new vehicle sales in Massachusetts be ZEVs by 2032. This should not only include personal vehicle sales, but also the purchase and lease of state and municipal fleets, including school buses, as well as light and medium duty commercial vehicle sales. This would put the Commonwealth on the path to achieve its current goal to have 300,000 zero emission vehicles on the road by 2025 and the Department of Energy Resources' (DOER) comprehensive energy planning process, which assumes that two-thirds of new vehicle sales will be electric by 2030⁸. To accelerate this transition, the MBTA, MassDOT, and DOER should conduct a study of opportunities for near-term electrification of vehicles owned and/or leased by municipalities, school districts, and Regional Transit Authorities (RTAs), including an assessment of charging needs.

Numerous countries, including Denmark, France, Germany, India, Ireland, Israel, Netherlands, Norway, Scotland, Taiwan, the United Kingdom, and the Province of British Columbia, have announced measures to phase out ICE vehicles in favor of ZEVs by a specific year.⁹ In the United States, cities such as Denver, New York, and Seattle have announced goals to have ZEVs comprise a percentage of vehicle registrations by a targeted year.¹⁰ Adopting a ZEV mandate by a specific timeframe, along with a plan delineating concrete steps to accomplish this goal, sends a clear message to both vehicle manufacturers and consumers, helping grow the market and drive technological innovation.

- ▶ **Action 3.3: Expand funding for electric vehicle sales and charging infrastructure.** The Massachusetts Electric Vehicle Incentive Program (EVIP) Fleets is a MassDEP rolling grant program aimed at making EVs more widely available across Massachusetts. The program provides incentives for public entities to buy or lease EVs, with funding awards dependent on the size and type of EV the public entity is looking to purchase. In addition to incentivizing EV purchases, MassEVIP also offers programs to support a host of EV charging infrastructure options, including Direct Current Fast Charging, Multi-Unit Dwelling and Educational Campus Charging, Public Access Charging, and Workplace and Fleet Charging.¹¹ This program has allowed MassDEP to provide hundreds of millions of dollars in funding to

7 <https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard>

8 Synapse Energy Economics, Inc. (2018). Massachusetts Comprehensive Energy Plan Stakeholder Meetings Presentation. <https://www.mass.gov/files/documents/2018/07/20/CEP%20Stakeholder%20Meetings%20Presentation.pdf>

9 European Countries Banning Fossil Fuel Cars and Switching to Electric, Road Traffic Technology, August 1, 2018.

10 Percentage goals to have ZEVs comprise vehicle registrations: Denver – 30% by 2030, New York – 20% by 2025, Seattle – 30% by 2030.

11 <https://www.mass.gov/how-to/apply-for-massevip-fleets-incentives>.

cities and towns and regional entities to electrify public fleets and expand charging infrastructure. The Legislature should increase funding for the MassEVIP program to accelerate these efforts.

To incentivize EV adoption, the Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program currently offers a rebate of up to \$2,500 for the purchase of an EV. The DOER will make at least \$27 million available per year in 2020 and 2021 for EV incentive programs including MOR-EV. The Legislature should allocate additional funds to extend and target the impact of the MOR-EV program. The MOR-EV program should re-focus this additional funding entirely to provide a more substantial income qualified rebate for residents with low and moderate incomes, create a scrappage program for ICE vehicles, and grow the used ZEV market to further incentivize the purchase of zero emission vehicles. Looking ahead, the Legislature should codify the MOR-EV program in statute to ensure stable long-term funding.

As transportation network companies (TNCs) like Uber and Lyft continue to have a large role in our transportation system and contribute to transportation emissions and vehicle air pollution, there are strategies the Commonwealth can pursue to promote access to EVs for Uber and Lyft drivers. The MOR-EV program should establish standalone or additional rebates for 1) qualified high mileage fleet operators and drivers and 2) low-to moderate-income drivers. In addition, a rebate for the purchase and lease of certified pre-owned full battery EVs should be provided through the MOR-EV program. These efforts should be paired with tailored outreach and education to low- and moderate-income households. The program should also create incentives for car dealerships to ensure a greater share of their vehicles sold are electric. California, Oregon, and Washington¹² offer rebates based on driver income, while Connecticut¹³ and Colorado¹⁴ offer rebate incentive programs for dealerships and ride-hailing companies, respectively.

► **Action 3.4: Expand procurement opportunities and advance funding programs for fleet electrification.** Existing opportunities for cities and towns, the MBTA, RTAs, and state agencies to invest in electrifying their fleets should be expanded and broadened. Efforts to lower vehicle costs and grow the market can be accomplished by expanding region- and state-run collective procurements, such as via group purchasing that enables bulk pricing for school buses. The parameters set within public vehicle procurements can be a driving force in expanding the EV market.

In addition to increasing funding for the MassEVIP program, as detailed in Action 3.3, the Commonwealth should explore a voucher program to assist with the upfront purchase or lease of fleet vehicles. For example, with funds from the Volkswagen Settlement and Congestion Mitigation and Air Quality (CMAQ) Improvement Program, New York's Truck Voucher Incentive Program provides vouchers to public, private, and nonprofit fleets for the purchase or lease of all-electric vehicles¹⁵. Robust funding programs must be available and collective purchasing tools leveraged to enable the transition to fleet electrification and ensure that additional financial burdens are not placed on municipalities and agencies.

12 Transportation Electrification: States Rev Up, National Governors Association, 2019.

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

14 Colorado Lawyer, Plugging into the Colorado Region, February 2020.

15 <https://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program>

Nationwide, municipalities and states are implementing innovative and ambitious programs to transition to electric school buses. For example, in partnership with Dominion Energy, the state of Virginia launched a program to replace its entire school bus fleet with electric buses by 2030. To accelerate the adoption of electric buses by school districts, New York's Truck Voucher Incentive Program¹⁶ covers 80 percent of the incremental cost and California's Hybrid & Zero-Emission Truck & Bus Voucher Incentive Project¹⁷ offers up to \$220,000 per school bus, plus \$15,000 per bus if operated in a disadvantaged community. Massachusetts must act at least as boldly

- ▶ **Action 3.5: Adopt a statewide right to charge policy.** A right to charge policy states that residents in multi-unit buildings (and other buildings) have the right to install vehicle charging infrastructure for their private use.¹⁸ Right to charge policies typically outline reasonable regulations and conditions that must be met for individuals to move forward with installation. In January 2019, Governor Baker signed into law a home rule petition filed by the City of Boston to enact a local right to charge policy for condominium unit owners.¹⁹ This now allows condo owners to install EV charging stations at or near their parking spaces, subject to reasonable rules and restrictions. The Legislature should pursue a statewide right to charge policy so that residents of multi-family buildings across the Commonwealth have the ability to install charging infrastructure for their personal use, and so that living in a multi-family building does not present a barrier to purchasing an EV.

16 <https://www.nyserda.ny.gov/All-Programs/Programs/Truck-Voucher-Program>

17 <https://www.californiahvip.org/>

18 NASCAUM Right to Charge Laws, October 2019. <https://www.nescaum.org/documents/ev-right-to-charge.pdf>.

19 An Act Establishing Guidelines for the Installation and Use of Electric Vehicle Charging Stations in the City of Boston, <https://malegislature.gov/Laws/SessionLaws/Acts/2018/Chapter370>.

20 <https://thehill.com/policy/energy-environment/421438-california-commits-to-100-percent-electric-bus-fleet-by-2040>

21 <https://ny.curbed.com/2019/5/6/18533462/mta-re-tires-diesel-buses-rapid-transit-series-all-electric-fleet>

22 <https://la.streetsblog.org/2017/11/09/l-a-city-approves-full-ladot-transit-electrification-by-2030/>

23 <https://www.masstransitmag.com/bus/vehicles/hybrid-hydrogen-electric-vehicles/article/21076292/chicago-city-council-approves-transition-to-100-percent-renewable-energy>

24 <https://www.theurbanist.org/2020/01/31/king-county-purchases-40-battery-powered-buses-and-ponders-full-electrification-by-2035/>

Strategy 4

Accelerate a commitment to expand and electrify public transportation.

Making it easier for more people to use our most efficient mode of transportation, public transit, is a fundamental component of our efforts to decarbonize transportation. While the social, public health, and environmental benefits of making biking and walking the most convenient and enjoyable mobility option cannot be overstated, a well-designed and reliable public transit network is also a necessary component of a low-carbon public transportation system, particularly for longer distances. Along with lowering air pollution and improving public health outcomes in Environmental Justice communities, electrified public transit also has the potential to provide significant economic benefits due to reduced maintenance and fuel costs, especially in high-mileage use cases.

Across the country, cities are advancing fleet electrification commitments and initiatives. In California²⁰, all transit agencies will be required to procure fully electric buses starting in 2029. New York City²¹, Los Angeles²², Chicago²³, and Seattle²⁴ all have commitments to convert their fleets entirely to fully electric. The MBTA's Focus40 Plan has broadly pledged to undertake a "phased conversion to zero-emissions fleet and facilities" once successful electric bus pilot programs are

complete and a capital plan for the maintenance facilities has been developed. The MBTA must strengthen and accelerate this pledge²⁵.

While vehicle electrification is an essential component of any transportation decarbonization scheme, the Commonwealth must also invest a robust, reliable, and affordable public transit network and accelerate the production of affordable housing and mixed-used development near transit. Compact growth near high quality transit and enabling people to live with no or fewer vehicles offers many co-benefits, including improving economic mobility, reducing commute times, improving public health outcomes by reducing air pollution and traffic fatalities, and conserving open space necessary for carbon sequestration. Ways to accelerate this mode shift are explored more deeply in “**Improve accessibility and regional connectivity**” and “**Reduce vehicle miles traveled and the need for single-occupant vehicle travel through increased development in transit-oriented areas and walkable centers.**”

- ▶ **Action 4.1: Pursue public-private partnerships to advance electrification upgrades to MBTA bus maintenance facilities.** Providing adequate charging infrastructure is imperative to effectively advance bus electrification. The MBTA’s 2017 Integrated Fleet and Facilities Plan recognized that either upgrading or replacing all eight of the facilities that maintain and garage MBTA buses is a critical need. However, the MBTA faces fiscal challenges to acquire new funding resources to bring these facilities up to a state of good repair. The MBTA should pursue public-private partnerships to accelerate both bus electrification and modernization of bus facilities. Using the Albany Street Garage in Boston as a case study, A Better City explored the potential for electric bus technology to serve as the basis of a public-private partnership in which the private sector could finance and/or construct an electric bus maintenance facility as part of a larger mixed-use development project. The study concluded that this concept has the potential to provide a cost-effective public/private site development strategy that could both modernize and expand the MBTA’s bus facility network.²⁶
- ▶ **Action 4.2: Require all electric utilities to establish time varying rate structures for EV charging infrastructure and financing programs that support the acquisition and operation of electric buses.** Utilities need to play a proactive role that supports and facilitates the transition to transit electrification. Municipalities and transit agencies should work collaboratively with the DPU, Eversource, and National Grid to design rate structures that support transit electrification by making charging more economical. Specifically, this includes working with utilities to offer off-peak discounts for charging and time-of-use (TOU) pricing, and instituting policies and practices that make the business case for buses to be used for energy storage and vehicle-to-grid technology.

25 <https://www.mbtafocus40.com/focus40theplan>

26 A Better City, New MBTA Bus Maintenance Facilities and Evolving Battery Electric Bus Technology, August 2019.

Another option is to develop a financing program in which electric utilities provide upfront funding for vehicle investments and allow municipalities and public transit agencies to pay the utility back on their utility bills as they save on fuel and maintenance costs. A “pay as you save” financing or repayment program can enable municipalities and public transit agencies to address the challenge of higher upfront costs associated with purchasing electric buses and allow for short-term financial savings that could be used to pay for other electrification investments such as charging infrastructure²⁷.

²⁸.

► **Action 4.3: Take part in battery leasing programs with manufacturers.**

Primarily due to battery cost, electric buses require more upfront investment than their diesel counterparts do. The MBTA should take part in financing and leasing programs offered by bus manufacturers designed to reduce the barrier of higher upfront capital investments. For example, the electric bus manufacturer Proterra offers a battery leasing program. While Proterra retains ownership of the battery, this program allows public transit agencies to use the battery over a multi-year agreement²⁹. Battery leasing is a low-cost financing program that accelerates the procurement of electric buses. The battery leasing concept effectively splits the ownership of an electric bus between the transit agency, which owns the body of the vehicle, and the company that owns and powers the battery.

Best/emerging practice: Low-emission zones (LEZs) have been established in more than 260 cities across Europe. While design and regulation of LEZs varies by city, they all work on the principle of prohibiting or levying fines on polluting vehicles, while granting preferential access to approved vehicles in a defined geographic area. Although definitions and designs vary, the primary goal of LEZs is to reduce exposure to traffic-related air pollution and curb tailpipe emissions.

Many LEZs have increasingly strengthened their requirements over time and are expected to continue doing so. These requirements consist of stricter emissions criteria, extension of regulated areas, and inclusion of more vehicle types (e.g., light-duty or heavy-duty). For example, London is in the process of implementing “ultra-low emission zones.” The majority of LEZs operate 24 hours a day, 365 days a year (e.g., Berlin, Stuttgart, Amsterdam, Brussels), but others operate only on certain days and at certain times (e.g., Paris)^{30, 31}.

²⁷ U.S. PIRG Education Fund, Environment America Research and Policy Center, Frontier Group, *Electric Buses in America - Lessons from Cities Pioneering Clean Transportation*, October 2019.

²⁸ Frontier Group, MassPIRG Education Fund, Environment Massachusetts Research and Policy Center, *Electric Buses in America – Clean Transportation for Healthier Neighborhoods and Cleaner Air*, May 2018.

²⁹ Clean Tech Media, *Proterra Rolls Out \$200 Million Electric Bus Battery Leasing Program with Mitsui*, April 19, 2019.

³⁰ *Impacts of the Paris Low-Emission Zone and Implications for Other Cities*, The Real Urban Initiatives Initiative, March 2020.

³¹ *Urban access regulations in Europe* <https://urbanaccessregulations.eu/>.

► **Action 4.4: The Executive Office of Energy and Environmental Affairs should establish a statewide VMT reduction goal in the Clean Energy and Climate Plan.** While vehicle electrification is an essential component of any transportation decarbonization scheme, the Commonwealth must also work to reduce the need to drive and shift a larger share of those trips to walking, biking, or transit. MAPC estimates vehicle miles traveled (VMT) will grow 21% from 2010 to 2030 in the absence of any intervention, and relying on electrification alone means costly subsidies and tremendous pressure on the grid to accommodate the swift electrification of personal vehicles. Reducing the need to drive by improving and expanding walking, biking, and public transit infrastructure and facilitating more compact mixed-used development near transit offers a host of benefits beyond reduced emissions. Expanding the number of destinations accessible by modes beyond driving can reduce traffic congestion and traffic fatalities, improve air quality, and reduce transportation cost burden and improve economic mobility among low-income individuals.

The Interim Clean Energy and Climate Plan (CECP) currently includes a goal to reduce commuter VMT by 15% by 2030. This is an important first step, and requires strengthening the existing Rideshare Regulations within the Department of Environmental Protection (see specific program recommendations in Action 3.3. in “**Reduce vehicle miles traveled and the need for single-occupant vehicle travel through increased development in transit-oriented areas and walkable centers**”). The Executive Office of Energy and Environmental Affairs (EEA) should build upon this goal and identify a statewide VMT reduction target within the CECP. At a minimum, given current travel behavior changes resulting from the COVID-19 pandemic, there should be a short-term goal to stabilize VMT. A longer-term statewide VMT reduction goal should be identified once current trends stabilized. Commute trips only represent about 25 percent of all trips taken.³² As post-pandemic commute and travel writ large continues to become more flexible, the Commonwealth should take a more holistic approach to reducing VMT, lowering emissions while enabling more access to opportunity without a car. Planning to achieve this target should be guided by prioritizing access in communities with a higher percentage of individuals who are low-income and transit-dependent, and should happen in coordination with similar efforts at MassDOT (see “**Improve regional accessibility and connectivity**”).

³² https://www.ctps.org/data/pdf/studies/other/Exploring_2011_Travel_Survey.pdf.