RECOMMENDATIONS OF THE CLIMATE CHIEF

Pursuant to Section 3(b) of Executive Order No. 604

MELISSA HOFFER

CLIMATE CHIEF

OCTOBER 25, 2023

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THE OFFICE OF CLIMATE INNOVATION AND RESILIENCE

CHIEF MELISSA HOFFER

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Pursuant to Section 3(a) of Executive Order No. 604 (EO 604), the Office of Climate Innovation and Resilience within the Office of the Governor (Climate Office), in collaboration with each of the eleven Secretariats of the executive branch, as represented by their respective Secretariat Climate Officers (SCO), has reviewed the present organization, staffing, and policy-making practices of executive department agencies and offices for the purpose of developing a comprehensive, unified, whole-of-government approach to advancing executive department climate policy and achieving the Commonwealth's Net Zero and related emissions reduction mandates.[1] Based on that review, and in accordance with EO 604 Section 3(b), the Climate Chief provided draft recommendations to the Governor on July 7, 2023. The final recommendations are presented herein.

[1] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 604*: Establishing the office of climate innovation and resilience within the office of the governor* (Jan. 6, 2023), https://archives.lib.state.ma.us/bitstream/handle/2452/865288/ocn456714827-2022-eo604.pdf?sequence=1&isAllowed=y [*hereinafter* EO 604].

EXECUTIVE SUMMARY

In the ten months since the Healey-Driscoll Administration began, the urgency of reducing greenhouse gas emissions has only increased. In March, the Intergovernmental Panel on Climate Change issued its starkest warning yet:

> More than a century of burning fossil fuels as well as unequal and unsustainable energy and land use has led to global warming of 1.1°C above pre-industrial levels. This has resulted in more frequent and more intense extreme weather events that have caused increasingly dangerous impacts on nature and people in every region of the world. **Every increment of warming results in rapidly escalating hazards**. More intense heatwaves, heavier rainfall and other weather extremes further increase risks for human health and ecosystems. In every region, people are dying from extreme heat. Climate-driven food and water insecurity is expected to increase with increased warming. When the risks combine with other adverse events, such as pandemics or conflicts, they become even more difficult to manage. . .
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> **In this decade, accelerated action to adapt to climate change is essential to close the gap between existing adaptation and what is needed. Meanwhile, keeping warming to 1.5°C above pre-industrial levels requires deep, rapid, and sustained greenhouse gas emissions reductions in all sectors. Emissions should be decreasing by now and <u>will need to be cut by almost half by 2030</u>, if warming is to be limited to 1.5°C.**[2]

Massachusetts finds itself at a pivotal moment: global average surface air temperatures for July 2023 were the highest ever recorded;[3] three days in the first week of July 2023 set successive global records for the hottest days in Earth's modern history;[4] sea surface temperatures hit an unprecedented high for April 2023 and the ocean remained exceptionally warm through July 2023;[5] expanses of the boreal forest in Quebec burned in an inferno that enveloped the eastern half of North America in harmful smoke for days;[6] multiple marine heatwaves around the world this summer posed a deadly threat to marine life;[7] and a heat dome over Texas and Mexico

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[2] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), AR6 Synthesis Report, *Press Release: Urgent climate action can secure a liveable future for all*, (Mar. 20, 2023) (emphasis added) https://www.ipcc.ch/report/ar6/syr/downloads/press/IPCC_AR6_SYR_PressRelease_en.pdf.

[3] U.N. WORLD METEOROLOGICAL ORGANIZATION, *Copernicus confirms July 2023 was the hottest month ever recorded*, https://public.wmo.int/en/media/news/copernicus-confirms-july-2023-was-hottest-month-ever-recorded (last visited Aug. 8, 2023).

[4] Brad Plumer & Elena Shao, *Heat Records Are Broken Around the Globe as Earth Warms, Fast*, THE NEW YORK TIMES (July 6, 2023), https://www.nytimes.com/2023/07/06/climate/climate-change-record-heat.html).

[5] Elena Shao, *What This Year's 'Astonishing' Ocean Heat Means for the Planet,* THE NEW YORK TIMES (Aug. 3, 2023), https://www.nytimes.com/interactive/2023/08/03/climate/ocean-temperatures-heat-earth.html.

[6] Norimitsu Onishi, *Fires Burning Where They Rarely Have Before,* THE NEW YORK TIMES (June 8, 2023), https://www.nytimes.com/2023/06/09/world/canada/quebec-canada-wildfires-locations.html.

[7] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, Global ocean roiled by marine heatwaves, with more on the way (June 28, 2023), https://research.noaa.gov/2023/06/28/global-ocean-roiled-by-marine-heatwaves-with-more-on-the-way/.

shattered records.[8] Historically intense rainstorms caused flooding across inland-New England, including western Massachusetts, where about 1,000 acres of farmland were affected and farms across the region reported near total crop loss.[9] A Merrimack Valley storm dropping over six inches of rain within six hours caused approximately $30 million in damages in North Andover in early August,[10] and in September, Leominster experienced life-threatening flooding when about ten inches of torrential rain fell in the span of about six hours.[11] Record low sea ice extent in Antarctica is causing major concern, with implications for global ocean circulation.[12] In early August, coastal Iran saw a heat index of 158 degrees F, a condition which healthy humans cannot survive for more than a few hours.[13] More than a million people were displaced by heavy rains in China,[14] and record monsoon rains in northern India forced 30,000 people into relief camps.[15] People jumped into the sea in Maui to escape fast moving wildfires that are among the deadliest in U.S. history.[16] September 2023 was the hottest September on record, with global temperatures soaring to about 1.8 degrees C above pre-industrial levels, an increase climate scientists characterized as "unprecedented," "shocking," "extraordinary," and "absolutely gobsmackingly bananas."[17] By the time this report is released, more records will have fallen, more floods will

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[8] Oliver Milman, *Current heatwave across US south made five times more likely by climate crisis,* THE GUARDIAN (June 27, 2023), *https://www.theguardian.com/environment/2023/jun/27/heatwave-human-caused-climate-crisis-texas-louisiana-mexico*.

[9] Colin A. Young, *Heavy rains damage crops, homes and flood the Connecticut River in western Mass.,* WBUR (July 12, 2023)*, https://www.wbur.org/news/2023/07/12/heavy-rains-damage-crops-homes-and-flood-the-connecticut-river-in-western-mass*; John Bender & Irina Matchavariani, *Many farms in Western Mass. may see extended damage as flood watch continues*, WBUR (July 14, 2023), https://www.wbur.org/news/2023/07/14/western-massachusetts-farms-flood-crop

[10] Allison Kuznitz, *North Andover tallies flood damage at $30 million*, WBUR (Aug. 22, 2023), https://www.wbur.org/news/2023/08/22/north-andover-flood-damage-merrimack-valley-rain

[11] Michael Casey & Kathy McCormack, *Heavy rain brings flash flooding in parts of Massachusetts and Rhode Island*, ABC News (Sept. 12, 2023), https://abcnews.go.com/US/wireStory/heavy-rain-brings-flash-flooding-parts-massachusetts-rhode-103111095#:~:text=The%20Associated%20Press-,LEOMINSTER%2C%20Mass.,condition%20led%20to%20more%20evacuations; Paulina Villegas, *'Catastrophic' flooding causes damage and evacuations in Massachusetts*, Washington Post (Sept. 12, 2023), https://www.washingtonpost.com/weather/2023/09/12/leominster-massachusetts-flash-flooding-fitchburg/.

[12] Delger Erdenesanaa and Leanne Abraham, *Antarctic Sea Ice Is at a 'Very Concerning' Record Low,* THE NEW YORK TIMES (updated Aug. 3, 2023), https://www.nytimes.com/2023/08/02/climate/antarctic-sea-ice-record-low.html.

[13] Ian Livingston*, Hot-tub-like Persian Gulf fuels 158-degree heat index in Iran*, THE WASHINGTON POST (Aug. 9, 2023), https://www.washingtonpost.com/weather/2023/08/09/iran-persian-gulf-extreme-heat/.

[14] McCarthy et. al., *More than a million displaced and dozens dead after record rain drenches northeastern China,* CNN (Aug. 5, 2023), https://www.cnn.com/2023/08/04/china/china-northeast-hebei-beijing-flooding-recovery-intl-hnk/index.html.

[15] Ashok Sharma and Rishi Lekhi, *Record monsoon rains have killed more than 100 people in northern India over two weeks*, THE ASSOCIATED PRESS (July 13, 2023), https://apnews.com/article/india-monsoon-floods-deaths-8185e8e5b05fe9de76efc609928ec360.

[16] Sangal et. al., *Maui wildfires prompt evacuations. At least 36 people have died, officials say,* CNN, https://www.cnn.com/us/live-news/maui-wildfires-08-10-23/index.html (last visited Aug. 10, 2023).

[17] Damian Carrington, *'Gobsmackingly bananas': scientists stunned by planet's record September heat*, The Guardian (Oct. 4, 2023), https://www.theguardian.com/environment/2023/oct/05/gobsmackingly-bananas-scientists-stunned-by-planets-record-september-heat.

have claimed lives, and more of the world's precious forest ecosystems will have been lost to wildfire.

The people of the Commonwealth and communities throughout the region, the Nation, and the world are witnessing and experiencing the deadly and costly impacts of policy and market failures—failures that now threaten the stability of our economy, public health, food systems, drinking water supplies, safety and security, and the biodiverse ecosystems that sustain all human life.

Massachusetts, like other state and local governments, must play a leading role in climate policy and implementation, spurring innovation in technology, climate finance, and resilience. Congress and the Biden Administration are directing transformative levels of federal funding to state and local governments to support wide-scale, accelerated decarbonization[18] and continue to set aggressive policy to decarbonize the power and transportation sectors.[19,20] Federal agency action, however, has come under increasing scrutiny by the United States Supreme Court, further underscoring the critical importance of state and local government leadership at this time.[21] Given its longstanding leadership on climate issues—including the Commonwealth's historic victory in *Mass. v. EPA*, which confirmed the authority of the U.S. Environmental Protection Agency (EPA) under the Clean Air Act to regulate greenhouse gas emissions;[22] its role in founding the Regional Greenhouse Gas Initiative (RGGI), the first regulated power sector cap and trade program;[23,24] and its recent establishment of the Massachusetts Community Climate Bank, the first green bank in the Nation to focus on affordable housing decarbonization—the Commonwealth is poised to lead the Nation and the world in creating opportunity and resilience amid extreme climate crises.[25]

To fulfill this historic opportunity to lead on climate, Massachusetts must act with far greater urgency and our efforts must be better coordinated. Every state agency must prioritize, as a *core*

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[18] ROCKY MOUNTAIN INSTITUTE, Lachlan Carey & Jun Ukita Shepard, *Congress's Climate Triple Whammy: Innovation, Investment and Industrial Policy* (Aug. 22, 2022), https://rmi.org/climate-innovation-investment-and-industrial-policy.

[19] U.S. ENVIRONMENTAL PROTECTION AGENCY, *Biden-Harris Administration Proposes Strongest-Ever Pollution Standards for Cars and Trucks to Accelerate Transition to a Clean-Transportation Future* (Apr. 12, 2023), https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strongest-ever-pollution-standards-cars-and.

[20] Coral Davenport, *E.P.A. Proposes First Limits on Climate Pollution From Existing Power Plants,* THE NEW YORK TIMES (May, 11, 2023), https://www.nytimes.com/2023/05/11/climate/epa-power-plants-pollution.html.

[21] Adam Liptak, *Supreme Court Strips Federal Government of Crucial Tool to Control Pollution*, THE NEW YORK TIMES (updated July 1, 2022), (https://www.nytimes.com/live/2022/06/30/us/supreme-court-epa.

[22] Massachusetts v. EPA, 549 U.S. 497.

[23] MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, *Regional Greenhouse Gas Initiative (RGGI)*, https://www.mass.gov/regional-greenhouse-gas-initiative-rggi (last visited July 17, 2023).

[24] THE REGIONAL GREENHOUSE GAS INITIATIVE, *A brief history of RGGI,* https://www.rggi.org/program-overview-and-design/design-archive (last visited Aug. 10, 2023).

[25] OFFICE OF THE GOVERNOR, *Governor Healey Announces Creation of Massachusetts Community Climate Bank, Nation's First Green Bank Dedicated to Affordable Housing* (June 6, 2023), https://www.mass.gov/news/governor-healey-announces-creation-of-massachusetts-community-climate-bank-nations-first-green-bank-dedicated-to-affordable-housing.

function, efforts to drive effective action to reduce emissions, build resilience, and mitigate the impacts of climate change on our communities and the natural world.

This report reviews trends, barriers, and gaps in the arena of Massachusetts climate policy and presents thirty-nine specific recommendations, covering eight topics: (1) funding; (2) state capital investment, asset management, grantmaking, procurement, and environmental justice; (3) emissions mitigation; (4) public health and resilience; (5) workforce; (6) economic development; (7) education; and (8) process for implementation. Key areas of focus include the need to develop concrete strategies for funding decarbonization and resilience investments; the need to shift from planning to comprehensive statewide implementation of resilience measures to protect communities from intensifying impacts of climate change; and the need for tighter coordination of cross-agency efforts on workforce development and clean energy and climate economic development planning to ensure these urgent priorities produce results on an accelerated timetable. A number of the program-specific recommendations address work that is underway, much of it initiated since the start of the Administration.

The recommendations set forth here represent a true whole-of-government approach, and extensive engagement of the Secretariats. Climate Office is grateful to our colleagues for their expertise, commitment, collegiality, and the many hours they put into helping to craft these recommendations. In particular, Climate Office wishes to thank and acknowledge the Executive Office of Energy and Environmental Affairs (EEA) for its work over the past two decades to help position Massachusetts as a national climate leader.

1. Role of Climate Office

The Climate Office is a catalyst for innovation. Climate change solutions require systems thinking, and cross-disciplinary problem-solving strategies. Because climate disruption touches on all economic activity, all aspects of human endeavor, it will become increasingly important in every C-Suite, every local and state government, every academic and non-profit institution, to have a governance function devoted to climate. That function is largely focused on the intersectional; the de-siloed, holistic frameworks for understanding and action, the interrelationships among building decarbonization, transportation electrification, grid decarbonization, and adaptation. The Climate Office elevates and connects that work across the executive branch agencies. This work builds on the solid foundation developed by previous administrations, notably the 2007 reorganization of the then- Executive Office of Environmental Affairs to integrate the Departments of Energy Resources and Public Utilities, and by the Legislature, through its passage of innovative clean energy and climate laws, including the 2008 Global Warming Solutions[26] and Green Communities Acts, [27] and the 2022 Act Creating A Next-Generation Roadmap for Massachusetts Climate Policy[28] and Act Driving Clean Energy and Offshore Wind.[29]

[26] Global Warming Solution Act, Mass. Acts (2008), ch. 21N.
[27] Green Communities Act, Mass. Acts (2008), ch. 169.
[28] An Act Creating A Next-Generation Roadmap for Massachusetts Climate Policy, Mass. Acts (2021), ch. 8.
[29] An Act Driving Clean Energy and Offshore Wind, Mass. Acts (2022), ch. 179.

The creation of the Climate Office, and its work, can be thought of as intentionally disruptive. It should break down siloes, align agency action with the Commonwealth's legislatively mandated emissions reduction requirements and Administration climate policy, and create opportunities for cross-pollination among agencies and with stakeholders and partners, including municipalities, labor, advocates, and the private sector. It should drive collaboration, spur different ways of defining problems and opportunities, lift up innovation and successful models, interrogate conventional wisdom, and, at all times, ensure policy choices are informed by the best available climate science.

Working with the Director of Federal Funds and Infrastructure and the Executive Office for Administration and Finance (A&F), the Climate Office must also ensure a strategic and coordinated effort to use federal funding available under the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) to support cross-agency, whole-of-government projects and work. As a result, traditional agency roles, as well as processes, have been and will be modified and will require new ways of working together and collaborating.

2. Guiding Principles for Whole of Government Climate Action

Without exception, the Secretariats have been eager to collaborate and have demonstrated a consistent and genuine commitment to do their part to address climate change. That said, given the sheer scope of the charge and the fact that we are early in the Administration and leadership is still in the process of learning their own roles, I provide these recommended guiding principles for ensuring the success of our whole-of-government approach.

- **Adopt a systems thinking approach**. Climate action touches on many interrelated areas of policy; for example, the issue of low income building decarbonization involves finance, workforce, electric distribution grid modernization, resilience, and public health, among others. Special expertise should be deployed in the service of systems thinking that results in comprehensive, cross-disciplinary problem solving. Siloed approaches will result in missed opportunities.

- **Incorporate climate science and data into decision-making**. All relevant decision-making should take the best climate science and data into account. From ensuring congregate settings have appropriate cooling to forestry practices, from infrastructure design to emissions mitigation strategies and workforce development, economic development, and housing production, climate science and data must be considered to avoid policy choices that undermine the Commonwealth's legislatively mandated emissions reduction requirements and climate policy goals. Careful consideration of climate science ensures our decisions will incorporate material information and better protect communities and vital ecosystem resources. EEA's newly established Office of Climate Science will serve as a cross-Secretariat resource and authority on accessing and integrating climate change science into agency planning and projects. Many of our EEA agencies, such as Department of Fish and Wildlife (MassWildlife), the Department of Environmental Protection (DEP), and the Department of Energy Resources (DOER), also

have staff that are experts in various areas of climate science; the Department of Public Health (DPH) is building expertise on climate and public health. The substantial and growing body of climate science literature, the many academic and technical experts available to advise our agencies, and the Climate Office are all resources available to support agency consideration of climate science.

- **Center equity and environmental justice**. The impacts of climate change around the world and here at home fall disproportionately on environmental justice communities. In particular, the current location of energy infrastructure reflects decades of systemic discrimination and exclusion. Current locations of much of our energy, transportation, and industrial infrastructure place a greater health-burden on environmental justice populations. As the Commonwealth responds to climate change, we must be very intentional in our efforts to avoid replicating these inequalities and ensuring that the burdens and benefits of a clean energy transition are shared equitably.

- **Consider resilience and adaptation in decision-making**. The climate in Massachusetts and New England is already changing. The Northeast region is projected to receive significant migration—both from other parts of the U.S. and outside the U.S.—as people flee areas suffering from severe heat waves, drought, storms, crop loss, water scarcity and other impacts of climate change.[30] Coastal areas are already experiencing the effects of sea level rise and more severe storm impacts; climate change is already changing the way farmers, fishers, and others work, and residents across the Commonwealth are experiencing health-related impacts.[31,32] How the Commonwealth builds, the steps the government takes to ensure our transportation infrastructure continues to operate safely, how Massachusetts government plans and prepares for various and more frequent extreme weather events and helps local governments to prepare—these are considerations all agencies must "own" and all agencies should put in place processes now to ensure the investments of time and money we make today will reduce our vulnerability in the future and build social, environmental, and economic resilience to a changing climate.[33]

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[30] MASACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Climate Change Assessment* (Dec. 2022), https://www.mass.gov/info-details/massachusetts-climate-change-assessment [*hereinafter* MA Climate Change Assessment].

[31] MASSACHUETTS EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, DEPARTMENT OF PUBLIC HEALTH, BUREAU OF CLIMATE AND ENVIRONMENTAL HEALTH, *Sea Level Rise*, https://www.mass.gov/info-details/sea-level-rise (last visited Aug. 10, 2023).

[32] MASSACHUETTS EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES*, Climate and Health*, https://www.mass.gov/climate-and-health (last visited Aug. 10, 2023).

[33] MASACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Climate Change Assessment, supra* note 30. The best climate science for MA continues to stress that we will see warmer temperatures and more heat waves that impact human health, agriculture yields, and a need for infrastructure repairs. Other projected changes include: more frequent seasonal droughts affecting water supply and agriculture; more intense days of high rainfall; increasing flooding; more intense and frequent coastal storms that cause power outages, injuries, deaths and damaged infrastructure; and, gradual sea level rise, which changes ecosystems and the coastal built environment.

- **Implement comprehensive planning and project management for cross-agency priorities**. More intentional integration of cross-agency (and quasi) expertise and authority via centralized, comprehensive, and specific implementation plans, with clear goals, metrics, responsibilities, and timelines will be necessary to successfully achieve key cross-agency priorities. The use of project management tools to ensure better communication, clarity of goals and objectives, direct involvement of agency leadership, early intervention to course correct as necessary and accountability, should be standard for these cross-agency priorities. While these processes take time and require direct participation of agency leadership, they will yield long-term benefits and be more efficient in the long term. Such key cross-agency priorities include (1) the rapid expansion of our clean energy and climate workforce; (2) creating the conditions necessary to amplify Massachusetts' role as a world leader in climate tech; (3) electrifying buildings (Commonwealth and privately-owned); (4) implementing necessary resilience measures at Commonwealth-owned assets and across agency and municipal plans and projects. More detail is provided below in the sections addressing specific recommendations.

- **Align state spending with climate mandates**. All discretionary State government spending should be aligned with our 2050 Net Zero mandate and climate resilience priorities. Grant programs and capital spending should advance, not undermine, state climate goals.

- **Deploy innovative funding strategies for decarbonization, adaptation, and resilience**. To extend our limited public resources to meet the scale of the climate challenge, all agencies must think creatively about ways to leverage innovative clean energy, decarbonization, and resilience funding tools to support policy goals. For example, advocates in Maryland have demonstrated that standard energy efficiency and decarbonization retrofits typically yield co-benefits in the form of decreased asthma symptoms and have monetized those benefits.[34,35] MassHealth has begun to build on current programs that allow various entities, including Accountable Care Organizations, to use MassHealth funds to pay for certain housing supports such as air conditioners and air filtration devices, which can help to improve poor air quality caused by climate change.[36] While these are not decarbonization measures, this work powerfully illustrates the direct public health benefits of housing improvements that promote climate resilience, such as air conditioning, and provides a model for funding decarbonization that results in better health outcomes. Similarly, by financing decarbonization through our new Massachusetts

[34] UNITED STATES SENATE COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS, Ruth Norton, *Green & Healthy Homes Initiative* (May 18, 2022), https://www.banking.senate.gov/imo/media/doc/Norton%20Testimony%205-18-22.pdf.
[35] NATIONAL ASSOCIATION FOR STATE COMMUNITY SERVICES PROGRAMS, GREEN AND HEALTHY HOMES INITIATIVE, *Connecting with Healthy Homes Projects in Your State* (July 30, 2019), https://nascsp.org/wp-content/uploads/2019/08/NASCSP-GHHI-Webinar_Part-2.pdf.
[36] THE EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, MASSHEALTH, *MassHealth MATCH Program Assistance* (Aug. 10, 2023), https://www.mass.gov/info-details/masshealth-match-program-assistance; THE EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, MASSHEALTH, *MassHealth Flexible Services Program Summary* (August 25, 2023), https://www.mass.gov/doc/flexible-services-program-summary/download.

Community Climate Bank, our public dollars go farther—because they can leverage private sector co-investment and other funds.

- **Focus on multi-solving**. All agencies should prioritize climate solutions that solve other problems, e.g., improve public health, protect biodiversity, grow our economy, eliminate deferred maintenance while improving accessibility, and increase food and water security. Where possible, agencies should consider solutions that advance regional or interstate partnerships.

- **Enhance transparency**. There is enormous public concern about climate change and interest in executive branch actions to reduce emissions and make our communities more resilient to the impacts of climate change. All agencies should be transparent with respect to our climate actions and progress toward our climate goals. The Commonwealth should publish an annual Climate Report Card illustrating our progress toward meeting our Clean Energy and Climate Plan (CECP) mitigation and resilience climate mandates, and regularly communicate with the public about our work.[37]

3. Overall Assessment and Early Administration Accomplishments

The Healey-Driscoll Administration is off to a strong start. The Climate Office has established active collaboration and partnership with all Secretariats. Since February, the Climate Office has engaged in regular meetings with the SCOs and agency leadership and staff across the executive branch. The Climate Office has convened monthly climate cabinet meetings since January, with a focus on deepening leadership understanding of the climate issues relevant to our everyday work.

The Climate Office has worked in partnership with agency staff and the Office of Federal Funds and Infrastructure to identify and pursue federal funding opportunities to support Administration climate priorities. Since January, the Healey-Driscoll Administration has submitted or is in the process of submitting 29 applications for climate-related federal programs. Together, these proposals request approximately $1.85 billion in public investment, a portion of which will be focused on attracting additional private investment.[38] These climate-focused funding opportunities are administered through multiple federal and state agencies and take various forms, including tax credits for specific clean energy measures, low-cost loans, appliance rebates, formula grants, and competitive grants. Climate Office is working with agencies to ensure that new federal investments in climate are optimized to take advantage of the full range of federal incentives, especially the tax credits available under the Inflation Reduction Act. To advance this all of government approach to the climate opportunities available under the IIJA and IRA, Governor Healey issued an

[37] MASACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Clean Energy and Climate Plan for 2050, Letter from the Secretary*, p. i (Dec. 2022), https://www.mass.gov/doc/2050-clean-energy-and-climate-plan/download [hereinafter *CECP 2050*].
[38] *See* Appendix 2.

Executive Order on October 19, 2023 creating the Federal Funds and Infrastructure Office and establishing the Capital Investment and Debt Reduction Fund.[39]

Although all agencies are organized to aggressively pursue these individual opportunities, the Climate Office has taken steps to support and strategically align the federal funding process for climate. This work is multi-faceted, including ensuring cross-agency collaboration in the development and execution of funding opportunities, convening stakeholders, such as organized labor, municipalities, and environmental justice communities for input on funding priorities, connecting funding opportunities with Administration climate goals, and engaging national thought-leaders in the development of strategies that combine multiple federal and state funding opportunities to transform the capital stack for key climate interventions. [40]

Key examples of early Administration climate policy accomplishments include:[41]

- For the first time, A&F reviewed proposed agency capital investments to ensure consistency with the CECP, resulting in a Capital Investment Plan (CIP) that integrated climate change as a core consideration.

- Pursuant to a cooperative agreement with the U.S. Environmental Protection Organization (EPA) funded by a federal Climate Pollution Reduction Grant, the Climate Office has organized a workgroup composed of staff from Secretariats including EEA, MassDOT, the Executive Office of Labor and Workforce Development (EOLWD), the Executive Office of Housing and Livable Communities (EOHLC), A&F, the Executive Office of Health and Human Services (EOHHS), and the Executive Office of Economic Development (EOED) to support an overarching federal funds planning process. This workgroup will engage in a series of prescribed analyses to identify the benefits that accrue from Commonwealth climate-related investments and to connect those investments with federal funding opportunities.

- The Massachusetts Department of Transportation (MassDOT) is developing a Climate Program Management Office (PMO) to fully operationalize climate work into the structure of MassDOT and monitor MassDOT's progress on MassDOT's climate mandates,

[39] *See* MASSACHUSETTS EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, *Governor Healey Files Legislation Unlocking $800 Million to Compete for Federal Funding* (October 19, 2023), https://www.mass.gov/news/governor-healey-files-legislation-unlocking-800-million-to-compete-for-federal-funding.

[40] A "capital stack" is a term of art used in energy and real estate finance to refer to the underlying financial structure of a transaction. Each layer of the capital stack refers to a particular type of capital with its own risk and cost, with layers typically "stacked" in the order in which they absorb risk. The two main components of the capital stack are debt and equity. *See* NATIONAL RENEWABLE ENERGY LABORATORY, Mendelsohn et al., *Financing U.S. Renewable Energy Projects Through Public Capital Vehicles: Qualitative and Quantitative Benefits,* pp. 15-19 (April 2013), https://www.nrel.gov/docs/fy13osti/58315.pdf.

[41] Each of these examples is addressed in more detail in the discussion section, below.

including bus fleet electrification and electric vehicle (EV) charging infrastructure installation.[42]

- DPH created a new Bureau of Climate and Environmental Health and designated climate as a public health priority for its Public Health Datawarehouse (PHD). This designation will allow the Commonwealth to expand and prioritize the collection of data on the impacts of climate change on public health and healthcare so that the Commonwealth can develop a broad understanding of risk and protective factors, treatment outcomes, and intervention effectiveness.[43]

- On April 20, 2023, EEA Secretary Tepper announced the establishment of the Commission on Clean Energy Infrastructure Siting and Permitting (CEISP) and the Interagency Offshore Wind Council (IOWC). The CEISP will be tasked with reducing permitting timelines, providing communities' input in the siting and permitting of clean energy infrastructure, and ensuring that the benefits of the clean energy transition are shared equitably.[44] The IOWC will meet regularly and develop and maintain an Offshore Wind Strategic Plan with stakeholder and community input.[45]

- On April 21, 2023, Governor Healey and Climate Chief Hoffer announced the creation of the Youth Climate Council. Since then, interested high school students have applied and been accepted to participate in this council that will advise the Governor and Climate Office on climate policy and actions to make Massachusetts communities more resilient. The council met for the first time on September 19, 2023, and again on October 17, 2023. The leadership of young people demanding bold, innovative action on climate inspired the formation of the council, which will meet regularly with Climate Chief Hoffer.[46]

- On April 27, 2023, Executive Office of Education (EOE) Secretary Patrick Tutwiler announced the creation of a new Clean Energy Innovation Career Pathway that will allow high school students to receive applied, hands-on learning opportunities in the renewable energy sector, a growing high-demand industry across Massachusetts. The Clean Energy Innovation Career Pathway will develop students to be the next generation of clean energy

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[42] PROJECT MANAGEMENT INSTITUTE, *The PMO: your key to strategy execution and results delivery* (May 14, 2014), https://www.pmi.org/learning/library/project-management-office-strategy-execution-1449. A PMO is "a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques."

[43] MASSACHUSETTS EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, BUREAU OF CLIMATE AND ENVIRONMENTAL HEALTH, Public Health Data Warehouse https://www.mass.gov/public-health-data-warehouse-phd (last visited Sept. 13, 2023).

[44] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Healey-Driscoll Administration Launches Commission on Siting and Permitting, Interagency Wind Council to Expedite Clean Energy Development* (April 20, 2023), https://www.mass.gov/news/healey-driscoll-administration-launches-commission-on-siting-and-permitting-interagency-offshore-wind-council-to-expedite-clean-energy-development.

[45] Id.

[46] OFFICE OF THE GOVERNOR, *Governor Healey, Climate Chief Hoffer Announce Creation of Youth Climate Council* (Apr. 21, 2023), https://www.mass.gov/news/governor-healey-climate-chief-hoffer-announce-creation-of-youth-climate-council.

leaders and position Massachusetts to meet the workforce needs of the growing renewable energy sector. [47]

- On June 6, 2023, Governor Healey announced MassTalent, an online hub that connects employers with workers in high-growth industries such as clean energy. MassTalent is a one-stop shop for resources that help residents find job training and employers find the skilled talent they need.[48] Through MassTalent, jobseekers and employers can tap Massachusetts' thriving ecosystem of world-class talent. Upon launch, MassTalent promoted over $50 million in workforce training funds available through the Workforce Competitiveness Trust Fund as a resource to close the skills gaps for in-demand occupations such as electricians and heating, ventilation, and air conditioning (HVAC) technicians.

- On June 7, 2023, the Healey-Driscoll Administration launched the "Forests as Climate Solutions" Forestry Initiative.[49] The initiative will expand existing state programs, invest in forest conservation, expand a network of forest reserves, develop forest management guidelines based on the latest climate science, and ensure Massachusetts meets its emissions reduction requirements for natural and working lands.[50]

- On June 13, 2023, Governor Healey announced the creation of the Massachusetts Community Climate Bank, the Nation's first green bank dedicated to affordable housing. The Massachusetts Community Climate Bank's $50 million in seed funding will leverage federal funding and private sector opportunities. This effort exemplifies our whole-of-government approach—housed at The Massachusetts Housing Finance Agency (MassHousing), the bank will operate as a partnership among MassHousing, the Massachusetts Clean Energy Center (MassCEC), and the Massachusetts Development Finance Agency (MassDevelopment). The Climate Office, the Governor's Legal Office, A&F, and EEA each played a role, in addition to the quasi-public agencies, in conceptualizing and launching the bank.[51]

- On June 16, 2023, through EEA Secretary Tepper and EEA's Federal and Regional Energy Affairs Office, Massachusetts led a bipartisan request to the U.S. Department of Energy (DOE) from all six New England states, New York, and New Jersey to form a "Northeast States Collaborative on Interregional Transmission," a new approach to planning for

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[47] OFFICE OF THE GOVERNOR, *Healey Driscoll Administration Announces Clean Energy Innovation Career Pathway for High School Students* (Apr. 27, 2023), https://www.mass.gov/news/healey-driscoll-administration-announces-clean-energy-innovation-career-pathway-for-high-school-students.

[48] MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT, *MassTalent*, www.mass.gov/masstalent (last visited July 27th, 2023).

[49] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Forests as Climate Solutions*, https://www.mass.gov/info-details/forests-as-climate-solutions (last visited July 17, 2023).

[50] Id.

[51] OFFICE OF THE GOVERNOR, *Governor Healey Announces Creation of Massachusetts Community Climate Bank, Nation's First Green Bank Dedicated to Affordable Housing* (June 13, 2023), https://www.mass.gov/news/governor-healey-announces-creation-of-massachusetts-community-climate-bank-nations-first-green-bank-dedicated-to-affordable-housing.

electric transmission infrastructure across multiple regions. Under the proposed structure, DOE would lead the states in exploring opportunities to enhance transmission ties between our states, including assessing offshore wind infrastructure needs and solutions. Greater interconnectivity between regions increases access to low-cost clean power generation and improves system reliability.[52]

- In early July 2023, MassDOT launched its Vehicle Census Dashboard that tracks statewide vehicle ownership by type and vehicle miles traveled, among others, further enhancing transparency of the Commonwealth's progress toward reducing total vehicle miles traveled and increasing the number EVs.[53]

- On September 21, 2023, Governor Healey issued Executive Order No. 618, Biodiversity Conservation in Massachusetts.[54] Massachusetts forests, coastline, state ocean waters, rivers, and wetlands provide habitat for plants, animals, and other organisms vital to our ecological and economic wellbeing and public health. The Executive Order promotes biodiversity conservation in Massachusetts by requiring strategies to halt and reverse the loss of species and habitats, which is exacerbated by climate change.

- On September 21, 2023, Governor Healey issued Executive Order 619, Eliminating the Purchase by the Executive Department of Single-Use Plastic Bottles,[55] barring all executive department offices and agencies from purchasing single-use plastic bottles in favor of less harmful alternatives, subject to specifically enumerated exceptions. Plastic bottles contribute to climate change because at every step, their production relies on fossil fuels and most plastic bottles are made from petroleum-based polyethylene terephthalate (PET), in refineries that run on fossil fuels. Plastics manufacture and disposal are particularly harmful to environmental justice communities, and pose a deadly threat to wildlife, especially in our oceans.

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[52] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Healey-Driscoll Administration Leads Multi-State Request for Federal Support to Establish Interregional Transmission Planning Collaborative* (June 16, 2023), https://www.mass.gov/news/healey-driscoll-administration-leads-multi-state-request-for-federal-support-to-establish-interregional-transmission-planning-collaborative.

[53] MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, *MassDOT Announces New Online Vehicle Census Dashboard* (June 30, 2023), https://www.mass.gov/news/massdot-announces-new-online-vehicle-census-dashboard.

[54] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 618*: Biodiversity Conservation in Massachusetts* (Sept. 21, 2023), https://www.mass.gov/executive-orders/no-618-biodiversity-conservation-in-massachusetts.

[55] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 619*: Eliminating the Purchase by the Executive Department of Single-Use Plastic Bottles* (Sept. 21, 2023), https://www.mass.gov/executive-orders/no-619-eliminating-the-purchase-by-the-executive-department-of-single-use-plastic-bottles.

- On September 26, 2023, Governor Healey issued Executive Order No. 620, Establishing the Commission on Energy Infrastructure Siting and Permitting.[56] The order recognizes that achievement of Net Zero greenhouse gas emissions with a minimum 85 percent reduction in greenhouse gas emissions as compared to 1990 levels in 2050 will require significant new renewable and clean energy generation, distribution, and transmission infrastructure to be constructed to ensure a strong and reliable electricity grid. The order establishes a commission to advise the Governor on accelerating the responsible deployment of clean energy infrastructure and to make recommendations with particular focus given to compliance with state climate laws, affordability, equity, and balancing the need for the infrastructure with its impact on the environment and climate.

- On October 18, 2023, Governor Healey filed the largest housing bond bill in state history that will spur housing production and preservation in a manner that is consistent with the state's emission reduction mandates. Specifically, the bill seeks $150 million to decarbonize public housing units, and will prioritize new housing construction projects that conform to the state's specialized energy code and retrofits that include energy efficiency measures, electrification, and decarbonization.

4. Trends and Barriers

The Commonwealth is simultaneously experiencing an unprecedented level of interest in driving climate action, and encountering several significant barriers that have the potential to slow action at this crucial juncture. Our task is to leverage these trends to build new and highly effective partnerships and durable frameworks for action while working to overcome barriers. Key trends include:

- Transformational, once-in-a-generation federal investment in clean energy transition.[57,58]

- Increased cost and humanitarian impact of multiple, recent, and highly visible extreme climate-driven weather events and disasters directly affecting many Americans.[59,60]

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[56] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 620*: Establishing the Commission on Energy Infrastructure Siting and Permitting* (Sept. 26, 2023), https://www.mass.gov/executive-orders/no-620-establishing-the-commission-on-energy-infrastructure-siting-and-permitting.
[57] THE WHITE HOUSE, *Guidebook to the Bipartisan Infrastructure Law* (2021), https://www.whitehouse.gov/build/guidebook/.
[58] THE WHITE HOUSE, *Inflation Reduction Act Guidebook* (2002), https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/.
[59] Rebecca Hersher, *Climate change makes heat waves, storms and droughts worse, climate report confirms*, NPR (Jan. 9, 2023), https://www.npr.org/2023/01/09/1147805696/climate-change-makes-heat-waves-storms-and-droughts-worse-climate-report-confirm.
[60] Christopher Flavelle, *Climate Change Could Cut World Economy by $23 Trillion in 2050, Insurance Giant Warns*, THE NEW YORK TIMES (updated Nov. 4, 2021), https://www.nytimes.com/2021/04/22/climate/climate-change-economy.html.

- High interest in partnership among private sector, local and state governments, public health, academia, and philanthropy.

- Increasing sophistication in climate finance and focus on de-risking clean energy and resilience investment.

- High level of youth interest and engagement in climate change.[61]

- High level of entrepreneurial interest in climate tech and other climate-related and sustainable business development.

- Increasing understanding within the healthcare sector of the relationship between climate change and health co-benefits of decarbonization.

- Federal recognition of climate-related risk to insurers,[62] recent flight of insurers from climate-disaster prone regions like California and Florida,[63] and insurers' decisions to no longer insure certain climate-related risks.[64, 65]

- Increasing recognition of financial market risk posed by climate change.

Critical barriers fall into six broad categories: (1) lack of adequate funding for mass-scale building and transportation electrification and resilience, natural and working lands investment, and adaptation measures; (2) workforce shortages; (3) supply chain disruptions and related cost increases; (4) technical barriers including delays in electric distribution system modernization, renewable energy interconnection, and transmission build out; (5) vested interest opposition to the clean energy transition; and (6) entrenched status quo bias.

These barriers are interrelated: in the case of decarbonizing existing housing, even where financing may be obtained, for example, for a project that would retrofit multiple units to increase efficiency

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[61] Ballew et. al., *Young adults, across party lines, are more willing to take climate action,* YALE PROGRAM ON CLIMATE CHANGE COMMUNICATION (Apr. 28, 2020), https://climatecommunication.yale.edu/publications/young-adults-climate-activism/.

[62] FINANCIAL STABILITY BOARD, *FSB Roadmap for Addressing Financial Risks from Climate Change: 2023 Progress Report* (July 13, 2023), https://www.fsb.org/2023/07/fsb-roadmap-for-addressing-financial-risks-from-climate-change-2023-progress-report/; Ephrat Livni, *Treasury Dept. to Ask Insurers for Data on Climate Risks to Measure Coverage Affordability,* THE NEW YORK TIMES (Oct. 18, 2022), https://www.nytimes.com/2022/10/18/business/dealbook/treasury-insurance-climate-risk.html.

[63] Emily Flitter, *Insurer's Retreat in Florida, Signals Crisis With No Easy Fix,* THE NEW YORK TIMES (July 14, 2023), https://www.nytimes.com/2023/07/14/business/farmers-homeowners-insurance-florida.html.

[64] Flavelle et. al., *Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse,* THE NEW YORK TIMES (July 14, 2023), https://www.nytimes.com/2023/05/31/climate/climate-change-insurance-wildfires-california.html.

[65] Jacob Bogage, *Home Insurers Cut Natural Disasters from Policies as Climate Risks Grow*, THE WASHINGTON POST (Sept. 3, 2023), https://www.washingtonpost.com/business/2023/09/03/natural-disaster-climate-insurance/.

and replace fossil fuel-based heating systems with electrification,[66] depending on the location, the grid may not be sufficient to support the increased power demand, delaying the transition. Electrification of the building and housing sectors together with the transportation sector is expected to at least double power demand,[67] and to achieve required emissions reductions, that power supply must become cleaner and cleaner—with decreasing amounts of fossil fuels in the mix—over time. The Commonwealth must do better—we must rapidly build, deploy, interconnect, and generate much more clean power. Our distribution system must be able to supply that power to homes and businesses. Similarly, the Commonwealth cannot build our clean energy future without concurrently investing in the rapid recruitment, training, and development of a Commonwealth clean energy workforce.

While the funding available through the IIJA and IRA will truly be transformative, it will fall well short of what is needed to decarbonize and make our communities resilient. The total cost to decarbonize the U.S. economy by 2050 is estimated in the range of $25-$30 trillion.[68] If this investment were to be spread evenly between now and 2050 (for purposes of generating an estimate and recognizing that investment likely will not occur in this manner), required investment is about $1T annually.[69] The Rocky Mountain Institute (RMI) estimates that the IIJA, CHIPS and IRA will, together, contribute almost $80 billion annually, or eight percent of the required decarbonization spending.[70] However, if spending is higher than the RMI estimates and/or projections incorporate private spending mobilized by those bills, decarbonization investments could total from $170-$300 billion annually, or 17-30 percent of the required spending.[71,72] Taking into account these variables, we can be reasonably confident that the IIJA, CHIPS, and IRA will contribute somewhere in the range of 8-30 percent of required decarbonization spending, which means that around 70-90 percent will need to be financed by other means.

Depending on the scale of competitive federal grants received by Massachusetts, the level of private investment mobilized, the number of Massachusetts companies and citizens availing themselves of federal clean energy tax credits available through the IRA, and the cost of decarbonization, federal funds may be expected to cover a similar range of total decarbonization costs in Massachusetts.

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[66] It should be noted that during the development of the Stretch Code and Specialized Stretch Code in 2022, DOER analysis found that electrification paired with weatherization and building envelope upgrades significantly reduces or zeroes out the incremental electric load for upgraded heating and cooling.

[67] Nadja Popovich & Brad Plumer, *How Electrifying Everything Became a Key Climate Solution,* THE NEW YORK TIMES (Apr. 4, 2023), https://www.nytimes.com/interactive/2023/04/14/climate/electric-car-heater-everything.html.

[68] MCKINSEY, Clune et al. *Navigating America's net-zero frontier: A guide for business leaders* (May 5, 2022), https://www.mckinsey.com/capabilities/sustainability/our-insights/navigating-americas-net-zero-frontier-a-guide-for-business-leaders.

[69] Id.

[70] Carey & Shepard, *supra* note 18.

[71] CREDIT SUISSE, *U.S. Inflation Reduction Act: A catalyst for climate action* (Nov. 30, 2022), https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/us-inflation-reduction-act-a-catalyst-for-climate-action-202211.html.

[72] GOLDMAN SACHS, *The US is poised for an energy revolution* (Apr. 17, 2023), https://www.goldmansachs.com/intelligence/pages/the-us-is-poised-for-an-energy-revolution.html.

This scale of funding, while historic in absolute terms, therefore, represents a modest catalyst to investment in the total cost of economy-wide decarbonization. For Massachusetts to realize the transformational nature of the IIJA and IRA, we must use federal funds strategically. The IIJA and IRA include diverse funding streams such as unlimited tax credits for specific climate measures, rebates for specific appliances, low-cost capital, unspecified grants and targeted grants.[73] These funding streams may be integrated or "braided" and targeted to specific climate interventions—heat pump installations, electric vehicle infrastructure, solar panel installations—in a way that amplifies the impact of each type of funding within the total capital stack for the specific measure. This capital stack-based approach requires sound financial analysis of climate project finance and a whole-of-government approach to utilizing federal funding regardless of which agency has applied for the funding. The Climate Office, in collaboration with the Office of Federal Funds, will develop analyses of the capital stacks for various climate interventions and the federal funding streams that may be optimally braided to achieve a transformative outcome.

It is critically important for leaders to understand that, while investments in decarbonization and resilience will be significant, those costs are much less than the cost of failing to make such investments—both in terms of the exponentially increasing costs of climate disaster response, loss of high-value ecosystem functions (e.g., clean air, clean water), food system impacts, economic destabilization, and humanitarian impacts. Business as usual options (e.g., building a new gas pipeline, building new housing that is dependent on fossil infrastructure, or expanding an airport) appear less expensive because the social cost of greenhouse gases (carbon dioxide, methane, nitrous oxide)—that is, the full cost of damages associated with additional greenhouse gas emissions—is not factored in. When government policymakers consider the social cost of greenhouse gases such as extreme weather and disaster response costs, infrastructure damage, and human morbidity and mortality, it becomes easier to see the true social cost of greenhouse gas emissions.[74] Bearing these social costs in mind, to ensure there are adequate resources to fund decarbonization, the Commonwealth should consider policy options, including potentially additional market-based mechanisms, that both reduce emissions and also produce a revenue stream that can be used to fund further decarbonization and resilience. A familiar example is the use of RGGI auction proceeds to fund investment in energy efficiency.

The U.S. is largely dependent on imports to grow its clean energy sector. Production of critical minerals is concentrated geographically, primarily in locations distant to the U.S.; bulk materials supply (i.e., steel) is dominated by China.[75] The U.S. imports, for example, about two-thirds of

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[73] U.S. DEPARTMENT OF ENERGY, *Inflation Reduction Act Summary* (Oct. 2022), https://www.energy.gov/sites/default/files/2022-10/IRA-Energy-Summary_web.pdf. The IRA creates over two dozen categories of clean energy tax credits, including investment-based and production-based credits. Those credits apply for large categories of activities, for example renewable electricity production, or technology types, such as, geothermal energy. Estimates for the final cost of these credits are based on projections for uptake, capital investment and production and vary widely. Tax credits persist for ten years to 2034.

[74] INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990* (Feb. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

[75] INTERNATIONAL ENERGY AGENCY, *Clean energy supply chains vulnerabilities*, https://www.iea.org/reports/energy-technology-perspectives-2023/clean-energy-supply-chains-vulnerabilities (last updated 2021).

solar photovoltaic (PV) modules from Southeast Asia.[76] According to the International Energy Agency, supply chain disruptions from the Covid-19 pandemic and the Russian invasion of Ukraine, combined with increasing global demand, have resulted in increased cost of both the materials necessary to the clean energy transition and energy required to process, produce, and transport materials.[77] For example, the cost of solar PV-grade polysilicon, copper, and steel roughly doubled between 2020 and 2022, pushing prices of PV modules up 25 percent and wind turbines (outside of China) 20 percent.[78] These cost increases have changed renewable project economics here in the Commonwealth.

Supply chain disruptions also delay availability and increase the cost of components necessary to grid modernization, such as distribution transformers. The electric industry is reporting over two-year lead times to fill utility equipment orders.[79] These delays cost critically important time in the race to decarbonize and prevent more dangerous levels of warming. DOE has been focused on alleviating supply chain constraints for critical grid components, and in June 2022, President Biden authorized the Department to use its authority under the Defense Production Act to accelerate domestic production of critical electric grid and clean energy components, including distribution transformers.[80] Non-wired alternatives that can replace the need for large, expensive, and backlogged components are also essential, and should be prioritized in utility planning. DOER's Grid Modernization Advisory Council, which began convening this year, will be addressing such needs in its recommendations on forthcoming electric sector modernization plans. DOER and DPU should accelerate efforts to align utility incentives to prioritize non-wired alternatives.

Those with vested interests in fossil fuel-based systems continue to use political and economic power to stall action in the Commonwealth and around the world. As well, status quo bias—the preference for maintaining one's current situation and to resist change—is probably familiar to us all. For state government, in particular, it will be vital for us all *to recognize that conditions have changed*, the climate system has become unstable, and that fact is and will continue to trigger a cascade of increasingly costly consequences. Many of our state facilities operators are already dealing with the physical impacts of climate change daily and understand well the need for efficiency improvements and modifications to building design, construction, and operations. Now is the time to operationalize that learning and expertise; the ways the Commonwealth has done many things in the past will no longer yield the results the Commonwealth needs and wants and we, as state government leaders, must innovate and get very good at recognizing and adapting to changing circumstances.

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[76] Id.
[77] Id.
[78] Id.
[79] U.S. DEPARTMENT OF ENERGY, OFFICE OF POLICY, *DOE Actions to Unlock Transformers and Grid Component Production* (Oct. 20, 2022), https://www.energy.gov/policy/articles/doe-actions-unlock-transformer-and-grid-component-production.
[80] U.S. DEPARTMENT OF ENERGY, *President Biden Invokes Defense Production Act to Accelerate Domestic Manufacturing of Clean Energy* (June 6, 2023), https://www.energy.gov/articles/president-biden-invokes-defense-production-act-accelerate-domestic-manufacturing-clean.

5. Significant Gaps

Significant gaps exist in Massachusetts climate policy. While steps are now being taken to address several of these gaps (see discussion below), these areas will continue to require focused attention.

- Lack of comprehensive economic analysis of total cost of achieving Net Zero by 2050 and necessary resilience investments over the next two decades. Such an analysis, led by A&F, Climate Office, EEA, and MassDOT/MBTA should be completed by the end of 2024, paired with recommended funding strategies.

- Need for additional market-based and other mechanisms to internalize the cost of carbon pollution and generate additional revenue streams for decarbonization and resilience. These might include generating marketable attributes, for example, in the form of credits associated with the installation of air and ground source heat pumps that could be sold to entities and used by them to achieve emissions reduction mandates.[81]

- Need for a clear and reliable market signal for consumers, retailers, and manufacturers for the phase-down of sales of fossil fuel heating equipment to help ensure that building electrification occurs on pace with the Commonwealth's heating equipment stock turnover targets.

- Need for comprehensive identification and prioritization of statewide resilience needs and an action plan for implementation that addresses, among others, sea level rise and vulnerability of coastal communities, extreme weather preparedness, extended drought and water scarcity contingencies, inland flooding risk, anticipated human migration to the Northeast, heatwaves, food security, increased adverse human health effects, including mental health effects, and risks to Commonwealth assets, including critical healthcare infrastructure such as hospitals. This effort should build on the existing state Climate Assessment and the ResilientMass State Hazard Mitigation and Climate Adaptation Plan. Greater state support for municipalities to address these resilience needs, while prioritizing environmental justice and equity concerns, will be vital.

- Need for a comprehensive statewide plan for decarbonization of Commonwealth-owned buildings and vehicle fleets with detailed actions and timelines for implementation, and clearly identified responsibilities for each agency involved.

- Need for a comprehensive plan for decarbonization of existing public schools in the Commonwealth and coordinated policies to ensure new public school construction is decarbonized.

[81] More initiatives are needed such as DCAMM's monetization of Renewable Energy Certificates (RECs) from solar generation and Alternative Energy Credits (AECs) from combined heat and power (CHP), ground source heat pumps, and other renewable thermal technologies, and reinvestment of funds in energy efficiency or return of funding to participating agencies for same.

- Need for a comprehensive long-term strategy to close the gap between projected emissions reductions attributable to CECP policies and the amount of carbon sequestration we can expect from our natural and working lands.

- Need for broad, multi-media statewide campaign to educate residents about anticipated effects of climate change, the energy transition underway, and how everyone can play a part to help keep our communities safer and healthier.

DISCUSSION AND RECOMMENDATIONS

1. Governing Legal and Policy Frameworks

With the passage of the Global Warming Solutions Act (GWSA) in 2008, Massachusetts became one of the first states to create a comprehensive regulatory program to reduce greenhouse gas emissions. The GWSA requires EEA to issue, every five years, a Clean Energy and Climate Plan[82] and to set interim limits on greenhouse gas emissions for 2030 and 2040.[83]

In 2016, the Massachusetts Supreme Judicial Court issued its decision in *Kain v. DEP* holding that the GWSA requires the Department of Environmental Protection (DEP), through the promulgation of regulations, to set actual limits for sources or categories of sources that emit greenhouse gases.[84] The Court further held that DEP is required to promulgate regulations that address multiple sources or categories of sources of greenhouse gas emissions, impose a limit on such emissions that may be released, limit the aggregate greenhouse gas emissions that are released from each group of regulated sources or categories of sources, set greenhouse gas emissions limits for each year, and set limits that decline on an annual basis.[85] In 2018, the Supreme Judicial Court issued its decision in *New England Power Generators Association*, upholding the Department's authority to establish annually declining aggregate carbon dioxide emissions limits on electricity generating facilities located in the Commonwealth.[86]

In 2019, EEA began development of the 2050 Decarbonization Roadmap which, in turn, resulted in the Interim Clean Energy and Climate Plan for 2030. In 2021, An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy (2021 Climate Law) amended the GWSA and established the requirement for Massachusetts to adopt a statewide limit for 2050 that achieves at least Net Zero emissions by 2050, codified environmental justice criteria into law, and required sector-based statewide greenhouse gas emissions sublimits.[87] To meet the 2050 requirement, the 2021 Climate Law required additional interim statewide greenhouse gas emissions limits such that interim limits are now required for 2025, 2030, 2035, 2040, and 2045; each interim limit is required to be accompanied by a comprehensive, clear, and specific roadmap plan to realize the limit.[88]

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[82] An Act Establishing the Global Warming Solutions Act, Chapter 298 of the Acts of 2008, Section 6, amending Chapter 21N, Climate Protection and Green Economy Act, Section 5. (https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298)

[83] An Act Establishing the Global Warming Solutions Act, Chapter 298 of the Acts of 2008, Section 6, amending Chapter 21N, Climate Protection and Green Economy Act, Section 3(b). (https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298)

[84] *Kain v. Department of Environmental Protection*, 474 Mass. 278 (2016).

[85] Id. at 291-92.

[86] *New England Power Generators Association, Inc. v. Department of Environmental Protection*, 480 Mass. 398 (2018).

[87] An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, Chapter 8 of the Acts of 2021, Section 8.

[88] Id.

On June 30, 2022, EEA determined the appropriate statewide emissions limits for 2025 and 2030 and released an accompanying CECP to achieve those limits.[89] The interim limit and sector-specific sublimits for 2035 are required to be published not later than January 1, 2028.[90] On December 21, 2022, Massachusetts adopted a statewide greenhouse gas emissions limit, Net Zero, and sector-specific sublimits for 2050.[91] "Net Zero" means a level of statewide greenhouse gas emissions that is equal in quantity to the amount of carbon dioxide or its equivalent that is removed from the atmosphere and stored annually by, or attributable to, the Commonwealth, and a reduction of greenhouse gas emissions by at least 85 percent relative to the 1990 baseline.[92, 93] On that same date, EEA released the CECP 2050 for Massachusetts which sets forth the method for Massachusetts to achieve Net Zero in 2050 in an equitable and just manner. Specifically, the CECP 2050 "incorporates strategies to reduce negative environmental impacts and increase investments in environmental justice communities."[94] The following are benchmarks included in the CECP:

- New heat pump systems should be installed in at least 100,000 residential homes between 2020 and 2025 to meet the 2025 building sector target (CECP 2025/2030).[95,96]
- EV registration in the Commonwealth should reach at least 900,000 by 2030 (CECP 2025/2030).[97]
- Permanent conservation of natural and working lands in Massachusetts must increase to at least 40 percent by 2050, with the more immediate goals of at least 28 percent conserved by 2025 and at least 30 percent by 2030 (CECP 2025/2030 and CECP 2050).[98]

On January 6, 2023, Governor Healey signed her first Executive Order, EO 604, which created the Office of Climate Innovation and Resilience and established the position of Climate Chief, the first cabinet-level climate officer in the Nation.[99] The Climate Office is mandated to marshal all resources and authority available to the Governor and the executive department in support of

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[89] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Clean Energy and Climate Plan for 2025 and 2030, Letter from the Secretary*, p. iv https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download (June 2022) [hereinafter *CECP 2025/2030*]

[90] Id.

[91] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2050, supra* note 37, at p. i.

[92] "Net Zero" is used throughout this report as a specific term to refer to the established statewide GHG emissions mandate for 2050. This report uses "net zero" in its more general sense to refer to a level of GHG emissions that is equal in quantity to the amount of GHG that is removed from the atmosphere.

[93] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2050, supra* note 37, at p. i.

[94] Id.

[95] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2025/3030, supra* note 89, at p. 31-2.

[96] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2050, supra* note 37, at p. i.

[97] Id at p. 158

[98] Id at p. 161

[99] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTTS, *EO 604, supra* note 1.

advancing the Commonwealth's climate innovation, mitigation, adaptation, and resilience policies including those set forth in the CECP.

2. Recommendations

The Climate Office makes the following specific recommendations, many of which build on, and are consistent with, the strategies and recommendations in the Commonwealth's existing climate-related plans.

6. Funding

As noted above, over the next three decades, the investment required to achieve economy-wide decarbonization in the Commonwealth will be substantial. Resilience investments will also be significant. Yet, the cost of failing to make these investments will be even greater.

New federal funding for climate action (IRA, CHIPS and IIJA) can be anticipated to mobilize between 8-30 percent of total decarbonization investment.[100] The Commonwealth should conduct economic analyses of the total investment required to meet our 2050 Net Zero mandate and resilience needs, and develop specific funding strategies for both.

(1) Prepare an economic analysis of the investment needed to achieve the greenhouse gas emissions reductions required by the CECP, including the 2050 Net Zero mandate, and recommendations for necessary funding mechanisms.

The Commonwealth currently lacks a comprehensive plan for financing the investment needed to achieve the greenhouse gas emissions reductions required by the CECP, including its 2050 Net Zero mandate. By December 2024, A&F and Climate Office, with input from MassDOT/MBTA, EEA, EOHLC, MassHousing, and MassCEC, should conduct an economic analysis of the investment needed to achieve our CECP mandates, including Net Zero by 2050, and develop a funding strategy. The Climate Office, in consultation with EEA, is presently developing a Priority

[100] Clune et al., *supra* note 68, Carey & Shepard, *supra* note 18, CREDIT SUISSE, *U.S. Inflation Reduction Act: A catalyst for climate action, supra* note 71, GOLDMAN SACHS, *The US is poised for an energy revolution, supra* note 72.

Climate Action Plan as a deliverable under EPA's Climate Pollution Reduction Grant (CPRG) that could directly support this effort.[101]

The analysis developed by A&F and Climate Office should estimate costs of priority measures to ensure they can be resourced with appropriate lead time. As subsequent CECPs are developed, such cost analyses should become common practice. Policy development should be conducted independently and precede cost analyses, based on the Commonwealth's decarbonization needs.

As part of the development of a funding strategy, EEA and other agencies as applicable should analyze feasible policies that both reduce emissions and generate additional revenue streams to invest in further decarbonization. Options may include market-based mechanisms to internalize the cost of carbon. These policy options should be evaluated on a continuing basis by agency leadership in collaboration with the Climate Office and A&F and all feasible options should be pursued.

(2) The Commonwealth should estimate the total investment needed for statewide resilience measures, consistent with the Massachusetts Climate Change Assessment and Statewide Hazard Mitigation and Climate Adaptation Plan (SHMCAP), and identify funding sources.

The Massachusetts Climate Change Assessment, SHMCAP, and other analyses identify a number of vital resilience needs and recommend actions. [102,103] To ensure these measures are funded and implemented on an expedited and cost-effective basis, however, greater coordination and accountability is vital. The Commonwealth should prioritize resilience needs, develop metrics for measuring progress toward meeting those needs, estimate the total cost of resilience measures, and identify funding to support agencies, municipalities, regions, Tribes, and NGOs in planning and implementing actions to prepare for: extreme heat events; storms, flooding, and other climate-driven weather extremes; sea level rise; wildfires; migration to the Northeast from other regions in the U.S. and other countries; food and water security; and, public health, including mental health, impacts.[104]

A&F should, in conjunction with other agencies and Climate Office, provide recommendations for resilience funding strategies. These recommendations should evaluate existing and new mechanisms for funding adaptation and resilience in the Commonwealth, including, but not limited

[101] Beyond the plan to resource priority measures within the CECP, and building on the work of the CECP and CPRG, the Climate Office will separately lead an effort to assess the costs of achieving net zero by 2050, paired with potential funding strategies.

[102] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *MA Climate Change Assessment, supra* note 30.

[103] MASSACHUSETTS EMERGENCY MANAGEMENT AGENCY, MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts State Hazard Mitigation and Climate Adaptation Plan – 2018* (Sept. 2018), https://www.mass.gov/files/documents/2018/09/17/SHMCAP-September2018-Chapter1.pdf.

[104] As a component of the Municipal Vulnerability Preparedness (MVP) process, municipalities assess costs for projects where it is relevant to do so.

to, federal funding, public-private partnerships, the Massachusetts Community Climate Bank, and market-based policies. Preliminary recommendations should be provided by December 2024.

(3) The Division of Insurance should continue to engage with other states and regulatory standard-setting bodies and accelerate its efforts to coordinate an appropriate climate-related risk and resiliency framework for the regulation and oversight of the Massachusetts insurance market.

The insurance industry plays a critical role in the Commonwealth's preparation for and response to climate change. For most property owners and renters, insurance is the primary tool to respond to the immediate impacts of climate-related disasters. Property and casualty insurance is required for most mortgaged real estate, making the cost and availability of insurance an important factor for commercial, industrial, and residential property owners. Moreover, the availability and cost of insurance can be a tool to communicate the risks of certain types of building construction, economic activities, and topographic locations in the face of climate change. Insurance companies themselves are critically important to the Massachusetts economy and are subject to the regulation of the Commonwealth's Division of Insurance (DOI).

The increased impacts of climate change have had significant impacts on the insurance sector in the United States. In addition to the risks that insurance will be less available, or premiums more costly, because insurance companies invest premiums and are themselves major institutional investors, the potential for multiple insurance company failures poses systemic risk to financial markets. The health of our insurance sector is therefore a key Commonwealth priority. In accordance with the insurance-specific recommendations of the Financial Stability Board's Task Force on Climate-Related Financial Disclosures (TCFD), insurance companies face three major types of risks: (1) physical risks from changing frequencies and intensities of weather-related perils; (2) transition risks resulting from a reduction in insurable interest due to a decline in value, changing energy costs, or implementation of carbon regulation; and (3) liability risks that could intensify due to a possible increase in litigation.[105]

The Massachusetts DOI should review existing insurance market guidance across the states to determine whether additional guidance would be appropriate for the Massachusetts insurance market.

As climate risks impact the availability and affordability of insurance products in the U.S. and globally, the DOI and other insurance regulators are committed to promoting competitive and healthy insurance markets for the protection of consumers. Insurance regulators are on the front

[105] FINANCIAL STABILITY BOARD'S TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES, *Recommendations of the Task Force on Climate-Related Financial Disclosures* (June 2017), https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf. The Task Force on Climate-Related Financial Disclosure's recommendations were approved by the G-20 Finance Ministers and created by an industry-led task force. These recommendations are the leading international standard for climate reporting for the insurance sector.

lines of climate-related natural catastrophe preparedness and response, protecting policyholders and maintaining well-functioning insurance markets. The role of insurance regulators and supervisors is to monitor the solvency of insurance companies and to ensure fair competition and broad access to insurance by consumers. As the regulator of the Massachusetts insurance sector, the DOI has been actively engaged in monitoring and addressing how climate-related risks affect policyholders and the insurance industry in the Commonwealth. For several years, the DOI has been evaluating climate risk and resiliency opportunities through the National Association of Insurance Commissioners (NAIC) Climate and Resiliency Task Force,[106] which serves as the U.S. coordinating body for discussion and engagement on climate-related risk and resiliency issues in the insurance sector, including dialogue among state insurance regulators, industry, and other stakeholders. The DOI is also engaged in assessing and responding to climate risk through the International Association of Insurance Supervisors (IAIS)[107] and the Sustainable Insurance Forum (SIF).[108] The IAIS is examining climate risk through financial stability risk assessment, the development of supervisory and supporting material, and capacity building. The SIF is an international group of regulators committed to finding sustainability solutions through collaborative action on climate issues, including research on emerging risks, knowledge-sharing on supervisory practices, high-level policy engagement, and joint supervisory statements. Recognizing that the insurance sector is positioned to be a key agent in identifying, mitigating, and managing climate risk and in contributing to a sustainable transition to net zero, insurance standard-setting organizations like the NAIC and the IAIS have made climate risk a strategic priority.

As an example of the DOI's coordinated work to address climate risk in the insurance sector, in June 2023, the DOI issued the Climate Risk Disclosure Survey (Survey) in partnership with twenty-six other state insurance departments to require insurance companies with a certain dollar amount of premium to respond to the Survey regarding their preparedness to address climate risks. Specifically, the Survey, which will be issued annually going forward, will allow the DOI to better understand how insurance companies are considering and addressing climate change and climate risk in their business operations, underwriting, and reserves. The Survey is focused on insurance companies' responses to climate change, covering topics such as investment, mitigation, financial solvency (risk management), emissions/carbon footprint, and engaging consumers. The Survey aligns with the recommendations of the TCFD. All insurance companies operating in Massachusetts that write at least $100 million in premiums are required to respond to the annual Survey and all Survey responses are publicly available.

DOI should use Survey results to shape policies that help to reduce insurer climate risk, such as working with insurers to develop incentives that discourage development in high-risk areas and

[106] NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS, CLIMATE AND RESILIENCY TASK FORCE, Climate and Resiliency (EX) Task Force (naic.org) (last visited Sept. 13, 2023).
[107] INTERNATIONAL ASSOCIATION OF INSURANCE SUPERVISORS, International Association of Insurance Supervisors (iaisweb.org) (last visited Sept. 13, 2023).
[108] SUSTAINABLE INSURANCE FORUM, Sustainable Insurance Forum (SIF) (last visited Sept. 13, 2023).

promote the use of building designs and materials that can withstand anticipated climate impacts in a given region.[109]

In establishing standards and best practices that relate directly to the DOI's regulatory authority, market-specific characteristics need to be considered. To that end, the DOI should continue to advocate for appropriate regulatory approaches to climate risk and resiliency for the Massachusetts insurance market, including reporting and disclosures, considering innovative insurance solutions to ensure a robust marketplace, and identifying sustainability, resilience and mitigation issues and solutions in the insurance industry. This work will be coordinated with other insurance regulators and supervisors, including through the NAIC and the IAIS.

I. State Capital Investment, Asset Management, Grantmaking, Procurement, and Environmental Justice

State government is itself a significant participant in the Massachusetts economy, with the potential to affect markets such as, for example, for clean energy and lower embodied carbon materials. State spending decisions reflect values and policy priorities. These recommendations address how state government can lead the clean energy transition by ensuring that state spending is aligned with CECP mandated emissions reductions.

(4) Formalize protocol for accounting for climate in the Capital Investment Planning (CIP) process.

Agencies have already refocused their CIP process in response to A&F's and the Climate Office's emphasis on climate during the 2023 CIP process. For example, EEA is more concertedly identifying whether individual line items advance climate mitigation and/or adaptation goals. This effort allows EEA not only to articulate how much budget goes toward these initiatives, but also to identify ways that non-climate-related EEA programs may better overlay this priority. A&F has worked closely with the Governor's Office and Secretariat agencies to appropriately prioritize climate and environmental justice considerations in the capital and operating budget development process. The Commonwealth should now formalize a CIP protocol for evaluating proposed capital projects in terms of CECP and climate resilience mandates and goals.

Climate Office and A&F will lead a working group of technical experts to develop a standard, user-friendly "mitigation tool" or set of metrics to evaluate all proposed capital projects in terms of climate mandates. The mitigation tool developed by the working group will be used in assessing and prioritizing proposed capital projects. The working group will consist of EEA, including DOER's Leading By Example LBE program, EOED, EOHLC, and other relevant agencies as

[109] DELOITTE, *How insurance companies can prepare for risk from climate change* (2023), https://www2.deloitte.com/us/en/pages/financial-services/articles/insurance-companies-climate-change-risk.html.

appropriate, and will report on its preliminary design of the tool by January 15, 2024, setting forth a plan to integrate the tool in the FY2025 CIP process. The mitigation tool will allow A&F to evaluate proposed CIPs in terms of reduced greenhouse gas emissions. The standard will be built to correlate with the modeled projections of the necessary rates of emissions reductions in relevant sectors (e.g., buildings, transportation) through 2050.

Among Massachusetts' priorities is to ensure our climate investments are being crafted, developed, and implemented in an equitable way. A companion EJ tool, under development, will take into account a set of criteria that may include community benefit plans (distinguishing between direct and indirect benefits), analysis of cumulative impacts, and disproportionality. EEA's EJ Office is convening an Interagency EJ Working Group, a cross-secretariat body, which will help define the parameters of metrics that may be considered by the EJ tool.

The mitigation and EJ tools will be developed and deployed together with the existing Resilient Massachusetts Action Team's Climate Resilient Design Standards Tool.[110] Capital planning proposals can be evaluated in an objective manner by A&F for consistency with CECP and resilience mandates and goals and EJ priorities, so that all Secretariats and agencies can advance equitable climate action in a standardized fashion.

(5) Center Environmental Justice.

The Commonwealth should continue to center EJ in climate policy and program implementation. Massachusetts' successful transition to a clean energy economy requires the input and participation of all Commonwealth communities. To that end, it is important for Massachusetts to continue to facilitate the adoption of necessary clean energy and efficient technologies by low- and moderate-income residents and to continue to commit to stakeholder engagement practices that overcome language and socio-economic barriers. To achieve widespread market deployment of technologies such as EVs and heat pumps, the Commonwealth should conduct outreach to people in rural areas, Gateway Cities, immigrant communities, working class neighborhoods, indigenous populations, and communities of color. When making significant siting decisions, the Commonwealth should consider the ways in which EJ populations have historically been impacted. The Commonwealth should encourage the ownership of renewable resources by EJ populations and increase access to these renewable energy resources in ways that align with the Commonwealth's responsible land use goals.

[110] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, RESILIENT MASSACHUSETTS ACTION TEAM, Climate Resilience Design Standards, https://resilientma.mass.gov/rmat_home/designstandards/ (last visited Aug. 9, 2023). The RMAT Resilience Tool is designed to help integrate climate projections and climate resilience design standards into state and local projects.

The Administration's climate and EJ goals are intimately related; the Commonwealth should accelerate its efforts to formalize procedures for considering EJ and cumulative impacts, including the following:

- The Massachusetts Environmental Policy Act (MEPA) Office should identify ways to improve and strengthen environmental justice reviews during the MEPA process, including potential regulatory and policy changes, by the end of 2023.

- DEP should complete updating its Air Pollution Control regulations to require a Cumulative Impact Analysis (CIA) for air permits by the end of 2023, while looking at other areas in which Cumulative Impact Analysis could be implemented.

- The EJ Office, in collaboration with the Interagency EJ Working Group, a cross-secretariat body, is developing a framework for tracking funding to EJ communities to ensure they are receiving at least 40 percent of the overall benefits of certain federal and state investment in accordance with the federal Justice40 initiative.[111] This framework will also incorporate public health outcomes as an EJ metric, including health-related climate impacts.

- The EJ Office, together with the Climate Office, should work together with agencies to develop and implement Community Benefit Plans to reduce and mitigate impacts and burdens on EJ populations.

- DCR is preparing to use its Asset Management Modernization Program to inventory, increase, and improve shade shelters and cooling structures prioritizing EJ communities that experience disproportionate exposure to extreme heat.

DPH's Environmental Public Health Tracking (EPHT) portal includes an EJ Tool, which incorporates data on EJ populations and specific health criteria into interactive data mapping to help understand the populations and neighborhoods most impacted by environmental burdens, and most likely to suffer from negative health conditions exacerbated by climate change. Secretariats should use this tool to inform relevant decision-making.

All Secretariats should build upon the work of the Interagency EJ Working Group to center EJ in policy development and decision making.

[111] THE WHITE HOUSE, *Justice40*, https://www.whitehouse.gov/environmentaljustice/justice40/ (last visited Aug 7, 2023). The Justice40 initiative, as outlined in federal Executive Order 14008, made it a goal that 40 percent of the overall benefits of certain federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution.

(6) Complete development of Strategic Plan by A&F's Division of Capital Asset Management and Maintenance (DCAMM) for state building decarbonization by March 1, 2024, and begin implementation in 2024.

Executive Order No. 594, Leading By Example: Decarbonizing and Minimizing Environmental Impacts of State Government (EO 594), established emissions reduction and clean energy goals for state agencies.[112] EO 594 recognized that the broad adoption by state government of clean energy and innovative technologies and strategies will reduce energy consumption, decrease greenhouse gas emissions, lower energy costs for the Commonwealth and taxpayers, and provide resilient infrastructure, while supporting the clean energy and innovation sectors in Massachusetts. EO 594 specifically establishes goals for the reduction of greenhouse gas emissions associated with burning onsite fossil fuel at state-owned buildings for 2025, 2030, 2040, and 2050. Reducing fossil fuel combustion at these facilities will also yield reductions in traditional pollutants that exacerbate adverse pulmonary and cardiac conditions.

The Division of Capital Asset Management and Maintenance (DCAMM) is in the process of developing "roadmaps" for each campus-style location and for each stand-alone facility over 100,000 square feet. As of August 2023, seven roadmaps are complete, two are in a draft-final form, and eight more are in the process of being drafted.[113] These roadmaps set forth the steps for decarbonizing the subject campus or facility, including associated cost, through 2050.[114]

By March 1, 2024, DCAMM should complete development of a strategic plan for state building decarbonization. The strategic plan will survey the DCAMM portfolio, identifying the timeline and estimated costs for completing the roadmaps currently under development, and identifying the need and cost to complete future roadmaps. The strategic plan should also describe the methodologies and approaches that should be employed in the development of roadmaps. The roadmaps will estimate the cost and timeline for facility decarbonization and consider resilience improvements. The aggregate costs reflected in the roadmaps and strategic plan will inform the CIP with a specific pipeline of decarbonization and resilience implementation projects.

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[112] Governor Charlie Baker, COMMONWEALTH OF MASSACHUSETTS, *Executive Order No. 594: Leading by Example: Decarbonizing and Minimizing Environmental Impacts of State Government* (Apr 22, 2021), https://www.mass.gov/info-details/leading-by-example-executive-order-594-decarbonizing-and-minimizing-environmental-impacts-of-state-government [*hereinafter* EO 594].

[113] In some instances, other entities, such as the University of Massachusetts, have developed their own decarbonization roadmaps with financial and technical support from LBE and DCAMM.

[114] Roadmap development is prioritized based on established criteria including the age and condition of infrastructure and building systems, onsite fossil fuel emissions, electric utility capacity, concurrent investment, resilience needs, and anticipated roadblocks. Each roadmap lays out decarbonization implementation project phases and associated costs to achieve Massachusetts' 2050 emissions mandates. Additionally, the roadmaps incorporate standards for future renovations or new construction. With a roadmap as a guide, future repairs, renovations, and new construction are designed toward the future decarbonized condition.

DCAMM should accelerate its work with all agencies and with A&F to develop and implement the roadmaps associated with the Strategic Plan.[115] Quasi-public authorities such as Massachusetts Water Resources Authority (MWRA), MBTA, Massport, or other Commonwealth entities to the extent they are beyond the scope of DCAMM's Strategic Planning process, should establish their own facility decarbonization and resilience roadmaps, working with LBE, in line with the goals and directives of EO 594.

(7) Develop and implement statewide plan for electrifying state-owned vehicle and equipment fleet and consider a single entity or centralized body to coordinate installation of charging infrastructure.

EO 594 also establishes goals for transitioning the state-owned and -operated vehicle fleet to zero-emissions vehicles, with specific goals for 2025, 2030, 2040, and 2050.[116] Despite these targets, the Commonwealth is facing significant challenges in its efforts to electrify its vehicle fleet.

There are varying reasons for the challenges in electrifying the fleet, including the lack of sufficient charging infrastructure at state-owned facilities and of well-resourced operations and maintenance plans for the charging infrastructure. A reliable network of fleet charging is crucial when transitioning fuel types and limiting employee downtime at public charging stations. To ensure the Commonwealth complies with EO 594 and truly leads by example, Climate Office will convene a working group consisting of the Operational Service Division (OSD), the LBE program, DCAMM, MassDOT, EEA, and the Executive office of Public Safety and Security (EOPSS) to develop preliminary recommendations by February 1, 2024, for the Climate Office outlining a process for electrifying the state-owned vehicle and equipment fleet and the effective deployment of EV charging stations for state fleet vehicles, including a draft strategy for ongoing maintenance and operation of these stations.

To ensure the availability of reliable fleet charging, the working group should offer preliminary recommendations concerning the creation or designation of a single entity or other centralized body with the authority, information, funding, and coordinating function necessary to direct electric vehicle supply equipment installations, coordinate ongoing operation and maintenance, coordinate with utilities, and implement the working group's plan. These discussions should be coordinated with the Electric Vehicle Infrastructure Coordinating Council led by EEA.

Based on these recommendations, OSD, LBE, DCAMM and other necessary agencies should prioritize among, and build out infrastructure at, high-traffic garaging locations throughout the fleet, representing hubs of activity to which state vehicles travel or where they reside overnight. Massachusetts should install electric vehicle charging infrastructure at all high-value garaging

[115] MASSACHUSETTS DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE, *Statewide Resilience Master Plan (SRMP)*, https://www.mass.gov/service-details/statewide-resilience-master-plan-srmp, (last visited July 20, 2023).
[116] Governor Charlie Baker, COMMONWEALTH OF MASSACHUSETTS, *EO 594, supra* note 112.

locations as soon as possible in keeping with the recommendations of the working group and terms of the plan.

In addition, a subset of the working group should by February 1, 2024, develop a draft strategy for long-term maintenance and operation of publicly maintained and operated direct current fast chargers.

(8) Ensure all Secretariats are aware of EO 594 goals and ensure appropriate staff are working toward them.

EO 594 requires agencies to assess and implement strategies to mitigate, and ultimately eliminate, greenhouse gas emissions from onsite fossil fuels from state government operations when planning for and executing projects related to the design, construction, operations, and maintenance of state facilities, and the procurement of goods and services, including fleet vehicles.[117] It further requires agencies to report applicable energy and fuel data to LBE, and to appoint LBE Coordinators to serve as liaisons to LBE and other agencies overseeing the implementation of EO 594.[118] The goals and directives set forth by EO 594 are cross-cutting and require coordination across multiple departments and facilities within each agency.

Achieving the goals set forth in EO 594 requires the full commitment and participation of agencies in these and other efforts and will require key individuals in every agency, including CFOs, facility managers, procurement officers, and fleet managers, among others, to be given the time and responsibility to work with LBE on decarbonization efforts. To date, agency staff have not consistently been provided the resources to implement successful, targeted onsite emissions reductions nor have they always been instructed that these efforts are a priority of the agency.

To ensure that agency participation is sufficient and meaningful, each Secretariat should direct its agencies to prioritize LBE efforts as part of their day-to-day operations and management of state assets. Specifically, every agency with at least 75 employees should be directed to ensure that at least two individuals with sufficient access to agency leadership and with the authority to make decisions about their facilities be given the role of LBE Coordinator. The existing Secretariat Climate Officers would be a natural choice for one of those roles. These Coordinators will be invited to participate in bi-monthly LBE Council meetings, engage in regular and ad hoc calls with LBE staff, and will be responsible for reporting applicable agency and facility data to LBE, all in support of ensuring that the directives of EO 594 are integrated into agency decision-making processes. Agencies that have multiple facilities should consider appointing staff from different facilities to ensure that they are fully aware of the resources and objectives of key programs. Additionally, agencies should consider the establishment of internal leading by example teams that

[117] Id.
[118] Id.

would serve to track and report on progress within the agency and ensure that key units within each agency are supporting these efforts.

(9) Incorporate CECP and resilience mandates into municipal grants and incentives.

Massachusetts municipal grant-making and incentives should be consistent with the CECP emissions reduction, carbon sequestration, and resilience mandates.[119] Grant-making and other incentives should be used as a tool to drive and amplify the decarbonization and resilience efforts underway. Such use of grant-making will offer more comprehensive assistance to municipalities to transition to clean energy, build resilience, and secure federal climate funding. Among the many ways in which Massachusetts incentivizes municipalities are the following:

- DOER's Green Communities Division has awarded over $160 million in grants to Massachusetts municipalities since 2010, funding energy efficiency and electrification projects at municipal facilities and fleets. The Division intends to launch a higher tier of Green Communities, called "Climate Leaders" that will focus specifically on decarbonization projects and include community engagements.
- EEA's MVP Program has provided $100M in grant funding to municipalities for resilience planning and implementation since the program was launched in 2017. Three hundred forty-nine municipalities are engaged in the program, and MVP 2.0 was launched in spring 2023 to support communities in centering environmental justice and community engagement, and move from planning toward action.
- CZM's Coastal Resilience grant program provides financial and technical assistance to Massachusetts coastal communities and nonprofits to advance a broad range of coastal resilience and climate adaptation efforts, including vulnerability assessments, public outreach, proactive planning, infrastructure retrofits, and shoreline restoration techniques. Since the grant program launched in 2014, over $37 million in grant funding has supported over two hundred resilience projects to reduce the impacts of flooding, erosion, and sea level rise.
- Through the Massachusetts Housing Choice Initiative and the new multifamily zoning requirements for MBTA Communities, the Commonwealth is working with local governments to promote housing near transit to maximize the benefits of public transit, including climate benefits.
- DPH provides Center for Disease Control and Prevention Public Health Emergency Preparedness funds to local boards of health to, among other goals, increase capacity to build community resilience, use data appropriately for emergency and climate change planning, and respond to health impacts.

[119] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2050, supra* note 37, at p. 85.

The Community Compact Cabinet Best Practices program offers a framework for municipal grantmaking best practices and the Community One Stop for Growth aggregates state grant opportunities. Climate Office will convene a working group composed of EOED, EOLWD, EOHLC, EEA, MassDOT, EOTSS, and other relevant agencies to offer preliminary recommendations on the alignment of municipal grantmaking with CECP and resilience mandates by July 2024, with final recommendations submitted no later than October 31, 2024.

(10) Implement MEPA regulatory or policy changes to strengthen environmental reviews of forest clearing, lower the forest clearing threshold, utilize a trust to receive mitigation funds for permanent conversion of private forest land, and develop MEPA EJ Guidance addressing urban tree canopy.

The MEPA Office should make regulatory changes to add a review threshold in MEPA regulations requiring projects engaging in a certain level of forest clearing to undergo environmental review, as referenced in the CECP.[120] In addition, the MEPA Office should also lower from 50 acres to 25 acres the level at which the requirement to include GHG analysis of land alteration is triggered. MEPA Office should utilize a trust to receive MEPA mitigation funds for tree clearing and other actions to be used as a source of funds to incentivize private landowners to maintain land in forest. The MEPA Office should also accelerate efforts to complete EJ guidance to establish a clear path to consider urban heat island and other health effects of destruction of urban tree canopy resulting in loss of cooling shade, air filtration, and stormwater management. Urban heat islands often occur in locations (in Massachusetts and elsewhere) that were historically subject to red-lining.[121] The MEPA Office should prioritize this critical EJ and climate issue because of the significant public health implications. Finally, the MEPA Office should follow the Council on Environmental Quality's (CEQ) recent NEPA Guidance and formally incorporate the Social Cost of Greenhouse Gases into environmental reviews.[122]

(11) Update procurement practices to require disclosure of emissions and climate risk.

The Commonwealth spent two billion dollars in FY 2022 on purchases of goods and services through OSD's Statewide Contracts. By signaling greater attention to emissions reduction, the

[120] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2025/3030, supra* note 89, at p. 95.
[121] Linda Poon, *Housing Discrimination Made Summers Even Hotter*, BLOOMBERG (Jan. 22, 2022), https://www.bloomberg.com/news/articles/2020-01-22/the-link-between-redlining-and-extreme-urban-heat.
[122] THE WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY, *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* (Jan 9, 2023), https://www.federalregister.gov/documents/2023/01/09/2023-00158/national-environmental-policy-act-guidance-on-consideration-of-greenhouse-gas-emissions-and-climate.

Commonwealth can drive more climate-responsible decision-making throughout the economy. Recognizing the economic risks posed by climate change to supply-chains, infrastructure, investments, and businesses, the federal government has proposed a procurement rule that would require major federal contractors to disclose their greenhouse gas emissions and climate-related financial risk.[123] This proposed rule leverages widely-adopted third party standards and systems that many federal contractors already use when disclosing their emissions and setting emissions reduction targets, including the Climate Disclosure Project (CDP)[124] and the Science Based Target Initiative (SBTI).[125,126]

Public procurement informed by climate goals will drive further emissions reductions and create markets for lower-carbon and fossil-fuel-free goods and services. Requiring disclosure should be the initial step with the goal, by 2026, of considering such information as a material factor in procurement decisions.

(12) Institute process to ensure Buy Clean is implemented.

On March 8, 2023, Massachusetts became a signatory to the federal Buy Clean Initiative launched pursuant to federal Executive Order No. 14057, the Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability.[127] The Buy Clean Initiative is a whole-of-government approach to reducing emissions economy-wide through innovation and environmental stewardship. The initiative aims to reduce greenhouse gas emissions, safeguard government investments against the effects of climate change, and expand technologies, industries, and jobs. DCAMM, MassDOT, MassCEC, and LBE, in consultation with the Climate Office, should lead the Buy Clean Initiative to prioritize the Commonwealth's purchase and use of lower embodied carbon, made-in-America construction materials, such as concrete and steel. DCAMM, MassDOT, MassCEC, and LBE, in consultation with other relevant agencies, should provide

[123] WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY, OFFICE OF THE FEDERAL CHIEF SUSTAINABILITY OFFICER, *Federal Supplier Climate Risks and Resilience Proposed Rule* (Nov. 10, 2022), https://www.sustainability.gov/federalsustainabilityplan/fed-supplier-rule.html.

[124] CLIMATE DISCLOSURE PROJECT. *CDP: Disclosure Insight Action*, https://www.cdp.net/en/climate (last visited July 7, 2023).

[125] SCIENCE BASED TARGETS, *Ambitious Corporate Climate Action*, https://sciencebasedtargets.org/ (last visited July 7, 2023).

[126] THE WHITE HOUSE, *FACT SHEET: Biden-Harris Administration Proposes Plan to Protect Federal Supply Chain from Climate-Related Risks* (Nov. 10, 2022), https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/10/fact-sheet-biden-harris-administration-proposes-plan-to-protect-federal-supply-chain-from-climate-related-risks/. As of November 2022, more than half of major federal contractors were already disclosing climate related information—greenhouse gas emissions and climate risk—through CDP. This includes 1,800 small and medium-sized enterprises. Further, nearly 4,000 companies globally—representing one third of the global economy's market capitalization—have voluntarily committed to setting science based-targets.

[127] WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY , OFFICE OF FEDERAL CHIEF SUSTAINABILITY OFFICER, *Federal Buy Clean Initiative*, https://www.sustainability.gov/buyclean/ (last updated Jan. 19, 2023).

specific recommendations to Climate Office for implementation of the Buy Clean Initiative by February 1, 2024.

(13) Identify a dedicated source of funding for MassCEC commensurate with the scale of the challenge and opportunity presented by climate change.

The founding of the quasi-governmental agency, MassCEC, was an early and nation-leading investment. However, MassCEC has never received the support necessary to fulfill its true potential. Because Massachusetts, like most states, has much work to do in a very short period of time to reduce emissions to safer levels and make our communities and infrastructure more resilient, it is vital that MassCEC be funded at a level that is commensurate with the scale of catastrophic climate risk we face. Ideally, the Commonwealth would make an investment of $1 billion dollars, which would be in line with our investment in life sciences a decade or so ago. Alternatively, the Commonwealth should secure a dedicated funding stream for MassCEC that would generate at least $100 million annually for a period of not less than 10 years. A substantial investment would have the advantage of allowing MassCEC to better leverage private investment, make longer horizon climate programming commitments, and better align with the Commonwealth's long-term market/climate tech economic development efforts.

(14) Bar procurement by the Governor's Office and executive branch agencies of single-use plastic bottles.

In light of this recommendation, on September 21, 2023, the Governor issued Executive Order 619, Eliminating the Purchase by the Executive Department of Single-Use Plastic Bottles, [128] which bars all executive department offices and agencies from purchasing single-use plastic bottles in favor of less harmful alternatives.[129]

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[128] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 619*: Eliminating the Purchase by the Executive Department of Single-Use Plastic Bottles* (Sept. 21, 2023), https://www.mass.gov/executive-orders/no-619-eliminating-the-purchase-by-the-executive-department-of-single-use-plastic-bottles.

[129] Executive Order 619 permits the purchase of single use plastic bottles in certain limited circumstances: when no alternative is available or practicable; when necessary to protect health, safety, and welfare; when compliance with the Executive Order would conflict with contract requirements or labor agreements in existence as of the effective date of the Executive Order or agreements solicited before the effective date of the Executive Order; and, to prepare for or respond to an emergency. In addition, the Executive Order requires each office or agency to provide for disability- or accessibility-related accommodations in its planning efforts concerning single-use plastic bottles.

Single-use plastic bottles (those that hold water or other beverages in a sealed, rigid plastic bottle having a capacity of 21 fluid ounces or less) contribute to climate change because at every step, production of plastic bottles relies on fossil fuels[130] and most plastic bottles are made from petroleum-based polyethylene terephthalate (PET), in refineries that run on fossil fuels.[131] Plastic bottles take about 400 years to break down into microplastic that still pollutes and can leach toxins.[132] It can take much longer for land-filled plastic bottles to break down.[133] Americans throw away about 2.5 million plastic bottles every hour.[134] Scientists have estimated there may be more plastic than fish (by weight) in the ocean by 2050.[135] Purchasing single-use plastic bottles is inconsistent with our climate policy. The manufacture of plastics and their disposal have resulted in egregious harm to environmental justice communities in the U.S and globally.[136] Plastic pollution harms birds, fish, and wildlife, across Massachusetts and the world, including in our oceans.[137]

II. Emissions Mitigation

These recommendations address the Commonwealth's strategy to reduce greenhouse gas emissions and achieve the mandate of Net Zero emissions in 2050.

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[130] **U.N. ENVIRONMENT PROGRAMME, *Plastic pollution is an environmental injustice to vulnerable communities – new report* (Mar. 30, 2023), https://www.unep.org/news-and-stories/press-release/plastic-pollution-environmental-injustice-vulnerable-communities-new.**

[131] Id.

[132] Kim Heacox, *Plastic can take hundreds of years to break down – and we keep making more*, THE GUARDIAN (Aug. 8, 2022), https://www.theguardian.com/commentisfree/2022/aug/08/plastics-climate-crisis-environment-pollution-kim-heacox.

[133] U.N. ENVIRONMENT PROGRAMME, *Plastic planet: How tiny plastic particles are polluting our soil* (Dec. 22, 2021), https://www.unep.org/news-and-stories/story/plastic-planet-how-tiny-plastic-particles-are-polluting-our-soil.

[134] Heacox, *supra* note 132.

[135] ELLEN MACARTHUR FOUNDATION, *Designing out plastic pollution,* https://ellenmacarthurfoundation.org/topics/plastics/overview (last visited Aug. 9, 2023).

[136] U.N. ENVIRONMENT PROGRAMME, *Plastic pollution is an environmental injustice to vulnerable communities – new report, supra* note 130.

[137] Id.

(15) Develop and Launch Corporate Climate Challenge.

In the first quarter of 2024, Climate Office will convene interested private sector stakeholders to establish a Corporate Climate Challenge that will promote voluntary commitments to reduce Scope 1, 2, and 3 emissions, help grow the clean energy and climate workforce, spur action in resilience, educate and engage their staffs in volunteer opportunities, and lift up innovative action.[138] Climate Office will develop a roster of private sector stakeholders in consultation with EOED, EEA, MassCEC, and other state entities.

(16) Analyze the best use of ratepayer funds currently allocated to Mass Save and accelerate work to establish a decarbonization clearinghouse by 2024 to ensure timely achievement of building emissions reduction mandates.

Mass Save is the Commonwealth's flagship program to incentivize energy efficiency and electrification of buildings. The program—a historic leader in creating a market for energy efficiency—now needs reform to maintain its key role in the Commonwealth's overall decarbonization plan. The Mass Save program currently is administered by electric and gas utilities. It has become increasingly clear, particularly in light of the successes of sister-state entities Efficiency Maine and Efficiency Vermont, that, under the current statutory framework, the Mass Save program is failing to take the steps necessary to achieve the transformative levels of building decarbonization required.

For example, Mass Save goals are not aligned with state building decarbonization goals, and the program administrators are not directly subject to those goals. Mass Save's planning and operations horizon is short term—three-year plans and an orientation to single energy assessments that do not reflect long term decarbonization planning.[139] Mass Save is structured primarily to support cost savings from energy efficiency and not to achieve building decarbonization/electrification; as a result, Mass Save continues to support fossil-fuel heating systems and typically does not support deep enough retrofits or related technologies (such as solar,

[138] U.S. ENVIRONMENTAL PROTECTION AGENCY CENTER FOR CORPORATE CLIMATE LEADERSHIP, *Scope 1 and Scope 2 Inventory Guidance*, https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance (last visited Sept. 13, 2023). Scope 1 emissions are direct greenhouse gas emissions occurring from sources owned or controlled by an organization (boilers, vehicles, and so on). Scope 2 emissions are indirect greenhouse gas emissions associated with the purchase of electricity, heat, and so on. Scope 3 emissions are indirect emissions produced by customers using the organization's products or suppliers making products the organization uses.

[139] Due to the many contractors and intermediaries required to support energy efficiency program deployment, advanced planning occurs for a three-year program cycle. Current program design is focused on the 2025-2027 program cycle.

EV chargers, storage). As well, there are inefficiencies in the collaborative decision making, staffing, and leadership structure.

The Mass Save program to reduce energy use is bounded by statute and Department of Public Utilities' (DPU) precedent and refined by a stakeholder negotiation process through the Energy Efficiency Advisory Council subject to the review and energy efficiency guidelines of the DPU.

Recognizing the statutory foundations of the program, the importance of established stakeholder process, and the independent regulatory role of the Department of Public Utilities over ratepayer funded programs, EEA and DOER should work with EOHLC, MassCEC, and others to articulate a vision for a future framework for Mass Save. That vision should be informed by an analysis of how other states have structured their energy efficiency and building decarbonization programs, the proper role for electric and gas utilities in a decarbonization program, the cost and benefits allowed or expected by statute and regulators, and emerging business models that can support state building decarbonization efforts.

Any reform of Mass Save will need a transition period to ensure that existing markets for energy efficiency services are not disrupted; that said, there is an urgent need to transform Mass Save and that work should occur on a parallel track with more incremental measures to be implemented in the three-year planning cycle. To ensure continuity of program delivery, these opportunities for changes to Mass Save should be implemented with an eye toward maintaining and growing program delivery capability and aligning and bringing it to the scale necessary to achieve Net Zero.

Over the last decade, other states have adopted a number of innovative energy efficiency program design structures. For example, New York has repurposed a portion of ratepayer dollars to provide additional capacity for targeted financial solutions to energy efficiency and renewable energy projects. [140,141] Other states, like Vermont and Maine, have structured their energy efficiency programs with an independent program administrator acting separately from the electric distribution utilities.[142,143] Finally, some states have created a role for third-party firms that rely on data analytics to model energy usage and physical building attributes to lower the cost of designing successful home interventions. The long-term success of the Mass Save program should be measured by the rate at which the programs accelerate the market transformation from incumbent fossil fuel use to the efficient electrification of heating. The Mass Save program administrators and the Energy Efficiency Advisory Council should focus on phasing out most fossil-fuel heating equipment in new construction and providing incentives for owners of existing buildings to transition to electric heating.

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[140] NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA), CLEAN PATH NY, *Purchase of New York Tier 4 Eligible Renewable Energy Certificates (RECs)* (May 2021), https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Clean-Energy-Standard/Tier4-Step-2-Bid-Submission-Response/Clean-Path-NY.pdf,.

[141] NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA), *Funding,* NYSERDA, https://www.nyserda.ny.gov/About/Funding (last visited Aug. 10, 2023).

[142] EFFICIENCY VERMONT, https://www.efficiencyvermont.com/ (last visited Oct. 23, 2023).

[143] MAINE GOVERNOR'S ENERGY OFFICE, *Energy Efficiency*, https://www.maine.gov/energy/initiatives/energy-efficiency, (last visited July 20, 2023).

EEA is leading the Commonwealth's effort to define and establish a Building Decarbonization Clearinghouse, based on the 2022 recommendations of the Clean Heat Commission.[144] The Clearinghouse will simplify and ensure equitable consumer access to building decarbonization solutions and could provide a pathway to Mass Save structure reforms. Mass CEC, through its Decarb Pathways Program, currently is piloting key components that could be integrated into a Building Decarbonization Clearinghouse or reformed Mass Save structure, including technical assistance to customers to support comprehensive decarbonization over time; right-sized, climate-aligned incentives; full support for the entire suite of equipment necessary to fully electrify existing buildings (e.g., EV chargers, induction stoves, and heat pump hot water heaters); and development of an entirely new building decarbonization assessment/audit. As noted above, Maine and Vermont have longstanding entities that provide efficiency and decarbonization services, operated independently of state utilities (though working in collaboration with them).

As part of its effort to consider options for the future of Mass Save and stand up a Building Decarbonization Clearinghouse, EEA is procuring a consultant with knowledge of regional and national energy efficiency and decarbonization program design to assist in development of a set of short, medium, and long-term program design recommendations for decarbonizing buildings with resources including but not limited to ratepayer funds. The Decarbonization Clearinghouse should be structured to ensure that funding, consumer information, and technical assistance are coordinated to lower barriers that customers face in making energy improvements.

The Decarbonization Clearinghouse should be designed to take full advantage of federal tax credits under the Inflation Reduction Act for building-sector decarbonization measures.[145] Residents, businesses, municipalities, and other institutions will be eligible to receive federal tax credits offering 10-40 percent value on decarbonization measures. The aggregate amount of these clean energy tax credits is unlimited, creating an opportunity for Massachusetts to pursue tax credits as a significant source to help finance decarbonization. The Clearinghouse should operate with other building sector funding programs such as the home energy rebate programs,[146] existing state grant programs for affordable housing decarbonization, programs from the Climate Bank, and Mass Save, to maximize widescale tax credit utilization.

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[144] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Learn about the commission on Clean Heat*, https://www.mass.gov/info-details/learn-about-the-commission-on-clean-heat (last visited Aug. 1, 2023). On September 20, 2021, Governor Charlie Baker signed Executive Order No. 596, establishing the Commission on Clean Heat in the Commonwealth to advise on a framework for long-term greenhouse gas emission reductions from heating fuels. The Commission explored options to accelerate the deployment of energy efficiency programs and clean heating systems in new and existing buildings and to transition existing distribution systems to clean energy. The final Commission report was issued on November 30, 2022.

[145] INTERNAL REVENUE SERVICE, *Credits and Deductions Under the Inflation Reduction Act of 2002*, https://www.irs.gov/credits-and-deductions-under-the-inflation-reduction-act-of-2022 (last visited Sept. 13, 2023).

[146] U.S DEPARTMENT OF ENERGY, OFFICE OF STATE AND COMMUNITY ENERGY PROGRAMS, *Home Energy Rebate Programs*, https://www.energy.gov/scep/home-energy-rebate-program (last visited Sept. 13, 2023).

As the Commonwealth accelerates building electrification, DPU should prioritize any rate reform necessary to ensure that electric bills will be affordable for all households, particularly those with low and moderate incomes.[147]

(17) Publish an annual report card on the Commonwealth's progress to achieve mandated greenhouse gas emission reductions.

The Global Warming Solutions Act required EEA to prepare a CECP for reducing greenhouse gas emissions and update it every five years.[148] As part of that planning process, Massachusetts collects data on key climate indicators and has established benchmarks for achieving the greenhouse gas emissions reductions associated with these indicators. For example, the CECP models 100,000 residential homes installing new heat pump systems from 2020 to 2025 to meet the 2025 building sector target.

Beginning in fall 2023, Massachusetts will publish an annual Climate Report Card, developed by EEA, MassDOT, EOHLC, and EOED, in consultation with the Climate Office, to inform Massachusetts residents of the progress the executive offices are collectively making to achieve CECP mandates. Convened by Climate Office, these agencies will develop by November 1, 2023, a detailed design for the Report Card including metrics, data sets, format of presentation, and public-facing internet host. The Report Card will be published by December 1, 2023.

Because building and transportation fossil fuel combustion jointly account for 72 percent of the Commonwealth's emissions, efforts to reduce reliance on fossil fuels in those two sectors through electrification will feature prominently in the Climate Report Card. The report card will track key metrics such as:

- ***Heat pump installations***. The CECP models 100,000 residential homes installing new heat pump systems from 2020 to 2025 to meet the 2025 building sector target. Estimates for 2022 indicate the Commonwealth is about 30 percent of the way there. Annual installation rates will need to ramp up quickly as the modeling escalates heat pump adoption through 2030. Massachusetts is promoting this acceleration through:

[147] *See, e.g.*, Sagarika Subramanian & Mark Kresowik, *Innovative Electricity Rates Can Advance Equity and Electrification*, ACEEE (Sept. 14, 2023), https://www.aceee.org/blog-post/2023/09/innovative-electricity-rates-can-advance-equity-and-electrification

[148] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2050, supra* note 37, at p. i.

- Mass Save incentives to retrofit existing homes and businesses to adopt heat pumps including air-source, ground-source, and variable refrigerant flow (VRF) systems.[149]

- MassCEC and DOER programs that demonstrate the feasibility and benefits of high-performance buildings.

- DOER's design of the Stretch and Specialized Code.

- The MEPA Office's program requirement for consideration of energy efficiency/greenhouse gas reduction measures for new building construction.

- ***Registered EVs.*** As of September 9, 2023, Massachusetts had about 92,100 EVs on the road (57,568 battery electric vehicles, 34,529 plug-in hybrid electric vehicles, and 3 fuel cell electric vehicles) with the CECP goal of reaching at least 900,000 EVs by 2030. To increase EV use:

  - Massachusetts is developing strategies to build out the transmission and distribution infrastructure to support vehicle electrification with EV charging stations.

  - Massachusetts will continue to drive EV use through adoption, pursuant to Section 177 of the Clean Air Act, of California's vehicle emissions standards, which require vehicle makers to sell EVs as an increasing proportion of their annual sales in Massachusetts.[150]

  - Massachusetts is offering rebates for EVs through DOER's Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program, which has provided more than 34,000 rebates over the past 8 years at a cost of nearly $79 million.[151]

  - The building energy codes (Base, Stretch and Specialized code) all require 10-20 percent (depending on building use) of new parking spaces to be wired as EV-ready.[152]

  - MassCEC motivates EV purchases with significant equity and public health benefits by partnering with community groups across the Commonwealth to offer

[149] VRF systems are Heating Ventilation and Air Conditioning (HVAC) technology systems that use refrigerant as the primary heating and cooling medium.
[150] 42 USCS § 7507.
[151] MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, *Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) Cost-Effectiveness Study*, p. 41 (Mar. 2, 2022), https://www.mass.gov/doc/zev-commission-april-15-2022-mor-ev-cost-effectiveness-study-32922/download; MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, *Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) Statistics* https://mor-ev.org/statistics (last visited Oct. 23, 2023).
[152] MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, *2023 Stretch Energy Code Update and Municipal Opt-in Specialized Code* (Sept. 22, 2022), https://www.mass.gov/doc/summary-document-explaining-stretch-energy-code-and-specialized-opt-in-code-language/download.

targeted incentives for vehicles including school buses, commercial vehicle fleets, and e-bikes.

- ***Accessibility of direct current fast chargers along key vehicle travel corridors***. MassDOT is leading Massachusetts' implementation of the National Electric Vehicle Infrastructure (NEVI) Development Plan.[153] MassDOT was among the first group of statewide plans approved by the Federal Highway Administration (FHWA) on September 14, 2022. MassDOT is focused on:

    - Equity such that Environmental Justice (EJ) communities are served by NEVI-funded direct current fast chargers (DCFCs) at a rate equal to or greater than non-EJ communities.

    - Completeness such that EV Adaptive Fast Chargers (AFCs) will be installed at locations wherein the distance between chargers will not be greater than 50 miles.

    - Financial sustainability with a goal that five years after the last DCFC site is installed, no continuing public investment will be needed for NEVI-funded stations.

    - Reliability so that DCFC sites achieve a 97 percent uptime target.

- ***Renewable power installed or procured.*** The Commonwealth's renewable power will, in large part, come from offshore wind, solar, and imported cleaner power from other regions.

    - Today, the Commonwealth has 800 MW of offshore wind contracted and under construction, with a total authorization to procure 5.6 GW by 2027, and an open RFP under which up to 3.6 GW of capacity may be selected and awarded contracts. Bids in the current RFP are due by the end of January, with project selection expected by the end of spring 2024.

        - MassCEC is helping to build a local workforce, support supply chain companies, and construct port infrastructure necessary for a robust Massachusetts offshore wind sector, including the expansion of the New Bedford Marine Commerce Terminal, redevelopment of other port facilities in New Bedford, the development of a new marshaling wind port[154] in Salem, adaptation of a commercial shipyard in Somerset to build wind farm service vessels, the construction of a high-voltage marine cable factory in

[153] U.S. DEPARTMENT OF TRANSPORTATION, *National Electric Vehicle Infrastructure Formula Program* (Feb. 10, 2022), https://www.transportation.gov/briefing-room/national-electric-vehicle-infrastructure-formula-program.
[154] Marshaling ports, also known as staging ports, collect and store wind turbine components before loading them on wind turbine installation vessels, as distinct from other offshore wind ports such as manufacturing ports or operating and maintenance reports.

Somerset, and expansion of the Wind Technology Testing Center in Charlestown.

- The Commonwealth's existing solar programs are designed to support the deployment of approximately 5.2 GW alternating current (AC), of which more than 3 GW AC is currently installed with another 0.7 GW AC in the pipeline.

  - DOER recently released its Massachusetts Technical Potential of Solar study that evaluates the total technical potential and suitability for solar construction across Massachusetts. Three main types of solar installations were evaluated: (1) rooftop; (2) ground-mounted; and (3) canopy.[155] The study includes a web application called a StoryMap, that allows users to explore solar suitability across Massachusetts.[156] This web application will also help the Grid Modernization Advisory Council, convened to advise electric-sector modernization plans on areas of high solar potential with low hosting capacity, and identify EJ populations with high solar potential.

- EEA is also looking beyond Massachusetts' borders to secure clean energy generation, pursuing contracts with clean energy projects throughout New England and in adjacent regions. One such project is the New England Clean Energy Connect (NECEC), a transmission line connecting Quebec to New England that, once operational, would deliver 9.425 TWh of hydroelectric power annually. EEA also led efforts to form a bipartisan coalition of New England states, New York, and New Jersey to work with the U.S. Department of Energy to explore enhancing interregional transmission connections, including offshore wind infrastructure.

- ***Natural and Working Lands Conserved.*** To retain natural and working lands' (NWL) carbon sequestration capacity through 2050 and beyond, and to prevent further emissions of carbon held primarily in forests and wetlands, the Commonwealth has committed to increasing permanent conservation of natural and working lands in Massachusetts to at least 40 percent by 2050, with the more immediate mandates of at least 28 percent conserved by 2025 and at least 30 percent by 2030. This requires conservation of an additional 685,000 acres by 2050 (+63,400 by 2025 and +167,000 by 2030).

  - EEA's "Forests as Climate Solutions" initiative will accelerate progress toward these mandates ensuring state forest management incorporates the best climate science, by enhancing forest conservation efforts through land acquisitions, increasing support for private and municipal forest conservation, and expanding and establishing forest reserves on public and private lands. The initiative will also

[155] MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, Massachusetts Technical Potential of Solar, Executive Summary at 1, https://www.mass.gov/info-details/technical-potential-of-solar-study (last visited Sept. 12, 2023).
[156] MASSACHUSETTS DEPARTMENT OF ENERGY RESOURCES, Massachusetts Technical Potential of Solar, https://technicalpotentialofsolar-ma-synapse.hub.arcgis.com/ (last visited Sept. 12, 2023).

set, and commit to attaining, goals for forest land protection and reduced deforestation.

- The Resilient Lands Initiative sets out a vision to conserve and enhance the health of Massachusetts' forests, farms, and soils for the benefit of residents. It includes a strategy for promoting the goal of no net loss of forests and farmlands through more coordinated land use planning, investments in natural resource-based economic development, and expansion of restoration and urban greenspace efforts.

- EEA and associated agencies are reviewing and updating evaluation criteria for state land acquisitions and land conservation programs to prioritize protection of forests vulnerable to development, carbon-rich forests, wetlands, and open space upstream of wetlands such as marsh migration corridors.

- MassDEP is investigating approaches to increase statewide protection of wetlands and, at minimum, the first 50 feet of the 100-foot wetland buffer zone.

- ***Environmental Justice.*** The annual Climate Report Card will monitor the overall benefits of certain federal and state investment to environmental justice communities, among other metrics the EEA EJ Office may suggest, for ensuring environmental justice in Massachusetts. The 2023 Report Card will include the EEA EJ Office's assessment of current metrics used for grants and investments, and report on existing gaps.

- ***Climate Resilience:*** In its first year, the Climate Report Card will report on progress to advance climate resilience action across the Commonwealth, through the amount of federal and state resilience funding, number of state agencies with climate vulnerability assessments of assets and operations, number of communities with updated Municipal Vulnerability Preparedness (MVP) 2.0 or hazard mitigation plans, and the percentage of 2023 SHMCAP actions in progress. In the 2024 report card, additional climate resilience metrics will be identified and developed for the Commonwealth.

(18) The Massachusetts Port Authority (Massport) and MassDOT should continue to develop a plan to reduce aviation emissions including consideration of alternative fuels and reduced availability of certain short hop flights where rail exists as an alternative.

Massport has an ambitious net zero plan with a goal of reaching net zero by 2031 for emissions within its direct control (Scope 1 and 2) and is working to influence Scope 3 emissions.[157,158] As part of that plan, Massport is working with airlines, academic institutions and others to advance sustainable aviation fuels (SAF). Given the funding opportunities, sophistication and expertise of Massport, and the existing relationships it has with leading science and technology institutions, Massport should pursue opportunities to pilot such technology and serve as a national leader in early adoption of SAF.[159]

(19) DEP, in coordination with EEA, EOHHS, DCAMM, and other agencies as necessary, should implement a plan to ensure institutions generating more than half a ton of commercial organic waste per week divert that waste to beneficial use in composting, biogas generation, and reuse.

DEP, in coordination with EEA, DOER's Leading by Example team, EOHHS, DCAMM, and other agencies as necessary, should lead an effort to coordinate with businesses and institutions to implement a plan in 2024 to ensure all hospitals, colleges, universities, schools, supermarkets, prisons, Commonwealth-owned properties, and others generating more than half a ton of commercial organic waste per week divert that waste from disposal and ensure its availability for beneficial use in composting, biogas generation, and reuse as appropriate. This effort should be complemented with an enhanced focus by DEP on enforcement of the organics ban.

In October 2014, MassDEP banned the disposal of commercial organic wastes by businesses and institutions that generate one ton or more of these materials per week.[160] Effective November 1, 2022, the threshold was reduced to a half-ton or more weekly.[161] As a result, businesses and institutions generating more than a half-ton of commercial organic waste per week are banned from disposing of it. The ban is an important tool for reducing emissions of methane—a powerful

[157] U.S. ENVIRONMENTAL PROTECTION AGENCY CENTER FOR CORPORATE CLIMATE LEADERSHIP, *Scope 1 and Scope 2 Inventory Guidance, supra* note 138.
[158] MASSACHUSETTS PORT AUTHORITY (MASSPORT), *Roadmap to Net Zero* (Mar. 2022), https://www.massport.com/massport/about-massport/roadmap-to-net-zero/.
[159] Roz Pidcock & Sophie Yeo, *Analysis: Aviation could consume a quarter of 1.5C carbon budget by 2050*, CARBON BRIEF (Aug. 8, 2016), https://www.carbonbrief.org/aviation-consume-quarter-carbon-budget/.
The global aviation industry is on track to consume a minimum of 12 percent of the global carbon budget set to limit global temperature increases to 1.5C by 2050. This conservative estimate accounts for meeting the net zero goals set out by the International Civil Aviation Authority (ICAO) (the U.N. body for aviation) by 2050. However, if these goals are not reached, aviation could make up as much as 27 percent of the global carbon budget by emitting 56 billion tons of the estimated 205 billion tons of CO2 remaining in the carbon budget (as of 2016).
[160] MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION, *Commercial Food Material Disposal Ban, About the Disposal Ban*, https://www.mass.gov/guides/commercial-food-material-disposal-ban#-about-the-disposal-ban- (updated Nov. 1, 2022).
[161] Id.

greenhouse gas—from landfills.[162] Diverting food wastes from disposal to composting, conversion, recycling or reuse cuts waste management costs and reduces the volume of landfill waste, an important benefit as availability of landfills in our region has become more constrained.[163]

Additional resources are needed for enforcement of the organics ban and EEA/DEP should make it a priority to fully fund and implement enforcement of the ban. DEP has a comprehensive technical assistance program to help commercial organic waste generators establish programs and connect with those seeking to source such materials; however, there is a need for greater focus on and prioritization of those efforts in order to build a statewide system for organics diversion. For example, operators of biodigesters report difficulty in sourcing sufficient volumes of commercial organic waste. These measures are necessary to ensure the ban fully achieves its intended benefits.

(20) EEA and MassDOT should promulgate regulations as necessary pursuant to the Global Warming Solutions Act, the Supreme Judicial Court's decision in *Kain v. DEP*, and An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy (2021 Climate Law).

Pursuant to the 2021 Climate Law, the EEA Secretary must establish programs to reduce greenhouse gas emissions and promulgate regulations regarding sources or categories of sources that emit greenhouse gases to achieve the greenhouse gas emissions limits and sublimits and implement the roadmap plans required by the Law.[164] Since the Global Warming Solutions Act was passed in 2008, DOER and DEP have passed numerous regulations to limit greenhouse gas emissions.[165] Consistent with the 2021 and 2022 climate laws, DOER and DEP are developing or amending the following regulations to achieve the required emissions reductions:

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[162] ROCKY MOUNTAIN INSTITUTE, Ellie Garland and Olivia Alves, *Waste Methane 101: Driving Emissions Reductions from Landfills* (June 14, 2023), , https://rmi.org/waste-methane-101-driving-emissions-reductions-from-landfills/. "Municipal solid waste landfills are the third largest source of human-related methane emissions in the United States. Our municipal landfills emit an estimated 3.7 million metric tons of methane, or about 295 million metric tons of carbon dioxide equivalent (MMT CO2e) on a 20-year time horizon. This is roughly equivalent to the annual emissions from driving 66 million gas-powered passenger cars or operating 79 coal-fired power plants. Furthermore, recent aircraft and satellite surveys have detected large methane plumes at landfills across the country with substantial under-reporting at some landfills."

[163] Id.

[164] An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, Ch 8 of the Acts of 2021, Section 8.

[165] *See*, *e.g.*, 225 CMR 4.00 (residential conservation service program); 225 CMR 13.00 (DOER CO2 budget trading program auction regulation (RGGI)); 225 CMR 14.00 (renewable energy portfolio standard - Class I); 225 CMR 15.00 (renewable energy portfolio standard - Class II); 225 CMR 16.00 (alternative energy portfolio standard (APS)); 225 CMR 20.00 (solar Massachusetts renewable target (SMART) program); 225 CMR 21.00 (clean peak energy portfolio standard (CPS)); 225 CMR 22.00 (Massachusetts Stretch code and specialized code for low-rise residential—2023 residential low-rise amendments to IECC2021 and IRC 2021 chapter 11: energy efficiency); 225

- Clean Heat Standard: to require heating energy suppliers to replace fossil heating fuels with clean heat over time by implementing clean heat or purchasing credits.

- Large Entity Reporting Requirement: to require certain owners of medium- and heavy-duty vehicle fleets to submit a one-time report that would enable DEP to assess the best way to develop electric vehicle charging infrastructure and other programs to accelerate the zero-emission vehicle market in Massachusetts.

- MOR-EV Rebate updates: to introduce new incentives that continue to support the adoption of zero emission vehicles and make sure the rebates are consumer-focused.

- Fossil Fuel Free Demonstration Project: to establish a demonstration program in which cities and towns may adopt and amend zoning ordinances or bylaws that require new buildings or major renovations to be fossil fuel-free.

- Municipal Lighting Plant (MLP) Green Communities: to enable additional cities and towns served by municipal lighting plants (MLPs) to become Green Communities.

- Large building energy use performance: regulations to be promulgated in 2024 detailing large building owners (over 20,000 sq. ft.) energy use for publication by DOER, starting in 2025 (as reported by the building's owner).

- Elimination of new biomass generation facilities from qualifying under the RPS.

On an ongoing basis, EEA will evaluate progress in reducing greenhouse gas emissions as a result of these regulations and other programs and policies identified in the 2025/2030 and 2050 CECPs and determine if additional actions are needed.

CMR 23.00 (Massachusetts front-end amendments to the International Energy Conservation Code 2021 Massachusetts Stretch energy code—2023 commercial amendments to IECC2021); 225 CMR 24.00 (Fossil Fuel Free Demonstration Project); 225 CMR 25.00 (MLPs Green Communities) [IN PROGRESS]; 225 CMR 26.00 (MOR-EV rebates [IN PROGRESS]); 310 CMR 7.40 (Low Emission Vehicle Program (ACCII/ACT)); 310 CMR 7.41 (Large Entity Reporting); 310 CMR 7.70 (Massachusetts CO2 Budget Trading Program (RGGI)); 310 CMR 7.71/7.75 (Reporting of Greenhouse Gas Emissions); 310 CMR 7.72 (Reducing Sulfur Hexafluoride Emissions from Gas-insulated Switchgear); 310 CMR 7.73 (Reducing Methane Emissions from Natural Gas Distribution Mains and Services); 310 CMR 7.74 (Reducing CO_2 Emissions from Electricity Generating Facilities); 310 CMR 7.75 (Clean Energy Standard); 310 CMR 7.76 (Prohibitions on Use of Certain Hydrofluorocarbons in Refrigeration, Chillers, Aerosol Propellants, and Foam- End Uses); 310 CMR 60.05 (Global Warming Solutions Act Requirements for Transportation); 310 CMR 60.06 (CO_2 Emission Limits for State Fleet Passenger Vehicles).

(21) Massachusetts Bay Transit Authority (MBTA) should develop a Climate Program Management Office responsible for ensuring achievement of CECP and resilience mandates.

A PMO is "a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques."[166]

MassDOT has released a request for qualification (RFQ) to fully operationalize climate work into the structure of MassDOT; the RFQ will create a MassDOT-wide PMO to monitor MassDOT's progress on MassDOT's climate responsibilities.

The primary function of this PMO is to support MassDOT's Divisional Staff by:

- Managing shared resources across all projects administered by the PMO.
- Identifying and developing project management methodology, best practices, and standards.
- Monitoring compliance with MassDOT's responsibilities for decarbonization and resilience as outlined.
- Developing and managing project policies, procedures, reporting, and other shared documentation.
- Coordinating communication across projects.
- Developing, coordinating and distributing policy and standard operating procedures.

Climate Office strongly recommends that the MBTA develop a corresponding Climate Program Management Office for the purpose of ensuring that MBTA's projects and capital investments reflect the mandates of the CECP and advance climate resilience through integrating climate change data in project identification and design. EEA, MassDOT, and other relevant agencies will develop guidance for advancing climate resilience. The CECP mandates applicable to the MBTA include those associated with:

- Developing a 2050 statewide long-term transportation plan to increase the use of public transportation, reducing reliance on personal vehicles, investing in multimodal transportation infrastructure, and improving the safety and reliability of our transportation system.

[166] PROJECT MANAGEMENT INSTITUTE, *The PMO: your key to strategy execution and results delivery, supra* note 42.

- The MBTA achieving an exclusively zero-emission passenger bus fleet not later than December 31, 2040, including purchasing and leasing exclusively zero-emission buses not later than December 31, 2030.[167]
- The MBTA exploring the electrification of the commuter rail as described in the MBTA Rail Vision report.[168]

Outside of the PMO, EEA, MassDOT, and the MBTA should work on developing additional goals and policies for possible PMO implementation. These goals and policies should focus on integrating climate change data into project identification and design, reducing vehicle-miles travelled through methods such as transit-oriented development and street design, and evaluating greenhouse gas emissions resulting from the transportation sector.

In line with these goals, on September 28, 2023, the MBTA announced the establishment of a new Office of Climate and Resiliency Policy and Planning to advance sustainability and resilience.[169]

(22) Ensure state and private-owned forest management is consistent with CECP goals.

As of the June 2022 publication of the CECP 2025/2030, about 27 percent of Massachusetts land and water (including wetlands) is protected from development through outright ownership, conservation restrictions, agricultural preservation restrictions, watershed preservation restrictions, and other deed restrictions.[170] A little less than half of these 1.4 million acres of protected undeveloped land and water are owned by the state. Cities and towns own almost a quarter, and private entities own the rest.[171]

The CECP 2025/2030 calls for increasing permanent conservation of undeveloped land and water in Massachusetts to at least 30 percent, or 167,000 more acres, by 2030. In addition to natural and working land conservation, the CECP 2025/2030 calls for incentivizing at least 20 percent of privately owned forests and farms to adopt "climate smart management practices" by 2030. "Climate smart management practices" refer to managing forest and farmland in a way that is more resilient to the anticipated impacts of climate change and, sequesters and stores as much carbon

[167] An Act Driving Clean Energy and Offshore Wind, Mass. Acts (2022), ch. 179, Section 65.
[168] MASSACHUSETTS BAY TRANSPORTATION AUTHORITY (MBTA), *MBTA Rail Vision,* p. 81 (Feb. 2020), cdn.mbta.com/sites/default/files/2021-07/2020-02-rail-vision-report.pdf.
[169] MASSACHUSETTS BAY TRANSPORTATION AUTHORITY (MBTA), *MBTA Establishes New Office Focused on Climate and Resilience, Takes Significant Steps to Increase Environmental Sustainability and Resilience* (Sept. 28, 2023), https://www.mbta.com/news/2023-09-28/mbta-establishes-new-office-focused-climate-and-resilience-takes-significant-steps.
[170] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *CECP 2025/3030, supra* note 89, at pp. 91-92.
[171] Id.

dioxide as possible while achieving habitat, food production, and other management goals.[172] These goals will help realize a 25 percent increase from 1990 levels in net carbon sequestration from natural and working lands in 2030 (approximately 7.3 MMT CO2e sequestered annually).[173]

EEA's "Forests as Climate Solutions" initiative will accelerate progress toward this goal by developing climate science-informed forestry practices, including expansion of existing reserves, for state lands that increase carbon storage and resilience to climate change.[174] EEA has convened a committee of scientific experts and will solicit public input to guide development of climate-oriented management guidelines, evaluating and building on the existing science-based practices currently in place. The initiative will create new incentives for private woodland owners and municipalities to conserve forests and optimize resilience and carbon storage when pursuing forest management objectives. EEA is on a fast track to develop expert recommendations, solicit public input, and finalize and implement new policy. EEA should ensure existing and expanded forest reserves are permanently protected.

(23) Ensure new housing production is consistent with CECP and resilience mandates.

Housing plays a key role in meeting the Commonwealth's greenhouse gas emissions reduction mandates, with buildings contributing 37 percent of the Commonwealth's GHG emissions in 2018 and 35 percent in 2020.[175] The Commonwealth deploys significant state resources to increase the production of much-needed market-rate and affordable housing. EOHLC and the quasi-public agencies that provide state financial assistance for new housing production should ensure that new housing production is consistent with CECP mandates for building, natural and working lands, and transportation sector emissions reductions. EOHLC should identify additional resources to cover any marginal increased cost of building more fossil-fuel-free housing in harmony with its core mission of promoting housing production and improving access to affordable housing. EOHLC and EOHHS should document the health co-benefits of, for example, heat pump installation and building insulation and seek funding for these measures through state programs that subsidize healthcare, as has been done in other jurisdictions.[176,177]

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[172] Id.
[173] Id.
[174] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Forests as Climate Solutions*, *supra* note 49.
[175] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Clean Energy and Climate Metrics*, https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-metrics, (last updated 2020).
[176] GREEN & HEALTHY HOMES INITIATIVE, *Medicaid Contracting for Healthy Home Services* (Nov. 2022), https://www.greenandhealthyhomes.org/wp-content/uploads/GHHI-MCO-Contracting-11.10.22.pdf.
[177] THE COMMONWEALTH FUND, Shattuck et. al., *The Untapped Potential of Medicaid to Reduce Greenhouse Gas Emissions* (July 19, 2023), https://www.commonwealthfund.org/blog/2023/untapped-potential-medicaid-reduce-greenhouse-gas-emissions.

EOHLC should accelerate its work in administering funding and other programs to meet the CECP's emissions reduction mandates. EOHLC has published Design Guidelines and Standards which govern both the renovation and redevelopment of the Commonwealth's public housing portfolio. These guidelines require new construction of public housing to be designed with fully electrified HVAC systems. Likewise, the Qualified Allocation Plan (QAP) that governs EOHLC's Low Income Housing Tax Credit (LIHTC) allocation decisions encourages the incorporation of sustainable design principles such as Enterprise Green Community standards and Passive House compliant design into affordable housing project proposals. It should be noted that in new construction, the vast majority of net zero ready buildings report a less than one percent cost premium, while buildings built to passive house standards report a cost premium ranging from one to 4.1 percent (averaging 2.3 percent).[178]

EOHLC also addresses emissions reduction through targeted energy efficiency awards and by partnering with the Mass Save income-eligible program to implement energy-saving measures in existing public housing developments.

EOHLC implements the MBTA Communities Zoning law which requires municipalities designated as MBTA Communities under G.L. c. 161A to zone for more transit-accessible multi-family housing. EOHLC also provides funding under G.L. c. 40R for cities or towns that zone for greater residential density by adopting "smart growth" zoning districts in areas near transit and areas of concentrated development such as town and city centers, other existing commercial districts, and existing rural village districts.

Properly resourced, EOHLC should build on this existing work to ensure new housing production is consistent with CECP and resilience goals. EOHLC, with Climate Office, MassCEC, MassHousing, Massachusetts Housing Partnership (MHP), MassDevelopment, the Massachusetts Community Climate Bank, and other quasi-public agencies that work on housing production should develop a clear path for financing any gaps in the cost of fossil-fuel-free, energy efficient, and climate resilient housing. These agencies should continue to advocate for new funding sources to help defray any upfront increase in the cost of building fossil-fuel-free, resilient housing. Additional funding should also be utilized to implement EOHLC's Climate Hazard and Resilience Masterplan at vulnerable climate housing authorities.[179]

Consistent with these recommendations, on October 18, Governor Healey filed the largest housing bond bill in state history which will spur housing production and preservation in a manner

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[178] PASSIVE HOUSE MASSACHUSETTS, *Passive House Buildings Costs and Benefits Factsheet* (2023), https://phmass.org/app/uploads/2023/03/PassiveHouseFactSheet.pdf. A report from Passive Housing Massachusetts found that new affordable housing construction is being built at low incremental cost, while meeting the high standards of energy efficiency and low greenhouse gas emission needed to achieve the Passive Housing certification. Examples of passive affordable housing developments include the Cambridge Finch construction. This 98-unit construction only cost 1.4 percent more compared with typical non-Passive House family construction. Similarly, The Loop at Mattapan Station, a 135-unit senior and family affordable housing development meets the passive building standard at only 2 percent increase in cost.

[179] MASSACHUSETTS EXECUTIVE OFFICE OF HOUSING AND LIVABLE COMMUNITIES, *Resiliency Initiatives*, https://www.mass.gov/service-details/resiliency-initiatives (last visited Aug. 1, 2023). DHCD's Climate Hazard Adaptation and Resilience Masterplan (CHARM) was developed by EOHLC in 2020. It is identified as a SHMCAP action and is a specific study on the climate vulnerability of state-funded public housing developments.

consistent with the state's emission reduction mandates. Specifically, the bill seeks $150 million to decarbonize public housing units, and will prioritize, for purposes of LIHTC allocation decisions, new housing construction projects that conform to the state's specialized energy code and retrofits that include energy efficiency measures, electrification, and decarbonization.

By May 1, 2024, a working group consisting of EOHLC, Mass Housing, Massachusetts Housing Partnership, and the Community Economic Development Assistance Corporation (CEDAC) shall develop a plan to decarbonize newly developed, preserved, or recapitalized affordable and public housing that receives state subsidies.

(24) The Governor's Office should coordinate with the Massachusetts School Building Authority (MSBA) to develop a plan to move toward requiring decarbonized and resilient designs for new school construction and major renovations, and to incentivize net zero and resilient schools.

The MSBA is a quasi-public authority chaired by the Treasurer. The MSBA has taken important steps to incentivize Massachusetts public school districts to construct new public schools and perform major renovations in such a manner that building systems run on electric power rather than fossil-fuels. Since its formation, the MSBA has been an advocate of "green" sustainable building design for all MSBA-funded public K-12 school buildings and has regularly adjusted its Green Program Policy since then to promote increasing levels of energy efficiency in school design in alignment with the CECP mandate to decarbonize buildings.[180] In the last ten years, 95 percent of the MSBA-funded schools have exceeded MSBA's base project requirements with one school achieving LEED "Platinum," 27 schools achieving LEED "Gold," and 47 schools achieving LEED "Silver."[181] As of June 2023, the MSBA has funded twenty all-electric schools and eighteen schools employing ground-source heat pumps.[182] The MSBA should enhance its efforts to ensure all new public schools and major renovations are decarbonized. It should also take steps to address climate change vulnerabilities, including flooding and increased temperatures, within the building design and construction phase. This is an issue of great interest to stakeholders, including parents and municipalities. Building on the MSBA's momentum to date, the Climate Office will engage with the Treasurer, the MSBA, and within the Office of the Governor to develop a plan to require all new Massachusetts public schools and major public-school renovations constructed with state

[180] MASSACHUSETTS SCHOOL BUILDING AUTHORITY, Recommendation to Update the MSBA Green Schools Program Policies, p. 1 (June 14, 2023) https://www.massschoolbuildings.org/sites/default/files/edit-contentfiles/About_Us/Board_Meetings/2023_Board/6.21.2023/UpdatedGreenSchoolsProgramPolicy6_21_2023.pdf

[181] Id.

[182] MASSACHUSETTS SCHOOL BUILDING AUTHORITY, Board Meeting PowerPoint Presentation, pp. 34-36 (June 21, 2023) https://www.massschoolbuildings.org/sites/default/files/edit-contentfiles/About_Us/Board_Meetings/2023_Board/6.21.2023/June%202023%20Board%20Presentation.pdf

funding to use electric power for building systems rather than fossil-fuels, and to incentivize net zero and resilient schools. [183]

(25) Launch a state-wide, multi-media campaign to educate Commonwealth residents about the anticipated impacts of climate change in Massachusetts and the opportunities presented by the clean energy transition, as well as what they can do to address the climate emergency.

Many Massachusetts residents are aware of and concerned about climate change; however, many are not, and many do not understand the scale of the energy transition underway or the likely impacts of climate change on our region that are locked in for centuries to come, even as we ratchet down emissions.[184] MassINC polling from spring of 2023 found that:[185]

- Three-quarters of residents think that climate change will pose a very (48 percent) or somewhat (29 percent) serious problem to the Commonwealth if left unchecked.
- Majorities say that climate impacts, including heat waves (58 percent), coastal flooding (60 percent), and more powerful storms (62 percent), are already hitting or very likely to hit the state in the next 5 years.
- Some residents reported feelings of climate-related anxiety (18 percent), sadness (14 percent), fear (13 percent), anger (8 percent), and helplessness (3 percent).
- Black and Latino residents were more likely to say climate change is a "very serious" problem for the state.

But when asked about actions to address climate change, responses show public education and outreach is an urgent priority to ensure residents understand the critical importance of the energy transition underway and its co-benefits, including cost savings, job creation, and improved public

[183] U.S. GREEN BUILDING COUNCIL, MASSACHUSETTS CHAPTER, *Zero Energy Buildings in Massachusetts: Saving Money from the Start 2019 Report* (2019), https://builtenvironmentplus.org/wp-content/uploads/2019/09/ZeroEnergyBldgMA2019.pdf. The U.S. Green Building Council Massachusetts Chapter in 2019 provided examples of electric buildings in Massachusetts including schools constructed with no added upfront costs in comparison to fossil-fuel reliant buildings. For example, the John J. Sbrega Health and Science Building at Bristol Community College was built with a less than one percent increase in the incremental cost before incentives and no change to the incremental cost after accounting for incentives. Also, the data supporting the report establishes that the King Open/Cambridge Street Upper School construction also had no change to the incremental cost.

[184] THE ROYAL SOCIETY, *If emissions of greenhouse gases were stopped, would the climate return to the conditions of 200 years ago?*, https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/question-20/ (last updated March 2020), "If emissions of CO_2 stopped altogether, it would take many thousands of years for atmospheric CO_2 to return to 'pre-industrial levels' due to its very slow transfer to the deep ocean and ultimate burial in ocean sediments. . . . The current CO_2-induced warming of earth is therefore essentially irreversible on human timescales. The amount and rate of further warming will depend almost entirely on how much more CO_2 humankind emits."

[185] MASSINC POLLING GROUP, *Poll: Massachusetts residents see climate change as a serious problem for state* (Apr. 2022), https://www.massincpolling.com/the-topline/poll-massachusetts-residents-see-climate-change-as-a-serious-problem-for-state.

health. Residents also need more information on how to access rebates and other subsidies to support the purchase of EVs, electric appliances, and heat pumps, and how to make their homes and communities safer and more resilient to the impacts of climate change. For example, 79 percent of respondents reported they recycle to help address climate change[186] (an action that currently has a relatively modest impact on emissions).[187] Thirteen percent of homeowners reported that they already have solar panels or a heat pump, only 21 percent of homeowners reported that they planned to install a heat pump at some point in the future; and only 27 percent are considering solar.[188] Importantly, majorities of homeowners reported that receiving an incentive or rebate (60 percent) or a tax break (54 percent) would prompt them to accelerate such improvements.[189] There is also majority support for the state requiring new and renovated buildings to use renewable power (67 percent), be pre-wired to charge electric vehicles (70 percent) and be fully electric (57 percent).[190]

Various efforts are underway, including MassCEC's Clean Energy Lives Here campaign which helps residents learn about clean energy technologies, acquire them, and redeem associated clean energy rebates, incentives, and tax credits.[191] Further, EEA is rolling out trainings through its MVP 2.0 program that equip communities with more accessible climate data and recently completed research to assess resident perceptions of climate interventions. These findings will shape more accessible messaging to communities and consumers of all types, and increase awareness of the changing energy infrastructure and more sustainable development needed for our decarbonized future. There should also be a focus on multicultural and multi-language outreach to ensure the populations in environmental justice communities are informed about climate action, empowered to act, and benefit from the Commonwealth's efforts to address climate change.

A large-scale, multi-media public education campaign is urgently needed to help the public understand the nature of the climate emergency and the likely impacts to our region, as well as the climate and other co-benefits of the clean energy transition. Such a campaign should also clearly communicate incentives available to support consumers in making clean energy investments and underscore the public health and cost savings benefits. EEA has budgeted funds to create a "Climate Campaign" in Fiscal Years (FY) 2023-2024. EEA, HHS, MassDOT/MBTA, MassHousing, EOHLC, and MassCEC should together engage a skilled marketing consultant to develop and launch the campaign, expanding on initial concepts developed by EEA.

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[186] Id.

[187] GREEN AMERICA, *Does Recycling Help the Climate?* (Nov. 15, 2019), https://greenamerica.org/blog/does-recycling-help-climate-crisis.

[188] MASSINC POLLING GROUP, *Poll: Massachusetts residents see climate change as a serious problem for state, supra* note 185.

[189] Id.

[190] Id.

[191] MASSACHUSETTS CLEAN ENERGY CENTER, *Clean Energy Lives Here*, https://goclean.masscec.com/, (last visited Aug. 2, 2023).

(26) Implement recommendations of the Commission on Energy Infrastructure Siting and Permitting.

On September 26, 2023, Governor Healey issued Executive Order No. 620, Establishing the Commission on Energy Infrastructure Siting and Permitting.[192] The order recognizes that achievement of Net Zero greenhouse gas emissions with a minimum 85 percent reduction in greenhouse gas emissions as compared to 1990 levels in 2050 will require significant new renewable and clean energy generation, distribution, and transmission infrastructure to be constructed to ensure a strong and reliable electricity grid. The order establishes a commission to advise the Governor on accelerating the responsible deployment of clean energy infrastructure and to make recommendations with particular focus given to compliance with state climate laws, affordability, equity, and balancing the need for the infrastructure with its impact on the environment and climate.

Accelerated implementation of Commission recommendations should be a top priority of executive branch agencies.

(27) Continue to prioritize development of a robust and flexible regional transmission infrastructure to remain a national climate leader.

As the building and transportation sectors are decarbonized, electricity demand will increase from a little less than 57 TWh in 2023 to almost 72 TWh in 2030—just 6.5 years from now.[193,194] Bringing online the cleaner power necessary to meet that demand, from offshore wind, Canadian hydropower, onshore wind, and other sources, will be a massive undertaking and challenges to projects along the way could delay or derail them. The Commonwealth should continue to prioritize development and optimization of its transmission infrastructure to support the import and export of clean power, lower energy costs, and improve system reliability and resilience.

As history has shown, however, that will not be enough. For example, public opposition in New Hampshire and then Maine has for years thwarted efforts to build a transmission line to bring hydropower from Quebec to the Commonwealth. EEA's work should be complemented by a large-scale public education campaign that helps the public understand the nature of the climate

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[192] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 620*: Establishing the Commission on Energy Infrastructure Siting and Permitting* (Sept. 26, 2023), https://www.mass.gov/executive-orders/no-620-establishing-the-commission-on-energy-infrastructure-siting-and-permitting.

[193] Sabrina Shankman, *Power Shift: In less than a decade, the state's electric grid must dramatically transform. It won't be easy,* THE BOSTON GLOBE (May 13, 2023), https://www.bostonglobe.com/2023/05/13/science/power-grid-new-england-climate-change/.

[194] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Massachusetts Workbook of Energy Modeling Results* (Jan. 2023), https://www.mass.gov/media/2553881/download.

emergency and the likely impacts to our region, as well as the climate and other co-benefits of clean energy and the required transmission infrastructure, which will nonetheless have environmental impacts. States through which such lines run must have clear benefits, and a coordinated effort to demonstrate regional benefits is critical. The Commonwealth should work to reduce to the greatest extent possible the environmental impacts of transmission infrastructure and make that a clear priority as it builds public support for these urgently needed projects.

EEA and DOER are working with state and regional partners to develop a multi-state invitation for innovative design concepts for issuance later this year for additional transmission infrastructure to position our region to compete in a subsequent round of U.S. Department of Energy (US DOE) funding. In addition, efforts are underway to establish a new regional, policy-focused transmission planning process as soon as next year that would allow the New England states to request that the Independent System Operator (ISO) New England issue a transmission procurement to integrate clean energy.

DOER will further manage a solicitation for up to 3.6 GW—enough generation to supply 25 percent of the Commonwealth's current electricity load—of offshore wind generation and related transmission and is charged with selecting winning proposals. DOER is additionally coordinating its transmission agenda with other states including through a shared transmission buildout in the waters off the New England coast.

Finally, EEA is also exploring with its state, regional and federal partners how to increase the amount of renewables/clean energy that can be imported into and exported out of New England by expanding interconnections with other regions (tie-lines) and developing infrastructure to integrate offshore wind.

(28) Expedite and prioritize efforts to resolve interconnection delays.

Interconnection is the process of connecting a distributed generation system (like a solar farm) to the electric grid. Prior to interconnection of a distributed generation system, the owner must obtain written approval from the local electric distribution company (electric utility) in the form of an Interconnection Service Agreement and subsequent Authorization to Interconnect.

Interconnection delays of up to eight years are threatening our ability to achieve our renewable energy targets and making projects uneconomic, particularly for solar project developers.[195] The challenges facing individual projects include lack of hosting capacity on the distribution and transmission systems, lack of necessary equipment (e.g., transformers), cost allocation methodologies that do not recognize all beneficiaries of grid upgrades, and historic underinvestment in distribution system infrastructure in certain locations. Further, traditional

[195] Ryan Kennedy, *Interconnection issues jeopardize New England's clean energy goals,* PV MAGAZINE (June 23, 2021), https://pv-magazine-usa.com/2021/06/23/interconnection-issues-jeopardize-new-englands-clean-energy-goals/.

utility planning is at odds with the sudden growth in demand for electrical system capacity and need for proactive distribution system planning for a future climate-ready grid that prepares for electrification and the interconnection of additional distributed energy resources. Although the existence of this problem preceded the Covid-19 pandemic and Russian invasion of Ukraine, supply chain constraints caused by these events have exacerbated the delays. Past approaches to resolve these delays have not resulted in speedier interconnection processes. Collectively, the Commonwealth, utilities, renewable power developers, and the DPU should prioritize near term resolution of this problem. Failure to resolve the interconnection barrier is a significant factor delaying our transition to clean energy and poses an existential threat to our ability to achieve our emissions reductions mandates.

Large-scale renewable energy projects seeking interconnection to the high-voltage transmission system face delays as well. There are more than 30,000 MW of clean wind, solar, and storage projects in the ISO New England interconnection queue. The Commonwealth, working with other New England states, ISO New England, and stakeholders, should advance solutions to ensure that resources that are ready to interconnect are not stalled by the ISO study queue process, incurring delays that magnify climate risk and increase costs. The Commonwealth is encouraged to see several key reforms in the Federal Energy Regulatory Commission's (FERC) final rule on *Improvements to Generator Interconnection Procedures and Agreements* (Order 2023), issued July 28, 2023, intended to streamline the interconnection process and ensure resources are able to interconnect to the transmission system in a reliable, efficient, transparent, and timely manner.[196]

According to the Energy Information Administration, in 2022, renewable electricity generation surpassed coal and nuclear power in the United States for the first time.[197] Wind has been the largest source of electricity generation in Kansas since 2019, when it surpassed coal's contribution.[198] That trend continued in 2022, when wind accounted for 47 percent of Kansas's total net generation.[199] By 2021, wind power constituted the largest share of electric power generation in Iowa, Kansas, and South Dakota.[200] By contrast, in 2021, of Massachusetts' total net generation, wind constituted one percent, hydro four percent, and solar less than 20 percent.[201]

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[196] FEDERAL ENERGY REGULATORY COMMISSION, *Improvements to Generator Interconnection Procedures and Agreements,* FERC Order No. 2023, FERC Docket No. RM22-14-000, 184 FERC ¶ 61, 054 (July 28, 2023), https://www.ferc.gov/media/e-1-order-2023-rm22-14-000 .

[197] U.S. ENERGY INFORMATION ADMINISTRATION, *Renewable generation surpassed coal and nuclear in the U.S. electric power sector in 2022*, https://www.eia.gov/todayinenergy/detail.php?id=55960 (last updated Mar. 27, 2023).

[198] U.S. ENERGY INFORMATION ADMINISTRATION, https://www.eia.gov/state/analysis.php?sid=KS (last updated June 15, 2023).

[199] Id.

[200] U.S. ENERGY INFORMATION ADMINISTRATION, *Coal was the largest source of electricity generation for 15 states in 2021*, https://www.eia.gov/todayinenergy/detail.php?id=54919 (last updated Dec. 7, 2022).

[201] U.S. ENERGY INFORMATION ADMINISTRATION, *Massachusetts*, https://www.eia.gov/state/print.php?sid=MA (last updated Oct. 20, 2022).

III. Public Health and Resilience

Climate change is already harming human health and damaging the built environment. The following recommendations address strategies the Commonwealth should undertake to adapt and respond to the impacts climate change currently is having and will have on our people, ecological systems, and infrastructure.

(29) Promote cross-Secretariat coordination with the Office of Climate Science to establish uniform guidance, standards, and use of statewide climate science and data.

Dedicated expertise and staff capacity is needed to support agencies and municipalities in understanding, accessing, and utilizing best available statewide climate science for purposes of developing policy, planning, and projects. The new team within EEA's Office of Climate Science should serve as a cross-Secretariat resource and provide subject matter expertise on statewide climate data and models, and support consistent application across agencies, within and outside of EEA. For example, the Department of Fish and Game (DFG) currently maintains scientific data and knowledge regarding climate impacts on species and ecosystems and EEA should develop a formal process for ensuring such data are taken into account in decision-making across the EEA agencies. As well, the EEA team should work closely with colleagues in EOHHS/DPH, who have and are developing data and expertise on climate and medical/health impacts. The EEA team should develop strong working relationships with academic institutions, federal agencies, and non-governmental organizations that have extensive climate science expertise.

(30) Develop a Comprehensive Coastal Resilience Plan, to be led by the Office of Coastal Zone Management (CZM), and establish a clear coordinating and oversight function within EEA senior leadership, and an interagency advisory body with representation from EEA, Massachusetts Emergency Management Agency (MEMA), DFG, the Department of Conservation and Recreation (DCR), DEP, MassDOT, EOHLC, DPH, and Climate Office, that will be responsible for implementing the Plan, securing funding, and informing state-led coastal resiliency projects in the Commonwealth.

With 1,500 miles of coastline, a strong maritime economy, and growing coastal population, the Commonwealth is particularly vulnerable to sea level rise and coastal impacts of extreme weather events, including storm surge. While there are many strong programs and regulatory efforts underway to address coastal impacts of climate change, these are spread across multiple agencies and the Commonwealth lacks a comprehensive plan that lays out how it will address a range of interrelated coastal resilience needs over the coming decades. Although there are varying

perspectives on what the Commonwealth needs to do, there is a high degree of agreement among advocates, researchers, philanthropy, and local governments that a centralized plan should be developed and that a central entity be tasked with primary responsibility for implementing the plan. More comprehensive coastal resilience planning is also a topic of interest to a number of members of the Legislature.

Such an entity could—but need not—be a new quasi-public agency; it could just as easily be a new division within an existing entity. The important characteristic will be its authority to convene other agencies and make science-based decisions in an efficient, transparent manner. EEA's Office of Coastal Zone Management has that authority, codified through state and federal agreement in 1978, including specific authority to prevent and mitigate threats to public safety, property and the environment from coastal erosion, flooding and storm damage.[202] With a strengthened charge, procedures to ensure inclusion of input from an expert interagency advisory body, oversight by senior EEA leadership, and adequate resources, CZM could successfully lead comprehensive coastal resilience planning and implementation for the Commonwealth.

As EEA's lead on coastal and ocean issues, CZM is developing the Resilient Coasts Plan, which will delineate coastal regions based upon current and future vulnerability to climate impacts and identify a policy framework for advancing coast-wide resilience action, including policy guidance and standards for built and natural infrastructure development within these areas. This effort will align with the Metro Boston Coastal Study, a 3-year planning study undertaken by EEA and the U.S. Army Corps of Engineers to develop a regional coastal vulnerability assessment and regional adaptation implementation plan for the seventeen municipalities in the Boston Harbor region.[203] The Resilient Coasts Plan should include clear and near-term timelines for implementation, in light of the urgent need for action.

EEA and MEMA engage agencies and municipalities on coastal resilience primarily through implementing the climate hazard mitigation measures in the ResilientMass SHMCAP.[204] The 2023 ResilientMass Plan, updating the SHMCAP, was approved by FEMA on September 15, 2023 and released on October 11, 2023.[205] Its cross-government action strategy identifies the need for the development of a comprehensive coastal resilience strategy.[206] EEA also implements MVP, which has engaged 99 percent of municipalities in climate planning and preparation (though this grant

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[202] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, *Findings of Robert W. Knecht Assistant Administrator for Coastal Zone Management National Oceanic and Atmospheric Administration Approval of the Massachusetts Coastal Zone Management Program*, (Apr. 24, 1978).

[203] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Boston Metropolitan Area Coastal Study*, https://www.mass.gov/info-details/boston-metropolitan-area-coastal-study (last visited Aug. 7, 2023).

[204] The 2023 SHMCAP identifies approximately 100 agency and cross-government actions to reduce the Commonwealth's risk to climate hazards and build resilience. The Resilient MA Action Team (RMAT) is an inter-agency working group charged with cross-government implementation of the SHMCAP and provides a regular forum for inter-agency updates and feedback related to plan implementation.

[205] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *Healey-Driscoll Administration Releases Readiness Plan to Protect Against Extreme Weather* (October 11, 2023) https://www.mass.gov/news/healey-driscoll-administration-releases-readiness-plan-to-protect-against-extreme-weather.

[206] The SHMCAP is a joint product between EEA and MEMA.

program is not limited to coastal resilience). The CZM Coastal Resilience Grant program also provides funding and technical assistance to coastal communities to restore the functions of coastal landforms, for example, salt marshes, and the protection and relocation of vulnerable public infrastructure. A key goal of EEA's resilience initiatives is to reduce disproportionate adverse effects of climate change on environmental justice and other vulnerable populations and ensure equitable distribution of resilience benefits.

The Commonwealth needs long-term planning that is clear-eyed about the total coastal resilience investment needed and the mechanisms to fund that investment. Assessing costs and putting a long-term plan in place to fund coastal resilience should be among the first and top priorities of the Resilient Coasts initiative. As well, while cities, towns, and individual property owners must be the ultimate arbiters of when managed retreat should be pursued, the Commonwealth can and should think about long-term fiscal, equity, and other impacts of continued state taxpayer support and/or subsidy for climate disaster response and redevelopment in high-risk areas subject to sea level rise, storm surge, and extreme storm damage—particularly high value, privately owned development that occurred after the likely impacts of climate change on Massachusetts coastal development were well known. Development impact fees and similar mechanisms should be considered for proposed new construction in any such locations to ensure the burden of climate risk is shouldered by developers, banks, and owners, and not the taxpayers.

To the greatest extent possible, coastal resilience should focus on nature-based solutions that enhance and restore the capacity of existing natural coastal resources that already protect our coastal communities from flooding, storm surge, and erosion, such as salt marshes, barrier beaches, and dunes, or on human-made technology that biomimics the functions of such features. To that end, it is vital that the permitting process for such nature-based solutions be less burdensome, and that EEA, DEP, DFG, and CZM, coordinating with federal agencies as necessary, by the end of 2023, identify a path to expedite state approvals for urgently needed actions to stem the loss of our existing coastal salt marshes.

(31) Prioritize investment in energy system resilience.

The urgent need for energy resilience continues to grow as increasingly frequent and severe weather events lead to disturbances on the electric distribution and transmission grids. When critical facilities such as schools, hospitals, cooling centers, and grocery stores are vulnerable to electricity outages, a community's inability to respond to an emergency compromises safety. This challenge is exacerbated in disadvantaged communities where many residents have no choice but to shelter in place.

Communities need help designing energy resilience solutions that can support critical facilities in a cost-effective manner. Clean energy solutions such as solar PV and energy storage can anchor such resilient energy systems while helping the state meet its clean energy deployment goals. The Commonwealth should prioritize investment in MassCEC's and DOER's energy resilience

programming to develop more energy resilient infrastructure and public and private critical facilities across the Commonwealth, improving our ability to manage and recover from widespread grid outages.

Some potential solutions, like community microgrids, have been well-studied by MassCEC and DOER in previous administrations. For example, the community microgrids program funded multiple feasibility studies to support development of islandable (ability to separate from the grid), multi-building resilient energy systems serving public and private critical facilities (hospitals, community centers, public schools, wastewater treatment plants) that were supported by clean energy assets (typically solar and storage). Projects supported included a microgrid, structured as a virtual power plant, in Chelsea, which recently secured financing. However, few of the projects were implemented, due to lack of incentives and complications with financing and legal structure. These experiences now present opportunities for policy innovation.

One barrier to the deployment of multi-user microgrids is the lack of clarity regarding the ownership of and access to certain electric grid assets during normal grid operations versus resilience events. Another barrier is the possible triggering of price regulation for a multi-building networked system. The DPU should take steps to clarify the regulatory treatment of such facilities, including identification of any necessary statutory changes.

MassCEC's Clean Energy and Resilience (CLEAR) program supports energy resilience at the level of the single building, and it has also supported pilot projects to ensure, for example—based on the lessons of Hurricane Sandy—continued operation of a gas service station.[207]

The question is not whether but when the Commonwealth will be struck by a devastating hurricane, heat dome, or other deadly climate-driven weather event; now is the time to invest in the resilient energy infrastructure that is necessary to keep our residents safe.

(32) EEA, EOHHS, EOPSS, MEMA, MassDOT, and EOHLC should develop and implement a comprehensive plan to ready the Commonwealth for the increasingly disruptive and dangerous impacts of climate change, building on the work of the Resilient Massachusetts Action Team (RMAT).

To ensure that Commonwealth communities are as resilient to the impacts of climate change as possible, the inter-agency Resilient MA Action Team (RMAT) should be properly supported to reduce impacts to populations, infrastructure, and vital ecosystems. Leading experts from academic institutions, nongovernmental organizations, and the private sector should be recruited

[207] MASSACHUSETTS CLEAN ENERGY CENTER, *Clean Energy and Resilience Program,* https://www.masscec.com/program/clean-energy-and-resilience-clear (last visited Aug. 10, 2023).

to support this effort. Among the areas of focus should be inland flooding, heat, migration, regional food and water security, climate disaster planning, and public health, including mental health.[208]

Inland Flooding

Extreme precipitation events can result in flooding, which can damage vulnerable infrastructure, harm ecosystems, and cause injury, disease, and death. Flooding associated with these events is sometimes categorized as inland flooding to distinguish it from coastal flooding. Climate change is expected to exacerbate the risk of inland flooding events by altering the intensity, duration, extent, and frequency of extreme precipitation. Additionally, changing land uses and increasing development can lead to a reduction in permeable surfaces and flood storage capacity, further increasing the risk of flooding.

As identified in the 2023 SHMCAP, EEA should develop both a Floodplain Management Coordination Framework and a Floodplain Management Plan.

A coordination framework should describe Commonwealth best floodplain management practices that consider climate change data and impacts. It should also identify best practices for municipalities to increase resilience standards for residential and non-residential construction in their communities.

A flood management plan should outline priority actions that can be taken statewide in the near term to address and mitigate floods and their impacts—including land purchases that allow for restoration of wetlands to enhance absorptive capacity for floodwaters. EEA and DEP should aggressively pursue regulatory options that reduce water pollution and also increase resilience, for example, updated stormwater standards requiring both management of increased volumes of stormwater from more extreme precipitation and increased levels of pollutant removal. Standards promoting green infrastructure as a cost-effective alternative to grey infrastructure will help achieve those objectives while also mitigating heat island effect. Such standards can provide a strong economic incentive to enhance flood storage capacity in urban areas and can be designed to prioritize environmental justice communities.

Heat

MEMA and EOHHS should also develop a new heat flag system in alignment with NOAA's Heat Advisory Criteria for Southern New England.[209] A heat flag system describes a process for

[208] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *MA Climate Change Assessment*, *supra* note 30. The 2022 Massachusetts Climate Change Assessment identified increased heat and inland flooding as top climate change risks with significant and near-term social, economic, and environmental impacts to the Commonwealth. These include health and cognitive effects from extreme heat, health effects from degraded air quality, damage to inland buildings, damage to electric transmission and utility distribution infrastructure, and reduced ability to work.

[209] NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, *Reference sheet for NWS-Norton Warning/Advisory Thresholds*, https://www.weather.gov/media/box/officePrograms/box_criteria_thresholds.pdf (last update July 1, 2022).

identifying days of extreme heat—and effectively communicating in advance heat risk, preparedness, and caution to the public.

Further, additional resources and guidance should be provided to municipalities to support expansion of cooling centers. During sustained extreme heat events, cooling centers are necessary to protect the public health of many Massachusetts residents. EOHHS and DPH are working with MEMA and the Climate Office to prepare Massachusetts for future heat events that are longer and hotter than the Commonwealth historically has experienced. DPH sent guidance to municipalities through their local boards of health in summer 2023 providing a health-based overview of the signs of heat stress and best practices for opening and operating a cooling center. EOHHS and DPH are further working with MEMA, the Climate Office, and other stakeholders to compile a comprehensive plan for heat-events.

Massachusetts provides toolkits to municipalities to educate residents to recognize and respond to heat emergencies within the context of MEMA's coordination with municipalities. MEMA monitors changes to weather patterns that could potentially impact health and safety or result in a need to adapt the Commonwealth's response, recovery, preparedness, or mitigation operations. For all emergencies, the response begins at the local level with MEMA providing or coordinating logistic and operational assistance as needed. Throughout the year, MEMA's twelve local coordinators work with municipalities to ensure they are prepared to respond to all emergencies. Part of the coordinators' work is providing technical assistance in the development of municipalities' all-hazards plan to address mitigation, preparedness, response, and recovery, known as a Comprehensive Emergency Management Plan (CEMP).

Further, the Executive Office of Veterans' Services (EOVS) is focusing on outreach and education to veterans throughout the Commonwealth through the Statewide Advocacy for Veteran Empowerment (SAVE) team, the Veteran Service Officers, and through the Chapter 115 program.[210] Each program is well suited to provide education and outreach to vulnerable veterans regarding plans for extreme heat, hurricanes, flooding, storms, or other destabilizing climate impacts. Utilizing all three channels maximizes the outreach to veteran populations, including vulnerable populations.

As the climate warms, the need for cooling in congregate settings becomes particularly vital. The Commonwealth should ensure adequate systems are in place to provide cooling within housing authority buildings, school buildings, and correctional facilities.

EEA and MassCEC should develop incentives for municipalities, businesses, and institutions to invest in energy resilience, design solutions that help to cool building interiors, and tree plantings and green space to reduce urban heat island effect.

[210] MASSACHUSETTS EXECUTIVE OFFICE OF VETERANS' SERVICES, *Chapter 115 Benefits/Safety Net Program*, https://www.mass.gov/info-details/chapter-115-benefitssafety-net-program (last visited Sept. 13, 2023).

EOHHS or DPH should consider appointing a chief heat officer—a position recently created by a number of cities (and under consideration by the state of California) to prepare for and manage climate-driven extreme heat events.[211]

Migration

The 2022 Massachusetts Statewide Climate Change Assessment identifies climate-driven in-migration from other regions of the United States as well as migration from other areas of the world to the Northeast as an urgent concern with a major level of consequence.[212] The assessment recognizes that the elevated incidence and intensity of extreme weather outcomes associated with climate change is causing migration to more climate-stable regions. The Northeast is projected to receive significant migration. The Commonwealth, led by EOHHS, EOED, EOHLC, EOPSS, and EEA should begin planning now—and partner with municipalities—to prepare to receive this migration. Planning for costs in the form of additional services and additional demands for housing (which can affect regional housing markets) should begin now. There are also economic development opportunities as this migration may help reverse trends in regional population decline. Extreme weather events in other locations can cause immediate and crisis-level impacts on cities and towns in the Commonwealth as Holyoke experienced when families fleeing the devastating impacts of Hurricane Maria on Puerto Rico sought refuge there. Beginning the process of planning now will help communities to prepare and build the human capacity to respond with skill and compassion to these events, which will become more common in the coming decades.

Food and Water Security

The Commonwealth should coordinate with other New England states to ensure measures are taken to enhance food and water security.

A 2023 study from the Greater Boston Food Bank, conducted in collaboration with Mass General Brigham, estimated that 1 in 3 adults in Massachusetts are food insecure, with the worst levels of food insecurity occurring geographically in western Massachusetts and among Black and Hispanic households.[213] As the climate changes, weather-related disruptions likely will affect parts of the country and the world from which we get our food, worsening food security in New England.[214] As of 2023, New Englanders consumed between 10 and 12 percent of regionally grown food.[215] In response to climate change, the Commonwealth should coordinate with neighboring states to strengthen local food systems and increase access to and the affordability of food for all.

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[211] Thad Rueter, *Chief Heat Officers Get into the Gov Tech Trenches*, GOVERNMENT TECHNOLOGY (Aug. 22, 2022), https://www.govtech.com/dc/articles/chief-heat-officers-get-into-the-gov-tech-trenches.

[212] MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS, *MA Climate Change Assessment*, *supra* note 30.

[213] THE GREATER BOSTON FOOD BANK, *Opportunities to Improve Food Equity and Access in Massachusetts: Ending Hunger Together* (2023), Ending-Hunger-Together_Opportunities-to-Improve-Food-Equity-and-Access.pdf (gbfb.org).

[214] Mara Hoplamazian, *More local food could increase New England's climate resilience. Animal processing capacity isn't ready,* NEW HAMPSHIRE PUBLIC RADIO (Apr. 19, 2022), https://www.nhpr.org/nh-news/2022-05-03/slaughterhouse-shortage-new-england-maine-climate-change-nh.

[215] Id.

The Commonwealth should also plan to enhance its water security. Although in New England we are fortunate to have abundant freshwater resources, as the population has grown, freshwater resources have experienced significant stresses in many areas during periods of drought. These stresses have been partially offset by declining rates of water withdrawals, with the deepest declines in withdrawals occurring here in Massachusetts and in the region's second most populous state, Connecticut.[216] Massachusetts should build upon this progress in preparation for climate change.

Climate Disaster Planning

MEMA and DHP, in coordination with the new EEA Office of Climate Science and other experts, should ensure tabletop and other disaster planning exercises account for the latest climate science and that the Commonwealth is adequately prepared for increasingly frequent extreme heat events, storms and other weather extremes, taking into account regional variations in vulnerability. Disaster planning should include specific plans for low-probability yet very high-risk catastrophic climate events to ensure viability of critical infrastructure and evacuation routes.

MEMA is continually facilitating a series of updates to emergency plans. The Department of Mental Health (DMH) supports these plans by providing trained crisis counselors to assist both survivors and responders and will participate in the planning process for further plan development. DMH has contracted with a training vendor to increase the number of trained crisis counselors, anticipating an increased number of natural disasters as a result of climate change.

Public Health

EOHHS should work with hospitals and other institutions to raise awareness of the public health—including disease transmission and mental health—impacts of climate change and ensure healthcare providers are adequately trained and prepared. To further this goal, EOHHS is convening a working group focused on Climate and Health to raise awareness of potential health harms resulting from climate change and its effects. The Department of Public Health's Bureau of Climate and Environmental Health (BCEH) plans to build health-related workforce capacity and expand technical support, trainings, and outreach to frame the public health issues and challenges related to climate adaptation, resilience, and mitigation. BCEH will work with direct care providers and healthcare professionals to educate them on climate and health and how to support their patients facing climate-related illnesses and challenges. Clear and focused workforce development and communication materials, including low-resource and easily implemented tools, will be shared with external partners such as community health workers and other health professionals, local health officials, and other state agencies. This workforce development complements the Commonwealth's larger workforce development initiatives stemming from the climate crisis.

[216] U.S. GOELOGICAL SURVEY, *New England Water Use* (Nov. 4, 2019), https://www.usgs.gov/centers/new-england-water-science-center/science/new-england-water-use#overview.

(33) Establish and implement a Commonwealth biodiversity goal.

Massachusetts should protect biological diversity (biodiversity) with a goal of preserving an appropriate percentage of our land in keeping with the 30 percent by 2030 goal reflected in the Kunming-Montreal Global Biodiversity Framework to address biodiversity loss, restore ecosystems, and protect indigenous rights.[217] Climate Office supports the early efforts of the Department of Fish and Game to assess an appropriate biodiversity goal for the Commonwealth. Climate change is driving biodiversity loss by altering terrestrial, marine, and freshwater ecosystems around the world leading to the loss of habitat, increased incidence of diseases, and mass mortality of animals and plants driving species extinction.[218]

Biodiversity enhances an ecosystem's resilience as well as its capacity to sequester carbon dioxide.[219,220] Biologically diverse forests are generally more resilient, that is, they are better able to recover from changes and disturbances; they are also more adaptable (better able to respond to changing conditions) because they have diversity at the genetic level (among trees of a given species), at the species level (among trees in a stand), and at the structural level (among the ages and sizes of trees in a stand).[221] Studies conducted across a range of forests around the world confirm that increasing biodiversity generally has a positive impact on the forest's overall productivity (including carbon storage) and resilience.[222] Protecting and restoring biodiversity therefore serves to maintain resilience in forests, and their ongoing capacity reliably to sequester and store carbon.[223]

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[217] U.N. ENVIRONMENT PROGRAMME, CONVENTION ON BIOLOGICAL DIVERSITY, *Kunming-Montreal Global Biodiversity Framework* (Dec. 19, 2022), https://www.unep.org/resources/kunming-montreal-global-biodiversity-framework.

[218] Jedediah F. Brodie & James E.M. Watson, *Human responses to climate change will likely determine the fate of biodiversity*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Feb. 15, 2023), https://www.pnas.org/doi/10.1073/pnas.2205512120.

[219] UNITED NATIONS, *Sustainable Development Goals*, *Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss* (2023), https://www.un.org/sustainabledevelopment/biodiversity/.

[220] CONGRESSIONAL RESEARCH SERVICE, *Forest Management for Resilience and Adaptation*, p. 0 (Summary) (Mar. 14, 2011), https://www.everycrsreport.com/files/20110314_R41691_ca771ba4edfdba529588ecc631db1c67eee5cdc0.pdf.

[221] Id.

[222] U.N. ENVIRONMENTAL PROGRAMME, SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY, *Forest Resilience, Biodiversity, and Climate Change,* pp. 17-28 (2009) https://www.cbd.int/doc/publications/cbd-ts-43-en.pdf. *See* Table 1 (pp. 20, 28) for a review of 20 studies that examined a relationship between diversity and production. The report summarizes its findings: "within a given biome, diverse forests are more biologically productive and provide larger and more reliable carbon stocks, especially in old-age stable forest systems. . . . Carbon sequestration is an ecosystem service that provides a vital contribution to climate change mitigation and this service can be enhanced by maintaining ecosystem resilience in space and time."

[223] Id.

In line with this recommendation, on September 21, 2023, Governor Healey issued Executive Order No. 618, Biodiversity Conservation in Massachusetts.[224] Massachusetts has 3,000,000 acres of forest, 1,500 miles of coastline, 2,522 square miles of state ocean waters, a vast network of rivers, and critical wetlands including 45,000 acres of salt marsh. These provide habitat for plants, animals, and other organisms which offer vital ecological, economic, and public health benefits to the people of Massachusetts. Pursuant to the Executive Order, the Commissioner of DFG will conduct a comprehensive review of the existing efforts of all executive department offices and agencies to support biodiversity conservation in Massachusetts and recommend biodiversity goals for 2030, 2040, and 2050 with strategies to meet these goals, including coastal and marine biodiversity, to halt and reverse the loss of species and habitats of Massachusetts, and which may include policy and conservation investment targets related to land protection and connectivity, habitat and species status, anticipated shifts in distribution and abundance, and critical restoration activities.[225]

(34) Publish data concerning the impact of climate change on public health as collected by the Department of Public Health.

DPH's Environmental Public Health Tracking (EPHT) is a public, online portal enabling all Massachusetts municipalities, local emergency planners, state agencies, community-based organizations, and other organizations conducting health impact analyses to collect and evaluate data on public health indicators, including the social and environmental factors that influence community health outcomes. Because DPH designated the impact of climate change on health as a public health priority in the Public Health Datawarehouse (PHD), climate change is now a public health indicator and can therefore be used in planning in a manner similar to other public health indicators, by pairing population demographic data including age, race, education, housing, and socio-economic status for any given municipality, with climate data including the number of days a given community is exposed to extreme heat conditions, flood risk from increased precipitation, and air quality concerns. [226]

DPH should educate stakeholders and the public about the availability of this information and its recommended uses to protect public health.

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[224] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, Executive Order No. 618*: Biodiversity Conservation in Massachusetts* (Sept. 21, 2023), https://www.mass.gov/executive-orders/no-618-biodiversity-conservation-in-massachusetts.

[225] Id.

[226] EXECUTIVE OFFICE OF HEALTH AND HUMAN SERVICES, MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH, *Massachusetts Environmental Public Health Tracking* (2023), https://matracking.ehs.state.ma.us/.

IV. Workforce

The need to reduce emissions and adapt to climate change will transform the Commonwealth's workforce. To implement the required mitigation and resilience measures, we need more electricians, HVAC technicians, EV mechanics, wind energy engineers, coastal resilience engineers, planners, regenerative farmers, bus and transit operators, PV installation technicians, climate finance experts, workers to collect, transport and aggregate organic waste for composting and biodigestion, and construction workers to retrofit buildings, among others. These recommendations address how the Commonwealth will build the workforce needed to power the clean energy transition and make our communities more resilient.

(35) Develop and implement a comprehensive, cross-agency plan for clean energy and climate resilience workforce development.

A comprehensive, cross-agency plan for developing Massachusetts' clean energy and climate resilience workforce is needed to align with the Commonwealth's climate mandates. The Massachusetts clean energy workforce will need to grow by an additional 29,700 full-time equivalent workers to meet the Commonwealth's 2030 greenhouse gas emissions reduction mandates.[227] This projected growth will require about 38,000 workers to be trained and ready to deploy some or all of their time on climate-critical work. Across all clean energy sectors, over 140 occupations will see job increases, and 20 of these occupations will account for 65 percent of jobs added in Massachusetts. To illustrate, the offshore wind industry, alone, is projected to grow in Massachusetts by 724 percent by 2030.[228]

A number of actions are currently underway to address clean energy and climate workforce needs, and these will be important components of any comprehensive cross-agency plan. Initiatives include new secondary school educational opportunities, adult education for job training and career pathways to help close the skills gaps, registered apprenticeship expansion, and workforce training programs to connect Massachusetts workers with clean energy jobs.

For example, the Workforce Skills Cabinet has identified building a talent pipeline and addressing a just transition for the clean energy industry as a major focus among high growth industry priorities. The Workforce Skills Cabinet's initiatives to date include supporting the creation of the Massachusetts Clean Energy Innovation Career Pathway for high school students, which will provide students with applied, hands-on learning opportunities in the renewable energy sector. This new pathway, designed by EOE and the Department of Elementary and Secondary Education

[227] MASSACHUSETTS CLEAN ENERGY CENTER, *Powering the Future: A Massachusetts Clean Energy Workforce Needs Assessment*, p. 5 (July 2023), https://www.masscec.com/resources/massachusetts-clean-energy-workforce-needs-assessment.
[228] Id.

(DESE) in partnership with MassCEC, will prepare the next generation of clean energy workers in Massachusetts by providing students experiential learning opportunities in the field.

Additionally, the Healey-Driscoll Administration launched MassTalent in June 2023 to streamline resources and connect employers with skilled workers in high-growth industries including the clean energy industry.[229] MassTalent partner organizations identified in-demand and projected high-growth occupations in clean energy including electricians, HVAC technicians, and electric power line workers.[230]

The Workforce Skills Cabinet will also focus on licensing, upskilling and reskilling the existing workforce, and engaging youth to raise awareness of skills and pathways for future careers in clean energy in coordination with the MassTalent initiative.

As well, MassCEC currently deploys $12 million in annual funding for Equity Workforce Development programming to support career training for priority populations (individuals residing within EJ or low-income communities, current and former fossil fuel workers, underrepresented communities, federally recognized and state acknowledged Tribes) and support for minority and women-owned businesses. These programs not only address the need to grow Massachusetts' clean energy workforce, but they also prioritize diversity, equity, and inclusion efforts across the full spectrum of economic opportunity, yielding both an increasingly diverse bench of highly trained new workers and a wider array of thriving minority- and women-owned business enterprises to help lead climate-critical work.

The Department of Corrections (DOC) is expanding its workforce programs to include training in green technologies for persons returning to their communities after incarceration. DOC is currently reviewing responses to its Green Training Programs request for information that sought vendors to provide training and certification in hybrid/electric automotive technology, solar photovoltaic installation, and wind turbine technology. As well, EOVS is currently working with EOLWD to build a new program focused on workforce skills development and opportunities for veterans.

These efforts, however, remain insufficient to prepare the Commonwealth workforce for the unprecedented energy system changes that are taking place and will continue over the next several decades. The world is undergoing a dramatic shift in how energy is produced, stored, and used, and that is occurring at the same time we are rapidly adapting to the disruptive impacts of climate change, which demands additional labor and expertise.

The Commonwealth should develop, by May 2024, a comprehensive, cross-agency plan to build the clean energy, climate, and resilience workforce that includes measurable targets and goals. The plan should be developed by MassCEC and the Workforce Skills Cabinet, with input from EEA, MassDOT, EOHHS, EOVS, and EOPSS. The plan should be reviewed and approved by Climate Office and the Director of Federal Funding and Infrastructure.

A comprehensive, cross-agency plan should:

[229] MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT, *MassTalent, supra* note 48.
[230] Id.

- Identify clear, actionable goals, metrics, responsibilities, and timelines for implementation, including quarterly progress reports to the Governor.
- Consider the feasibility of using a project management tool to ensure communication, clarity of goals and objectives, direct involvement of agency leadership, early intervention to course correct as necessary, and accountability.

- Reflect engagement with relevant stakeholders, including, in part, through the Climate Office via its Climate Pollution Reduction Grant convening, and through MassCEC in collaboration with the Workforce Skills Cabinet.

- Establish a centralized hub to coordinate and expand clean energy and climate workforce pathways, building on MassCEC's existing program.
- Integrate efforts by EOVS and DOC to expand workforce development opportunities for veterans and persons transitioning from incarceration.

(36) Develop and launch a Climate Service Corps.

The Commonwealth, led by MassCEC and the Climate Office, should establish a Climate Service Corps, consistent with the 2050 CECP, to drive awareness, engage residents and institutions, and develop career paths integral to climate-critical solutions. A Climate Service Corps is an organization that creates opportunities for people to take action to reduce emissions and make our communities more resilient. Efforts have been made to pass federal legislation that would establish a national Civilian Climate Corps. Building on the federal example, the Massachusetts Climate Corps would provide volunteer opportunities for all, and have particular programs focused on youth, preparing them for good-paying jobs in clean energy and climate resilience.

MassCEC's Clean Energy Internship Program and its Empower program, which supports community-based organizations serving EJ communities, provide a solid network of initial stakeholders, and there is strong interest among community colleges. The Climate Service Corps will provide longer-duration opportunities for a broad range of young adults, including those who are not currently engaged in post-secondary education, by introducing them to career paths, to potential training or educational opportunities, and to prospective employers. The Corps will include pre-apprenticeship opportunities for climate-critical trades.

Other states, including Maine, Michigan, and Hawaii, have launched Climate Service Corps in coordination with the national AmeriCorps program, which may also serve as an approach for Massachusetts. For example, the Maine Climate Corps offers programs to take action in eight areas: coastal zone, transportation, energy, housing, land and freshwater preservation, community resilience, education, and public health.[231]

[231] GOVERNMENT OF THE STATE OF MAINE, VOLUNTEER MAINE, *Maine Climate Corps*, http://volunteermaine.gov/serve-in-maine/climate-corps (last visited Jul 17, 2023).

As well, on September 20, 2023, the Biden-Harris Administration launched an analogous American Climate Corps to train young people in clean energy, conservation, and climate resilience skills.[232]

Climate Office will convene MassCEC, EEA EJ Office, and other stakeholders, in consultation with EOLWD and EOE, to develop preliminary recommendations for the Climate Service Corps by January 15, 2024.

V. Economic Development

Investments in economy-wide decarbonization will result in many direct and indirect economic benefits. Key direct benefits include the creation of new, good paying jobs and further strengthening of a long-term engine of economic growth. This recommendation addresses how the Commonwealth can continue to support climate innovation, bringing economic benefits and reducing the cost of achieving our goals.

(37) Develop and implement a comprehensive clean energy and climate economic development plan.

Massachusetts is home to a dynamic innovation ecosystem with expertise in the commercialization of new technologies, and is already a recognized leader in climate tech. Indeed, when it comes to climate tech, Massachusetts "punch[es] well above its weight."[233] For over a decade, the Commonwealth has cultivated the recipe for global success: access to venture capital and other investor networks; academic, R&D, and innovation resources; state laws and programs that have provided incentives and created early market adoption conditions; established climate tech clusters and incubators; and a network of entrepreneurs and start-ups.[234] We now have an unprecedented opportunity to leverage that expertise and ignite a clean energy revolution.

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[232] THE WHITE HOUSE, *Fact Sheet: Biden-Harris Administration Launches American Climate Corps to Train Young People in Clean Energy, Conservation, and Climate Resilience Skills, Create Good-Paying Jobs and Tackle the Climate Crisis* (Sept. 20, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/20/fact-sheet-biden-harris-administration-launches-american-climate-corps-to-train-young-people-in-clean-energy-conservation-and-climate-resilience-skills-create-good-paying-jobs-and-tackle-the-clima/.

[233] Rowan Jacobsen, *Can Boston's Energy Innovators Save the World?,* BOSTON MAGAZINE (May 31, 2023), https://www.bostonmagazine.com/news/2023/05/31/boston-clean-green-energy-climate/.

[234] *See, e.g.*, Thomas Burton & Billy Najam, *Cleantech Ecosystems: Why Massachusetts and California are Ahead of the Rest* (Nov. 10, 2010), MINTZ LEVIN, https://cityofshastalake.org/DocumentCenter/View/1351/App-3D_Cleantech-Ecosystems?bidId=.

The Commonwealth, however, currently lacks a comprehensive, coordinated plan for achieving that goal. EOED is currently leading a statewide economic development planning process that is in part focused on establishing and growing Massachusetts climate tech companies. The planning process has engaged leading companies and investors in the climate tech sector, and EOED is coordinating and collaborating closely with the Climate Chief, the Secretary of EEA, and the leadership of MassCEC to develop specific policy recommendations to foster climate tech innovation in Massachusetts.

The recommendations in the economic development plan should build upon and propose strategic expansion of the existing programs and investments that foster climate tech innovation in Massachusetts. For example, MassCEC currently acts as a venture funding entity for nascent climate technology companies in Massachusetts. Through a number of competitive processes for companies at distinct stages of technology readiness, such as the 2030 Fund, MassCEC supports early-stage climate innovation. In addition, a number of private sector energy investors in early-stage firms look to MassCEC as a bellwether and follow its guidance on investment in particular areas.

Massachusetts has the opportunity to enhance its position as a globally recognized leader in climate innovation, much as it is now recognized as the best place in the world for life sciences. To fully capitalize on this opportunity, the Commonwealth must have an investment strategy that leverages all of its economic development programs, and ensures climate tech companies have access to the capital required to innovate and scale in Massachusetts. MassCEC, in consultation with EOED, should develop a comprehensive strategy and investment plan that is well coordinated with academic institutions, private sector, municipalities, and existing climate tech incubators. That plan should have a clear vision, goals, metrics, and timelines. Additional capital authorizations required to fund this plan should be included in any bill filed to implement the statewide economic development plan. MassCEC and EOED should complete this work by spring of 2024, and include a strategy to implement the Governor's vision for a Commonwealth Climate Corridor.

VI. Education

The Commonwealth should enhance its efforts to educate our communities, including students, about the climate crisis. These efforts should include promoting a basic understanding of climate science and fostering the capacity of communities to deploy climate solutions.

(38) Support K-12 climate education curriculum.

Massachusetts leads the Nation in public education with math, science, and engineering as particular strengths. EOE should promote the adoption by school districts of a basic public-school

climate curriculum in addition to EOE's other climate-related programs. For example, as discussed in the accomplishments section above, EOE created a Clean Energy Innovation Career Pathway that builds upon math, science, and engineering skills and allows students to pursue careers in climate and clean energy.[235] On September 22, 2023, the Healey-Driscoll Administration announced six high schools preparing to pilot the Clean Energy Innovation Career Pathway.[236]

Further, EOE currently sponsors an initiative to collaborate with DESE and the Massachusetts Science, Technology, Engineering and Math (STEM) Council to engage stakeholders, curriculum providers, and education intermediaries to support high schools adopting high quality climate-related science course instructional curriculum.

In addition to its ongoing efforts, EOE should work with DESE to support the broad-based adoption by public school districts of a K-12 curriculum addressing climate change. Too few school districts currently have a basic public-school curriculum to teach children about climate change—what it is, the causes and projected impacts, and what can be done to avoid more dangerous levels of warming. Numerous stakeholders, including students themselves, have called for such a curriculum to be offered.

A climate curriculum would align to the DESE's frameworks, which are developed within DESE's governance to set forth standards and provide model curriculum units for subject matter. Local school districts have the authority to select curriculum including textbooks and materials to reflect the standards set forth in the frameworks. EOE should work with DESE to ensure the frameworks include standards for climate instruction. EOE should further support districts in identifying and utilizing the highest quality curriculum materials related to climate change, promoting selection by districts of those materials best aligned with existing curriculum frameworks. EOE should similarly broaden its current support of high school climate curriculum to include teacher professional development, materials (books, lesson plans, training modules, digital tools), and instructional technology.

Support for a K-12 climate curriculum should be accomplished consistently with the goals of pending legislation, to require current DESE environmental science and environmental protection standards to "promote an understanding of climate change including, but not limited to: (i) the human impact on the carbon cycle; (ii) the effect of climate change on life that exists on Earth; (iii) the effects of the environment on health, economics, and agricultural systems; (iv) the impact of climate change on the water cycle; and (v) the impact of the environment on natural disasters and weather."[237,238] Consistent with such proposed legislation, DESE is well positioned to help

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[235] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS, *Healey-Driscoll Administration Announces Clean Energy Innovation Career Pathway for High School Students, supra* note 47.

[236] MASSACHUSETTS EXECUTIVE OFFICE OF EDUCATION, *The Healey-Driscoll Administration Awards Planning Grants to 31 High Schools to Expand Innovation Career Pathways, 6 High Schools Preparing Brand New Clean Energy Pilot* (Sept. 22, 2023), https://www.mass.gov/news/the-healey-driscoll-administration-awards-planning-grants-to-31-high-schools-to-expand-innovation-career-pathways-6-high-schools-preparing-brand-new-clean-energy-pilot.

[237] An Act Implementing Elementary and Secondary Interdisciplinary Climate Justice Education Across the Commonwealth, BILL S.260, 193rd Session (Current).

[238] An Act to Include Climate Education in the Massachusetts Elementary and Secondary School Curriculum, BILL H.3887, 193rd Session (Current).

school districts select material and curriculum on climate change and to apply for funding to support these efforts. The knowledge and experience gained in this collaborative work between school districts and DESE in curriculum development well positions the Commonwealth to make improvements to Commonwealth standards for science, technology, and engineering "to include relevant and interdisciplinary climate change standards that will provide students with a deeper understanding of anthropogenic climate change," as called for in pending legislation.[239]

To address the climate crisis, EOE additionally offers other Youth Pathways[240] and Adult Workforce Pipeline activities relating to climate as follows, in addition to Clean Energy Innovation Career Pathway discussed above:

Youth Pathway Activities

- Collaborate with DESE and MassCEC to develop and provide Clean Energy and Climate Resilience College and Career awareness materials.
- Collaborate with DESE and MassCEC to develop and provide Clean Energy and Climate Resilience College Exploration Learning Modules to be used for youth (high schools and adults).
- Collaborate with the Mass STEM Advisory Council, MassCEC and the Climate Office to support development and deployment of STEM Week 2023 featured awareness opportunities and activities.
- Partner with DESE, EOLWD (YouthWorks), MassCEC, intermediaries (MassHire, Collaboratives, etc.), and industry partners to support scaling high school internships and co-op programs, including programs for out-of-school youth and young adults from low-income households.
- Collaborate with DESE to develop and provide high schools with clean energy and resilience-related curriculum modules, pre-apprentice options, and a catalog of related industry credentials to support high school students enrolled in Chapter 74 Career Technical Education (CTE) vocational programs.

Adult Workforce Pipeline Activities

- Collaborate with EOLWD, Commonwealth Corporation, and Mass Association of Community Colleges to develop and provide clean energy and resilience related curriculum modules, pre-apprentice options, and a catalog of industry credentials to support short-term adult training programs hosted by high schools through the Commonwealth's Career Technical Institute program including HVAC, plumbing, electrical, metal fabrication, carpentry, auto, and diesel.
- Collaborate with community colleges, state universities and UMass on development of wind and climate related training, certificate, and degree programs. Funding for planning

[239] An Act Implementing Elementary and Secondary Interdisciplinary Climate Justice Education Across the Commonwealth, BILL H.496, 193rd Session (Current).
[240] Youth Pathways refer to programs for students in grades 12 and below.

in FY 2024 and FY 2025 implementation would support development and scaling of program enrollment.

- Collaborate as requested with EOED and other state agencies to support public and private higher education institutions in securing and executing federal, state, and private sector sponsored climate research and development projects.

VII. Process

All Secretariats should undertake necessary actions to implement the recommendations of this report consistent with the timelines set forth herein. EOTSS will assist Climate Office in tracking progress across Secretariats.

(39) Development by Secretariat Climate Officers (SCOs) of plans setting forth all significant incremental steps and associated timelines for realizing each of the recommendations of this report.

Executive Order No. 604 provides in Section 4 that SCOs shall develop plans to advance the policies established under the Executive Order and by the Climate Office.[241] The SCO for each Secretariat should develop a plan, with the review and approval of the Secretary and the Climate Office, to implement the recommendations in this report. Where recommendations involve multiple Secretariats, Climate Office will assist in coordinating as necessary, and SCOs should work together to prepare discrete implementation plans, e.g., for clean energy and climate resilience workforce development. These plans are meant to be useful and helpful to Secretariats in tracking progress and project management and can take the form of a Gantt chart or similar.

[241] Governor Maura Healey, COMMONWEALTH OF MASSACHUSETTS*, EO 604, supra* note 1.

APPENDIX I: ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
AFCs	EV Adaptive Fast Chargers
A&F	Executive Office for Administration and Finance
BCEH	Bureau of Climate and Environmental Health
CDP	Climate Disclosure Project
CECP	Massachusetts Climate Energy and Climate Plan
CEDAC	Community Economic Development Assistance Corporation
CEISP	Commission on Clean Energy Infrastructure Siting and Permitting
CEMP	Comprehensive Emergency Management Plan
CEQ	White House Council on Environmental Quality
CIA	Cumulative Impact Analysis
CIP	Capital Investment Plan
Climate Office	Office of Climate Innovation and Resilience
CLEAR	MassCEC's Clean Energy and Resilience Program
CTE	Career Technical Education
CZM	EEA Office of Coastal Zone Management
DCAMM	A&F's Division of Capital Asset Management and Maintenance's (DCAMM)
DCFC	Direct current fast chargers
DCR	Department of Conservation and Recreation
DEP	Department of Environmental Protection
DER	DEP's Division of Ecological Restoration
DESE	Department of Elementary and Secondary Education
DFG	Department of Fish and Game
MassWildlife	Department of Fish and Wildlife
DMH	Department of Mental Health
DOC	Department of Corrections

DOER	Department of Energy Resources
DPH	Department of Public Health
DPU	Department of Public Utilities
EEA	Executive of Office of Energy and Environmental Affairs
EJ	Environmental Justice
EO 594	Executive Order No. 594: Leading by Example: Decarbonizing and Minimizing Environmental Impacts of State Government
EO 604	Executive Order No. 604: Establishing the Office of Climate Innovation and Resilience Within the Office of the Governor
EOE	Executive Office of Education
EOED	Executive Office of Economic Development
EOHHS	Executive Office of Health and Human Services
EOHLC	Executive Office of Housing and Livable Communities
EOLWD	Executive Office of Labor and Workforce Development
EOVS	Executive Office of Veterans' Services
EPA	U.S. Environmental Protection Agency
EPHT	The Department of Public Health's Environmental Public Health Tracking Portal
EOPSS	Executive Office of Public Safety and Security
EV	Electric vehicle
FHWA	Federal Highway Administration
GWSA	Global Warming Solutions Act
HVAC	Heating, ventilation and air conditioning
IAIS	International Association of Insurance Supervisors
IIJA	Infrastructure Investment and Jobs Act of 2021
IRA	Inflation Reduction Act of 2022
ISO New England	Independent System Operator New England
LBE	Leading By Example program

MassCEC	Massachusetts Clean Energy Center
MassDOT	Massachusetts Department of Transportation
MassDevelopment	Massachusetts Development Finance Agency
MassHousing	The Massachusetts Housing Finance Agency
Massport	Massachusetts Port Authority
MBTA	Massachusetts Bay Transit Authority
MEMA	Massachusetts Emergency Management Agency
MEPA	Massachusetts Environmental Policy Act
MHP	Massachusetts Housing Partnership
MOR-EV	Massachusetts Offers Rebates for Electric Vehicles Program
MSBA	Massachusetts School Building Authority
MVP	Municipal Vulnerability Program
MWRA	Massachusetts Water Resources Authority
NAIC	National Association of Insurance Commissioners
NECEC	New England Clean Energy Connect
NEVI	National Electric Vehicle Infrastructure
NWL	Natural and Working Lands
OSD	Operational Service Division
PET	Polyethylene terephthalate
PMO	Program Management Office
PV	Photovoltaic
RFI	Request for information
RFQ	Request for qualifications
RGGI	Regional Greenhouse Gas Initiative
RMAT	Resilient Massachusetts Action Team
SAF	Sustainable aviation fuels
SBTI	Science Based Target Initiative
SAVE	Statewide Advocacy for Veteran Empowerment

SCO	Secretariat Climate Officers
SHMCAP	State Hazard Mitigation and Climate Adaptation Plan
SIF	Sustainable Insurance Forum
STEM	Science, Technology, Engineering and Math
TCFD	Task Force on Climate Related Disclosures
U.S. DOE	U.S. Department of Energy
U.S. EPA	U.S. Environmental Protection Agency

APPENDIX II: CLIMATE-ORIENTED FEDERAL FUNDING TRACKER[242]

Source	Agency	Program Title	Type	$-MA Requested	Status
IIJA	DOER	US DOE Resilient and Efficient Codes Implementation	Competitive	3.9 M	Awarded
IIJA	DOER	US DOE Regional Clean Hydrogen Hubs	Competitive	MA included as part of a regional application	Not awarded
IIJA	DOER	US DOE Grid Innovation Program (GIP)	Competitive	$ 250 M	Not awarded
IIJA	DOER	US DOE Grid Innovation Program (GIP)	Competitive	$15.1 M	Application Submitted
IIJA	DOER	US DOE SEP Funding FY23 Allocation	Formula Grant	$5-8 M	Application Submitted
IIJA	DOER	US DOE SEP Funding (EE RLF Program)	Formula Grant	$1.87 M	Application Submitted
IRA	DOER	US DOE Home Efficiency Rebates (Homes)	Formula Grant	$73M	Plan Due in October
IRA	DOER	US DOE Home Electrification and Appliance Rebates (HEERA)	Formula Grant	$72M	Plan Due in October
IRA	DOER	US DOE Net-Zero Codes	Competitive	$20-50 M	Working on Application

[242] Status as of October 23, 2023.

IRA	EEA	USDA Urban Forestry Program	Competitive	$50 M	Not awarded
IRA	DOER	EPA GGRF - Solar for All	Competitive	$250M	Application Submitted
IRA	MassHousing	EPA GGRF Clean Community Investment Accelerator	Formula Grant	$10.6 M per institution	Application Process Ongoing
IRA	MassHousing	EPA GGRF National Clean Investment Fund	Competitive via Intermediaries	$14 B national total / approx. $250-500 M MA total	Project Information provided to Eligible Applicants
IIJA	DOER	US DOE Grid Innovation Program (GIP)	Competitive	$250 M	Competitive Process Underway to Identify Application for Next Year
IIJA	DOER	US DOE Energy Efficiency and Conservation Block Grant Program (EECBG)	Formula Grant	$2.5 M	Working on Application
IRA	TBD	EPA Climate Pollution Reduction Grant (Implementation)	Competitive	$10-$350 M	Working on Application
IRA	OCIR	EPA Climate Pollution Reduction Grant (Planning)	Formula Grant	$3 M	Application Submitted

IIJA	DOT	US DOT National Electric Vehicle Infrastructure	Formula Grant	$65 M	Application Submitted
IIJA	DOT	US DOT Charging and Fueling Infrastructure	Competitive	$15 M	Application Submitted
IIJA	DOT	US DOT PROTECT	Competitive	$40 M	Application Submitted
IIJA	MEMA	FEMA - BRIC	Competitive	$60 M	Applications Advanced to Next Round of Review
IRA	Local	EPA School Bus Grant	Competitive		Municipal Applications Submitted
IRA	Local	EPA School Bus Rebate	Competitive	$29 M	Applications Submitted and Additional Rounds under Development
IRA	EEA	NOAA Climate Resilience Regional Challenge	Competitive	$73 M	Application Submitted
IIJA	DOT	US DOT Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program	Competitive	$ 4 M	Applications Submitted

IIJA	EEA	Renewable Energy Siting through Technical Engagement and Planning (R-STEP)	Competitive	$1-2 M	Application in Development
IIJA	EEA	Renewable Energy Siting through Technical Engagement and Planning (R-STEP)	Competitive	$5.2 M	Application Submitted
IIJA	DPU	Transmission Siting and Economic Development Program (T-SED) Area of Interest 1	Competitive	TBD	Application in Development
IRA	DOER	State-Based Home Energy Efficiency Contractor Training Grants (CTG)	Competitive and Formula	TBD	Application in Development