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Turning Up the Heat on Cooling Down the Planet: Comparing the Climate Leadership Actions of Maryland and Massachusetts

APPENDICES

APPENDICES

Targets and Limits

Targets	Massachusetts	Maryland
Economy wide	GWSA: The legislation also authorizes EEA to establish emissions limits every five years and sub-limits for at least six sectors of the Massachusetts economy - electric power; transportation; commercial and industrial heating and cooling; residential heating and cooling; industrial processes; and natural gas distribution and service. Leading by Example (LBE): Reduce government energy consumption 35% by 2020; GHG emissions 40% by 2020 and 80% by 2050; 30% Renewable by 2020 (goal).	Reduce statewide emissions by 40% from 2006 levels by 2030.
Short Term (<10 years)	Establish an emissions limit of no less than 50% for 2030 of 1990 levels	Reduce statewide emissions by 40% from 2006 levels by 2030. 50% RPS by 2030 Requirement - RECs can be derived from Tier 1 Renewables within PJM, or from electricity delivered into PJM. A jump from 2.5% in-state solar to 14.5% by 2030; An increase from approximately 350 MW of offshore wind in 2022 to nearly 1600 MW of offshore wind in 2030. Tier 1 renewables to meet RPS includes biomass and waste-to-energy (including incineration)
Long Term (>10 years)	Establish an emissions limit of no less than 75% for 2040. No less than 85% by 2050 and target of Net Zero	In 2022, a report is due to the Governor and General Assembly assessing the progress toward the 40% emissions reduction and the GHG emissions reductions needed by 2050 in order to avoid anthropogenic changes to the Earth's climate system: 80-95% from 1990 levels
Other	Requires the state to set numerical benchmarks for the adoption of electric vehicles, charging stations, solar technology, energy storage, heat pumps, anaerobic digesters, and other clean technology solutions. These are required to align with new limits and sublimits every 5 years beginning in 2025.	GGRA 2030 Plan Requirements Develop the plans in recognition of the finding by the IPCC that developed countries will need to reduce GHG emissions by between 80% and 95% from 1990 levels by 2050; Analyze the feasibility of measures to comply with the GHG reductions required by the GGRA of 2016; Consider the impact on rural communities of any transportation-related measures proposed in the plans; Provide that a GHG emissions source that voluntarily reduces its GHG emissions before the Implementation of the GGRA of 2016 shall receive appropriate credit for its early voluntary actions; Provide for the use of offset credits generated by alternative compliance mechanisms executed

Targets	Massachusetts	Maryland
		within the State, including carbon sequestration projects, to achieve compliance with GHG emissions reduction required by the GGRA of 2016; Ensure that the plans do not decrease the likelihood of reliable and affordable electrical service and statewide fuel supplies; Consider whether the measures would result in an increase in electricity costs to consumers in the State; Consider the impact of the plans on the ability of the State to attract, expand, and retain commercial aviation services and conserve, protect, and retain agriculture; and Ensure that the GHG emissions reduction measures implemented in accordance with the plans: • Are implemented in an efficient and cost-effective manner; • Do not disproportionately impact communities or any other particular class of electricity ratepayers; • Minimize leakage; • Are quantifiable, verifiable, and enforceable; • Directly cause no loss of existing jobs in the manufacturing sector; • Produce a net economic benefit to the State's economy and a net increase in jobs in the State; and Encourage new employment opportunities in the State related to energy conservation, alternative energy supply, and GHG reduction technologies. COMAR Chap. 26 - regulations to reduce vented and fugitive emissions of methane from both new and existing natural gas transmission and storage facilities.
Takeaways	Updated, progressive targets have been established at regular intervals since GWSA was first implemented in 2008. Statutory requirement of 50% reduction in emissions from 1990 levels by 2030, 75% by 2040 and Net Zero by 2050. Requirements for sector-specific sublimits and numerical benchmarks for adoption of technologies to be established and updated in five-year intervals beginning in 2025. RPS of 40% by 2030	Required emission reduction of 40% from 2006 levels by 2030, with a goal (no requirement) of between 80% and 95% from 1990 levels by 2050. The plan cannot "Require greenhouse gas emissions reductions from the State's manufacturing sector." No sector sublimits or required technology deployment/adoption.

Legislation

Legislation	Massachusetts	Maryland
Targets	Global Warming Solutions Act (GWSA), SB. 9 An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy (2021), Executive Order 594: Leading by Example: Decarbonizing and Minimizing Environmental Impacts of State Government	Greenhouse Gas Reduction Act (GGRA) 2016, SB 516 Clean Energy Jobs Act
Authority	• EO 569. Establishing an Integrated Climate Change Strategy for the Commonwealth, represents the collaboration between the Office of the Governor, the Executive Office of Energy and Environmental Affairs, the Executive Office of Public Safety and Security, and key state, local and environmental stakeholders. • Executive Office of Energy and Environmental Affairs is the only state Cabinet-level office in the country that oversees both environmental and energy agencies • Executive Order No. 149 Flood Plain Management • Executive Order No. 181 Barrier Beaches • Executive Order No. 193 Agricultural Land • Executive Order No. 380 Protection and Preservation of the Westfield River • Executive Order No. 385 Planning for Growth • Executive Order No. 418 Assisting Communities in Addressing the Housing Shortage • Executive Order No. 552 Environmental Justice • Executive Order No. 569 Establishing an Integrated Climate Change Strategy for the Commonwealth • 310 CMR 7.00: Air Pollution Control • 310 CMR 7.70 Massachusetts CO2 Budget Trading Program • 310 CMR 7.71, which identifies the facilities that need to report, establishes methodologies for calculating and verifying emissions, and allows voluntary reporting by facilities for which it is not mandatory. • 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	• EC 01.01.2007.7 – Maryland Commission on Climate Change • EO 01.01.2019.08 - Energy Savings Goals for Government "Maryland Leads by Example" • EmPOWER Maryland Energy Efficiency Act (codified at Md. Code Ann., Public Utilities § 7-211). Established a goal to reduce per capita electricity usage and peak demand 15 percent by 2015. The 2015 goals were met statewide. In 2017, the General Assembly passed legislation that updated the EmPOWER statute to establish a new goal structure and cost-effectiveness requirements for the 2018-2020 and 2021-2023 program cycles. The new goal is an annual energy savings goal of 2% of gross energy sales. • Clean Energy Jobs Act - 50% RPS by 2030 Requirement. An existing PPRP study on RPS required by Chapter 393 of 2017 is expanded to include (1) additional impacts related to in-state clean energy generation as an increasing percentage of RPS and (2) an assessment of the costs, benefits, and any legal or other implications of expanding the geographic eligibility for renewable sources, as specified. - A jump from 2.5% in-state solar to 14.5% by 2030. - An increase from approximately 350 MW of offshore wind in 2022 to nearly 1600 MW of offshore wind in 2030. - Tier 1 renewables to meet RPS includes biomass and waste-to-energy (including incineration) • Maryland Offshore Wind Energy Act of 2013 amended the RPS to include offshore wind projects located between 10 and 30 miles off of Maryland's coast and to provide financial support for projects in the form of offshore wind renewable energy credits (ORECs). The law also created an application and review process for offshore wind developers to propose OREC projects tailored for Maryland. The OREC process is coordinated by the Maryland Public Service Commission (PSC). • 2015, SB 398: Electricity - Community Solar Energy Generating System Program • SB 936: Maryland Clean Energy Incentive Act of 2016; Extension of Credit against the State income tax for electricity-producing facilities

Legislation	Massachusetts	Maryland
	• 310 CMR 7.74 in 2017 to impose annually declining limits on emissions from MA fossil plants • 310 CMR 7.75 Clean Energy Standard settings a minimum percentage of electricity sales that utilities and competitive suppliers must procure from clean energy sources, beginning at 16% in 2018 and increasing 2% annually to 20% in 2020 with the obligation in 2020 at 16% and the 2030 obligation at 35% of retail electric supply and 80% in 2050. • 31 CMR 7.76 – Prohibitions on the Use of Certain Hydrofluorocarbons • 225 CMR – DER regulations including energy conservation, energy efficiency standards, RPS, SMART program and clean peak energy portfolio standard. • 14 CMR 188.00: An Act to Promote Energy Diversity	using specified qualified energy resources and established the Maryland Clean Energy Incentive Tax Credit Reserve Fund. • HB1325 – Oil and Natural Gas - Hydraulic Fracturing – Prohibition • HB1456 – Offshore Drilling Liability Act • Sea Level Rise Inundation and Coastal Flooding - Construction, Adaptation, and Mitigation Act (House Bill 1350 / Senate Bill 1006) 2018 • CARES (proposed) - Both renewable energy and additional zero- and low-carbon electricity sources to meet that goal where most cost-effective, including: - Additional Maryland solar power beyond the current RPS requirements; - New efficient Combined Heat and Power (CHP) systems in Maryland buildings; - New nuclear power; and - Natural gas or qualifying biomass power plants with carbon capture and storage (CCS). • Utility Regulation – Consideration of Climate and Labor. This bill requires the Power Plant Research Program (PPRP) to include an evaluation of the impact of electric power plants on climate change as part of its ongoing research, as specified. Separately, the Public Service Commission (PSC), in supervising and regulating public service companies, must consider (1) the maintenance of fair and stable labor standards for affected workers and (2) additional specified climate effects and greenhouse gas (GHG) emissions. Relatedly, PSC may not take final action on a Certificate of Public Convenience and Necessity (CPCN) without considering the effect of climate change on the project and, for a generating station, the impact of the project on GHG emissions and its consistency with the State's GHG emissions reduction goals.
Funding	• MassSave - 2 cents per kilowatt-hour surcharge for MA residents. The Mass Save programs are funded by a variety of sources, the largest of which are a historical System Benefit Charge (SBC) and the Energy Efficiency Reconciliation Factor (EERF) created by the Green Communities Act. About 11 percent of Mass Save's funding also typically comes from the Regional Greenhouse Gas Initiative's carbon dioxide allowance auction proceeds • Over $2.4 billion in capital allocations for investments in safeguarding	• Strategic Energy Investment Fund - Funded primarily through proceeds from the auction of GHG allowances under RGGI, to implement energy programs that promote affordable, reliable, and cleaner energy for Maryland residents. • Environmental Trust Fund - 2016 Maryland Code Natural Resources Title 3 - Environmental Programs Subtitle 3 - Power Plant Research Program § 3-302. Environmental Trust Fund. there is established as an added cost of electricity distributed to retail electric customers within the State, an environmental surcharge per kilowatt hour of electric energy distributed in

Legislation	Massachusetts	Maryland
	residents, municipalities and businesses from the impacts of climate change, protecting environmental resources, and improving recreational opportunities. Codifies elements of EO569, such as the development and updates of the state climate adaptation plan and the establishment of vulnerability assessment framework and grant program for municipalities. The bill authorizes over $500 million to climate change resiliency efforts and stipulates those investments made by EEA and its agencies must be consistent with the state climate adaptation plan. The legislation includes over $350 million in authorizations for critical infrastructure and the prevention, adaptation and mitigation of climate change. $185 million is authorized for investments in coastal and inland infrastructure, such as dams and seawalls, as well as nature-based solutions for climate change resilience. Another $100 million is authorized for continuous implementation of the integrated state hazard and climate adaptation plan, and $75 million to partner with cities and towns in the municipal vulnerability preparedness program. Other key capital authorizations to address climate change include $16.5 million for the Executive Office of Public Safety and Security to develop and support climate-based emergency response and natural hazards preparedness programs; and $10 million for the climate change science and data program to track and monitor impacts from climate change, and the maintenance and expansion of the climate change clearinghouse data and tools available to municipalities. • Total Environmental Affairs budget 2021: $564.4 M	the State to be paid by any electric company as defined in § 1-101 of the Public Utilities Article. The Public Service Commission shall impose the surcharge per kilowatt hour of electric energy distributed to retail electric customers within the State and shall authorize the electric companies to add the full amount of the surcharge to retail electric customers' bills. • Resiliency Authorities - Resilience Authorities the ability to draw on a range of funding options for resiliency projects. Resilience Authorities may charge and collect non-tax related fees, issue or sell state or local tax-exempt bonds, and utilize local, state, nonprofit funding to provide capital for projects. They may also combine any of these funding mechanisms. • MDE Budget 2021: $442. 1 M
No Rollbacks	None.	• Section 2-1206 blocks action on manufacturing and industry. • CARES (proposed) would enable natural gas and biomass with CCS technology to qualify as renewable; refocus on nuclear. • CEJA – Waste incineration classified as a Tier 1 Renewable
Other		

Legislation	Massachusetts	Maryland
Takeaways	• Strong leadership Initiatives with consistently progressing legislation to move forward targets and requirements. • Large public funding initiative ($1B+) available for climate related projects in addition to state budget and efficiency programs; interest in green financing bank, but no action taken. • GWSA and SB9 contain extensive prescriptive language for key sectors.	• Minor new legislation since initial passage of GGRA, with efforts primarily concerned with increased renewable generation. • No exclusive funding source for programs outside of funding through EmPower, RGGI, etc. and state budget allocations. • Resilience Authorities are limited to local jurisdictions, not state level action. • 2016 GGRA economic development requirements (Section 2-2016) may enable rollback of targets. • CARES Clean Energy Standard seeks to augment targets with inclusion of fossil resources. • GGRA language is broad and short without directives for implementation

Equity and Justice

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Equity and Justice	• SB9. The environmental justice council shall conduct a comprehensive analysis by not later than July 31, 2022, and every fifth year thereafter, to ensure the definition of environmental justice population achieves the objectives of the environmental justice principles, pursuant to the definitions of environmental justice population and environmental justice principles contained in section 62. The analysis shall include, but not be limited to, an evaluation of this definition as compared to the demographics of environmental justice populations in the commonwealth. As part of the analysis, said council shall provide advice and make recommendations to the secretary on any necessary changes to the percentage thresholds included in this definition and any related regulation. The secretary shall consider the recommendations of the council regarding any proposed changes to the percentage thresholds under this definition; provided, however, that such changes are needed to achieve and promote the environmental justice principles as defined under said section 62. Proposed regulations shall be adopted only after the approval of the council by a majority vote in the affirmative of those members so voting. The environmental justice council may recommend and provide advice to the secretary on proposed substantial legislative or regulatory changes related to this definition at any time prior to conducting a comprehensive analysis. • An environmental impact report shall contain: (i) statements describing the nature and extent of the proposed project and its environmental and public health impact as result of any development, alteration and operation of the project; (ii) studies to evaluate said impacts; (iii) all measures being utilized to minimize any anticipated environment and public health damage; (iv) any adverse short-term and long-term environmental and public health consequences that cannot be avoided	• No specific analysis requirement, only that GGRA actions "Do not disproportionately impact rural or low–income, low–to moderate–income, or minority communities or any other particular class of electricity ratepayers."

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	should the project be undertaken; and (v) reasonable alternatives to the proposed project and their environmental consequences. Said report shall contain statements about the results of an assessment of any existing unfair or inequitable environmental burden and related public health consequences impacting the environmental justice population from any prior or current private, industrial, commercial, state, or municipal operation or project that has damaged the environment. The required assessment shall conform to the standards and guidelines established by the secretary. If the assessment indicates an environmental justice population is subject to an existing unfair or inequitable environmental burden or related health consequence the report shall identify any: (i) environmental and public health impact from the proposed project that would likely result in a disproportionate adverse effect on such population; and (ii) potential impact or consequence from the proposed project that would increase or reduce the effects of climate change on the environmental justice population. The secretary may require that an assessment be performed at any stage of the review process.	
Public Health	• SB9 Institutionalizes definitions for environmental benefits, environmental burdens, environmental justice populations, environmental justice principles, and neighborhoods. • The Act expands the Massachusetts Environmental Policy Act (MEPA) review process to require EEA to prepare a state environmental impact report for any project that is "likely to cause damage to the environment and is located within a distance of one mile of an environmental justice population." For projects that impact air quality, environmental impact reports are required "if the project is likely to cause damage to the environment and is located within a distance of five miles of an environmental justice population." If EEA's environmental impact report	• There are numerous safeguards in the Code of Maryland Regulations related to the GGRA of 2016, which specifically address considerations for a variety of vulnerable populations and historically disadvantaged communities that have been evaluated. These include consideration of the impacts of implementation of the 40% by 2030 plan may have on: electricity costs; the availability of reliable and affordable electrical service and fuel supplies; the state's agricultural and manufacturing sectors; and rural or low-income, low- to moderate-income, or minority communities. Specific protections related to public health, jobs, and the economy are discussed below. The state must ensure that equity as well as climate and environmental justice are key principles of climate policies moving forward. Maryland must also ensure that residents and businesses across all communities have ample opportunity to shape and comment on climate policy, direct

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	determines that an environmental justice population is subject to "an existing unfair or inequitable environmental burden or related health consequence," the report must identify "any: (i) environmental and public health impact from the proposed project that would likely result in a disproportionate adverse effect on such population; and (ii) potential impact or consequence from the proposed project that would increase or reduce the effects of climate change on the environmental justice population." • The Act defines an "environmental justice population" as "a neighborhood that meets at least one or more of the following criteria: • the annual median household income is not more than 65 percent of the statewide annual median household income; • minorities comprise 40 percent or more of the population; • 25 percent or more of households lack English language proficiency; or • minorities comprise 25 percent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 percent of the statewide annual median household income." • The Act also establishes an environmental justice council. The Governor will appoint nine to 15 members to the council to provide recommendations on policies and standards to meet environmental justice principles. By July 31, 2022, and every five years thereafter, the council must evaluate and analyze the definition of an "environmental justice population" and provide advice and policy recommendations to EEA when needed, to ensure the objectives of the state's environmental justice principles, as defined in the Act, are being met.	resources from climate programs like RGGI to help disadvantaged communities address climate change and benefit from the transition to cleaner energy. • Maryland has identified EJ as an ethical mandate and seeks equal protection from environmental and public health hazards for all residents regardless of race, income, culture and social class. A key piece of the 2030 GGRA Plan is Maryland's commitment to ensure that equity and environmental justice are key principles of all climate policies moving into 2021. • The Commission on Environmental Justice and Sustainable Communities (CEJSC) is a twenty-member body that is tasked with advising State government on environmental justice and analyzing the effectiveness of State and local government laws and policies to address issues of environmental justice and sustainable communities. • No specific analysis requirements. Statute is: "The Commission shall: 1. Advise State government agencies on environmental justice and related community issues; 2. Review and analyze the impact of current State laws and policies on the issue of environmental justice and sustainable communities; 3. Assess the adequacy of State and local government laws to address the issue of environmental justice and sustainable communities; 4. Coordinate with the Children's Environmental Health and Protection Advisory Council on recommendations related to environmental justice and sustainable communities; 5. Develop criteria to assess whether communities in the State may be experiencing environmental justice issues; and 6. Recommend options to the Governor for addressing issues, concerns, or problems related to environmental justice that surface after reviewing State laws and policies, including prioritizing areas of the State that need immediate attention."
Economic Hardship	• SB9 authorizes municipalities, including those with environmental justice populations at high risk from the effects of climate change, to approve one or more solar energy projects (paired with energy storage, where feasible) that are owned and operated by an electric or gas	• SEIF Strategic Energy Investment Fund (SEIF) l, a non-lapsing fund established by for low-income rate assistance and clean energy and energy efficiency investments. The primary source of funding for SEIF comes from carbon allowance auctions through Maryland's participation in the Regional Greenhouse Gas Initiative. Half or more of the funds going into

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	distribution company. The intent of such projects is to "improve community climate adaption and resiliency or contribute to the commonwealth meeting its carbon emissions limits." Municipalities with environmental justice populations are to receive a preference for participation in such projects. Projects undertaken by an electric or gas distribution company on behalf of a municipality are eligible for cost recovery, subject to criteria defined in the Act. • The Act directs EEA to create a grant program to provide solar energy technology to eligible non-profit organizations offering services such as food security, homelessness, and emergency shelter. The program's budget is not to exceed $500,000 per fiscal year, subject to appropriation, and no grant amount can exceed $50,000. • Gives the Massachusetts Clean Energy Center (MassCEC) $12 million in new annual funding for clean energy workforce development for minority and women owned small businesses, environmental justice communities, and fossil fuel workers. The program would provide educational and professional development, job placement, startup opportunities, and grants to participants • What about issues other than RE?	the SEIF for energy efficiency as a result of § 2–1002(g) of the Environment Article must be targeted at low- or moderate-income Maryland residents. • SEIF to provide $7.0 million in funding for access to capital for small, minority, women, and veteran-owned businesses in the clean energy industry under the Small, Minority, and Women-Owned Businesses Account (SMWOBA) in Commerce, subject to specified conditions, including an annual reporting requirement. The funding must be allocated in annual increments from fiscal 2021 through 2028, MEA must also use SEIF to invest in pre-apprenticeship, youth apprenticeship, and registered apprenticeship programs to establish career paths in the clean energy industry under the Maryland Employment Advancement Right Now (EARN) program. Subject to specified requirements, starting in fiscal 2021, $1.5 million must be transferred for grants to pre-apprenticeship jobs training programs and $6.5 million must be transferred for grants to youth and registered apprenticeship jobs training programs until all amounts are spent. • The EmPOWER Low Income Energy Efficiency Program (LIEEP) and the Multifamily Energy Efficiency and Housing Affordability Program (MEEHA) provide grants and deferred loans to limited income households and individually metered affordable housing managers respectfully. These awards fund installation of energy conservation measures in homes and buildings. Funding is provided by ratepayers of the participating EmPOWER Maryland utility companies. These funds are regulated by the PSC
Takeaways	• Environmental Justice is codified in regulations and an environmental justice council was established. By July 31, 2022, and every five years thereafter, the council must evaluate and analyze the definition of an "environmental justice population" and provide advice and policy recommendations to EEA when needed, to ensure the objectives of the state's environmental justice principles, as defined in the Act, are being met. • SB9: "An environmental impact report shall be required for any project that is likely to cause damage to the environment that is not insignificant and is located within a distance of 1 mile of an environmental justice population.	• The Commission on Environmental Justice and Sustainable Communities (CEJSC) was established in 2001 to review actions and make recommendations to the governor • No specific environmental justice analysis is provided by regulation. Language in GGRA: MDE must ensure the plans "Do not disproportionately impact rural or low–income, low– to moderate–income, or minority communities or any other particular class of electricity ratepayers;" • (CEJA) The Maryland Energy Administration (MEA) must use SEIF to provide $7.0 million in funding for access to capital for small, minority, women, and veteran-owned businesses in the clean energy industry under the Small, Minority, and Women-Owned Businesses Account (SMWOBA) in Commerce, subject to specified conditions, including an annual reporting requirement.

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	Said report shall contain statements about the results of an assessment of any existing unfair or inequitable environmental burden and related public health consequences impacting the environmental justice population from any prior or current private, industrial, commercial, state, or municipal operation or project that has damaged the environment. If the assessment indicates an environmental justice population is subject to an existing unfair or inequitable environmental burden or related health consequence the report shall identify any: (i) environmental and public health impact from the proposed project that would likely result in a disproportionate adverse effect on such population; and (ii) potential impact or consequence from the proposed project that would increase or reduce the effects of climate change on the environmental justice population. The secretary may require that an assessment be performed at any stage of the review process." To further the environmental justice principles the secretary shall direct its agencies, including he departments, divisions, boards and offices under the secretary's control and authority, to onsider the environmental justice principles in making any policy, determination or taking any other action related to a project review, or in undertaking any project pursuant to said 38 of 56 sections 61 through 62J, inclusive, and related regulations that is likely to affect environmental justice populations. In addition, the secretary shall establish standards and guidelines for the implementation, administration and periodic review of environmental justice principles by the executive office of energy and environmental affairs and its agencies • Final plans must summarize the steps taken by the commonwealth to improve or mitigate economic, environmental and public health impacts on low- or moderate-income individuals and environmental justice populations.	• (CEJA)MEA must also use SEIF to invest in pre-apprenticeship, youth apprenticeship, and registered apprenticeship programs to establish career paths in the clean energy industry under the Maryland Employment Advancement Right Now (EARN) program. Subject to specified requirements, starting in fiscal 2021, $1.5 million must be transferred for grants to pre-apprenticeship jobs training programs and $6.5 million must be transferred for grants to youth and registered apprenticeship jobs training programs until all amounts are spent.

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	• DPU shall annually transfer funds to the MA Clean Energy Center for the purposes of implementing the clean energy equity workforce and market development program; provided, that the department shall transfer no less • than $12,000,000 no later than December 31 each year	
Economic Recovery		
Jobs and Growth	• SB9 directs the creation of a "clean energy equity workforce and market development program" within the Massachusetts Clean Energy Technology Center to "provide workforce training, educational and professional development, job placement, startup opportunities and grants promoting participation in the commonwealth's energy efficiency, clean energy, and clean heating and cooling industries to: (i) certified minority-owned and women-owned small business enterprises; (ii) individuals residing within an environmental justice community; and (iii) current and former workers from the fossil fuel industry." The Act authorizes at least $12 million per year in program funding, which will be funded by customer charges to implement electric and gas energy efficiency programs. • In June 2020, the Massachusetts House of Representatives, led by Speaker Robert DeLeo, created a Green Recovery Task Force comprised of House members of the Joint Committee on Telecommunications, Utilities, and Energy following the major impacts of the COVID-19 pandemic in the Commonwealth. The House Green Recovery Task Force is dedicated to protecting the clean energy economy from the effects of the pandemic, and recommending aggressive policy action to mitigate our carbon footprint, while creating jobs and advancing social and economic justice for residents all across the Commonwealth.	• Clean Energy Workforce Program - The EARN program was established in 2013 to create industry-led partnerships to advance the skills of the State's workforce, grow the State's economy, and increase sustainable employment for working families. Specifically, the program provides general fund grants job-readiness and skills training. In 2019, the Maryland General Assembly passed the Clean Energy Jobs Act, which in part, establishes the Clean Energy Workforce Account in the EARN Maryland program. • CEJA Established the Clean Energy Workforce Account for training programs related to: (i) renewable energy; (ii) energy efficiency; (iii) energy storage; (iv) resource conservation; and (v) advanced transportation • Department of Commerce: Job Creation and Economic Development Initiatives Related to Climate Change - This voluntary program promotes economic development opportunities associated with reducing GHG emissions in Maryland. There are six areas of focus: - Strengthen coordination and communication across State agencies, partners and stakeholders to provide strategic vision for advancing a green economy. - Promote energy and resource efficiency efforts. - Develop and foster clean, local energy production and industrial capacity. - Capitalize upon economic opportunities to restore and protect Maryland's natural resources. - Promote sustainable development practices that create jobs, generate prosperity and make Maryland more self-reliant. - Increase access to capital for green businesses and projects. • Maryland Offshore Wind Workforce Training Program

	Massachusetts	Maryland
Fiscal Stability		• An analysis of the overall economic costs and benefits to the state's economy, environment, and public health of a continuation or modification of the requirement to achieve a reduction of 25% in statewide greenhouse gas emissions by 2020, including reductions in other air pollutants, diversification of energy sources, the impact on existing jobs, the creation of new jobs, and expansion of the state's low carbon economy. As a result: • In 2019, MDE tasked the Regional Economic Studies Institute at Towson University (RESI) with evaluating economic dislocations resulting from potential carbon mitigation strategies. These economic dislocations included direct impacts to fossil fuel-reliant workers, fiscal impacts resulting from industry changes at the local level, and other related disparities associated with the State's efforts to reduce GHG emissions. Additionally, to meet the objectives set in the State's 40 by 30 Plan, MDE requested strategies for transitioning impacted fossil fuel-reliant workers and mitigating other economic dislocations associated with GHG reduction efforts. • The report found that each of 3 policy scenarios which achieved emissions reduction targets for 2030 also achieved necessary 2030 economic goals. Policy scenario 3 (mitigation working group reccomendations) had the highest positive impact through 2030, which Policy scenario 2 (CES) had the lowest. • A fourth policy scenario was modeled that used scenario 1 as a baseline, with additional actions taken from scenarios 2 and 3 (used as a forecast for GGRA 2019)
Takeaways	• State funding allocated to the Massachusetts Clean Energy Technology Center to "provide workforce training, educational and professional development, job placement, startup opportunities and grants promoting participation in the commonwealth's energy efficiency, clean energy, and clean heating and cooling industries, with specific provisions for EJ populations. • No specific green recovery program established to date; COVID relief package included $400M for water and sewer infrastructure, $300M for culverts, dams and other environmental infrastructure, $100M for state parks	• State funding allocated to the Clean Energy Workforce Program. for training programs related to: (i) renewable energy; (ii) energy efficiency; (iii) energy storage; (iv) resource conservation; and (v) advanced transportation • No specific green recovery program established to date, no environment specific programs in COVID relief package.

Whole of Government

Whole of Government	Massachusetts	Maryland
State Executive Agency Participation	• Executive Office of Energy and Environmental Affairs: The only state Cabinet-level office in the country that oversees both environmental and energy agencies. Oversight of: - Department of Agricultural Resources - Department of Conservation and Recreation - Department of Energy Resources - Department of Fish and Game - Department of Public Utilities - Department of Environmental Protection - Office of Coastal Zone Management - Environmental Police - Environmental Trust - Environmental Policy Act Office - Administrative Council on Toxics Use Reduction - Advisory Committee to the Administrative Council on Toxics Use Reduction - Division of Conservation Services - Water Resources Commission - Water Infrastructure Advisory Committee - EEA Office of Grants and Technical Assistance - Drought Management Task for Office of Technical Assistance and Technology	• MDE oversees implementation of all GGRA Programs, with programs established across agencies: - MEA: Oversight of EmPower Maryland in conjunction with PSC and Maryland Utilities, Energy Efficiency and Clean Energy Programs under SEIF, MD RPS, development/implementation of CARES (proposed only) in conjunction with MDE - DNR: Forestry and Sequestration, Ecosystem Markets Programs - MDOT: Transportation Technologies, Multimodal Freight, Public Transportation, Pricing Initiatives, Bicycle and Pedestrian Initiatives, Port Partnership - MPA: Port Partnership - DGS: Leadership-by-Example (energy savings in buildings) - DHCD: Housing and Building Energy Programs - Labor: Building and Trade Codes - MDP: Land Use Programs - Commerce: Lead for job creation and economic development initiatives related to climate change • Maryland Commission on Climate Change - MCCC Act of 2015. The tasks and responsibilities assigned to the MCCC under the act are generally similar to those under the 2014 Executive Order, including the requirement to report to the Governor and General Assembly each year on the status of the state's efforts to "mitigate the causes, prepare for and adapt to the consequences of climate change, including future plans and recommendations, if any, to be considered by the General Assembly." The MCCC now has representatives from the administration, the legislature, business, nonprofit organizations, academia, and local governments.
State Interagency Coordination	• Executive Office of Energy and Environmental Affairs oversees coordination of agency programs and interagency partnerships. • Resilient MA Action Team (RMAT) - • Led by the Executive Office of Energy and Environmental Affairs (EEA) and the Massachusetts Emergency Management Agency (MEMA), the RMAT is an inter-agency team comprised of representatives from	• The Maryland Department of the Environment (MDE) is leading Governor Hogan's efforts to reduce GHG emissions while creating jobs and benefiting the economy, as required by the Greenhouse Gas Reduction Act (GGRA). Although many initiatives throughout the State contribute to these efforts, the Regional Greenhouse Gas Initiative (RGGI) and the Maryland Commission on Climate Change (chaired by MDE Secretary Ben Grumbles) are key efforts

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	each Secretariat, called Climate Change Coordinators, who are supported by agency staff, stakeholders, and subject matter experts. The RMAT is tasked with monitoring and tracking the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) implementation process, making recommendations to and supporting agencies on plan updates, and facilitating coordination across State government and with stakeholders. • LBE Council - The LBE Council (which is comprised of representatives from executive branch agencies, institutions of higher education, and quasi-public authorities) provides feedback to program staff on priorities, makes recommendations on the desired types of assistance and guidance, and supports the overall objectives established in Executive Order 594	by MDE. Oversight of Public outreach programs, Federal implementation, Transportation (with MDOT/MEA), Methane and HFC programs. Lead agency for US Climate Alliance, Zero Emission Vehicle (ZEV) MOU Partnership, MD Green Registry, Volkswagen Mitigation Fund, Metropolitan Washington Council of Government Climate Energy and Environmental Policy Committee (CEEPC), Idle Free Maryland and Transportation Climate Initiative • Smart Growth Subcabinet facilitates interagency coordination for Transportation and Land Use programs. • Maryland Green Purchasing Committee was established to facilitate procurement of environmentally preferable products and services across agencies. • Maryland Commission on Climate Change – requirement to report to the Governor and General Assembly each year on the status of the state's efforts to "mitigate the causes, prepare for and adapt to the consequences of climate change, including future plans and recommendations, if any, to be considered by the General Assembly." Establishment of four working groups - Adaptation and Resiliency WG - Mitigation WG - Education, Communication and Outreach WG - Scientific and Technical Working Group
State Legislative Bodies	• Senate Committee on Global Warming and Climate Change • House Committee on Global Warming and Climate Change	• House Committee on Environmental and Transportation • Senate Committee on Education, Health and Environmental Affairs
Staff Capacity Building	• In the first five years of GWSA implementation, EEA focused on building substantial institutional capacity, both within EEA and across state agencies, to enable smoother and more rapid implementation of climate and clean energy programs. This included close collaboration of EEA state agencies and coordination with other Secretariats that continues to date, as well as valuable external stakeholder engagement (such as the GWSA Implementation Advisory Committee) and important regional coordination both within and outside the Commonwealth. • Capacity building also included development of systems to track, evaluate, and report on climate	• Maryland Climate Leadership Academy - Established in 2018, Maryland's Climate Leadership Academy (Academy) is the nation's first state-sponsored institution providing continuing education and executive training programs specifically designed for state and local government officials, infrastructure executives and business leaders. The Academy supports the work of the MCCC, serving as a tool that establishes a community of climate smart local government and infrastructure leaders. The Academy's programs and planning efforts are informed by an advisory council that includes senior leadership from numerous Maryland state agencies in order to ensure continuity and coordination with the MCCC. Note: this academy is third party program by

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	change and clean energy programs, and the staff and software investments in GHG measurement, reporting, and policy implementation progress evaluation. In the first five years of GWSA implementation, EEA state agencies developed the Massachusetts GHG Registry and Inventory and various systems that document progress made toward GHG mitigation program goals, identify program impacts, inform program planning and management decisions, and provide transparent information to the public. In the last five years, EEA has increased staff capacity to analyze the GHG reductions from policy implementation, and developed the Massachusetts Clean Energy and Climate Performance Management System (CCPMS) for tracking and reporting policy implementation progress. These investments help EEA and state agencies estimate how much of the emissions reduction in the GHG inventory is due to policy implementation thus far and how much GHG emissions reduction can be expected in 2020. • For GWSA commitments beyond 2020, EEA and state agencies have begun preparing for the development of the Massachusetts Clean Energy and Climate Plan for 2030—due by the end of 2020—and a roadmap of how the Commonwealth can reach the GWSA emissions limit for 2050 in a strategic, equitable, and cost-effective manner. Analyses of what statewide GHG emissions would be in 2050 with only existing GHG mitigation policies implemented (i.e., no new policies) have been conducted by EEA staff in the Long-Range Energy Alternatives Planning (LEAP) modeling tool. Additionally, DOER recently completed a Comprehensive Energy Plan (CEP) that provides guidance to policy makers by examining the impacts of policies to reduce GHG emissions on cost and reliability. The Commission on the Future of Transportation in the Commonwealth, established by Governor Baker in January 2018 as part of Executive Order 579, also	ACCO and not the same as an internal, mandated program • Maryland Green Purchasing Committee - Training on green purchasing as part of Maryland Procurement Academy, a mandatory requirement for all procurement officers. Over 30 Office of State Procurement staff completed the Green Purchasing training in 2020 as they work towards earning a State of Maryland procurement credential. In 2021, the Academy will open to other State Agency procurement staff. Green Purchasing will continue to be a required course and will be delivered quarterly to new cohorts.

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	recently released a report summarizing the results of their fact finding, scenario development, and recommendations on transportation sector trends, needs, and GWSA compliance between 2020 and 2040. In early 2019, building upon recent analyses in the LEAP modeling tool, the analyses and subsequent recommendations from the CEP, and recommendations of the Commission on the Future of Transportation, EEA is commissioning a multi-year comprehensive "80x50 Study" to analyze and integrate the development of GHG emissions reduction pathways with a suite of recommended policies for the Commonwealth to set appropriate emissions limits for 2030 and to ultimately best meet the emissions limit of at least 80% below the 1990 baseline level by 2050. The recommended policies and implementation timeline could inform what policies are to be included in the Massachusetts Clean Energy and Climate Plan for 2030	
Federal Coordination	• EEA manages federal coordination and must consider how measures and strategies taken to reduce GHG emissions will affect other criteria and public policy considerations which are important to the Commonwealth, including interaction with federal and state air quality standards	• MDE oversees Federal coordination, including with EPA, HUD, DOE, USDA and others. This includes the Clean Power, Affordable Clean Energy (ACE) Rule, New Source Review (NSR) program, NHTSA and EPA fuel economy standards (ligth and heavy duty), Renewable Fuel Standard, Greenhouse Gas Reporting Program, Clean Air Act and Short lived Climate Pollutant SNAP regulations
Local Coordination	• Green Communities Designation & Grant Program - The Green Communities Division (GCD) provides grants, technical assistance, and local support from Regional Coordinators to help municipalities reduce energy use and costs by implementing clean energy projects in municipal buildings, facilities, and schools. • Smart Growth/Smart Energy Toolkit - This Toolkit is designed to help introduce newcomers and practitioners such as planners, developers and site and building designers to smart growth and smart energy strategies. It serves as a resource for case studies and model bylaws	• MCCC and CEJSC helps facilitate local coordination and stakeholder participation in conjunction with MDE and serve as a resource for stat and local governments for tools and planning resources. • Resilient Maryland programs work with local governments to drive growth in the adoption of microgrid and other distributed energy resource ("DER") systems. $1.03M awarded in 2020. • Maryland Smart Energy Communities program is to support local governments as they adopt smart-energy policies and commit to them for the long term. $750,000 available in 2021.

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Takeaways	• Executive Office of Energy and Environmental Affairs oversees coordination of agency programs and interagency partnerships • House and Senate Committees on Global Warming and Climate Change established. • Resilient MA Action Team (RMAT) is tasked with monitoring and tracking the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) implementation process. It oversees actions of lead agencies. It is envisioned this will be through some type of action tracker—a customized spreadsheet tool for reporting progress status updates on individual actions. The action tracker will be developed by the RMAAT after this plan is approved; serve as the primary mechanism for reporting and tracking the status updates on each action; and establish metrics to measure effectiveness. All agencies and Executive Offices that have been assigned as the lead for an action will be required to provide annual implementation updates using the action tracker developed by the RMAAT. • LBE Council provides feedback to program staff on priorities, makes recommendations on the desired types of assistance and guidance, and supports the overall objectives established in Executive Order 594. • EEA conducted staff capacity building and training in GHG measurement, reporting, and policy implementation progress evaluation and developed the Massachusetts Clean Energy and Climate Performance Management System (CCPMS) for tracking and reporting policy implementation progress. • Specific requirements for strategies for engagement with and development of resources for regional authorities	• No centralized executive office for climate programs • Maryland Commission on Climate Change – requirement to report to the Governor and General Assembly each year on the status of the state's efforts to "mitigate the causes, prepare for and adapt to the consequences of climate change, including future plans and recommendations, if any, to be considered by the General Assembly." Establishment of four working groups • Adaptation and Resiliency WG • Mitigation WG • Education, Communication and Outreach WG • Scientific and Technical Working Group • Working Group and Council make recommendations to the Governor and are well staffed by members of government, institutions and the private sector, but do not implement policy or have regulatory authority.
Stakeholder Planning		
Stakeholder Consensus Building	• SB9 Directs the Department of Environmental Protection (DEP) to engage with stakeholders, conduct public hearings, and propose emissions limits in 5-year increments between 2025 and 2050.	• Before finalizing the GGRA Plan, Maryland undertook a significant stakeholder process to ensure that opportunities existed to publicly comment on the 2019 GGRA Draft Plan (and 2030 Plan), which can be read in Appendix L. The release of the 2030 GGRA

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	Development of a natural and working lands plan that outlines actions to meet statewide goals, including, but not limited to, land protection, management and restoration and state and local legislation, laws and regulations, programs, grants, loans, incentives and public-private partnerships, and provide guidance and strategies for state agencies, authorities, municipalities, regional planning agencies, nonprofit organizations, landowners and operators; provided, however, that said plan shall be developed and informed by a stakeholder process and that the baseline, goal and plan shall be integrated into the inventory, baseline assessment, plan and reporting requirements pursuant to this chapter and shall be consistent with state climate change adaptation and resiliency policies; (xiv) include the results of quantitative modeling and analysis of the commonwealth's energy economy and greenhouse gas emissions in their state and regional context, including, but not limited to, the regional electric distribution and transmission grid; provided, however, that said modeling and analysis may be conducted in conjunction with other states or regional entities as part of an analysis of reducing regional emissions to a level consistent with this chapter; provided further, that the secretary is authorized to utilize back-cast methodology; (xv) publish the results of any modeling and analysis performed pursuant to this section and, to the maximum extent permitted by law, make available for public inspection and use the model, all model assumptions, and all input and output data; provided, that the secretary may protect from public disclosure, trade secrets, confidential, competitively sensitive or other proprietary information provided in the course of proceedings in the same manner as provided in section 5D of chapter 25; and (xvi) make recommendations for future policy action	Plan is the culmination of this process. MDE hosted 8 public meetings during development of the plan.

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Transparency and Inclusion	• SB9 Mandates transparency with respect to the inputs, outputs, assumptions, and modeling involved in the formulation of state climate policy. All state environmental impact reports must examine both environmental and public health impacts and include opportunities for "meaningful public involvement."	• GGRA plan includes multidisciplinary collaboration among various stakeholders, including communities, businesses, public health and education experts, air quality scientists, meteorologists, engineers and community planners, and federal, state, and local regulatory agencies. Climate justice is given specific attention, principles may include: • Supporting the right to economic development and employment opportunities • Sharing benefits and burdens equitably; • Ensuring decisions are participatory, transparent, and accountable; • Supporting education for climate stewardship; and • Using effective partnerships. Necessary steps and opportunities to achieve environmental and climate justice are included throughout the 2030 GGRA Plan, and considerations of how each measure can advance those objectives is considered in the program-by-program discussions in Chapter 3. • State-level reductions in energy consumption from MD LBE program shall be recorded in a Comprehensive Utility Records Management Database that is made available
Stakeholder Capacity Building	• SB9 - Invests $12 million in new annual funding, provided from the Department of Public Utilities, in a Clean Energy Equity Workforce and Market Development Program "to provide workforce training, educational and professional development, job placement, startup opportunities and grants promoting participation in the commonwealth's energy efficiency, clean energy, and clean heating and cooling industries. • Creates a heat pump market development program to fund and offer training to expand markets for space and water heating using efficient heat pump technology, including specific training for heating oil dealers. • The resilient MA Climate Clearinghouse provides communities with the best science and data on expected climate changes, information on community resiliency, and links to important grant programs and technical assistance. • MassCEC began the Reheat Mass program in 2018 to expand the public awareness campaign across the	• Various clean energy workforce development and training programs including the Clean Energy Workforce Program, the EARN Maryland Program, Maryland Offshore Wind Workforce Training Program. • Maryland Healthy Soils Program provides research, education, and assistance necessary to improve the health, yield, and profitability of Maryland's soils and increase soil carbon storage capacity on Maryland farms • Education, Communication and Outreach Working Group working with CEJSC to host public listening sessions and develop workplans. • Maryland's Climate Leadership Academy (Academy) is the nation's first state-sponsored institution providing continuing education and executive training programs specifically designed for state and local government officials, infrastructure executives and business leaders. • Maryland Green Registry - The Maryland Green Registry is a free, voluntary program offering tips and resources to help businesses and other organizations set and meet their own goals on the path to sustainability.

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	entire state through online advertisements focused on specific consumers based on geographic location and socio-demographic profiles. Analysis will be undertaken to refine the advertisement messaging in future years.	
Key Takeaways	• MA has public consultative requirements within SB9 for public engagement on development of GHG reduction and natural and working lands plans, with specific directives for methodology for engagement with environmental justice populations. Public hearings are all required for development of stretch energy codes, solar initiatives, GHG study analysis and for development of statewide GHG emissions targets. • RMAAT is charged with providing outreach, technical assistance, stakeholder engagement, and other educational services that increase general awareness and understanding of the SHMCAP. • The resilient MA Climate Clearinghouse is a in depth resource for public education • EO 569 directs the Secretary of Energy and Environmental Affairs to: - establish a framework for each City and Town in the Commonwealth to assess its vulnerability to climate change and extreme weather events, and to identify adaptation options for its assets; • provide technical assistance to Cities and Towns to complete vulnerability assessments, identify adaptation strategies, and begin implementation of these strategies	• MCCC, Education, Communication and Outreach Working Group and CEJSC are charged with communicating with and education citizens about climate change. • Public comment sessions were held in conjunction with development of GGRA. The requirements for public consultation are: "on or before December 31, 2018, the department shall: (1) submit a proposed plan to the governor and general assembly; (2) make the proposed plan available to the public; and (3) convene a series of public workshops to provide interested parties with an opportunity to comment on the proposed plan."

Policies and Measures Climate Mitigation

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Pricing and social cost of carbon	• SB9 Requires that the cost of climate change on society (i.e., the social cost of carbon) be part of the Mass Save Three-Year Energy Efficiency Plan cost-benefit analysis (utility regulation). • Legislation passed to enable market-based carbon pricing mechanisms. Assumed to be implemented through TCI-P; MA is one of 3 states to sign most recent MOU (of 13 original signatories), maybe be implemented in 2022 • RGGI Participant	• Carbon pricing included in RGGI participation. • Social Cost of Carbon used for calculation of financial benefits of GGRA 2030 plan, but otherwise not addressed in plan. • MD PSC used social cost of carbon in valuation of DERs in a 2018 rulemaking. • Carbon pricing bills have been submitted (most recently HB33, the Climate Crisis and Education Act (2021)), but none have passed the state legislature.
Information and Education	• Mass DEP oversees monitoring and assessment of climate actions, collaboration with other states, oversight of mitigation programs, GWSA implementation, natural resource conservation programs and climate preparedness and resiliency. • Resilient MA, an online clearinghouse for local governments and the public with comprehensive information about the state's work on climate adaptation and mitigation. The clearinghouse contains science and data on expected climate changes, information on community resiliency, decision support tools, and links to grant programs and technical assistance that local government and communities can use to fund and support actions to adapt to climate change.	• Minor public education programs held, focused on schools
Outreach	• Municipal Vulnerability Preparedness Program. MVP Planning grants awarded totaled $4.9 million and are currently being used by municipalities to complete a community-driven process to identify hazards and develop strategies to improve resilience, and host listening sessions across the Commonwealth to discuss solutions and engage the public. Action grant funding (implementation) totaled nearly $2.3 million and are being used for a variety of projects that address the priority actions municipalities identified in their planning processes. • Community Clean Energy Resiliency Initiative - grant program focused on municipal resilience that uses clean energy technology solutions to	• MCCC Education, Communication and Outreach Work Group's work is related to three specific charges in the MCCC law: (1) communicating with and educating citizens about the urgency of acting to reduce the impacts of climate change; (2) addressing any disproportionate impacts of climate change on low-income and vulnerable communities; and (3) developing broad public and private partnerships with local, state, and federal agencies. • For 2021 ECO should continue to build relationships with other state agencies, inventorying their existing EJ/CJ outreach programs and activities, and explore new ways state agencies and the MCCC can apply CJ to their work. (Working with the MCCC co-chair and the CJ team.) ECO will continue to seek and solicit opportunities to identify and engage with organizations, and to participate

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	protect communities from interruptions in energy services due to severe climate events made worse by the effects of climate change.	as a presenter (principally MCCC Chair Ben Grumbles) at appropriate meetings and events. (ex., Maryland Association of Counties and Maryland Municipal League.) In that effort, ECO should: • Make pre-meeting calls with the leadership of organizations to understand the interest of a group and to provide the most relevant information. • Create a short overview Powerpoint presentation about MCCC to use at events and/or listening sessions. o Whenever possible, begin community listening sessions with questions from the group so the conversation can address concerns directly. • Continue to create educational and outreach materials for the Commissions Website
Other	• EO 569 directs: The Department of Energy Resources (DOER) Leading by Example Program (LBE) shall work collaboratively across state government to develop and employ appropriate strategies and programs to provide for the accomplishment of all of the provisions of this Executive Order. All agencies shall collectively work to: - Meet GHG emissions targets by substantially reducing or eliminating emissions from onsite combustion of fossil fuels in buildings and vehicles; - Expand and intensify energy efficiency efforts; - Ensure that new construction and substantial renovations meet the highest performance standards practicable; - Prioritize strategic electrification of buildings, central plants, and vehicles, and/or use of zero-carbon fuels; - Increase the amount of renewable and clean energy on the grid by increasing onsite renewable energy generation, the procurement of renewable energy supply, and continued development of clean energy resources; - Expand the deployment and use of energy storage and other strategies to minimize peak demand; and - Ensure that state facilities are designed and managed to	• EO 01.01.2019.08 directs: - MEA and DGS shall develop and management a "Maryland Leads by Example" energy savings initiative with the goal of a 10% reduction in energy consumption in state owned buildings by 2029 from a 2018 baseline. - All units of State Government shall implement projects and initiatives to conserve energy - DGS, MEA, Department of Budget and Management and the Department of Information Technology shall collaborate on designing and staffing other cost-effective and energy efficient savings initiatives. • SB 258 (2015): Each state agency shall review its planning, regulatory, and fiscal programs to identify and recommend actions to more fully integrate the consideration of Maryland's greenhouse gas reduction goal and the impacts of climate change. (2) the review shall include the consideration of: (i) sea level rise; (ii) storm surges and flooding; (iii) increased precipitation and temperature; (iv) extreme weather events. (b) each state agency shall identify and recommend specific policy, planning, regulatory, and fiscal changes to existing programs that do not currently support the state's greenhouse gas reduction efforts or address climate change.

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	withstand the impacts of a changing climate while continuing to provide critical services. - In all planning and deployment activities related to the implementation of this order, agencies shall prioritize efforts at facilities located in Environmental Justice populations as designated by the Secretary of the Executive Office of Energy and Environmental Affairs in accordance with law, when key fiscal, physical, and environmental factors are fundamentally equivalent.	
Takeaways	• LBE program: Required emission reduction goals (2025, 2030, 2040, 2050) from 2004 and adoption of technologies for MA state government agencies including: - 95% reduction in fossil fuel emissions by 2050 - 100% EVs by 2050 - 25% EUI reduction by 2030 for buildings - LEED silver certification for all new buildings • All state agencies directed to conduct studies of GHG emissions, and must assess its' vulnerability to climate change and extreme weather events, and to identify adaptation options for its and its agencies' assets • Social Cost of Carbon mandated for incorporation into utility planning (MassSave) • Legislation passed to enable market-based carbon pricing mechanisms. • Comprehensive online resource (all sectors) published for public education and outreach	• LBE Program: Goal of 10% reduction in building energy use by 2029 compared to 2018. Annual building audits to identify opportunities for energy efficiency improvements. • Agencies directed to incorporate climate change into planning and regulatory programs • Public Utility Records Management Database provides state energy use data. • No carbon pricing or social cost of carbon. • PSC mandated to consider climate effects and GHG reduction strategies in regulation of utilities (HB298)
Energy supply		
Renewable energy	• Offshore Wind: 4,000 MW by 2027 • RPS: 40% by 2030, 1% annual increase thereafter. • The Massachusetts Clean Peak Energy Standard is designed to provide incentives to clean energy technologies that can supply electricity or reduce demand during seasonal peak demand periods established by DOE. 225 CMR 21.00. Utilities in the state must obtain clean	• §7–702 of the Public Utilities article that enabled Maryland's RPS. Maryland's Renewable Portfolio Standard (RPS) statutorily requires Maryland electricity suppliers to obtain renewable energy credits (RECs) from qualified renewable energy generators for 50% of its electricity supply by 2030, where one REC is equal to one megawatt-hour (MWH) of electricity generated by a qualified renewable energy generator. To be eligible, generators need to

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	peak credits equal to a percentage of total electricity delivered in the year, starting at 1.5 percent in 2020 and growing annually. • MA currently has 3,262.7 MW of solar installated in the state, forecasted growth of 1,851 by 2025.	be located within the Pennsylvania Jersey Maryland Interconnection, LLC (PJM) region, or in a control area adjacent to the PJM region. In addition, there is a solar carve-out that will ultimately require solar RECs equal to 14.5% of retail electricity sales to be obtained from solar energy generation directly connected to Maryland's electric distribution grid by 2030, as well as a requirement for a carve out for offshore wind. Energy suppliers are required to purchase RECs in order to demonstrate compliance with the RPS. If insufficient RECs are not purchased, suppliers can instead opt to make an Alternative Compliance Payment (ACP) which is then used to incentivize the adoption of new RPS-eligible technologies. While Maryland's RPS is overseen by the PSC, PJM oversees the tracking and sale of RECs. Details about the status of RECs by state, generation type, year, and REC status (i.e., active, retired, etc.) can be found on PJM's Generation Attributes Tracking System (GATS). • In 2017, the PSC awarded offshore wind renewable energy credits (ORECs) to two offshore wind projects totaling 368 MW of capacity. The Clean Energy Jobs Act (Chapter 757 of 2019) updated the RPS to provide for incentives, via Offshore Renewable Energy Recs, for at least an additional 1,200 MW of ocean energy. • Maryland Climate Change Program is managed by MDE and informed by the Maryland Commission on Climate Change. • Governor's Task Force on Renewable Energy Development and Siting was established by Governor Larry Hogan under Executive Order 01.01.2019.09 in August 2019 to examine renewable energy siting issues, and in particular, siting of utility-scale solar on farmland. Task force consists of the Secretaries of Agriculture, Commerce, Environment, Natural Resources, Planning, Transportation and the Director of MEA. • PPRP in the Department of Natural Resources (DNR) was created in 1971 to conduct research on the impacts of existing and proposed power plants in each county. PPRP is required to undertake a continuing research program for electric power plant site evaluation and related environmental and land use considerations. PPRP is funded through an assessment on electricity used in the State, which accrues to the Environmental Trust Fund (ETF). PPRP must evaluate proposed solar electric generating facilities as

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		part of the existing Certificate of Public Convenience and Necessity (CPCN) process. • CPCN process currently creates a major obstacle for siting of new utility scale solar projects resulting in severally restrained sector growth in comparison to neighboring states. • Maryland currently has 1,342.4 MW of solar installed and 1,373 forecasted by 2025.
Low carbon fuels	• MassDEP promulgated 310 CMR 7.74 in 2017 to impose annually declining limits on emissions from MA fossil plants These regulations limit emissions in 2020 to 8.5 MMTCO2e, an amount calibrated to ensure reductions needed to implement the 2015 CECP Update and ensure that reductions from other clean energy policies are realized in Massachusetts. • A cap-and-trade structure is used to enforce the program, while allowing flexibility for facilities that must operate to ensure the reliability of the electricity grid. Declining limits extend to 2050 to encourage long term planning for decarbonization of the electric sector	• One of eight partner states in the Midwest Region Carbon Sequestration Partnership whose role is to identify, locate, and characterize potential geologic storage opportunities. This has evolved into the Mid-West Region Carbon Initiative which is a coordination of over 12 states, the nonprofit Battelle Memorial Institute, and the U.S. Department of Energy. More than 10 gigatons of storage capacity has been identified within the terrestrial portion of Maryland (103 years of storage capacity at current CO2 estimated production rate of 97 MMt per year). • Woody biomass is currently classified as a Tier 1 renewable energy source in Maryland's Renewable Portfolio standard, eligible to generate renewable energy credits (RECs) providing it meets the following criteria: • Waste material that is segregated from inorganic waste material and is derived from sources • Except for old growth timber, any of the following forest-related resources: A) Mill residue, except sawdust and wood shavings; B) Precommercial soft wood thinning; C) Slash; D) Brush; or E) Yard waste; • A pallet, crate, or dunnage; • Agricultural and silvicultural sources, including tree crops, vineyard materials, grain, legumes, sugar, and other crop by-products or residues; or • Gas produced from the anaerobic decomposition of animal waste or poultry waste; or • A plant that is cultivated exclusively for purposes of being used at a Tier 1 renewable source or a Tier 2 renewable source to produce electricity.
Other	• $10 million commitment from the Department of Energy Resources (DOER) and a two-part study from DOER and the Massachusetts Clean Energy Center (MassCEC) to analyze opportunities to support Commonwealth storage companies, as well as develop policy options to encourage energy storage deployment.	• The EmPOWER Maryland suite of energy efficiency programs offered by the participating utilities are funded by ratepayers. Each utility is responsible for procuring or providing programs in its service territory designed to meet the EmPOWER program goals. The PSC monitors and analyzes the impact of the programs and, in consultation with the Maryland Energy Administration (MEA), reports on the status of the programs, a recommended funding level

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	• $220M investment in Grid Modernization over three years (onoing)	for the programs, and the per capita electricity consumption and peak demand for the previous calendar year. EmPOWER programs must be approved in advance by the PSC. In July 2015, the PSC issued order No. 87082 directing the continuation of utility programs supporting EmPOWER Maryland energy reduction policy and setting new savings targets that extend beyond the original 2015 goals in the EmPOWER Maryland statute. In its order, the PSC directed utilities to ramp up electricity savings to 2% of each company's gross retail sales baseline based on three-year cycles.
Takeaways	• Strong solar sector with Net Metering (3,200 MW cap) (and RPS targets (40% by 2030) • Offshore wind target of 5,600 MW; 4,000MW by 2027 • Clean Energy Standard required utilities to procure 80% of energy from clean sources by 2050 (includes nuclear) • Clean Peak Standard provides incentives to clean energy technologies that can supply electricity or reduce demand during seasonal peak demand. • Budget allocation to research on deployment of energy storage. • MassSave program had goal of 2.7% electricity savings for last program cycle' new target announced by July 15 • Utility scale thermal pilot program for fossil-based natural gas substitution for development by 2023. • All coal plants in MA have been retired	• Strong RPS target with specific solar carve out of 14.5%. • Slow growth in solar sector in comparison to other states for utility-scale • RPS includes biomass and waste incineration as a qualifying Tier 1 renewable resource. • Offshore wind requirement of 1200 MW by 2030 • EmPower Program provides 2% energy efficiency targets for utilities in three-year cycles.
RCI		
Energy efficiency	• Massachusetts adopted a requirement that building energy codes meet or exceed the International Energy Conservation Code (IECC) and stay current with the IECC's three-year update cycle. An update to the base energy code is currently underway based on the 2018 International Energy Conservation Code (IECC2018). 250 communities in Massachusetts, representing more than 2/3rd of the state population, have voluntarily adopted the Massachusetts stretch energy code as of November 2018. • Within 18 months of SB9's effective date, DOER must develop and adopt	• The "Maryland Leads by Example" initiative is to reduce energy consumption in state-owned buildings by 10% by 2029. To accomplish this goal, DGS has been tasked to annually audit state-owned buildings determined to be the least energy-efficient. The audit shall identify low-cost measures for increasing energy efficiency and savings while reducing future costs and expenses. • Maryland Building Performance Standards: Maryland law requires the latest edition of International Codes (except for IGCC) be adopted within 18 months from their publication. Among the codes adopted, the energy code, IECC, has a direct impact on the GHG emission in Maryland. For Maryland specifically, 2.91 MMt of CO2 reduction for

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	"a municipal opt-in specialized stretch energy code that includes, but is not limited to, net-zero building performance standards and a definition of net-zero building, designed to achieve compliance with the commonwealth's statewide [GHG] emission limits and sublimits. • MassSave program implementers committed to promoting fuel switching in both the residential and the commercial and industrial sectors in the filed 2019- 2021 Mass Save® plan, with a focus on shifting customers away from delivered fuels (heating oil and propane) to efficiency, and in particular cold-climate air source heat pumps (ASHPs). • The Massachusetts Clean Energy Center's Clean Heating and Cooling programs have committed $48 million through 2020 to support the installation of highly efficient or renewable heating and hot water technologies at homes and businesses across the Commonwealth that often replace or supplement systems burning f ossil fuel.	residential buildings and 2.80 MMt of CO2 reduction for commercial buildings between 2010 and 2030 can be achieved. COMAR 09.12.51, COMAR 09.12.50 • All new and renovated State of Maryland facilities larger than 7,500 gross square feet which are fully funded by the state, kindergarten through 12th grade (K -12) public schools and new community college buildings are required to comply with the Maryland High Performance Green Building Program. A High-Performance Building is one which achieves either a Silver rating or better under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, a two Green Globes rating or better under the Green Building Initiative's Green Globes rating system, or which complies with the Maryland Green Building Council's supplement to the International Green Construction Code. • In its 2020 Annual Report, MCCC identified initial steps Maryland can take to increase the use of efficient electric heat pumps to heat homes and businesses, while launching a Building Energy Transition Plan process for 2021. Those steps include reforming the EmPOWER Maryland program to pursue a portfolio of mutually reinforcing goals, including GHG reductions, energy savings, net customer benefits, and reaching underserved customers. Broadening the goals of the EmPOWER program and removing existing barriers to fuel switching would allow Maryland to provide funding for homeowners and building managers to replace fossil fuel burning furnaces and boilers with efficient electric heat pumps when those systems need to be replaced and it is cost effective to do so.
Distributed energy	• Alternative Energy Portfolio Standard: requires meeting 5% of the state's electric load with "alternative energy" by 2020, includes combined heat and power (CHP) projects, flywheel energy storage, energy efficient steam technology. And renewable technologies that generate useful thermal energy. • Solar Massachusetts Renewable Target (SMART) Program is DOER's incentive program established to support the development of solar in Massachusetts. The DOER regulation in 225 CMR 20.00 sets the regulatory framework for the program. Incumbent to the SREC program.	• Resilient Maryland Program – aimed at driving growth in the adoption of microgrid and other distributed energy resource ("DER") systems that provide clean, efficient, reliable energy to key entities across the State of Maryland. In FY20, the program experienced an immensely successful inaugural year in which MEA received twenty-five (25) unique project proposals from various organizations across the State and awarded fourteen (14) grants for a combined total of over $1.03 million in issued Grant funds. • Community Solar Pilot Program – Maryland Public Service Commission has adopted regulations for a community solar pilot program in Maryland, with an emphasis on providing renewable energy benefits for low- and moderate-income customers. Set aside

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		program capacity for each area of the state with a statewide cap at about 418 MW. About 125 MW is set aside for projects focused on low- and moderate-income customers
Other		
Takeaways	• Statewide regulation for buildings to meet International Energy Conservation Code (IECC) requirements and updates, adoption of some CA appliance standards and more stringent requirements for 17 appliance categories (SB9) • No RCI efficiency mandate, however stretch goals have been developed and adopted in 250 municipalities and new stretch goals are currently being developed. • Incentives to enable fuel switching/electrification for RCI under Mass Save program • New state buildings mandated LEED silver and 25% EUI reduction by 2030 • PACE financing program • Alternative Energy Portfolio Standard: requires meeting 5% of the state's electric load with "alternative energy" by 2020, includes combined heat and power (CHP) projects, flywheel energy storage, energy efficient steam technology.	• Statewide regulation for buildings to meet International Energy Conservation Code (IECC) requirements and updates. • Federal appliance standards • No stretch goals • Electrification and energy efficiency programs implemented through EmPower Program. • New state buildings mandated LEED silver and general goal of 10% reduction in energy use by 2029. • PACE financing program
Industry		
Energy efficiency	• Sector emissions sublimits by 2025 includes: 1) commercial and industrial heating and cooling, 2) industrial processes and 3) natural gas distribution and service	• The GGRA of 2016 requires in 2022 an independent study of the economic impact of requiring GHG emissions reductions from the State's manufacturing sector. The GGRA of 2016 also requires that this study be overseen by the MCCC. This study will be included in an update to the 2030 GGRA Plan.
Industrial process	• MassDEP amended the regulation 310 CMR 7.72 Reducing Sulfur Hexafluoride Emissions from Gas-Insulated Switchgear to add declining annual limits on total SF6 emissions from large electric utilities. Sulfur hexafluoride, or SF6, is a GHG that has a GWP 23,900 times higher than CO2 and has an atmospheric • The replacement of aged cast-iron, wrought-iron and noncathodically protected steel pipes has been accelerated, especially to repair natural gas leaks that pose significant public safety or environmental impact, in response to the Natural Gas Leaks Act of 2014,	• Industrial Processes represent 5.9% of Maryland's gross emissions. It includes GHG emissions from the four main industrial processes that occurs in the State: • CO2 emissions from cement production, soda ash, dolomite and lime/limestone consumption; • CO2 emissions from iron and steel production; • SF6 emissions from electric power transmission and distribution (T&D) system, transformers use, and • HFC and PFC emissions resulting from the consumption of substitutes for ozone-depleting substances (ODS) used in cooling and refrigeration equipment. • Industrial processes sharply cut emissions after 2006 in the 2011 Emissions Inventory but

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	the Energy Diversity Act of 2016, and DPU directives.	have not made significant reductions since. Currently, the large majority of emissions from this sector are from ODS substitutes. • MDE finalized regulations in 2020 that will phase out the use of certain HFCs in multiple end-uses, such as foam products and certain refrigeration equipment in retail establishments such as supermarkets. The phase out of HFCs will require the use of alternatives with much lower GHG emissions.
Other	• Some hydrofluorocarbons (HFCs) were added in 2018 to the list of regulated chemicals under the Toxics Use Reduction Act, which requires large toxic chemical users in Massachusetts to submit a Toxics Use Report annually, develop a plan to reduce their use of regulated chemicals, and pay an annual Toxics Use Fee. • Massachusetts joined other members of the U.S. Climate Alliance in committing to the Short-Lived Climate Pollutant Challenge to develop and implement state-specific strategies to reduce short lived climate pollutants, which include HFCs.	• Federal BACT/MACT regulations: - The United States Environmental Protection Agency (EPA) adopted new air emissions requirements for industrial, commercial, and institutional boilers under two separate rulemakings. Specific implementation milestones include: o January 2013: established national emission standards for HAPs for major sources. O The rule affects thousands of boilers and process heaters at facilities nationwide that are considered as major sources. o February 2013: EPA issued a Boiler MACT rule for smaller "area sources". o March 2014: All boilers demonstrate compliance with emission limits and perform compliance reports as mandated. o January 2016: 18 new boilers have obtained permits and are subject to the MACT • GGRA 2016 legislation enacted Subtitle 12 – Greenhouse Gas Emissions Reductions § 2-1206. Factors in adoption of final plans, which includes language that says emissions reductions plans must: - "(v) Directly cause no loss of existing jobs in the manufacturing sector - (vi) Produce a net economic benefit to the State's economy and a net increase in jobs in the State"
Takeaways	• Sector emissions sublimits by 2025 include: 1) commercial and industrial heating and cooling, 2) industrial processes and 3) natural gas distribution and service. • Specific regulations for HFCs and some industrial processes, including natural gas	• Manufacturing sector is not currently addressed by GGRA; up for review through 2023. Report due in 2022. • Specific regulations for HFCs and natural gas
Transportation		
Vehicles	• Executive Order No. 579, establishing the Commission on the Future of Transportation in the Commonwealth	• I and EPA Emissions standards • EV adoption goal of 300,000 by 2025; 540,000 by 2030 (25,700 at end of 2020). Goal of 100% ZEV sales by 2050.

Cross Cutting	Massachusetts	Maryland
	• Transportation emissions sublimits enacted by 2025 • I standards and EPA medium and Heavy-duty standards. • Transportation and Climate Initiative MOU signatory (1 of 3 states). The TCI-P will work by requiring large gasoline and diesel fuel suppliers to purchase "allowances" for the pollution caused by the combustion of fuels they sell in participating jurisdictions. Auctioning those allowances would generate $300 million every year among the jurisdictions for investments in equitable, less polluting, and more resilient transportation (Not yet implemented) • 310 CMR 60.05 Global Warming Solutions Act Requirements for Transportation – Impose declining annual limits on emissions from MassDOT vehicles and facilities. Second, MassDOT is required to report on mass-based, annually declining aggregate targets on CO2 emissions from Massachusetts' multimodal surface transportation system, including the highway and transit networks. • 310 CMR 60.06 CO2 Emission Limits for State Fleet Passenger Vehicles – reduces carbon dioxide (CO2) emissions from certain vehicles owned or leased by Commonwealth of Massachusetts Executive Offices through the imposition	• 90% of the agency's light duty fleet (1,925 vehicles) are targeted for transition by 2030 • Maryland Transit Administration (MTA), beginning in fiscal 2023, from entering a contract to purchase buses for its transit bus fleet that are not zero-emission buses (as defined by the bill); however, MTA may purchase an alternative-fuel bus (as defined by the bill) instead if it determines that no available zero-emission bus meets the performance requirements for a particular use. • TCI-P partner, did not sign recent MOU for rulemaking/implementation • Smart Growth Program – Updated VMT growth rates consistent with Maryland Department of Planning (MDP) population growth projections and metropolitan planning organization (MPO) cooperative land use forecasts and travel demand model forecasts indicate an annual 0.6% VMT growth through 2030. This growth rate is overall consistent with average annual growth from 2016 to 2019 (0.5%), and the average annual growth for most of the decade (0.8%). This growth rate assumes that VMT growth in 2021 and beyond gradually returns to pre-pandemic levels. • ZEV MOU – reaffirmed their strong commitment to a clean, low-carbon transportation sector with the release of a new Multi-State ZEV Action Plan for 2018-2021 to support the successful implementation of the states' ZEV programs. • MVHD ZEV MOU – he MHDV MOU identifies a target of 30% of all medium- and heavy-duty vehicle sales will by ZEVs by 2030. Maryland has outlined a Maryland Clean Truck Planning Framework that will engage stakeholders and communities to collaboratively develop an action plan to reduce air pollution and GHG emissions from the trucking industry, while preserving existing jobs and creating new jobs.
Fuels	• Federal RFS, Potential Regional Clean Fuel Standard under TCI-P • MOR-EV provides rebates of up to $2,500 for the purchase or lease of battery electric vehicles and fuel-cell electric vehicles and up to $1,500 for plug-in hybrid electric vehicles with a sales price not more than $50,000. Provided approximately $23 million to provide over 11,300 rebates to consumers who purchased or leased plug-in electric vehicles since its start in 2014. The MOR-EV Trucks Program aims to provide air pollution emission	• Federal RFS, Potential CFS under TCI-P • Electric Vehicle Supply Equipment (EVSE) Rebate Program: The Maryland Energy Administration (MEA) offers a rebate to individuals, businesses, or state or local government entities for the costs of acquiring and installing qualified EVSE. • Electric Vehicle Supply Equipment (EVSE) Workplace Charging Grant. The Maryland Department of Environment (MDE) offers grants of up to $4,500 per charger, $600,000 total per applicant for the installation of EVSE at workplaces through the Charge Ahead Grant Program (CAGP). CAGP funding is

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	reductions for the Commonwealth of Massachusetts (Commonwealth) by increasing the use of electric trucks (incl. buses, vans, etc.) through the offering of rebates to purchasers who register their medium duty/heavy duty on-road vehicles in the Commonwealth. Purchases or leases of battery electric and fuel-cell electric vehicles with a sales price of more than fifty thousand dollars ($50,000) and having a gross vehicle weight rating (GVWR) of more than 8,500 pounds made on or after February 16, 2021 are eligible for a rebate in the MOR-EV Trucks Program. • The Massachusetts Electric Vehicle Incentive Program (MassEVIP) through the Department of Environmental Protection (MassDEP) has given $2.66 million to Massachusetts municipalities, state agencies, and public colleges and universities to acquire 267 electric vehicles and 92 publicly accessible charging stations, and $1.35 million to employers to acquire 543 electric charging stations at 265 separate locations. The 15,111 electric vehicles registered in the Commonwealth as of September 2018 have resulted in net reductions of 33,150 metric tons of CO2e in 2018. • Installed publicly available electric vehicle fast charging stations at 6 service plazas along the Massachusetts Turnpike and 30 electric vehicle charging stations in parking facilities. • Replaced 50 percent of the commuter rail fleet with new diesel-electric locomotives. • Converted tolled highways in Massachusetts to electronic tolling, which reduces emissions as a vehicle using a transponder can pass through a toll plaza more efficiently than one that must slow down or stop and idle to pay a toll.	available for costs directly attributable to the design, installation, and operation of eligible workplace EVSE. • At least 50% of state vehicles using petroleum diesel fuel must use a minimum blend of 5% biodiesel (B5) or other biofuel approved by the U.S. Environmental Protection Agency as a fuel or fuel additive.
Community Design	• EEA launched a Planning Grant Program in 2017 to help municipalities update their land use plans and regulations, favoring projects that address climate change. Over $2 million has been provided to advance 68 different planning projects.	• MDOT Solar Initiative: MDOT issued Master Services Agreements (MSAs) to six qualified contractors to design, construct, commission, finance, operate and maintain photovoltaic (PV) energy facilities at MDOT locations throughout Maryland. The MSAs provide MDOT with the flexibility of developing PV energy systems quickly and efficiently. The GHG benefit has increased by 10% over

Cross Cutting	Massachusetts	Maryland
	• The Baker-Polito Administration launched its Housing Choice Initiative in 2018 to promote housing production in sustainable patterns and places • MassDOT programmed over $220 million dollars of capital expenditure in the 2017-2021 fiscal year window for: increasing the availability of walking and cycling options in Massachusetts.	the last year and resulted in 15 metric tons of reductions • MDOT State Highway Administration (MDOT SHA) is a recognized national leader in the testing and deployment of real time technologies to adjust signal operation to maximize throughput and reduce delay. The system uses real-time traffic conditions and artificial intelligence to adjust the timing of traffic signals and synchronize the entire corridor and effectively deploys artificial intelligence to keep traffic moving. The smart traffic signals have been implemented in 16 of the 21 planned corridors across the State ($22.1 million in the FY21-26 CTP). • The Maryland Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC) promotes the use of promotes the use of ZEVs, including plug-in electric vehicles (PEVs) and fuel cell electric vehicles (FCEV), in the state. Specific responsibilities of ZEEVIC include the following: - Smart Growth Subcabinet – Makes recommendations to the Governor regarding changes in State law, regulations, and procedures needed to create, enhance, support, and revitalize Sustainable Communities across Maryland. Facilitates interagency coordination to ensure successful statewide community reinvestment and compact development initiatives through implementation of the recommendations from the Maryland Sustainable Growth Commission's Reinvest Maryland 2.0 report and the strategies associated with the new state development plan, A Better Maryland. • Maryland Smart Growth Coordinating Committee – Identifies regional growth and development issues for the Governor's Smart Growth Subcabinet and advises on the local impacts of state policies and laws. Recommends ways to collaborate on planning between State agencies and local governments and coordinate growth and development among jurisdictions. Reviews statewide efforts to implement the State growth plan and the State plans for transportation and housing. Facilitates the review of State programs and development of tools and recommendations through the Reinvest Maryland 2.0 effort to assist Maryland's counties, towns, and communities to accelerate infill, redevelopment and revitalization
Other	• To assist the Commonwealth with its goals to reduce petroleum dependence and greenhouse gas	• Maryland Clean Cities Coalition - In addition to enhancing the nation's air quality, the U.S. Department of Energy's Clean Cities

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	emissions, Mass DOER works with other agencies and stakeholders to make alternative fuel vehicles and related infrastructure a viable option in Massachusetts. The Massachusetts Clean Cities Coalition (MCCC) is part of a nationwide partnership sponsored by the U.S. Department of Energy (DOE) Clean Cities Program. Clean Cities aims to reduce petroleum consumption in the transportation sector and support development of infrastructure necessary to make alternative fuel vehicles a viable transportation option.	Program promotes the economy, protects the environment, and secures our energy future through public and private partnerships. These partnerships encourage the development of clean-burning alternative fuel vehicles (AFVs) as well as their associated fueling infrastructure.
Takeaways	• Transportation emissions sublimits enacted by 2025, with mandated targets for EV adoption. • Transportation and Climate Initiative MOU signatory (1 of 3 states) for implementation. The TCI-P will work by requiring large gasoline and diesel fuel suppliers to purchase "allowances" for the pollution caused by the combustion of fuels they sell in participating jurisdictions (Not yet implemented) • MOR-EV and MassEVIP programs offer rebates to incentivize EV purchases and deployment of charging infrastructure. • EEA Planning Grant Program to help municipalities update their land use plans and regulations, favoring projects that address climate change. Over $2 million has been provided to advance 68 different planning projects. • MassDOT programmed over $220 million dollars of capital expenditure in the 2017-2021 fiscal year window for: increasing the availability of walking and cycling options in Massachusetts • VMT target is 1.7% reduction by 2020	• No specific transportation emissions limits; EV adoption goal of 300,000 by 2025; 540,000 by 2030 (25,700 at end of 2020). Goal of 100% ZEV sales by 2050 (no mandate) • TCI-P partner, did not sign recent MOU for rulemaking/implementation • Low funding for charging infrastructure; EV tax incentive no longer available. • 90% of the MTA light duty fleet (1,925 vehicles) are targeted for transition by 2030; zero emission bus procurement after 2023. • Smart Growth Program focused on reducing VMT and fossil fuel consumption through land use planning and development around public transportation hubs; targets a .6% growth rate in VMT
Agriculture		
Land protection and recovery	• Massachusetts Environmental Policy Act (MEPA) - MEPA and its regulations establish procedures to ensure that the environmental impacts from development projects requiring state approvals are identified and addressed. MEPA authorizes the Secretary of the Massachusetts Executive Office of Energy and Environmental affairs (EOEEA) to review the environmental	• Maryland Agricultural Land Preservation Foundation – MALPF purchases agricultural preservation easements that forever restrict development on prime farmland and woodland and has permanently preserved land in each of Maryland's 23 counties. In FY19 alone, MALPF settled 45 easements and preserved 5,430 acres of farmland. Since its inception through the end of FY19, MALPF has purchased easements on a cumulative total of 2,347 properties and permanently preserved

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	impact of development projects over which it has jurisdiction. The MEPA office within EOEEA carries out this function on behalf of the Secretary of EOEEA. MEPA's framework has two purposes: 1. To ensure that state agencies are aware of potential environmental impacts before they take action on projects. 2. To make sure that prior to taking action on projects, state agencies utilize "all feasible means to avoid Damage to the Environment or, to the extent Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable	318,215 acres of farmland at a public investment of over $752 million. MALPF and its other state agency and local government partners are working to meet a legislative goal (SJ 10, 2002) of preserving 1,030,000 acres of agricultural land by 2022. As reported by MDP, total private land under easement by MALPF, GreenPrint, Rural Legacy, and local preservation programs was 662,923 acres as of the end of FY19, according to best available data as of August 23, 2019. This represents over 64% of the goal.
Low carbon management practices	• To assist in the development of a healthy soils program, as instructed by the director, to: (i) improve soil quality on lands utilized for commercial farming, suburban and urban lawns, yards and gardens, public and private forests, parks and other open or green spaces and non-paved outdoor areas of office complexes, mixed-use facilities, businesses, industries and colleges and other institutions; (ii) increase carbon sequestration or storage on such lands to help reduce harmful atmospheric greenhouse gases and the effects of climate change; and (iii) provide other measurable benefits, determined as applicable under the program to certain types of lands, related to climate change, plant growth, erosion control and water absorption and quality. • To encourage and promote the use of healthy soils policies and practices by private and public landowners, including commercial farmers, and any assistance available to program participants, which may consist of grants, technical assistance or education on the benefits and implementation of healthy soils best practices, as the director may instruct, to achieve the purposes of the healthy soils program	• GGRA 2030 Appendix K provides a listing of suggested agricultural management practices for implementation with estimates of carbon impacts. • Maryland Healthy Soils Program – 2017. HB 1063. MDA to provide farmers with the research, education, and assistance necessary to improve the health, yield, and profitability of Maryland's soils and increase soil carbon storage capacity on Maryland farms. • Maryland Soil Health Advisory Committee – Develop program recommendations to improve the health of Maryland's agricultural soils and promote the use of agricultural practices that enhance the sequestration capacity of Maryland farms. These practices were identified on the basis of their efficacy, scientific support, and suitability for Maryland-specific conditions and represent a range of options open to state producers. The Committee is currently prioritizing practices • and discussing the preliminary stages of a state program framework. • Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that helps agricultural producers in a manner that promotes agricultural production and environmental quality as compatible goals. Through EQIP, agricultural producers receive financial and technical assistance to implement structural and management conservation practices that optimize environmental benefits on working agricultural land
Other	• ACRE Program – Reimbursement grant program that funds materials and labor for the implementation of practices that address the agricultural sector's vulnerability to climate change, improves economic resiliency	• MDA partnered with the USDA Regional Conservation Partnership Program on a $1 million grant to promote soil heath and adaptive management strategies on Maryland's Eastern Shore. Farmer interest was high, with applicants signing up for this

Cross Cutting	Massachusetts	Maryland
	and advances the general goals identified in the Massachusetts Local Action Food Plan. Reimbursement grants up to $50,000 will be awarded on a competitive basis.	special funding opportunity. Grant funds were targeted to farmers in Caroline, Kent, • Queen Anne's, and Talbot Counties to support the installation of practices that increase soil organic matter, reduce erosion, promote nutrient cycling, improve water retention, and reduce competition from weeds and pests.
Takeaways	• Minor overall focus on sector in comparison to other efforts • Existing land conservation/ preservation regulations • ACRE program to fund climate change adaptation/mitigation programs in the ag sector • Healthy Soil program funds education, technical assistance and financial incentives to farmers and land managers who utilized healthy soil practices such as no till or low till farming, cover crops and other practices that reduce the need for synthetic inputs and increase resilience to extreme weather events. • GWSA Plan must "(A) contain a statewide baseline measurement and measure the current carbon flux on natural and working lands; (B) adopt statewide goals to reduce greenhouse gas emissions and increase carbon sequestration on natural and working lands; and (C) develop a natural and working lands plan that outlines actions to meet these statewide goals, including, but not limited to, land protection, management and restoration and state and local legislation, laws and regulations, programs, grants, loans, incentives and public-private partnerships, and provide guidance and strategies for state agencies, authorities, municipalities, regional planning agencies, nonprofit organizations, landowners and operators; provided, however, that said plan shall be developed and informed by a stakeholder process and that the baseline, goal and plan shall be integrated into the inventory, baseline assessment, plan and reporting requirements pursuant to this chapter and shall be consistent with state climate change adaptation and resiliency policies; • No sector sublimits, though can be implemented	• Existing land conservation/ preservation regulations • Healthy soils program provides research, education, and assistance necessary to improve the health, yield, and profitability of Maryland's soils and increase soil carbon storage capacity on Maryland farms. • Minor list of ag management practices included in GGRA
Forestry		

Cross Cutting	Massachusetts	Maryland
Land protection and recovery	• The Massachusetts Forest Cutting Practices Act was created to ensure the long-term public benefits provided by forests. The Forest Cutting Practices Act (FCPA) states that public welfare requires the rehabilitation, maintenance, and protection of forestlands for the purposes of conserving water, preventing floods and soil erosion, improving conditions for wildlife and recreation, and insuring a continuous supply of wood. • Massachusetts Forest Stewardship Program (MFSP) supports and encourages private forest landowners' efforts to manage, enjoy, and care for their land using a long-term approach	• The 2030 goals for managing Maryland forests are to provide sustainable forest management on 38,000 acres of private land annually, ensure greater than 50% of state-owned forest lands will continue to be third-party certified as sustainably managed, support forest markets that keep land in forest use, and provide sustainable management for multiple benefits on other state lands where possible. In addition to managing existing forests many new trees are planted in the state every single year. These plantings expand the state's forest cover and stores of carbon by regenerating or establishing healthy, functional canopies and forests utilizing practices such as soil preparation, erosion control and supplemental planting. By 2030, the goal is to achieve the afforestation or reforestation of 68,530 acres in Maryland, including planting 4.6 million trees. The 2030 GGRA Plan also includes planting 2.65 million urban trees, for a total of 7.25 million trees planted by 2030. • The Maryland Forest Conservation Act (FCA) (Natural Resources Article Section 5-1601 through 5-1613), Enacted to minimize the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the site planning process. Identification of priority areas prior to development makes their retention possible. Of primary interest are areas adjacent to streams or wetlands, those on steep or erodible soils or those within or adjacent to large contiguous blocks of forest or wildlife corridors. Although DNR Forest Service administers the FCA, it is implemented on a local level. • Forest Preservation Act – The Forest Preservation Act expands upon the FCA by setting a no-net loss of forest land in the state, setting a minimum tree canopy cover threshold of 40% and establishing new landowner incentives for forest management. Several counties and municipalities have committed to the Chesapeake Bay urban tree canopy goals, with some requiring a 1:1 replacement of any tree cut over a certain diameter. • Tree Solutions Now Act of 2021 – 5 million trees to be planted over an eight-year period with 500,000 of them targeted to urban, underserved areas. • Natural Filters Program – Restores wetlands and buffers on state and public lands to meet water quality goals and is provided through the Chesapeake and Atlantic Coastal Bays

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		Trust Fund. The Natural Filters Program restored 8.5 acres of wetlands on state and public land and planted 1.2 acres of streamside forest buffers on state and public lands in CY19, working toward the state's Watershed Implementation Plan (WIP) goals for state and public lands • Coastal Wetlands Initiative Program: As of 2019, 505.6 acres of coastal wetlands have been restored by plugging existing drainage ditches to restore these drained wetlands.
Low carbon management practices	• Forest Resource Management Plan Mandate - The intent of the FRMP is to inform the public on how the forest resources in the District will be managed and what will be the predicted results of management decisions; provide forest management direction to ultimately favor greater diversity of size and age classes; direct the management of forests that will provide key ecosystem services such as: water, habitat, recreation, wood products and carbon sequestration; establish guidelines that will protect and enhance rare species; provide a balanced approach to recreation and active forestry; help supply local wood products to local forest economies; and provide the basis for demonstrating "excellent forestry." Each plan is designed to provide a 100 year strategy that is condensed to an initial 10 year implementation schedule. The plans identify lands designated as Reserves, Parklands and Woodlands, describe their current condition and provide guidelines for their management and continued monitoring. Given the guidelines for management, the FRMPs predict the short and long term effects on forest structure and the expected resource outputs. Each plan is written to meet and exceed Massachusetts Forestry Best Management Practices and fulfill the standards for future third party forest certification.	• Forest Action Plan – The first goal of the 2020 Maryland Forest Action Plan Strategy is to "Grow forests, habitats, markets, and jobs." This is reinforced and refined by an additional four goals to maximize public benefits over the long term: Manage forest health and fire, provide clean water, create healthy, livable communities, and respond to climate change. The 2020 strategy remains based on the seven principles of sustainable forestry as defined in the international Montreal Process: biodiversity, forest productivity, ecosystem health, soil and water health, global carbon, socio-economic support, and legal/institutional frameworks. MDE, MDNR, and MDA adopt the term "Natural and Working Lands" to refer to all GGRA programs concerning land-based carbon sequestration and avoided emissions of carbon or other GHG's. This will allow Maryland to better align with the effort coordinated by the US Climate Alliance.
Other	• Greening the Gateway City Tree Planting Program – The Greening the Gateway Cities Tree Planting Program is designed to bring the energy efficiency and environmental benefits of a healthy tree canopy to Gateway Cities, former industrial cities identified by the Baker administration	• Forest Stewardship Plan – Private landowners are encouraged to practice forest stewardship and leave the land and its resources in better condition for future generations. Each individual landowner can contribute to the future environmental quality and economic stability of Maryland by managing forestland according to a resource conservation plan.

Cross Cutting	Massachusetts	Maryland
	for targeted redevelopment efforts. So far, over 8,000 trees have been planted throughout 13 Gateway Cities. Increase the urban tree canopy to 5-10% in select neighborhoods in each Gateway City, in order to reduce heating and cooling costs and improve health and safety for residents.	• Woodland Incentive Program – Private, non-industrial woodland owners who manage their forest land may apply for financial assistance through the Woodland Incentive Program (WIP). WIP is administered by the Department of Natural Resources – Forest Service.
Takeaways	• Minimal programs to enhance forest sector, Forest Resource Management Plan Mandate provides sector wide management goals and criteria. • Urban Tree planting program	• By 2030, the goal is to achieve the afforestation or reforestation of 68,530 acres in Maryland, including planting 4.6 million trees. The 2030 GGRA Plan also includes planting 2.65 million urban trees, for a total of 7.25 million trees planted by 2030. • Forest Preservation Act – The Forest Preservation Act expands upon the FCA by setting a no-net loss of forest land in the state, setting a minimum tree canopy cover threshold of 40% and establishing new landowner incentives for forest management. Several counties and municipalities have committed to the Chesapeake Bay urban tree canopy goals, with some requiring a 1:1 replacement of any tree cut over a certain diameter.
Waste		
Solid waste management	• Massachusetts 2010-2020 Solid Waste Master Plan (SWMP) published in April 2013. Set a goal of decreasing solid waste disposal by 30% by 2020 and by 80% by 2050. The Commonwealth has implemented a nation-leading strategy to reduce food waste, highlighted by a commercial organics disposal ban for facilities generating a ton or more of organic material a week in 2014. Supported by a comprehensive strategy, the rescue of fresh and perishable foods grew by 60%, innovative companies and municipalities established 600,000 tons of anaerobic digestion capacity, the number of businesses with food waste collection programs grew by 70%, and annual food waste reduction grew by 180,000 tons through 2018. • Draft 2030 SWMP – 2030 Goals: MassDEP's proposed waste reduction goal for 2030 is to reduce disposal by 1.7 million tons annually from a 2018 baseline of 5.7 million tons to 4.0 million tons by 2030, a 30% reduction. Reduce the toxicity of the waste stream by improving the availability	• Maryland Recycling Act (MRA) – Mandates that State government achieve a waste reduction goal of at least 30%, or to an amount that is determined "practical and economically feasible", but in no case less than 15%. The Maryland Recycling Act (MRA) requires all Counties and Baltimore City to recycle 20% (populations under 150,000) or 35% (populations over 150,000) of the waste generated. State government is required to recycle 20% of their solid waste. In addition, Maryland established a voluntary waste diversion goal of 60%, and a voluntary recycling rate of 55% by 2020. The waste diversion goal is comprised of the recycling rate plus source reduction credits (maximum 5%) that Maryland Counties and Baltimore City earn through activities designed to reduce the amount of waste going to the waste stream. • Executive Order 01.01.2017.13, Waste Reduction and Resource Recovery Plan for Maryland – The order adopts a first-ever sustainable materials management (SMM) policy for Maryland that aims to minimize the environmental impacts of the materials' use throughout the entire lifecycle. The policy emphasizes environmentally and economically sustainable methods to capture and reinvest resources into our economy,

Cross Cutting	Massachusetts	Maryland
	of household hazardous waste collection programs and implementing producer responsibility approaches for targeted materials. • Recycling programs including: Sustainable Materials Recovery Grants Program ($7.5M), Recycling Dividends Program ($14M), Recycling Business Development Grant Program, Closed Loop Fund (signed MOU), Recycling Loan Fund	including everything from metals and plastics to energy, nutrients, and soil. It initiates a stakeholder consultation process to establish ambitious but achievable goals and to ensure tracking of complete materials management data. It also empowers new partnerships across State and local agencies, the agricultural, energy, and transportation sectors, environmental organizations, and recycling innovators. Maryland's SMM Policy It is the policy of the State that solid waste and recycling planning should, to the extent practicable, seek to: 1. Minimize the environmental impacts of materials management over their entire life cycles, including from product design to production, consumption, and end-of-life management; 2. Conserve and extend existing in-State disposal capacity through source reduction, reuse, and recycling; 3. Capture and make optimal use of recovered resources, including raw materials, water, energy, and nutrients; and 4. Work toward a system of materials management that is both environmentally and economically sustainable in the long term. • Voluntary Statewide Goal by 2035 • Reduction in the amount of waste generated by 10% to 5.5 lbs./person/day • Annual reduction of 1.2 million MTCO2e in 2035, compared to a baseline year of 2016. • Annual reduction of 4.3 trillion BTUs in 2035, compared to 2016. • Voluntary recycling rate goals: • Food scraps – 60% • Yard trimmings – 85% • Glass – 55% • Metal – 75% • Paper products – 65% • Plastic – 25% • Maintain the goals of 55% recycling and 60% waste diversion currently in the statute but extend the timeframe to 2035. • Department of Commerce has formed a subcabinet team with DNR, the Port Authority, MDE, MDA, and MEA to manage waste materials as efficiently and sustainably as possible throughout a waste stream's entire life cycle. The Subcabinet team is approaching waste streams on a project-by-project basis. Each identified SM3 project is highlighted to the Subcabinet, Maryland Environmental Services and an external stakeholder group.

Cross Cutting	Massachusetts	Maryland
		The goal is to bring state funding programs together with project managers who can then leverage the private sector to manage ongoing waste streams.
Liquid waste management		
Waste to energy	• There are seven waste-to-energy facilities in Massachusetts. Together, they burn more than one-third of the solid waste generated in our state. This guide provides an overview of the role they play in our state's waste management system, how they operate and are regulated, and the progress they are making toward reducing their emissions of targeted air pollutants. The owner/operators of the five largest combustion facilities in Massachusetts are required by MassDEP to submit oOe-time Emission Control Plans, demonstrating how and when they will use pollution control technologies to reduce air emissions, and Periodic emissions reports to MassDEP, including notification of when facilities have exceeded specific emission limits. • RPS Class II Waste Energy – This class includes generation units that are classified as Waste Energy Generation Units and are located in Massachusetts. Typically these units burn solid waste at extremely high temperatures to generate electricity or steam power, in addition to providing funding to support recycling programs in Massachusetts. Eligible facilities generated Class II Waste Energy Certificates (WECs) and the annual percentage requirement is fixed at 3.5% per year. • RPS Class I includes Landfill methane and anaerobic digester gas	• There are currently three waste-to-energy facilities in Maryland—the Wheelabrator facility in Baltimore City, the Montgomery County Resource Recovery Facility in Dickerson, and the Harford County Resource Recovery Facility. • RPS Tier 1 technologies include Methane from a landfill or wastewater treatment plant, Poultry litter-to-energy, Waste-to-energy, and Refuse–derived fuel.

Climate Adaptation

Climate Resilience	Massachusetts	Maryland
Equal Priority with Mitigation	• Adaptation Advisory Committee - EEA established an Adaptation Advisory Committee in 2009 to review potential approaches to help Massachusetts become more resilient in the face of growing evidence of climate change impacts. The Committee led the publication of the Climate Change Adaptation Report in 2011, which included an overview of the observed and predicted changes to Massachusetts' climate and the anticipated impacts, key vulnerabilities to climate change, and adaptation strategies that could increase resilience and preparedness. Since then, EEA has hired a Director of Climate Adaptation and created the position of Assistant Secretary of Climate Change to oversee both climate change mitigation and adaptation efforts. Additionally, Governor Baker issued Executive Order 569 in 2016 establishing an integrated climate strategy for the Commonwealth. It requires: - The development of state-wide climate adaptation plan within 2 years; - The establishment of a framework for each Executive Office and for each municipality in the Commonwealth to assess its vulnerability to climate change and extreme weather events and to identify adaptation options for its assets; - Technical assistance to Cities and Towns to complete vulnerability assessments, identify adaptation strategies, and begin implementation of these strategies.	• Maryland has been implementing climate adaptation efforts for more than a decade. In 2008, the Adaptation and Resiliency Working Group (ARWG), a working group of the MCCC, published Phase I: Comprehensive Strategy to Reduce Maryland's Vulnerability to Climate Change, which focused on sea level rise and coastal storms. In 2011 the second phase strategy was published, focused on societal, economic and ecological resilience. These strategies together laid out recommendations on adaptation efforts that address changes in precipitation patterns and increased temperature as well as the likely impacts to human health, agriculture, forest and terrestrial ecosystems, bay and aquatic environments, water resources, and population growth and infrastructure. In addition to the ARWG, Maryland's participation in multi-jurisdictional compacts such as the Chesapeake Bay Program (CBP) is essential to the state's success in the adaptation arena. The CBP's Climate Resiliency Work Group (CRWG) leads and monitors work being done in accordance with the climate resilience goal of the 2014 Chesapeake Bay Watershed Agreement. • Resilience Authorities - Authorizes local governments to establish and fund a Resilience Authority under local law, outlines the requirements to do so, and specifies the powers local governments may grant to an Authority. A Resilience Authority enables a local jurisdiction to flexibly organize funding structures for and manage large-scale infrastructure projects specifically aimed at addressing the effects of climate change, including sea-level rise, flooding, increased precipitation, erosion, and heatwaves. The power to establish these Authorities allows local governments to accelerate infrastructure financing, reduce implementation costs, and better adapt to climate change. Local revenues increase from bonds issued under the bill beginning as soon as FY 2021 to the extent that local governments choose to establish resilience authorities. Local expenditures from bond proceeds and/or direct local government support increase beginning that same year for authorized purposes. Local revenues further increase, likely beginning no earlier than FY 2022, from income and/or property tax revenues to the extent that resilience projects funded because of the bill maintain or generate additional economic growth.

Climate Resilience	Massachusetts	Maryland
Comprehensive Coverage of Systems	• Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan - This plan, the first of its kind to comprehensively integrate climate change impacts and adaptation strategies with hazard mitigation planning, also complies with current federal requirements for state hazard mitigation plans and maintains the Commonwealth's eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The plan received FEMA approval and is effective 9/19/2018 through 9/18/2023. • Municipal Vulnerability Preparedness Program - provide support for cities and towns in Massachusetts to plan for resiliency and implement key climate change adaptation actions for resiliency. The Commonwealth awards communities with funding to complete vulnerability assessments and develop action-oriented resiliency plans. For help completing their assessment and resiliency plan, communities can choose from a list of MVP certified providers trained on The Nature Conservancy's Community Resilience Building Framework. Communities who complete the MVP program become certified as an MVP community and are eligible for MVP Action grant funding and other opportunities. As of November 2018, 74 municipalities have been designated MVP communities, with another 83 communities currently completing the MVP planning grant as part of the designation process. Since its establishment, EEA has provided $7.88 million in MVP Action and Planning Grants for municipalities to complete a workshop process that identifies climate change related hazards, and develops strategies to improve resilience and to implement priority actions. In 2018, EEA released the second round of MVP planning grants and the first round of MVP Action grants. The total funding awarded for both programs equaled nearly $7.24 million. The MVP Planning grants awarded totaled $4.9 million and are currently being used by municipalities to complete a community-driven process to identify hazards and develop strategies to	• Maryland Climate Adaptation Framework. Documentation of Maryland's Climate Adaptation and Resilience Framework 2020-2030: A Roadmap for Action (In process). When developing the concept for the Framework, ARWG members recognized the importance of addressing sector- specific adaptation needs and opportunities as well as considering overarching issues that impact all sectors. As a result, the Framework is being organized into five sectors: Natural Resources, Natural and Working Lands, Human Health, Water Resources - Quality and Quantity, and Protecting Critical Infrastructure. In addition, there are three focus areas that will be integrated into all of the sectors: Diversity and Environmental Justice, Climate Jobs and Training, and Local Government Action and State Service Delivery. The final Framework report will provide goals, strategies and action items for each sector and focus area while also acknowledging and addressing the connections between sectors. • In 2020, the Maryland Department of Natural Resources (DNR) Chesapeake and Coastal Services funded the University of Maryland Center for Environmental Sciences - Integration and Application Network (UMCES-IAN) to develop an Adaptation Report Card and indicators to track Maryland adaptation progress. Through their partnership with ARWG, its members, stakeholder workshops and expertise within their organization, UMCES-IAN has begun to research and review existing adaptation metrics, discuss targets and goals of state climate adaptation work, and develop a series of adaptation metrics to track progress towards these goals.

Climate Resilience	Massachusetts	Maryland
	improve resilience, and host listening sessions across the Commonwealth to discuss solutions and engage the public. Action grant funding (implementation) totaled nearly $2.3 million and are being used for a variety of projects that address the priority actions municipalities identified in their planning processes."	
Takeaways	• Established a Director of Climate Adaptation and created the position of Assistant Secretary of Climate Change to oversee both climate change mitigation and adaptation efforts in the state. • State Hazard Mitigation and Climate Adaptation Plan published in 2018, which qualifies for federal requirements for funding under the Stafford Act for disaster recovery and hazard mitigation. • $2.4B Environmental Bond Bill has significant allocations to climate adaptation programs • EEA has provided $7.88 million in Municipal Vulnerability Preparedness Action and Planning Grants for municipalities to complete a workshop process that identifies climate change related hazards and develops strategies to improve resilience and to implement priority actions. • RMAAT oversees effective implementation of programs and projects under SHMCAP	• Maryland Climate Adaptation Framework. Documentation of Maryland's Climate Adaptation and Resilience Framework 2020-2030: A Roadmap for Action is in process. • No specific guidelines for implementation of actions from upcoming roadmap or funding strategies identified. • Adaptation Report Card and indicators tool is being developed by the University of Maryland in conjunction with DNR and ARWG to track Maryland adaptation progress.

Implementation Mechanisms

Implementation Mechanisms	Massachusetts	Maryland
Monitoring, Reporting and Verification	• MassDEP maintains an inventory of Greenhouse Gas (GHG) emissions in Massachusetts in accordance with the state's Global Warming Solutions Act using EPA State GHG Inventory Tool (SGIT). SGIT consists of a series of modules, or spreadsheets, which calculate emissions from the various sources of GHGs. Gases included in the inventory are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), • hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3). • 310 CMR 7.71 Reporting of Greenhouse Gas Emissions. Identifies the facilities that need to report, establishes methodologies for calculating and verifying emissions, and allows voluntary reporting by facilities for which it is not mandatory. All facilities regulated under Title V of the federal Clean Air Act and Appendix C of 310 CMR 7.00: Air Pollution Control Facilities emitting more than 5,000 tons per year of Carbon Dioxide Equivalent (CO2e). By April 15,2010, and April 15th of each year thereafter, any entity owning, operating or controlling a facility that is required to report air emissions data to the Department pursuant to 310 CMR 7.00: Appendix C and had stationary emission sources that collectively emitted greenhouse gases in excess of 5,000 short tons of greenhouse gases in carbon dioxide equivalents during the previous calendar year, or was previously required to report direct emissions pursuant to 310 CMR 7.71(5)(a)1 .a., shall report and certify direct emissions of greenhouse gases for the previous calendar year in accordance with 310 CMR 7.71(5) and (6).	• The Maryland Department of the Environment (MDE) tracks the State's emissions through its Greenhouse Gas (GHG) Emissions Inventory. The 2006 GHG emissions inventory serves as a baseline, which is then compared to other years to determine progress. Since 2006, three additional GHG emissions inventories have been completed for years 2011, 2014, and 2017. The GHG emissions inventory is a core part of the State's overall strategy to measure emission reduction. It shows purely data and serves as a tool to help planners track progress and make policy decisions. The GHG emissions inventory is mandated by the Greenhouse Gas Emissions Reduction Act – Reauthorization of 2016 (GGRA of 2016) – Senate Bill (SB) 278 and House Bill (HB) 315 in 2009, which is codified in Maryland Annotated Codes, Title 2, Subtitle 1203). • The GGRA of 2016 requires that the State reduce emissions by 42.89 million metric tons of carbon dioxide equivalent (MmtCO2e) (40% of the state's gross GHG emissions in 2006) to achieve the 2030 goal. To account for both reductions in emissions and improvements in sequestration from forests and agricultural soils, Maryland's net GHG emissions must be reduced to 52.55 MmtCO2e (42.89 MmtCO2e below the state's net GHG emissions in 2006). The combined emissions reductions of all programs in the 2030 GGRA Plan will yield a total of 47.4 MmtCO2e in emissions reductions in 2030, compared to 2006. This will result in a total reduction of 44%, achieving 4.5 MmtCO2e of emission reductions more than the 2030 GGRA goal. • Much of Maryland's GHG inventory input data comes from the following sources: the United States Energy Information Administration (EIA), the United States Environmental Protection Agency's (EPA) State Inventory and Projection Tool (SIT), EPA's MOVES model and the MDE's Compliance Program – Emission Certification Report. • MDE also released a separate inventory to document methane emissions that occur outside of Maryland from the production and transport of fracked natural gas consumed in Maryland. The analysis includes fugitive leakage emissions and well construction emissions.
Governance and Barrier Removal	• Executive Office of Energy and Environmental Affairs is the only state	• MCCC identified initial steps Maryland can take to increase the use of efficient

Implementation Mechanisms	Massachusetts	Maryland
	Cabinet-level office in the country that oversees both environmental and energy agencies. • GWSA Implementation Advisory Committee – Technical Steering Committee of local academic experts, community organizations, Environmental Justice organizations and communities, regional planning authorities, and other stakeholders • Specific programs between DOER and DCHD to target removal of barriers for adoption of energy efficiency programs targeting: 1. Aligning housing and clean energy processes, especially budget cycles and capital needs assessments. 2. Improving technical assistance and communication of benefits at the community level. 3. Targeting funding initiatives at specific barriers in very low-income communities and households.	electricheat pumps to heat homes and businesses, while launching a Building Energy Transition Plan process for 2021. Those steps include reforming the EmPOWER Maryland program to pursue a portfolio of mutually reinforcing goals, including GHG reductions, energy savings, net customer benefits, and reaching underserved customers. Broadening the goals of the EmPOWER program and removing existing barriers to fuel switching would allow Maryland toprovide funding for homeowners and building managers to replace fossil fuel burning furnaces and boilers withefficient electric heat pumps when those systems need to be replaced and it is cost effective to do so. • ZEEVIC has made progress on several vital initiatives and is continuing to work on removing barriers to the adoption of ZEVs, including ensuring that charging is available to those who live in urban environments, multi-unit dwellings, or in homes governed by homeowner's associations. • The Growing Climate Solutions Act of 2020, would create a USDA carbon credit certification program. The goals would be to break down barriers of entry for forest and agricultural landowners through technical assistance (PROPOSED ONLY). Removing barriers to accessing federal funds could also incentivize landowners to participate in restoration projects. DNR is actively working with the Maryland Department of Agriculture and the United States Department of Agriculture • There are efforts in the Chesapeake Bay region by timber investment management organizations and NGOs to overcome the cost barrier by grouping multiple landowners for single carbon credit projects. • The Nontidal Wetlands Mitigation Banking bill removes barriers to mitigation banking in Maryland, with the goal of reducing the cost for meeting mitigation requirements in an ecologically beneficial way
Financial Mechanisms		
Public sources	• Over $2.4 billion in capital allocations for investments in safeguarding residents, municipalities and businesses from the impacts of climate change, protecting environmental resources, and improving recreational opportunities. Codifies elements of EO569, such as the development and updates of the state climate adaptation plan and the	• Environmental Trust Fund – 2016 Maryland Code Natural Resources Title 3 – Environmental Programs Subtitle 3 – Power Plant Research Program § 3-302. Environmental Trust Fund. There is established as an added cost of electricity distributed to retail electric customers within the State, an environmental surcharge per kilowatt hour of electric energy distributed in the State to be paid by any electric company

Implementation Mechanisms	Massachusetts	Maryland
	establishment of vulnerability assessment framework and grant program for municipalities. The bill authorizes over $500 million to climate change resiliency efforts and stipulates those investments made by EEA and its agencies must be consistent with the state climate adaptation plan. The legislation includes over $350 million in authorizations for critical infrastructure and the prevention, adaptation and mitigation of climate change. $185 million is authorized for investments in coastal and inland infrastructure, such as dams and seawalls, as well as nature-based solutions for climate change resilience. Another $100 million is authorized for continuous implementation of the integrated state hazard and climate adaptation plan, and $75 million to partner with cities and towns in the municipal vulnerability preparedness program. Other key capital authorizations to address climate change include $16.5 million for the Executive Office of Public Safety and Security to develop and support climate-based emergency response and natural hazards preparedness programs; and $10 million for the climate change science and data program to track and monitor impacts from climate change, and the maintenance and expansion of the climate change clearinghouse data and tools available to municipalities.	as defined in § 1-101 of the Public Utilities Article. The Public Service Commission shall impose the surcharge per kilowatt hour of electric energy distributed to retail electric customers within the State and shall authorize the electric companies to add the full amount of the surcharge to retail electric customers' bills. • Strategic Energy Investment Fund (SEIF) – Funded primarily through proceeds from the auction of GHG allowances under RGGI, to implement energy programs that promote affordable, reliable, and cleaner energy for Maryland residents. Additionally, MEA is focused on enhancing resiliency and reducing GHGs from buildings and the transportation sector. Through its energy programs, MEA also strives to distribute funds across the state to support efforts to improve energy equity, helping all Marylanders have access to clean and affordable energy. MEA implements programs through a mix of rebates, grants, loans, technical assistance and partnerships as well as funding efforts underway by sister agencies focusing on specific areas of Maryland's economy. • Numerous grant and loan programs through MEA, DCHD and other agencies for energy and environmental projects (low funding levels).
Private sources	• Volkswagen – Massachusetts is expected to receive more than $75 million to spend on environmental mitigation projects. MassDEP is developing a plan for investing these funds in better air quality, cleaner transportation, and healthier communities across the state.	• Clean Access Fund – The Climate Access Fund reduces electricity bills for lower-income households in Maryland through community solar power, while providing a financial return for solar investors. • Volkswagen Mitigation Plan – Maryland is eligible to receive $75.7 million for use on specifically defined mitigation projects to remediate the excess Nox emissions. MDE was the lead agency tasked with developing Maryland's mitigation plan in accordance with the list of eligible projects and matching fund requirements required under Appendix D-2 of the Settlement. Allocated 15% of the VW funds to install EV charging infrastructure across the State, and funding for electric school buses and replacement of older, dirty diesel engines with new, cleaner

Implementation Mechanisms	Massachusetts	Maryland
		technologies. Electric buses and heavy-duty equipment such as trucks, boats and locomotives are also eligible for funding.
Blended Finance	• Public-Private Partnership Oversight Commission – This commission was created by the legislature as part of Transportation Reform in 2009 and is responsible for reviewing and recommending public-private partnership opportunities for transportation infrastructure projects.	• PPPs – Over the past several years, the State of Maryland has been working to develop the State's capacity and framework to implement innovative financing and delivery mechanisms for vital infrastructure projects. One tool the State has identified is Public-Private Partnerships (P3) to leverage the expertise and efficiencies of the private sector and mitigate risk for the State when undertaking large transportation infrastructure projects. In order to create an enhanced framework for future P3s that will attract private investment to help build new infrastructure, Maryland passed House Bill 560, which was signed into law on April 9, 2013. The new legislation provides the private sector with a stronger, more predictable and streamlined process, protects public assets, ensures a strong workforce, requires competitive bidding for all projects and allows the private sector to submit new unsolicited concepts to address Maryland's infrastructure needs. Initial estimates indicate that additional P3s could contribute six to 10 percent of Maryland's $3.1 billion annual capital budget and create 4,000 jobs each year. The Maryland Department of Transportation's (MDOT) P3 regulations (COMAR 11.01.17) became effective under emergency action in July 2013 and as final action in October 2013. The Maryland Transportation Authority also amended and adopted new regulations (COMAR 11.07.06 – Public-Private Partnership Program) in October 2015 to clarify the process of public-private partnerships (describe and provide a process for the development, solicitation, evaluation, award, and delivery of public-private partnerships in the MDTA's Program) pursuant to House Bill 560. • SB0737 Comprehensive Conservation Finance Act – DID NOT PASS – this bill makes changes to a broad variety of existing programs related to environmental conservation and natural resources management and expands opportunities for agencies to obtain private investment and financing for State environmental projects, including conservation efforts, restoration projects, and the installation and repair of green and blue infrastructure. The bill also alters existing and establishes new State policies for several related programs and establishes a new workgroup, commission, and task force.

Implementation Mechanisms	Massachusetts	Maryland
		The primary agencies that are affected are the Maryland Department of Agriculture (MDA), the Maryland Department of the Environment (MDE), and the Department of Natural Resources (DNR), but there are changes to procurement and contracting opportunities for additional agencies.
Takeaways	• MA has established Executive Office of Energy and Environmental Affairs to oversee management of climate programs • "Market-based compliance mechanism", any form of market-based or priced compliance system imposed on sources or categories of sources of greenhouse gases, or any pricing mechanism imposed directly on greenhouse gas emissions sources or on their distribution or sale, designed to reduce emissions as required by this chapter, which shall include, but not be limited (i) a system of market-based declining annual aggregate emissions limitations for sources or categories of sources that emit greenhouse gases; (ii) greenhouse gas emissions exchanges, banking, credits and other transactions governed by rules and protocols established by the secretary, the regional greenhouse gas initiative or other regional program that result in the same greenhouse gas emissions reduction, over the same time period, as direct compliance with a greenhouse gas emissions limit or emission reduction measure adopted pursuant to this chapter; or (iii) a system of charges or exactions imposed to reduce statewide greenhouse gas emissions, in whole or in part. • RGGI and Mass Save Program drive utility energy efficiency and emissions reductions, with allocated funding for energy efficiency programs • Over $2.4 billion bond bill authorizes over $500 million to climate change resiliency efforts and stipulates those investments made by EEA and its agencies must be consistent with the state climate adaptation plan. The legislation includes over $350 million in authorizations for critical infrastructure and the prevention, adaptation, and mitigation of climate change. $185 million is authorized for	• The Maryland Department of the Environment (MDE) tracks the State's emissions through its Greenhouse Gas (GHG) Emissions Inventory. The GHG emissions inventory is mandated by the Greenhouse Gas Emissions Reduction Act – Reauthorization of 2016, Codes, Title 2, Subtitle 1203, published every three years. • RGGI and EmPower Programs establish mechanisms for utility emissions reductions. • Environmental Trust Fund – 2016 Maryland Code Natural Resources Title 3 – Environmental Programs Subtitle 3 – Power Plant Research Program § 3-302. Environmental Trust Fund. There is established as an added cost of electricity distributed to retail electric customers within the State

Implementation Mechanisms	Massachusetts	Maryland
	investments in coastal and inland infrastructure, such as dams and seawalls, as well as nature-based solutions for climate change resilience. Another $100 million is authorized for continuous implementation of the integrated state hazard and climate adaptation plan, and $75 million to partner with cities and towns in the municipal vulnerability preparedness program. Other key capital authorizations to address climate change include $16.5 million for the Executive Office of Public Safety and Security to develop and support climate-based emergency response and natural hazards preparedness programs; and $10 million for the climate change science and data program to track and monitor impacts from climate change, and the maintenance and expansion of the climate change clearinghouse data and tools available to municipalities.	
Innovation Programs		
Technology	• The Massachusetts Clean Energy Center (MassCEC) is a state economic development agency dedicated to accelerating the growth of the clean energy sector across the Commonwealth to spur job creation, deliver statewide environmental benefits and to secure long-term economic growth for the people of Massachusetts. MassCEC works to increase the adoption of clean energy while driving down costs and delivering financial, environmental, and economic development benefits to energy users and utility customers across the state. MassCEC funds more than 25 programs including incentives for clean energy technology installations, financing for early-stage companies and technology development as well as investments in training programs to build a clean energy workforce. MassCEC, which is publicly-funded, drives innovation by serving as a clearinghouse and support center for the clean energy technology sector, providing assistance to enable companies to access capital and other vital growth resources. The trust is	• Maryland Clean Energy Center - The Maryland Clean Energy Center (MCEC) is a corporate instrumentality of the state created by the General Assembly with a statute-directed mission to advance clean energy and energy efficiency products, services, and technologies as part of a specific economic development strategy. In FY 2020 MCEC received approximately $885,000 in operational grant funding from Regional Greenhouse Gas Initiative (RGGI) auction proceeds, through the Maryland Energy Administration to the Maryland Energy Innovation Fund held at the University of Maryland College Park. • Maryland Energy Innovation Institute - The Maryland Energy Innovation Institute will provide a platform to catalyze basic research into new technology while stimulating economic growth and improving millions of lives across the state of Maryland. The Institute will bring together science, industry, government and economic leaders to develop new energy technologies and facilitate the transfer of technology ideas into a reality. • Maryland Innovation Initiative - created as a partnership between the State of Maryland and five Maryland academic research institutions (Johns Hopkins University; Morgan State University; University of Maryland, Baltimore; University of Maryland,

Implementation Mechanisms	Massachusetts	Maryland
	funded by a systems benefit charge of $0.0005 per kilowatt hour paid by electric ratepayers of investor-owned utilities in Massachusetts, as well as municipal electric departments that have opted to participate in the program. The average Massachusetts household contributes $0.32 to the Renewable Energy Trust each month.	Baltimore County; University of Maryland, College Park). The program is designed to promote commercialization of research conducted in the partnership universities and leverage each institution's strengths. • Maryland Energy Innovation Accelerator - MEIA focuses on early-stage technology commercialization in partnership with Maryland-based Universities and Labs to support Maryland's Clean Energy and Climate Goals. MEIA supports solar, wind, batteries, energy efficiency, grid modernization, carbon capture utilization and storage (CCUS), and any other technology that reduces greenhouse gas emissions or provides negative emissions benefits in the electric, oil and gas, residential, commercial or industrial sectors. • Maryland Industry Partnerships Program (MIPS) - MIPS is nationally recognized by the U.S. Small Business Administration as a model program for best practices in transferring technology and is a proven program that contributes significantly to job creation and high-tech product development in Maryland
Best Practices	• The resilient MA Climate Clearinghouse provides communities with the best science and data on expected climate changes, information on community resiliency, and links to important grant programs and technical assistance, including best practices guides on a variety of subjects.	• MD Green Purchasing Committee – Develops and executes statewide green purchasing policies, guidelines and best practices and conducts training to raise awareness of these issues. • MD Green Registry – Listing of best practices from voluntary registrants for environmental management, leadership, waste reduction, conservation, transportation and green building design.
Financing	• MassCEC FY2021 Budget - $27.4M	• FY 2020 MCEC received approximately $885,000 in operational grant funding from Regional Greenhouse Gas Initiative
Governance	• New England States' vision, expressed through the New England States Committee on Electricity (NESCOE), for a clean, affordable, and reliable 21st century regional electric grid necessitates significant changes in three core segments of our shared energy system: Wholesale Electricity Market Design, Transmission System Planning, and ISO New England (ISO-NE) Governance. The New England States will initiate a public process, supported by NESCOE, to inform the development of any proposals related to the Vision set forth below. • Commission on the Future of Transportation • MA 2050 Decarbonization Roadmap	• MCCC and Working Group Recommendations

Implementation Mechanisms	Massachusetts	Maryland
	• MA Comprehensive Energy Plan	
Mechanisms		
Takeaways	• The Massachusetts Clean Energy Center (MassCEC) is a state economic development agency dedicated to accelerating the growth of the clean energy sector across the Commonwealth to spur job creation, deliver statewide environmental benefits and to secure long-term economic growth for the people of Massachusetts. MassCEC funds more than 25 programs including incentives for clean energy technology installations, financing for early-stage companies and technology development as well as investments in training programs to build a clean energy workforce. FY 2021 Budget $27.5M • The resilient MA Climate Clearinghouse provides communities with the best science and data on expected climate changes, information on community resiliency, and links to important grant programs and technical assistance, including best practices guides on a variety of subjects. • Commission on the Future of Transportation Report provided reccomendations on mechanisms to improve long term planning (2040) for transportation sector growth, land use and technology deployment.	• Maryland Clean Energy Center - The Maryland Clean Energy Center (MCEC) is a corporate instrumentality of the state created by the General Assembly with a statute-directed mission to advance clean energy and energy efficiency products, services, and technologies as part of a specific economic development strategy. In FY 2020 MCEC received approximately $885,000 in operational grant funding from Regional Greenhouse Gas Initiative (RGGI) auction proceeds, through the Maryland Energy Administration to the Maryland Energy Innovation Fund held at the University of Maryland College Park. • MCCC and working groups provide significant recommendations for mechanisms to implement projects and programs to enhance climate change programmatic goals and emissions reductions. • GGRA progress report due in 2022.

Measurement Systems

Measurement Systems	Massachusetts	Maryland
Baselines	• GWSA established the Climate Protection and Green Economy Act in Massachusetts General Law, which requires the Massachusetts Department of Environmental Protection (MassDEP) to, among other actions "… triennially publish a state greenhouse gas emissions inventory that includes comprehensive estimates of the quantity of greenhouse gas emissions in the commonwealth for the last 3 years in which the data is available," and "…determine the statewide greenhouse gas emissions level in calendar year 1990 and reasonably project what the emissions lever will be in calendar year 2020 if no measures are imposed to lower emissions other than those formally adopted and implemented as of January 1, 2009." • On March 26, 2021, An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy was signed into law. Some major requirements of this statute include: - The adoption of interim statewide GHG emissions limits for 2025, 2030, 2035, 2040, and 2045; - An interim 2030 statewide GHG limit that is at least 50% below the 1990 level, an interim 2040 GHG limit that is at least 75% below the 1990 level, and a statewide greenhouse gas emissions limit for 2050 that achieves at least net zero statewide greenhouse gas emissions provided that in no event shall the level of emissions in 2050 be higher than a level 85% below the 1990 level; and - The adoption of sector-based statewide greenhouse gas emissions sublimits for electric power, transportation, commercial and industrial heating and cooling, residential heating and cooling, industrial processes, and natural gas distribution service.	• The Maryland Healthy Air Act was signed into law in 2006 and required Maryland to join RGGI by July 2007. MDE subsequently adopted COMAR 26.09.01 to .03, implementing the "Maryland CO2 Budget Trading Program", which became effective on July 17, 2008. COMAR 26.09.04 ("Auctions") became effective as a permanent regulation on August 25, 2008. RGGI originally set a cap of 188,076,976 tons of CO2 emissions for the region, based on average 2000 to 2002 CO2 emissions from eligible electricity generators subject to the program Maryland received 37,503,983 CO2 allowances each year through 2013. After the 2012 Comprehensive RGGI Program Review, changes to the cap resulted in Maryland receiving 20,360,944 CO2 allowances in 2014. Between 2015 and 2020, Maryland's allowance budget reduced by 2.5% per year along with the other participating states'. Maryland originally set aside 7,388,491 allowances in four different set aside accounts to account for special needs or programs, but this number and the number of set aside accounts was reduced through the 2016 Comprehensive Program Review • The Maryland Department of the Environment (MDE) tracks the State's emissions through its Greenhouse Gas (GHG) Emissions Inventory. The 2006 GHG emissions inventory serves as a baseline, which is then compared to other years to determine progress. Since 2006, three additional GHG emissions inventories have been completed for years 2011, 2014, and 2017. The GHG emissions inventory is a core part of the State's overall strategy to measure emission reduction. It shows purely data and serves as a tool to help planners track progress and make policy decisions. The GHG emissions inventory is mandated by the Greenhouse Gas Emissions Reduction Act – Reauthorization of 2016 (GGRA of 2016)
Attainment	• Recent analyses of GHG emission trends and policy impacts on GHG emissions indicate that the Commonwealth is on the way to	• Maryland performs comprehensive greenhouse gas inventories on a 3-year cycle to coincide with the National Emissions Inventory. The most recent inventory year is

Measurement Systems	Massachusetts	Maryland
	meeting the GWSA emissions limit for 2020. Most of the emissions reductions observed in the GHG inventory since passage of the GWSA are directly attributable to the policies listed in the 2015 CECP Update and additional GHG mitigation policies implemented since then. However, there are also reductions in GHG emissions that are from policies implemented before the GWSA, reductions that cannot be directly attributable to policies due to lack of data, or reductions from other factors such as mild weather, relative fuel prices, and changes in consumer preferences. Nevertheless, overall GHG emissions in 2020 are projected to be 25% below the 1990 baseline level.	2017; MDE will complete the next inventory for 2020 in late 2021 once federal datasets on 2020 energy use are published. • The report and the emissions inventory is divided into seven major sectors that contribute to greenhouse gases emissions in Maryland: - Electricity use and supply - Residential, commercial and industrial fossil fuel combustion (RCI) - Transportation - Industrial processes - Fossil fuel industry (fugitive emissions – greenhouse gas released from leakage) - Waste management - Agriculture • The core programs of the 2030 GGRA Plan extend from the suite of programs developed for previous GGRA plans, specifically the state's 25% by 2020 Plan and the 2019 GGRA Draft Plan. Based on the recently completed 2017 inventory, the state's GHG emissions are already below the 2020 Plan goal.
Social cost of CO2, CH4, N2O	• SB9 includes provisions regarding use of the social cost of carbon in energy efficiency proceedings and tasks the Department of Public Utilities (DPU) with helping the entities it regulates to achieve the state's emissions limits and sublimits. Specifically, the Act directs DPU and utilities to, when calculating and evaluating the cost effectiveness of utility energy efficiency programs and investment plans, "include calculations of the social value of [GHG] emissions reductions," except in some cases. The Act also modifies DPU's enabling statute to add the following: "In discharging its responsibilities…, the department shall, with respect to itself and the entities it regulates, prioritize safety, security, reliability of service, affordability, equity and reductions in [GHG] emissions to meet statewide [GHG] emission limits and sublimits established pursuant to [this Act]."	• RGGI carbon pricing. • SCC used in PSC 44 rulemaking and in partial GGRA analysis (benefits).
Takeaways	• GHG inventories are taken in three-year cycles in accordance with EPA guidelines by DPE. • Sector emissions sublimits to be established by 2025 to include: - electric power	• GHG inventories are taken in three-year cycles in accordance with EPA guidelines by MDE. • Based on the 2017 GHG inventory, emissions are expected meet the 25% by 2020 GGRA program goal. New inventory will be published in 2021.

Measurement Systems	Massachusetts	Maryland
	- transportation - commercial and industrial heating and cooling - residential heating and cooling - industrial processes - natural gas distribution service • Overall GHG emissions in 2020 are projected to be 25% below the 1990 baseline level. • DEP is expected to publish an updated 1990 emissions baseline in 2021. • SB9 includes provisions regarding use of the social cost of carbon in energy efficiency proceedings and tasks the Department of Public Utilities (DPU) with helping the entities it regulates to achieve the state's emissions limits and sublimits. • The secretary shall evaluate the total potential costs and economic and noneconomic benefits of various reduction measures to the economy, environment and public health, using the best available economic models, emissions estimation techniques and other scientific methods.	
GHGs		
Standard IPCC gases	• Gases included in the MA GHG inventory are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), • hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3).	• The inventory covers the six types of gases included in the U.S. GHG Inventory: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). Emissions of these GHGs are presented using a common unit, million metric tons of carbon dioxide equivalent, which indicates the relative contribution of each gas, per unit mass, to global average radiative force on a global warming potential (GWP) weighted basis.
Short Lived/Super Polluting	• In December 2020, MassDEP issued a new regulation (310 CMR 7.76) that prohibits the use of certain hydrofluorocarbons (HFCs) in refrigeration equipment, air conditioning chillers, aerosol propellants, and foams that are manufactured or used in Massachusetts. • In June 2018, Massachusetts signed onto the U.S. Climate Alliance's Short Lived Climate Pollutant Challenge, pledging to explore potential policies to reduce emissions	• SLCPs make up only about 13% of GHG emissions in Maryland when measured over a 20-year period. In other states, like California, SLCPs contribute as much as 40% of total GHGs. Although SLCPs contribute a small fraction of Maryland's total GHG emissions, their potency is why Maryland is reviewing policies and implementing programs to reduce emissions of SLCPs. • After efforts to limit fugitive emissions of HFCs stalled at the federal level, several states began their own initiatives to phase out certain highly potent HFCs – some with the climate forcing effect of approximately 1,400 pounds of CO2. MDE finalized regulations in

Measurement Systems	Massachusetts	Maryland
	of short-lived climate pollutants, which include HFCs. • In 2018, the Administrative Council of the Toxics Use Reduction Act (TURA) program voted to add the category C1-C4 Halogenated Hydrocarbons/Halocarbons Not Otherwise Listed (C1-C4 NOL), which will include HFCs with 1 to 4 carbon atoms, to the list of regulated chemicals under TURA. This addition will be effective starting on January 1, 2019. The TURA program requires large toxic chemical users in Massachusetts to submit a Toxics Use Report annually, develop a plan to reduce their use of regulated chemicals, and pay an annual Toxics Use Fee.	2020 that will phase out the use of certain HFCs in multiple end-uses, such as foam products and certain refrigeration equipment in retail establishments such as supermarkets. The phase out of HFCs will require the use of alternatives with much lower GHG emissions. • Methane, the primary constituent of natural gas, is a short-lived but potent GHG that leaks from the natural gas delivery system. The 2030 GGRA Plan includes measures to catch and eliminate those leaks, including regulations MDE finalized in 2020 that require leak detection and repair measures in the transmission system, and replacement of old and leaky pipes throughout the utility distribution systems. Overall, the GHG emissions from the natural gas distribution infrastructure piping/services in Maryland have been reduced approximately 3% per year, based on reported PHMSA data. MDE is looking at regulatory actions that can help mitigate methane emissions from the natural gas distribution sector. MDE has engaged with stakeholders and works with the University of Maryland to review atmospheric data.
Black Carbon	• Massachusetts DEP monitors black carbon at seven sites across the state. EPA projects that black carbon emissions will decline 86% from 2005 by 2030 though federal regulations on diesel fueled equipment through two primary mechanisms: - emissions standards for new engines, including requirements resulting in use of diesel particulate filters (DPFs) in conjunction with ultra low sulfur diesel fuel; and - retrofit programs for in-use mobile diesel engines, such as EPA's National Clean Diesel Campaign and the SmartWay Transport Partnership Program." • Combustion of biomass in industrial and residential wood combustion also contributes to black carbon emissions in Massachusetts. For industrial sources, available control technologies and strategies include direct particulate matter reduction technologies such as fabric filters (baghouses), electrostatic precipitators (ESPs), and diesel particulate filters (DPFs).	• From GGRA: "There is limited data available for black carbon emissions in Maryland. This is an area that needs a greater focus."

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	Residential black carbon emissions from wood stoves in the Commonwealth have been addressed through rebate offers40 to assist Massachusetts residents in replacing non-EPA-certified wood stoves with cleaner, more efficient EPA-certified wood or pellet stoves. Wild fires, which contribute substantially to black carbon emissions in many states, are not a significant source in Massachusetts.	
Other		
Takeaways	• Emissions are regulated in accordance with federal standards • Specific regulations have been passed limiting the use of specific HFCs	• Emissions are regulated in accordance with federal standards • Specific regulations have been passed limiting the use of specific HFCs