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Review of the Massachusetts Clean Energy and Climate Plan for 2025 and 2030

Center for Climate Strategies

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Executive Summary

The "Massachusetts Clean Energy and Climate Plan for 2025 and 2030,"[1] released by the Executive Office of Energy and Environmental Affairs on June 30, 2022 (EEA Plan), provides updated assessments of policy opportunities across economic sectors to meet the state's near-term climate targets. As such, it was intended to provide comprehensive planning and assessment support to executive branch and legislative actions to enable and implement the state's climate-related goals.

However, the EEA Plan adopts an aggregate sector-level approach to assessments and policy design specifications instead of line-item impact analyses and granular program level baselines, design, and performance metrics needed to fully support target attainment and future implementation needs. Granularity of design and analysis is central to progress in virtually all areas of policy development and implementation. Detailed policy design and analysis ensures that goals sync with concrete governance, regulatory, and financing actions, particularly to meet sweeping federal funding legislation that depends upon such specificity. The decision not to provide this level of specificity of planning, design, and assessment creates a barrier to future implementation that requires immediate additional action.

Furthermore, the EEA Plan was not developed with fully open and transparent stakeholder engagement and interactive consensus building, relying instead on minimum requirements for public disclosure and input and on selective private conferrals. Among other problems, this has negative impacts on the state's ability to galvanize the business sector and nongovernmental community interests needed to forge ambitious, collaborative approaches to target attainment. This also creates a barrier to the further development and implementation of specified programs needed to support high levels of ambition with broad based stakeholder support. The lack of transparency and critical consensus building, particularly with the private sector, also requires immediate additional action.

The incoming administration must adopt a more comprehensive leadership approach which recognizes the imperative for shared public and private decision making as well as the concrete design, analysis, and implementation of specific programs and regulations at a granular level across state institutions.

[1] Executive Office of Energy and Environmental Affairs: *"Massachusetts Clean Energy and Climate Plan for 2025 and 2030"*, 06/30/2022, https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download

Background and Methodology

This report provides an updated comprehensive policy review of the "Massachusetts Clean Energy and Climate Plan for 2025 and 2030," released by the Executive Office of Energy and Environmental Affairs on June 30, 2022, here referred to as the EEA Plan. The present report is based on a methodology established and previous applied by the Center for Climate Strategies (CCS) in its 2021 Abell Report.[2] The method provides an evaluation framework for governmental climate change leadership with key metrics related to 1) goals and targets, 2) environmental justice, 3) whole of government, 4) policies and measures, 5) implementation mechanisms, and 6) measurement systems.

Prior review of Massachusetts' actions in the Abell Report found that Massachusetts scored comparatively high on climate change leadership metrics, but with key areas identified for improvement. These areas included stakeholder inclusion and consensus building, policy-specific and transparent analysis, and concrete program design and implementation mechanisms for proposed policy actions. The present report identifies progress made by the state since the issuance of the 2021 Abell Report, as well as critical new areas in need of improvement.

The results of this report are based on review of the EEA Plan and Appendices, conferrals with the Massachusetts EEA on policy research activities, as well as review of the EEA March 2021 Interim Report[3] and the 18 new policy actions it proposes for the state's 2030 Clean Energy and Climate Plan (CECP) here referred to as the EEA Plan. This report also considers the potential impacts of Governor Baker's decision to not seek reelection on climate leadership activities, as well as the level of engagement in interagency and stakeholder collaboration, especially within the business community.

Findings

1. Goals and Targets

In 2008, Massachusetts enacted the Global Warming Solutions Act (GWSA)[4] with first-in-the-nation climate change targets for 2050 assigned to individual economic sectors. These were intended to increase the level of accountability and augment mandates underlying policies and programs within each sector and agency. These targets remain an important driver for new policy and program action in Massachusetts. However, the targets need actualization through further development, assessment, and implementation of concrete policy and program actions coupled with definable stakeholder support.

The new EEA Plan recognizes the 2050 sector targets and the need for sector-level policy action as it provides updated assessments of policy opportunities. However, its policy impact analyses are confined to aggregate sector-level goals as specified in the 2008 GWSA, which is an insufficient methodological standard. Progress in virtually all areas of policy is critically dependent upon granular, line-item analyses of policy impacts. This level of detail is needed for planning, assessment, and implementation of specific

[2] The Abell Foundation: *"Turning Up the Heat on Cooling Down the Planet: Comparing Maryland and Massachusetts Climate Leadership Actions"*, Dec 2021, https://abell.org/publication/turning-up-the-heat-on-cooling-down-the-planet/
[3] Executive Office of Energy and Environmental Affairs: Clean Energy and Climate Plan for 2030, 12/30/2020, https://www.mass.gov/doc/interim-clean-energy-and-climate-plan-for-2030-december-30-2020/download
[4] The 192nd General Court of the Commonwealth of Massachusetts: *"An Act Establishing the Global Warming Solutions Act"*, 08/07/2008, https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298

program actions. The lack thereof inhibits progress in policy action development, feasibility analysis, budget assessment, investment mobilization, and environmental justice, as discussed later in this report. Translation of sector-level targets to discrete policies and program actions within each sector is urgently needed to augment broader, aggregate analysis.

The capability for such analysis is readily available in Massachusetts and substantiated by widely deployed best practices and guidelines for policy, regulatory, and financial impact analysis. For instance, the Pathways model used in the EEA's 2050 Roadmap Study[5] which computed the transformations necessary to achieve net zero by 2050 and formed the basis for Massachusetts' 2050 Roadmap Bill passed in 2021.[6] As noted in the EEA Plan, the Pathways model provided policy-specific cost inputs needed to assemble broader strategies and scenarios.[7] The 2050 Roadmap Study contains numerous examples of policy-specific impact analyses used to calibrate and assemble broader strategies, for instance pertaining to heat pumps, as discussed on page 24 of the EEA Plan. However, no granular analysis inputs or results were disclosed for the EEA Roadmap Study. The Pathways tool was not used to report effects of line-item policy measures, despite its efficacy for this purpose.

The Pathways model has also been used in conjunction with additional modeling tools that provide technology- and program-specific inputs, including a variety of energy systems and desktop models used for direct impacts analysis. This includes the Low Emissions Analysis Platform (LEAP) licensed by the Stockholm Environment Institute, a research affiliate of Tufts University in Massachusetts. LEAP is one of the most widely applied modeling platforms for energy and emissions modeling in the world. It provides technology- and program-specific outputs to support scenario analysis and optimization across a suite of decision support metrics. For macroeconomic analysis, a platform of tools is available through Regional Economic Modeling, Inc. (REMI) of Amherst, Massachusetts. Both LEAP[8] and REMI[9] have been used for impact analysis of US state-level climate action plans and many global policy and technology development initiatives. Many other third-party analysis tools and technical assistance programs are available through in-kind contribution and procurement. These tools should be applied to strengthen and supplement the high-level analysis performed to date. A broader discussion of measurement issues is provided later in this report.

2. Environmental Justice

[5] Massachusetts Executive Office of Energy and Environmental Affairs: *"Massachusetts 2050 Decarbonization Roadmap"*, Dec 2020, https://www.mass.gov/doc/ma-decarbonization-roadmap-lower-resolution/download
[6] An Act Creating a Next-generation Roadmap for Massachusetts Climate Policy. https://malegislature.gov/bills/192/S9
[7] Massachusetts Executive Office of Energy and Environmental Affairs: *"Massachusetts 2050 Decarbonization Roadmap"*, Dec 2020, https://www.mass.gov/doc/ma-decarbonization-roadmap-lower-resolution/download (see page 21, "The updated analysis reflects the impacts of key policies in the transportation, electricity, and industrial sectors")
[8] Maryland Department of the Environment: *"The Greenhouse Gas Emissions Reduction Act – 2019 GGRA Draft Plan"*, Oct 2019, https://mde.maryland.gov/programs/Air/ClimateChange/Documents/2019GGRAPlan/2019%20GGRA%20Draft%20Plan%20(10-15-2019)%20POSTED.pdf
[9] Miller S, Wei D, Rose A: *"The Macroeconomic Impact of the Michigan Climate Action Council Climate Action Plan on the State's Economy"*, Jan 2010, https://www.remi.com/wp-content/uploads/2017/12/168-CCS-Michigan-Climate-Action-Plan-Study-JAN-2010.pdf

In the 2050 Roadmap Bill, Massachusetts established commitments to advance environmental justice goals and objectives through specific targeting requirements and performance criteria. This included environmental justice ("EJ") policy guidance issued by the EEA on June 24, 2021.[10] New actions to comply with federal Environmental Justice 40 (J40) provisions of the 2021 Infrastructure Investment and Jobs Act (IIJA) are underway due to new federal requirements. The passage of the Inflation Reduction Act of 2022 will also require additional compliance actions related to J40 and Low and Moderate Income (LMI) metrics, workforce and labor diversity, and domestic content. These provisions encourage or require documentation of specific, line-item program and project actions that can be targeted to EJ and LMI metrics and tracking. They are driven by highly specific state and local policy measures such as those typically included in comprehensive multi-sector carbon reduction plans.

Like all recipients of IIJA funds, Massachusetts will be required to demonstrate J40 attainment and verification by demonstrating that 40 percent of funds or benefits have been allocated to disadvantaged communities through formula funds and competitive grants. This includes both geographically concentrated as well as dispersed populations with common conditions. To be effective at meeting J40, LMI, and other justice and diversity requirements, Massachusetts agencies (and other applicants) will need to develop granular program design and performance metrics for grant applications and tax credit/direct payment requirements. Inevitably, this will require the kind of highly specific, line-item impact analysis described above, including the capability to determine disproportional impacts and diversity implications of both action and inaction.

To perform this level of assessment, impact analyses must evaluate the net economic effects of specific policy measures. This includes estimating job losses and gains for highly specific subsector activities and analyzing these for disproportionate impact on sensitive populations and places, such as low- and moderate-income communities. In contrast, the EEA Plan includes macroeconomic analysis results from the IMPLAN[11] and I-JEDI[12] models, which are aggregated at the policy measure level. The models also use gross as opposed to net impact methods[13] and do not provide distributional impacts analysis. As a result, these tools do not identify the separate winners and losers from climate policy implementation, or the disproportionate impacts on sensitive populations within each, such as LMI households or disadvantaged businesses. In the future, evaluation tools to support Massachusetts' climate policy will need to be carefully selected and applied to address J40 and other justice needs.

3. Whole of Government

"Whole of Government" refers to the horizontal and vertical collaboration of state and local agencies toward comprehensive implementation of climate policy goals and targets, as well as the integration of non-governmental stakeholder communities in this process. Massachusetts scored high in the 2021 Abell Report on its progress toward forming vertical and horizontal interagency mechanisms for climate change leadership across state agencies, including designation of an executive coordinating function to

[10] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs: *"Environmental Justice Policy of the Executive Office of Energy and Environmental Affairs"*, updated 06/24/2021, https://www.mass.gov/doc/environmental-justice-policy6242021-update/download

[11] The Impact Analysis for Planning (IMPLAN) model (https://implan.com/) uses gross impact methods

[12] The International Jobs & Economic Development Impacts (I-JEDI) model (https://www.i-jedi.org/index.html) uses gross impact methods

[13] Figure 9.1 on page 105 is incorrectly labeled "Net Jobs Created by Sector from 2019 Baseline" and should read "Gross Jobs…" based on the use of IMPLAN and I-JEDI.

the EEA. While the above interagency mechanism remains in place, it is unclear how effectively and frequently it is being used because meetings do not appear to be announced or accessible to the public. Furthermore, there is little indication for interagency coordination of projects built upon IIJA funds. State agencies may be devolving to focus on individual rather than interagency activities. Turnover of state officials may be a contributing factor. For example, EEA Secretary Kathleen Theoharides resigned on April 26, 2022, possibly as part of the turnover of state officials expected due to Governor Baker's decision not to seek reelection.

In addition to governmental coordination, the 2021 Abell Report identified a significant lack of inclusion of nongovernmental entities in Massachusetts' government planning and policy decisions and noted the importance of stakeholder inclusion and collaboration as part of the whole of government approach. The Abell Report described the need for Massachusetts' executive agencies to move beyond minimum requirements for public or working group input, such as through comment and consultation, to adopting best practices through open collaboration and formal consensus building.[14] Best practices involve joint fact finding and joint decision making through stepwise decision process that is formal, open, transparent, and inclusive. This remains a significant area of improvement, and the next administration will have to consider effective and equitable inclusion of nongovernmental entities in the policy planning and implementation process.

Transparency of stakeholder conferral is also a key concern. The EEA Plan cites numerous statistics, notices, comments, and in some cases consultations, but the participants and results of these interactions remain unclear, and the approach appears to be less than systematic. For example, questions about the future of zero-emission vehicles (ZEVs) were answered by a Policy Advisor at Tesla and a General Motors employee, and there is even a comment from the Massachusetts State Auto Dealers Association.[15] The Zero Emission Vehicle Commission, in contrast, had little input, and it remained unclear who the commissioners are. This lack of transparency signals an in consistent stakeholder engagement process, particularly as it relates to the business community.

There is little indication that the private sector was meaningfully engaged in the stakeholder feedback process. For example, while the EEA Plan Appendices mention that "the Energy Efficiency Advisory Council (EEAC) regularly engaged with EEA staff and stakeholders on the energy efficiency programs," it provides no clarity on the engagements. With regards to environmental justice initiatives, which included meetings with stakeholders[16] with a focus on CBOs, NGOs, and members of disadvantaged populations, it is unclear if the private sector in Massachusetts was part of the conversation and how it can support these initiatives. Overall, lack of private sector engagement is a lost opportunity for effective stakeholder collaboration.

For example, a 2021 report by the Massachusetts Clean Energy Center (MassCEC)[17] found that independently owned small businesses make up 61 percent of the clean energy industry in the state.

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[14] Note inclusion of consensus building in environmental justice best practices in the EEA Report page 16-17.
[15] Massachusetts ZEV Commission: *"DRAFT Minutes of the MA ZEV Commission Meeting"*, 04/15/2022, https://www.mass.gov/doc/zev-commission-april-15-2022-draft-meeting-minutes/download
[16] Executive Office of Energy & Environmental Affairs: *"Environmental Justice Stakeholders Focus Group Session Comments March 29 – April 1; May 25 – 26, 2021".* https://www.mass.gov/files/documents/2021/08/20/EJ-Focus-Group-Comments_0_0.pdf
[17] Massachusetts Clean Energy Center: *"2021 Massachusetts Clean Energy Industry Report"*, https://www.masscec.com/resources/2021-massachusetts-clean-energy-industry-report

Thus, any support for wind and solar technologies also supports Massachusetts' small business growth. According to the MassCEC report, the clean energy sector was one of the fastest growing sectors in the state's economy. From 2010 to 2020, clean energy employment grew 68 percent. This growth included nearly 41,000 jobs to over 101,000 clean energy workers in Massachusetts, constituting three percent of the workforce. In 2020, the clean energy industry contributed over $13.7 billion to Massachusetts' Gross State Product (GSP). It has outpaced the state GSP and generated over $4.1 billion in investment since 2012 at a growth rate of 50 percent. Policy input from the Massachusetts clean energy sector would ensure growth and opportunity in the industry, in turn furthering state progress towards emissions targets.

The EEA received a total of 1,277 public comments on the 2021 Interim CECP, many of which were part of form letters related to Mass Audubon, Canadian hydropower, or Environmental Justice initiatives. Massachusetts residents submitted 80 percent of all comments. Only 112 comments were submitted by organizations, and only 48 of these were businesses, a comparatively low number in relation to all comments. The EEA Plan Appendices list a selection of "the most common and most actionable comments pertaining to the Interim," but not a summary of all feedback received. Furthermore, feedback was not coded based on stakeholder group, so it remains unclear whose opinions were incorporated. In many cases, response to feedback is broad and lacks detail on how the issue is approached. For example, the EEA Plan Appendices note that "[t]he Administration hears the concerns from public comments on incentivizing development within the 100-foot wetland buffer zone. MassDEP will further investigate how best to protect wetlands and adjacent land against conversions for development." This response illuminates the general lack of specificity in incorporating stakeholder feedback into defined and actionable next steps.

One theme emerging from the feedback was stakeholder concern about accuracy of gas leak accounting. The administration responded to this concern by noting that "MassDEP and EPA continually monitor emerging research and routinely incorporate new information into its procedures." The stakeholder feedback had included the specific request to ensure funding is available, with particular attention to ensuring accessibility in disadvantaged communities. The response to this was even more vague: "The Administration continues to seek sustainable funding to support decarbonization efforts in Massachusetts and is cognizant of the costs of policies to rate payers and residents, particularly EJ and LMI communities." These responses further show the lack of detailed, effective action in response to feedback.

Importantly, many commenters supported the Transportation Climate Initiative and were concerned about alternative funding sources. The state's response was similarly void of detail – "The Commonwealth welcomes new federal funding for transportation infrastructure, which will provide five years' worth of additional support for maintaining and improving all of our transportation facilities. The Commonwealth will also explore additional sources of funding for transportation investments." This raises the concern of how the state plans to secure funding beyond the five-year mark.

Additionally, the EEA declined requests to share specific technical information related to its analysis of proposed policies, or specifics of the policy development and analysis process. In February 2022, for instance, the Center for Climate Strategies (CCS) and the Climate and Business Association (CABA) requested a meeting to identify available information for the assessment of proposed 2030 policies and nested measures, and to clarify information expected to become available. The information request included a standard table of impact analysis metrics for specific polices and measures within sectors.

The state chose not to respond or engage in dialog and rejected the idea of evaluating specific policies and measures within sectors (see section below on measurements).

Together, transparency and fine-grained policy analysis provide a gateway for stakeholder-based collaboration on the selection, design, and evaluation of actions and agreements needed for their implementation. In contrast, the lack of specificity, transparency, and inclusion prohibits meaningful stakeholder cooperation, and the mobilization of practical expertise and diverse perspectives in private and nongovernmental organizations – inputs which typically enable higher levels of ambition. Absent this level of collaboration, government agencies tend to be less creative and practical, and more risk averse. A public comment period is not a substitute because it does not enable joint fact finding and deliberation through focused dialog, particularly when there is a lack of sufficiently detailed and relevant information. This is of particular concern in Massachusetts, given that the state does not provide granular policy information.

4. Policies and Measures

On December 30, 2020, EEA Secretary Kathleen Theoharides released the Interim 2030 CECP aimed at achieving 2030 emissions 45 percent below 1990 levels. Eighteen policy proposals to achieve this goal were put forward for public comment.

These policies included an estimated reduction of 8 $MMTCO_2e$ from the **Transportation** sector through:

(T1) Transportation Climate Initiative (TCI). An initiative designed to cap GHG emissions related to transportation fuels and create a market-based compliance mechanism through provision of limited purchasable allowances, including a set-aside of at least 35 percent of proceeds from the auction of allowances for underserved communities.
(T2) Zero Emissions Vehicle (ZEV) Adoption. This rule requires implementation of 100 percent new light-duty ZEV sales by 2035.
(T3) Electrification of Light and Heavy-Duty Vehicles. This program provides incentives for light-duty and heavy-duty vehicles, including public fleets, transit buses, and school buses through the MOR-electric vehicle (EV) program, MassEVIP, and other state funding,
(T4) Expansion of EV charging and smart charging infrastructure. This program combines enabling regulation and funding to accelerate and expand EV charging infrastructure installation.
(T5) Low Carbon Fuel Standard. This regulation encourages reduction of the carbon content of transportation fuels by working with partners/stakeholders to explore the design and implementation of a low-carbon fuel standard.
(T6) Vehicle Miles Traveled (VMT) reduction. This program explores methods for limiting commuter vehicle miles traveled through enabling actions.
(T7) Urban Smart Growth. This program provides a Smart Growth policy package for location efficient urban development that multi-modal, multi-objective development of sites and systems.

For **Buildings** the Interim 2030 CECP included a ~9.4 $MMTCO_2e$ reduction by instituting:

(B1) High-efficiency energy code. This regulation requires installation of energy efficiency improvements in buildings to achieve quantitative gains in energy efficiency through a combination of technologies and practices.
(B2) MassSave®. This policy provides adjustments to the MassSave® program including limiting fossil fuel heating system incentives from 2022 and ending them by 2024. It also includes increasing

electrification through heat pump incentives and consumer education as well as expanding access to energy efficiency and clean heating for LMI renters and homeowners.

(B3) Heating Fuels Cap. This policy creates a cap on heating fuel emissions through a combination of technologies and practices.

(B4) Commission and Task Force on Clean Heat. This Commission is designed to identify and develop policies and measures to achieve stronger GHG reductions while meeting heating needs.

For **Electricity** it included a >4.2 $MMTCO_2e$ reduction by instituting:

(E1) Offshore Wind. This policy includes execution of existing procurements of offshore wind (3.2 GW), solar energy (3.2 GW), and hydroelectricity (1 GW).

(E2) Clean Energy Generation. This policy creates plans for additional clean energy including 2 GW of distributed clean energy generation between 2025-2030 and 6 GW of offshore wind between 2030-2040.

(E3) Clean Energy Program Review. This policy requires review and revision of clean energy programs, including municipal light plants, to achieve stronger emissions reductions.

(E4) Energy Market Planning. This policy requires revising wholesale energy markets and planning to achieve stronger GHG reductions.

For stabilization of **Non-energy Emissions** by instituting:

(N1) Hydrofluorocarbons (HFC) reduction. This policy enables implemention of regulations limiting the sale of HFCs and supporting federal actions further phasing down their use.

(N2) Resource Sector Emissions. This set of policy actions encourage the adoption of best practices to limit waste, wastewater, and agricultural emissions.

(N3) Waste Disposal Reduction. This policy sets a goal of reducing the Commonwealth's solid waste disposal by about 90 percent by 2050.

As noted, the EEA Interim Report would have benefited from identifying line-item impacts associated with each of these policy and program actions, along with supporting analyses documenting expected impacts, including GHG reductions and economic costs and savings for each. Because the state did not approach this work in a granular or collaborative manner, it did not provide the transparency needed for third party review and impeded a clear review of the 18 2030 CECP policies proposed. This also hindered review of the final 2030 CECP report provided by the EEA Plan. The EEA Plan appears to have incorporated the results of the Interim Report, but it is not clear to what extent. If this final report relied on the interim results, it would have incorporated its transparency and specificity flaws.

A case in point is the Buildings Strategy B2 (below) that proposes to "Phase out incentives for fossil fuel heating systems as soon as possible, limiting fossil fuel heating system incentives in the 2022-2024 Three Year Plan, and eliminating them by 2024."[18] The EEA Plan does not elaborate on this measure. House Bill H5060, signed into law in August of 2022, prohibits "spending on incentives, programs or support for systems, equipment, workforce development or training as it relates to new fossil fuel equipment," although such incentives will not be phased out until 2025. Analysis of policy impacts will require in-depth assessment of net costs and savings, distributional impact analysis to determine equity impacts on LMI households, and analysis of broader macroeconomic impacts. Bill H5060 mandates "consideration of historic and present program participation by low and moderate-income households."

[18] Executive Office of Energy and Environmental Affairs: Clean Energy and Climate Plan for 2030, 12/30/2020, https://www.mass.gov/doc/interim-clean-energy-and-climate-plan-for-2030-december-30-2020/download

The executive branch remains responsible for producing additional details, and the EEA Plan would have been well positioned to provide the necessary groundwork for this.

Such groundwork generally requires detailed analyses of financial flows and of the sources and uses of funds for policy implementation. The level of funding required by government and citizens is likely to be large, and federal funding options will be important when assessing cost and feasibility. Without granular, policy-specific analyses, these issues cannot be adequately addressed. Furthermore, program-specific costs and revenues are needed to guide federal funding assessments, and this same information serves as an input to macroeconomic analyses of the effects of shifting spending from business-as-usual activities to a policy intervention scenario. The Request for Proposals for the macroeconomic analysis included a task for scoping the methodology for such analysis but was not stipulated as a requirement.[19]

The following sections provide a broader review of each of the 18 proposed policy actions from the Interim Report based on best available information, including state conferral. The results and discussion below indicate several instances where proposed policies need greater clarity or revision to better reflect their potential for implementation and achievement of the GHG reduction goals. Many of the proposed policy strategies do not appear to involve new levels of program activity, and few provide clarity on implementation mechanisms to back up assumptions on the scale of adoption of the technologies or practices envisioned. As a result, many of the proposals appear speculative and uncertain in relation to 2030 goal attainment.

Transportation

The transportation sector is Massachusetts' largest GHG emitter. Progress in reducing this sector's carbon footprint of 30 $MMTCO_2e$ critically depends on replacing gasoline- and diesel-powered vehicles with battery-electric and low-carbon drop-in replacement fuel vehicles. In the interim, more stringent federal fuel efficiency standards and a reduction in vehicle miles traveled also have a role to play, but a near-complete electrification of the light-duty fleet appears unavoidable if Massachusetts' emissions targets are to be met.

The EEA Plan specifies 2025 and 2030 caps on GHG emissions from the transportation sector corresponding to 24.9 percent and 19.8 percent from 1990 levels, respectively. This is based on a goal of 200,000 and 900,000 EVs (ZEV and plugin hybrids) on the road in 2025 and 2030. A conceptual outline of strategies to achieve these limits is provided.

Below is a review of publicly available information from the state on each of the 18 proposals.

Strategy T1 involves capping transportation sector emissions and investing in clean transportation solutions. This strategy includes the Transportation and Climate Initiative (TCI), which would "cap" CO_2 emissions from on-road gasoline and diesel fuel, with the cap declining over time. Fuel suppliers would be required to purchase allowances for the emissions produced, resulting in an estimated $130 million in annual revenue to support other carbon-reduction programs. Another example is the Low Carbon

[19] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs Request for Response (RFR) Document Title: 2030 Clean Energy & Climate Plan Economic Impact & Equity Analysis, COMMBUYS Bid#: Bid BD-22-1042-ENV-ENV01-67782, Agency Document Number: ENV 22 CEC 01, 10/21/2021, https://www.commbuys.com/bso/external/bidDetail.sdo?docId=BD-22-1042-ENV-ENV01-67782&external=true&parentUrl=close

Fuel Standard (LCFS) planned for 2026, a regional market-based program in partnership with TCI to support the deployment of low-carbon liquid transportation fuels. Lifecycle GHG emissions are to be determined for each fuel type and compared to a carbon intensity benchmark that becomes stricter over time. Providers of transportation fuels must demonstrate that the mix of fuels they supply meets this benchmark and, if not, acquire credits to cover the deficit. Of note, the TCI was cancelled by Governor Baker, and to date, no replacement for the anticipated revenues has been identified except to suggest that IIJA funds may play this role.

Strategy T2 involves implementing coordinated advanced clean vehicle emissions and sales standards. These include goals of 750,000-1,000,000 ZEVs on the road by 2030 (representing 17 percent of the light duty fleet), and ZEVs making up 50 percent of all new light-duty vehicle sales by 2030. Furthermore, there is a proposal to adopt and implement California's Clean Cars II Program, which includes 100 percent ZEV sales by 2035.[20] Finally, Massachusetts filed emergency regulations to adopt California's Advanced Clean Trucks regulation, which requires an increasing percentage of medium- and heavy-duty ZEV truck sales from 2025 through 2035, with targets of 30 percent ZEV trucks on the road by 2030 and 100 percent by 2050.[21] However, California has not finalized these regulations, and the 100 percent ZEV by 2035 goal is not confirmed at this time. A proposed alternative is as low as 70 percent.

Strategy T3 involves reducing upfront ZEV purchase costs. Related programs include the Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program, administered by the Department of Energy Resources (DOER). The MOR-EV pilot program does not explain what is entailed. Furthermore, the source of funding for additional incentives is not entirely clear as no increase in programmatic funding is apparent.

DOER currently also provides consumers with a $2,500 rebate for the purchase or lease of a new battery or fuel cell EV and a $1,500 rebate for the purchase or lease of a new plug-in hybrid electric vehicle (added to $7,500 in federal tax credit). This program spent $37 million from June 2014 to Feb 2021. In addition, $9 million in funding has been made available as block grant programs for EV trucks based on vehicle size and cost requirements. The DOER is working on enabling dealerships to provide these incentives at the point of sale, which will help increase accessibility of EVs. The EEA and MassCEC are also seeking to develop LMI consumer programs to provide more equitable access to ZEV benefits.

Another program in this category is the Massachusetts Electric Vehicle Incentive Program (EVIP), which provides funding for EV charging station hardware and, in certain cases, also for installation costs. Grants cover 60 to 100 percent of eligible costs. A total of $7 million for charging infrastructure is available. An additional grant program, the Volkswagen Settlement Open Solicitation Grants, provides $7.5 million in funding for projects aimed at reducing GHG emissions and driving technological innovation. While these grants are valuable, they do not form part of an overarching funds allocation strategy to maximize benefits and, as a result, appear to be duplicative.

Strategy T4 involves deploying EV supply equipment and enabling smart charging. Support for such initiatives comes from the Mass Save® energy efficiency program and the Department of Utilities Electric

[20] California Air Resources Board: *"Advanced Clean Cars Program – Advanced Clean Cars II"*, accessed on 09/01/2022. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/about
[21] Massachusetts Department of Environmental Protection: *"MassDEP Files New Regulations to Reduce Emissions, Advance Market for Clean Trucks in the Commonwealth"*, 12/30/2021. https://www.mass.gov/news/massdep-files-new-regulations-to-reduce-emissions-advance-market-for-clean-trucks-in-the-commonwealth

Vehicle charging infrastructure program (DPU EV). Under these programs, the Massachusetts Department of Environmental Protection (MassDEP) is allocating $11.3 million from the VW Settlement to related projects, while Eversource Energy company is allocating $40 million and National Grid utility $25 million for public charging infrastructure.

The EEA and DOER are exploring a utility-based residential EV charging incentive program, and together with MassCEC, will address how to improve Direct Current Fast Charging (DCFC) financial viability through pilot projects and by seeking to resolve current punitive rate structures. DOER will analyze and propose potential revisions to rate structures (e.g., demand charges) that may represent barriers to public charging, and, in collaboration with EEA, will explore and support Time-Varying Rates (TVR) and Active Demand Response (ADR) programs. TVR and ADR will also be part of demand response programs in the next Mass Save® Three-Year Plan (2022-2024).[22] Notably most of these actions to date do not involve clear commitments but mere plans to study the issue.

Strategy T5 is to engage consumers and facilitate markets. This includes the MassEVolves Program, which revolves around providing technical assistance and public education. It also includes the Accelerating Clean Transportation Now (ACTNow) Program, which provides $1.4 million in funding for scalable business and finance, including dealership education, electric school buses, last-mile shuttle services, carpool, and income-tiered carsharing models.

Strategy T6 is to stabilize light-duty vehicle-miles traveled and promote alternative transportation modes. As part of this goal, MassDEP is currently implementing the Massachusetts Rideshare Regulation (310 CMR 7.16), which requires certain facilities to implement and maintain measures designed to achieve a non-binding goal of reducing single-occupancy vehicle commutes by 25 percent.

A comment which applies to all of the above transportation policies is that they do not represent new programs or strategies. Some predate the EEA Plan and 2021 Interim Report, others are adopted from other states, yet others are simply incentivizing a broad range of Smart Growth Policies. While this does not diminish their effectiveness, it reflects a lack of policy innovation in the service of an overarching strategy goal.

Buildings

The building sector accounts for 27 percent of Massachusetts' GHG emissions, driven largely by fossil fuel combustion for space and water heating. The 2050 Roadmap found that electrifying these and other end uses, along with increasing building energy efficiency, represent the most promising opportunities to decrease emissions from this sector.

Strategy B1 is to avoid the lock-in of building systems that are not 2050-compliant. The EEA Plan projects new construction in the 2020s to produce approximately one billion square feet of additional building space in Massachusetts by 2030 (although documentation of this estimate is sparse). Decisions made in their construction will impact GHG emissions and related policy for decades to come. Therefore, updates to the stretch energy code[23] are expected in 2022 to promote energy efficiency and EV

[22] Massachusetts Energy Efficiency Advisory Council: *"Three-Year Electric & Gas Energy Efficiency Plans"* https://ma-eeac.org/plans-updates/

[23] 780 CMR Chapter 115 AA: *"Stretch Energy Code"*. https://www.mass.gov/regulations/780-CMR-chapter-115-aa-stretch-energy-code

readiness of new buildings. However, this code will first need to be adopted by local jurisdictions, with expansion to a statewide energy code as late as 2028. Appliance standards also contribute toward preventing such lock-ins. While new standards for 15 appliances were adopted in March 21, 2021, the impact of these changes has not yet been forecasted. No new guidance criteria are provided in the EEA Plan.

Strategy B2 is to pivot the market toward building envelope retrofits and clean heating systems. This includes phasing out incentives for fossil fuel heating systems as soon as possible, limiting them in the 2022-2024 Three Year Plan and eliminating them thereafter. Furthermore, the Mass Save® program incentivizes building electrification. There are initiatives incentivizing heat pump adoption and building envelope improvements, and some of these initiatives expand access to clean heating and energy efficiency upgrades for disadvantaged communities.

Programs under this strategy tend to lack concrete commitment and, in part, the necessary funds. Fossil fuel incentives are not phased out in the 2022-2024 Plan – the language is to "work to phase out" but does not create a requirement. Furthermore, the Mass Save® 2022-2024 draft program states that funds will be insufficient to meet state deployment targets. The forecasted deployment scenario of 1,000,000 heat pumps installed by 2030 is extremely ambitious, and heat pump adoption plans need clarification on detail, especially on where additional funds will come from. Throughout, impact analyses are needed for new standards and costs.

Strategy B3 is to convene the Commission and Task Force on Clean Heat and to cap heating fuel emissions. Specifically, by 2023, the Commonwealth will impose a long-term declining cap on heating fuel (gas, oil, and propane) emissions, and the Commission and Task Force on Clean Heat will propose statutory, regulatory, and financing mechanisms needed to ensure the development of reliable and affordable clean heat solutions for the Commonwealth's buildings. However, to date, specific definitions of the heating fuel emissions caps in terms of timing, levels, and applicability is lacking. Further clarification is also required of Task Force assumptions on regulation and financing to support analysis, including coverage, form, and scale.

Energy

The electricity sector in Massachusetts accounts for approximately 19 percent of its emissions. Existing policies have achieved significant decarbonization, nearly halving emissions since 1990 with the closure of coal- and oil-fired power plants. Natural gas remains the predominant source of GHG emissions from this sector. Renewable energy sources have been growing, but significant capacity additions are needed and planned, particularly from offshore wind and solar resources, to replace natural gas and achieve the doubling of capacity that is anticipated by 2050 due to electrification of the transportation and building sectors. Storage and intermittent thermal generating resources, as well as significant expansion of the transmission and distribution systems are needed to maintain reliability.

Strategy E1 is to fill current standards and execute procurements. This includes the continued implementation of the Clean Energy Standard, the Renewable Portfolio Standard (RPS), and increased solar and offshore wind procurement (2,400 and 5,600 MW by 2030, respectively). An evaluation of these programs is impeded by the lack of detail provided. The solar technology applications are not specified and require clarification for analysis purposes. Detailed information on offshore wind lease assumptions and cost benchmarks are also not available. The Quebec Hydro transmission project falls into this category, although the project is currently on hold due to a court order.

Strategy E2 is to develop and coordinate regional planning and markets, including coordination with other states on their new or existing clean energy standards. The process of ensuring regional clean energy would greatly benefit from NE-ISO development and New England States Committee on Electricity (NESCOE) coordination. Further description of the status of such endeavors and next steps is needed for effective implementation.

Strategy E3 is to align Attribute Markets with GWSA compliance. Massachusetts' RPS target was raised to 40 percent renewable electricity by 2030, and by the end of 2022, EEA and DOER will complete a review of current Attribute Markets (including RPS, solar carve-outs, APS, and CPS) to ensure those programs continue on pace to meeting the targets. This requires tightening regulations on in-state generators (e.g., 310 CMR 7.74). For example, Municipal Light Plants (MLPs) must purchase 50 percent of their power from "non-carbon emitting" sources by 2030 and get to net-zero emissions by 2050.

Whereas tighter regulations on in-state generators have the potential to reduce emissions, their overall impact is dependent upon coordination with regional power supply strategies as outlined in strategy E2. Overall, multiple programs under this category are based on opaque assumptions that need clarification, including the DOER review of Attribute Markets, the RPS portfolio assumptions and scenarios, program level assumptions for Attribute Markets, and assumptions for the MLP 50 percent purchase requirement. Currently MLPs are responsible for 14 percent of in-state electricity generation, and scale-up issues require clarity.

Strategy E4 is to continue to deploy solar energy in Massachusetts. Related initiatives include incentivization and improvements for ground-mounted solar installations to achieve an estimated 60,000 acres of solar installations by 2050 and meet the RPS requirement of 2,400 MW of new solar energy by 2030. There are also efforts to improve the integration of resource planning and changes are planned to the Renewable Energy Credit (REC) process, which is currently held through 2023. To date, these strategies lack clarification of assumptions and concrete detail, for example on location and site feasibility of the estimated 60,000 acres of new solar installations by 2050, and on the anticipated changes to the REC process.

Strategy E5 is to develop a mature offshore wind industry in Massachusetts. This involves the RPS requirement of procuring 5,600 MW of new offshore wind energy by 2030. MassCEC will continue to support development of the offshore wind workforce, build local supply chains, ensure adequate port infrastructure, and advance research and innovation. Note, however, that the RPS requirement is for procurement and not deployment by 2030, suggesting that associated emissions reductions cannot be expected until a later point in time. Furthermore, MassCEC funding is unclear. Given budget constraints, such as $12 million in 2020, its ability to support offshore wind development may be limited.

Strategy E6 involves incorporating GWSA into distribution-level policy considerations. This includes grid modernization and improved coordination of supply sources, as well as the integration of the social cost of carbon (SCC) into DPU and utility planning. To date, however, the status of increased investment by utilities in grid modernization remains unclear, and additional details and assumed scenarios are needed on SCC for analysis purposes.

Industrial and Non-Energy

Energy-related emissions from Massachusetts' industrial sector are responsible for 5 percent of its total GHG emissions. Non-energy emissions are responsible for 8 percent of total emissions in the form of methane, nitrous oxide, and fluorinated gas emissions. These arise from refrigeration, cooling, and electrical switchgear, as well as solid waste management, wastewater treatment, natural gas transmission and distribution, agricultural practices, and non-combustion industrial processes. Hydrofluorocarbon (HFC) use and leakage is the fastest-growing source of GHG emissions in Massachusetts.

Strategy N1 is to target non-energy emissions that can be abated or replaced. This includes the implementation of 2020 regulations prohibiting the use of HFCs (310 CMR 7.76), a proposed expansion strengthening SF6 leakage regulations, and improvements to regulations targeting methane leaks. For policy evaluation, agency calculations of leakage-related emissions need to be clarified. This is particularly pertinent in light of the recently publicized underestimation of methane leakage by MassDEP.[24]

Strategy N2 is to implement best practices around residual non-energy emissions. This includes the goal of reducing solid waste disposal by 30 percent by 2030, and by 90 percent by 2050, relative to a 2018 baseline. Best practices also include the Solid Waste Master Plan (SWMP) target of avoiding 300,000 tCO_2 through reduced burning of plastics, and improvements to waste-to-energy facilities including improvements to municipal waste combustors. The strategy lacks further detail on solid waste disposal for assumed source reduction and recycling levels.

There are also efforts to transition residences from standalone septic systems to managed sewer systems and to increase the deployment of anaerobic digestors at wastewater treatment plants. Finally, the strategy includes plans to improve the carbon sequestration capabilities of natural and agricultural lands, although, for agriculture, no specific actions are listed.

Natural and Working Lands

In accordance with Strategy N2, Massachusetts has programs and plans to support land conservation and sustainable management practices to ensure its extensive forested land (64 percent of its land surface) can continue to provide or even expand substantial carbon sequestration services. The management of working lands also impacts Massachusetts' carbon budget.

Strategy L1 is to protect natural and working lands. A related program is the Resilient Lands Initiative, as part of which the EEA will explore the potential of creating and funding an expanded suite of incentive-based programs to prevent net-loss of forest and farmland.

Strategy L2 is to manage ecosystem health with the aim of enhancing carbon sequestration. Building upon the land use analysis in the 2050 Roadmap, the EEA will commission additional forest carbon sequestration research to assess the long-term impacts of sustainable forest management practices.

[24] The Boston Globe: *"Massachusetts vastly underestimates emissions from natural gas, study find"*, 10/25/2021. shttps://www.bostonglobe.com/2021/10/25/science/state-vastly-underestimates-emissions-natural-gas-study-finds/

Strategy L3 is to incentivize regional manufacture and use of durable wood products. This includes an improved regional use of local timber for long-lived products rather than for combustion.

Strategy L4 is to develop sequestration accounting and market frameworks. This includes carbon pricing mechanisms integrated into Senate Bill 9, and the review establishment of a carbon sequestration market.

The above strategies and initiatives do not estimate resulting emissions reductions. Additionally, all of them are marked by a lack of detail on analysis methods, and on policy and program design.

5. Matching Implementation Mechanisms

In the past, Massachusetts has focused on the parallel development of policy and implementation mechanisms to enable goal attainment. However, because policy-specific impacts are no longer considered, the state is not well positioned to specify the implementation mechanisms needed to match funding sources and uses for each of the policy and program measures. As noted earlier, this is a barrier to the pursuit of funding, as well as to program regulations and incentives.

For instance, the state does not appear to have assessed the funding levels needed for each policy and measure aimed at meeting the 2030 GHG emission goals, or potential funding sources. As a result, Massachusetts has not developed a clear statement of need for federal funds to enable policy implementation at scale, which is also needed to support the targeting of IIJA mechanisms. The EEA Plan could address this need by clearly laying out the funding requirements for existing, planned, and proposed new actions at a line-item policy-specific level in a straightforward accounting format.

Massachusetts took preliminary steps, including the development of MassCEC, toward forming a state green bank or equivalent mechanism to help target funds to climate change, clean energy, and conservation programs, and to leverage private funds. State financing mechanisms is needed for the leveraging and deployment of federal IIJA funds, and to transition funds into long-term sustainable funding sources. One of the critical functions of such mechanisms would be the assessment of funding needs and their matching to actionable sources, to ensure that policy and investment planning for climate actions are coordinated. This remains an outstanding need that is hindered by the lack of a fine-grained financial analysis of policies and programs.

A case in point is the TCI. This initiative was expected to generate $160 million annually in revenues for Massachusetts, to be employed for carbon reduction and other programs. TCI administration required reporting of the revenue reinvestment at a line-item level. TCI was cancelled by Governor Baker in late 2021, and to date, the only replacement revenue cited by the state is IIJA funding. However, state IIJA funding requests are uncertain due to a lack of identified policies (uses of funds) and a lack of policy-specific analysis of costs and impacts. Thus, it is unclear which program would be supported at equivalent levels of emissions reductions compared to TCI. In effect, the loss of TCI resulted in a hole in GHG policy that has not been filled.

A line-item financial assessment of policies and programs in all sectors would be a first step towards clearing up these needs. This is to be followed by a further specification of funding sources and deployment mechanisms, and the identification of public and private partners needed for development and implementation of state formula funds and competitive grants. This process could be facilitated by

the inclusion of stakeholders in the development and assessment of program funding requests and associated collaborations. While Massachusetts scored high in the past for supporting climate policies with specific matching program funds and regulations, this process is currently impaired by the lack of granularity in policy design and impact analysis.

6. Measurement Systems

An earlier report noted Massachusetts' leadership in pushing forward requirements and associated practices for state-of-the-art policy impact analysis through in-house and third-party technical assistance. This includes the progression toward the use of SCC methodologies to internalize risks of climate change in decision making. As noted, the state indicated that it is no longer using line-item assessment methods for the updated 2030 CECP (the EEA Plan), and the associated lack of detail in the EEA Plan has been accompanied by a step backward in planning and analysis of specific program actions.

During public briefings on the 2030 Climate Action Plan update, a spokesperson for the state indicated that the only level of analysis required by legislation for climate policy is aggregate state and sector level based on the structure of statewide GHG reduction goals. This statement appears to be a misread of legislation. Legislative goals and targets are formulated to support the further development and implementation of procedures at a higher level of detail. This detail then enables rulemaking, line-item budget authorizations and appropriations, discrete program funding, and specific program management functions within state executive agencies. While Massachusetts has set sector-level goals for 2050, it has not set 2030 or 2040 goals that require highly specific analysis to address nearer term cost, feasibility, and attainment issues.

Several modeling tools are available to support the analysis of policy impacts, costs, and feasibility. As mentioned, the Pathways model has previously been successfully employed in the Massachusetts legislative process. As the name implies, is serves the purpose of connecting the dots between climate goal impacts (as defined, for instance, in the GWSA and RPS) and the necessary policy-specific cost inputs. Whereas the Pathways tool can be configured for both aggregate sector-level analysis and analysis of line-item policy measures, other modeling tools are specialized for certain technologies or sectors by design. This includes desktop models such as LEAP for energy system emissions, REMI for macroeconomic analysis, tools specialized for non-energy sectors, and many other third-party tools that could be used for granular impact analysis of state-level climate initiatives.

The EEA Plan employed no such modeling tools for impact, cost-benefit, or feasibility analyses of individual policy measures. This is consistent with the lack of guidance by an overarching strategy to achieve Massachusetts' emissions targets, as noted throughout this report. Individual programs are not evaluated in relative terms at conception, which may explain why some much-celebrated initiatives have met a sudden early demise. The development of new policy measures should follow policy gaps and opportunities identified by detailed modeling analyses. The EEA Plan conveys a picture of a disjoint assembly of existing measures and generic plans to be fleshed out at a later time.

Summary and Conclusions

Massachusetts has ambitious climate goals and, in the past, has demonstrated broad-scale competence and diligence in climate change leadership. However, executive branch action in climate policy development appears to have undergone notable shifts, having moved away from developing and implementing concrete programmatic actions to meet specific target requirements toward a "let's see what we can do" attitude that relies on existing initiatives. Accordingly, the EEA Plan predominantly points toward existing plans and strategies. The policy measures listed are not associated with granular program and performance metrics, and thus remain vague. Furthermore, the initiatives tend to be disjoint rather than constituting calibrated components of an integrated strategy to achieve Massachusetts' emission targets. As a result, funding allocation is not optimized for efficiency due to lack of cost-benefit analysis, and funds often do not match the targeted impacts. A case in point are the ambitious heat pump deployment goals of the Mass Save® program, which face a funding gap with no apparent contingency plan.

Minimal-level stakeholder engagement in new policy development impedes the ability to engage the private sector and integrate it into an overarching financial strategy. Public buy-in is similarly important for policy development but has equally been neglected. As such, clearly expressed concerns by the public about environmental and safety impacts of methane leakage have not elicited any meaningful response. Public buy-in is critical for the successful implementation of pioneer project initiatives, in particular. This is most prominently exemplified by the TCI, which was well developed but failed to solicit public buy-in and thereby became politically unsustainable.

Overall, a new goal-driven leadership approach is needed in Massachusetts in order to move forward with effective and impactful climate action and meet prescribed emissions goals.