



Climate Partners' Recommendations for Achieving Maryland's Climate Goals

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marylandclimatepartners



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Signatories

The following organizations, as part of Climate Partners, support the included recommendations to achieve Maryland's climate goals.

Amalgamated Transit Union Local 689
CASA
Cedar Lane Environmental Justice Ministry Unitarian Universalist Congregation
Center for Progressive Reform
Central Maryland Transportation Alliance
Chesapeake Climate Action Network
Chesapeake Physicians for Social Responsibility
Climate Communications Coalition
Climate Law & Policy Project
Climate Reality Greater Maryland
Climate XChange Maryland
Earthjustice
Echotopia LLC
Elders Climate Action Maryland
Fix Maryland Rail
Green & Healthy Homes Initiative
Howard County Climate Action
Indivisible Howard County
Institute for Market Transformation
Interfaith Power & Light (DC.MD.NoVA)
League of Women Voters of Maryland
Maryland League of Conservation Voters
Maryland Legislative Coalition
MLC Climate Justice Wing
NAACP Maryland State Conference, Environmental and Climate Justice Committee
National Housing Trust
One Montgomery Green
Policy Foundation of Maryland
Progressive Maryland
Safe Healthy Playing Fields Inc.
Sierra Club Maryland Chapter
The Climate Mobilization Montgomery County Chapter
Transform Maryland Transportation Coalition
Unitarian Universalist Legislative Ministry of Maryland



Acknowledgements

Climate Partners would like to thank the many organizations and individuals who helped shape these final recommendations.

This report was a truly collaborative effort that included significant drafting, input, and review from a wide range of organizations and individuals. These organizations include CASA; Chesapeake Climate Action Network; Center for Progressive Reform; Climate Communications Coalition; Climate XChange Maryland; Earthjustice; Green & Healthy Homes Initiative; Institute for Market Transformation; Interfaith Power & Light (DC.MD.NoVA); Maryland League of Conservation Voters; Maryland Legislative Coalition; Mountain Maryland Movement; NAACP Maryland State Conference; National Housing Trust; Progressive Maryland; expert review of the buildings comments from RMI; Sierra Club Maryland Chapter; and many [members of the Transform Maryland Transportation Coalition](#), which led the drafting of the transportation comments.

Our recommendations were informed by Marylanders' perspectives shared at over a dozen town halls and roundtable events, through interviews and consultations, and in response to surveys. We'd like to extend a special thank you to the community members who shared their experiences for our spotlight features and to the many town hall participants. Additional gratitude goes to Action in Montgomery, Greater Baltimore Wilderness Coalition, and South Baltimore Community Land Trust for their testimonials. Thank you as well to the people who made this outreach possible, including but not limited to the staff at Henderson-Hopkins Elementary School where we hosted one of our town hall events.

Center for Climate Strategies provided technical support and guidance, as well as modeling of Climate Partners' recommendations, which is included as an appendix.

Introduction

The passage of the Climate Solutions Now Act (CSNA) of 2022 made Maryland a national leader in greenhouse gas (GHG) emissions reduction goals. Maryland is currently developing the plan to meet those goals. The Maryland Department of Environment (MDE) recently published its [Maryland's Climate Pathway](#) report (Pathway Report) and will in December, based upon feedback, publish a final plan to reduce climate pollution 60% below the 2006 baseline by 2031. Full and equitable implementation of the CSNA will mean a healthier future for everyone in our state. Climate Partners is a coalition of over one hundred environmental, faith, consumer advocacy and social justice organizations focused on ensuring equitable implementation of the CSNA. We are deeply invested in Maryland's climate future and in the success of this endeavor.

Climate Partners formed in 2021 to support the passage of bold climate legislation, engaging thousands of Marylanders to contribute their voice to this critical conversation. Earlier this year Climate Partners submitted [robust preliminary priorities](#) to inform the development of the Pathway Report. Climate Partners is now in this document providing comments on the Pathway Report itself and our recommendations for Maryland's climate plan.

Climate Partners has worked for over a year to bring forth a set of shared recommendations developed and strongly supported by of a broad cross-section of Maryland organizations and communities. Our recommendations are informed by input from over one hundred community organizations and Maryland leaders, gathered through over a dozen town halls and roundtable events, over 25 interviews and consultations, surveys, and more.

The recommendations that make up this document cover areas including transportation, energy and electricity, buildings, natural resources, and waste along with overarching themes relating to equity, revenue, and monitoring and evaluation. Each sector-focused chapter includes a summary of greenhouse gas reduction projections from our recommendations, commentary on the Pathway Report, specific policy recommendations, and when appropriate, key design principles for specific policies to enable successful and equitable implementation. Additionally, each sector-focused chapter includes community testimonials to illustrate and contextualize the issues.

A technical report from Center for Climate Strategies is included as an appendix, showing greenhouse gas reductions projections for different strategies and select discussion of methodology. A more in-depth technical report is forthcoming later this year.

As Maryland works to reduce greenhouse gas (GHG) emissions by 60% from the 2006 baseline over the next eight years, it can boldly lead in systems change in terms of what it does in different sectors and in terms of how it makes changes. Grounding its strategies and implementation in equity, strategically investing funds such that EJ communities are at the forefront, providing transparency at every level, and regularly monitoring and evaluating progress will help ensure an equitable clean energy future for all Marylanders.

Climate Partners is grateful for the opportunity to give input to this important work and hopes the recommendations made in this document will be useful in the development of Maryland's climate plan. Climate Partners applauds the Pathway Report authors and technical reviewers for advancing the state towards a climate plan. Our comments build on the work done in the Pathway report, while identifying some of its limitations and proposing recommendations for improving and strengthening the climate plan to be issued in December 2023.

Collaboration with Center for Climate Strategies

Climate Partners worked in cooperation with Center for Climate Strategies to support the development of a statewide energy and climate impact analysis, using the LEAP model. Creating such a model for Maryland enables civil society, business, and government to develop and test different policy selection, design, and analysis assumptions in a dynamic model that includes the integrated impacts within and between sectors. Furthermore, Climate Partners wanted to be able to objectively convey the potential impacts of its proposed policy recommendations based on national expertise and best available information for Maryland through an open, broad based review and input process.

Center for Climate Strategies developed an initial scenario analysis of "Recent Policies," which includes a listing of several policies codified in law or regulation but not yet implemented. Center for Climate Strategies then developed a scenario that reflected the sector-specific inputs from Climate Partners to evaluate the impact of our recommendations. This next modeling analysis, referred to here as the "Climate Partners' Recommended Actions" scenario, looks at the Climate Partners' recommendations to determine impacts beyond business as usual activities in Maryland.

Based on the preliminary results of the modeling, we offer a summary of the net impacts of our recommendations, as well as a breakdown in each chapter. Some policy recommendations, mostly related to natural resources and waste, were not modeled, due to uncertainties around appropriate modeling assumptions, and are noted accordingly. See the Technical Appendix for specific details.

Executive Summary of Recommendations

Topline sector-based and overarching recommendations are summarized below.

Equity

- 1. Meaningfully engage underserved, overburdened, and communities disproportionately impacted by climate change and increase their representation in decision making.**

Engage underserved, overburdened, and communities disproportionately impacted by climate change by hosting in-person and virtual listening sessions around the state for feedback about top concerns and needs. Co-develop meaningful strategies to address environmental injustice, reduce emissions, and build climate equity and resilience and build climate equity and resilience in those communities. Ensure that relevant climate plan commitments are revisited at least annually with and for impacted communities. Increase representation of climate and environmental justice experts as well as representation from environmental justice communities or representatives on the Maryland Clean Energy Center's Board of Directors, Fund Oversight Committee, and staff.

- 2. Prioritize climate-related funding and benefits to underserved and overburdened frontline communities.**

Prioritize climate-related funding and benefits to underserved and overburdened frontline communities but avoid arrangements that require communities to partner with polluters. Apply and align current and future state investments with the federal Justice 40 initiatives across all departments and initiatives.

- 3. Adopt an accessible technical assistance strategy with low-interest loans and training and workforce development for the clean energy transition.**

Adopt an accessible technical assistance strategy and formulate a targeted approach to providing technical assistance in isolated rural and urban areas with limited internet accessibility to ensure inclusivity in serving all Marylanders. Create a forgivable or very low-interest loan program or refundable tax credit for energy efficiency, weatherization and decarbonization improvements in underserved and overburdened frontline communities. Direct federal funds to underserved and overburdened frontline communities that will result in climate-related benefits, such as social housing and energy efficient housing for Marylanders of all income levels. Training and workforce development associated with the clean energy transition should also be targeted toward Marylanders from underserved, overburdened, and frontline communities to provide

economic opportunity and career pathways out of poverty for unemployed and underemployed residents.

Transportation Recommendations

We urge the Maryland Department of Environment to work with the Maryland Department of Transportation to incorporate the following objectives and policies into the forthcoming climate plan.

1. **Prioritize transportation projects that reduce greenhouse gas emissions.**

Fix transportation planning modeling and project impact analysis to emphasize a state of good repair policy that prioritizes alternatives to highway expansion, accounts for induced demand, and requires accounting of (i) greenhouse gas emissions and (ii) VMT impacts of proposed highway projects. Any anticipated increases in GHG or VMT from that project need to be offset by other transportation projects that would reduce GHG and/or VMT by the same amount or more (e.g., more transit, bike and pedestrian infrastructure).

2. **Reduce Vehicle Miles Traveled by 20% by 2030.**

The Maryland Department of the Environment, in conjunction with the Maryland Department of Transportation, should adopt a specific VMT reduction goal of 20% and develop a VMT reduction strategy, no later than Dec 2025, that identifies and models policies, programs, and projects that will lead to a 20% per capita VMT reduction below 2019 levels by 2030. Strategies including public transit, transit-oriented development, cycling and pedestrian infrastructure, and transportation demand management that would lead to a mode shift from single-occupancy vehicles and freight trucks to public transit, freight rail, cycling and walking are listed in the recommendations below and should be included in the VMT reduction strategy. Some examples of key projects to fund and complete include the Red Line, Purple Line, rapid transit connections in Southern Maryland, MARC expansion, and completion of the Capital Trails Network and Baltimore Greenways Trail Network.

3. **Adopt binding targets and programs to transition to electric light, medium and heavy-duty vehicles.**

Adopt the following transportation electrification schedules. Maryland should take actions outlined in the recommendations to ensure the charging infrastructure, utility transmission, distribution and storage infrastructure, and funding mechanisms are in place to ensure an equitable and smooth transition to electric or other zero-emission vehicles.

- a. Provide local governmental entities the funding and technical assistance needed to ensure that starting in 2025 the procurement of all new transit and school buses consist of only zero-emission vehicles.
- b. Require that all sales of medium- and heavy-duty vehicles in the state are zero-emission as of 2036.
- c. Electrify all MARC trains by 2035 and work with federal leaders to set requirements for CSX and Norfolk Southern train lines to be all-electric by 2035.

Energy and Electricity Recommendations

1. Set clear numerical targets for solar energy, offshore wind and grid connections, and energy storage.

We recommend targeting a goal of obtaining 20% of Maryland's electricity consumption from solar energy, building 8.5 GW of offshore wind (OSW) with planned transmission improvements to connect this energy to the grid, and installing at least 3 GW of storage by 2030. Ensure state policies and regulations support full implementation of the significant offshore wind bill (the POWER Act) of 2023; establish a clear framework and incentives for accelerating deployment of solar across utility scale, community, distributed, and residential solar; and use a combination of market incentives and power purchase agreements to drive the rapid transition to 100% clean energy.

2. Reform the Renewable Portfolio Standard (RPS).

The General Assembly should reform the RPS to support a 100% clean energy policy that limits qualifying resources to only those that are truly renewable and are non-emitting, non-combustible resources, a category that excludes woody biomass, trash incineration, and biogas. The Administration should also encourage the other Regional Greenhouse Gas Initiative (RGGI) states to introduce a regional CO₂ emission cap that decreases to zero by 2040, along with interim targets for 2030 and 2035.

3. Establish storage targets and build the Maryland Energy Storage Program consistent with state goals.

Support the PSC as it takes steps to establish storage targets and builds the Maryland Energy Storage Program consistent with and supportive of the state goal of achieving 100% in-state generation of clean energy by 2035. Develop safety and siting standards, model fire codes, and community engagement requirements for battery storage and H2Hub facilities; incentivize adoption of distributed behind-the-meter storage; and develop policies that encourage the co-location of renewables and battery storage to reduce interconnection costs and increase utilization of the facility. Apply for the federal funding that is available to support locating solar and storage on former coal sites, and additional co-location funding.

4. Recruit and train a clean energy workforce.

Work with the Maryland Clean Energy Center, Unions, and organizations working with underserved and minority communities to recruit and train a much-needed clean energy workforce. Grow and foster partnerships with community/technical colleges, high schools, skills centers, trade unions, and community organizations that prepare youth and adults for green jobs, including in the solar, wind, waste management (composting, recycling) industries, etc. Bolster minority involvement in non-construction and manufacturing clean energy jobs, including in clean energy policy, law, site assessment, plant design, permitting, financing, project management, and research and development. Establish community outreach programs in conjunction with local organizations that connect overburdened and under resourced communities with climate financing options including grants/loans from MCEC, MDE, etc.

5. Ensure sufficient transmission and distribution infrastructure to achieve state targets.

Ensure Maryland's grid has sufficient transmission and distribution infrastructure to achieve the state's GHG reduction and clean energy targets. Maryland should consider significantly increasing staffing and resources dedicated specifically to addressing transmission planning and implementation, both within Maryland and in coordination with neighboring states. One option could involve creating an "Office of Transmission, Interconnection and Siting," either as an independent agency or within MEA. Maryland should incorporate Grid Enhancing Technologies (GETs), as GETs allow for Maryland to get more out of existing transmission systems. Maryland should also actively participate in or convene PJM's stakeholder discussion to address interconnection issues and contribute to the development of policies, guidelines, procedures, processes, and regulations that impact the state.

Buildings Sector Recommendations

1. Introduce a suite of policies that provide clear building decarbonization market signals to key stakeholders.

Maryland should implement policies that provide clear market signals to manufacturers, builders, property owners, and utilities, encouraging them to plan for a transition to a highly-electrified buildings sector. Without these regulations and early policy signals, the state will miss opportunities to appropriately phase-in the building decarbonization transition, catalyze the market, train contractors, adequately design subsidy programs, work in tandem with stakeholders, and ensure long-term affordability of electrified technologies.

This suite of policies would include four elements: A) begin phase-in of pollution-free HVAC and water heating equipment in 2027 through a zero-emission appliance

standard; B) implement zero-emission new construction by 2027; C) develop BEPS that will support an equitable transition for all buildings; and D) set clean heat standards.

Additional recommendations on how best to implement these policies can be found in Section 1 of the Buildings chapter.

2. Design comprehensive strategies to promote the equitable adoption of electrified technologies in existing buildings.

Maryland should design comprehensive strategies to promote the equitable adoption of electrified technologies in existing buildings, including addressing barriers and protections for renters. To do so, a statewide electrification goal should be set for the next decade through cross-agency collaboration, including a sub-goal for low-income households. Weatherization and efficiency upgrades should play a key role in the building energy transition and additional funding options should be explored to expand incentives. A statewide, whole-home retrofit program should be developed for low-income households to holistically deliver housing rehabilitation, efficiency upgrades, and electrification. This approach minimizes program deferrals, reduces energy consumption, and reduces administrative costs from siloed programs. Maryland should prioritize the investment of as many energy efficiency funding streams to low-income households as possible in order to support a whole-home retrofit program that meets the state-wide need and ensures these families are not left behind as the state transitions to clean energy technologies.

3. Align gas and electric utility planning with Maryland's climate needs.

Maryland should align EmPOWER with state climate goals and ensure all residents have access to these programs. Doing so will ensure that increasing gas infrastructure costs are not shouldered by residents with high energy burden left on the gas system. A PSC proceeding to address long-term gas transition planning and STRIDE will help address the long-term financing of gas system infrastructure costs and address the risk of stranded assets. Maryland's utilities and PSC should explore new models for electric utility pricing that facilitate equitable electrification. Whether through a Percentage of Income Payment Plan (PIPP) or others, the state will need to take steps to ensure that utility rate structures facilitate the movement from fossil fuel utilities to electric utilities without creating undue burden on customers, especially low-income households.

Natural Resources Recommendations

1. Develop an updated methodology for estimating carbon sinks and fluxes across natural resources and working lands categories.

Maryland should strive for developing (or improving when possible) an updated methodology for estimating carbon sinks and fluxes, which will help: set concrete and

achievable goals in GHG reduction goals for Natural Resources-related policies; measure progress toward these GHG reduction goals; inform policy development and implementation towards adaptive management, track performance of existing programs and projects, and communicate and coordinate with stakeholders.

2. Establish clear policies and timelines for achieving expected reductions in agricultural emissions and incentivize regenerative agriculture practices and other related opportunities.

There is a need for more detail on how MDE/MDA plans to achieve the expected reductions in agricultural emissions. MDE/MDA/MDNR must expand the incentives for the implementation of regenerative agriculture practices, including conservation buffers, cover cropping, intensive rotational grazing, no-till farming, and agroforestry. They should also incentivize and promote the role of agrivoltaics and other co-siting opportunities (parking lots, brownfields, and landfills), ideally taking advantage of recently approved funds for the development of renewable energy in rural areas, such as in the IRA as part of the Rural Energy for America Program.

3. Establish policies aimed at minimizing forest disturbances.

In order to minimize carbon emissions from forestry, Maryland should establish policies aimed at minimizing forest disturbances. This could mean more clearly differentiating between preserving forest ecosystems, conserving newly afforested areas, and logging tree farms and plantations. MDE/MDNR must incorporate forest and ecosystem fragmentation goals and metrics directly into policy, in addition to overall forest cover measures. Special attention should be given to mature trees and remaining old-growth forests. Overreliance on net forest loss as the only metric to measure progress is inappropriate. Maryland must expand urban canopy goals, especially in areas where structurally marginalized communities and historically underserved populations reside. MDE/MDNR must establish robust mechanisms to collaborate, coordinate, and assess progress towards the Pathway's goals with private landowners and various levels of government. MDE/MDNR should explore alternative uses for woody biomass beyond burning (or biochar), such as using woody biomass to improve soils in gardening, farming, and livestock bedding, bioplastics, pressed building materials and flooring, pallets and crates, or as flooring for playgrounds.

4. Establish robust and verifiable carbon accounting mechanisms for policies aimed at reducing emissions from forestry and agriculture.

Maryland should establish robust life-cycle accounting mechanisms for measuring the impact of biomass for energy production. This requires differentiating between different sources associated with biomass, such as forest vs. farming. Similarly, in the case of mass timber, life-cycle assessment must include how much CO₂ would be emitted in the logging, manufacture, and transport of the wood products used in the construction, as

well as end-of-cycle steps. In the case of agriculture-related emissions, MDE/MDA must account for the full carbon cycle of policies aimed to reduce methane from enteric fermentation from ruminants.

5. Improve the current state of knowledge about carbon sinks and fluxes associated with wetlands.

MDE (in coordination with state and federal agencies) must improve the current state of knowledge about carbon sinks and fluxes associated with wetlands (across wetland categories), the impact of ongoing programs aimed at restoring and preserving wetlands, and future policies that will improve current conditions and create more resilient ecosystems and communities. Establish and collect data to track progress and impact of: Healthy Soils Competitive Fund and other related policies towards improving the Chesapeake Bay Ecosystem and of the Maryland Wetlands and Waterways Protection Program.

Waste Recommendations

1. Include more robust modeling of emissions reductions associated with Waste policies, as well as track and monitor these actions and their impacts.

The report does not recommend any specific additional policies to reduce emissions in the solid waste sector beyond what Maryland has already passed. It omits significant opportunities to reduce emissions and conserve resources through Zero Waste policies. Figure 2.18 speculates that annual waste diversion efforts would drive a 10% reduction from the baseline methane emissions through 2050. No specific policies or evidence are provided to support this. In order to meaningfully shape climate policy in Maryland, we encourage MDE to elaborate on or develop specific additional policies for their climate plan.

2. Waste less; reduce, reuse, compost, and recycle more.

Maryland should phase out Maryland's two trash incinerators as soon as possible; this is an additional policy that is likely to be adopted and the impact should be modeled. Reduce waste and greenhouse emissions from the extraction, manufacture, transport, and disposal of products by (i) prohibiting or significantly limiting the provision of single-use plastic products and packaging for which there are more sustainable alternatives; (ii) adopting a deposit/return system for beverage containers; and (iii) increasing minimum post-consumer recycled content for plastic beverage containers, rigid food containers, and rigid non-food containers. Increasing commercial, household, and institutional food scrap composting statewide can divert additional food waste from landfills.

Cross Cutting, Financial, and Operational Recommendations

Overarching recommendations relate to revenue and monitoring and evaluation.

1. **Save revenue by ceasing spending on counterproductive subsidies.**

Cease counter-productive and harmful spending on subsidies for polluting electricity generation, expansion of gas infrastructure, and new highway construction that will increase vehicle miles traveled.

2. **Maximize federal funding for emissions reduction goals.**

Maximize federal funding for GHG emissions reduction goals by taking advantage of clean energy and energy efficiency funding, investment tax credits, consumer rebates, environmental justice resources, and workforce development training funds made available by Congress in the November 2021 Bipartisan Infrastructure Law (BIL) and the August 2022 Inflation Reduction Act of 2022 (IRA).

3. **Assess a one-time fee on the largest historic polluters.**

Assess a one-time fee on the largest historic polluters, such as oil companies that have profited from decades of pollution while funding misinformation about the severity of the climate crisis. Such fees could pay into a fund to be used for mitigation and adaptation in Maryland.

4. **Build equity into policies to avoid disproportionate harm to low- and moderate-income Marylanders.**

Avoid disproportionate harm on low to moderate income Marylanders by prioritizing progressive rate structures that tier the amount paid based on income levels, reduce the energy burden for low income Marylanders, and implement a Percentage of Income Payment Program that caps the total percentage of a household income that will pay for utilities.

5. **Design and implement a robust monitoring, evaluation, and accountability framework.**

Ensure the climate plan has a robust performance monitoring and accountability framework that (i) indicates which elements have the biggest effects on emissions, (ii) monitors whether steps are implemented, (iii) includes provisions for policy and administrative responses to shortfalls in action, (iv) revisits periodically realistic assumptions about progress, and (v) sustains political support by identifying and monitoring co-benefits such as cleaner air, shorter commutes, and better access to greenspaces.

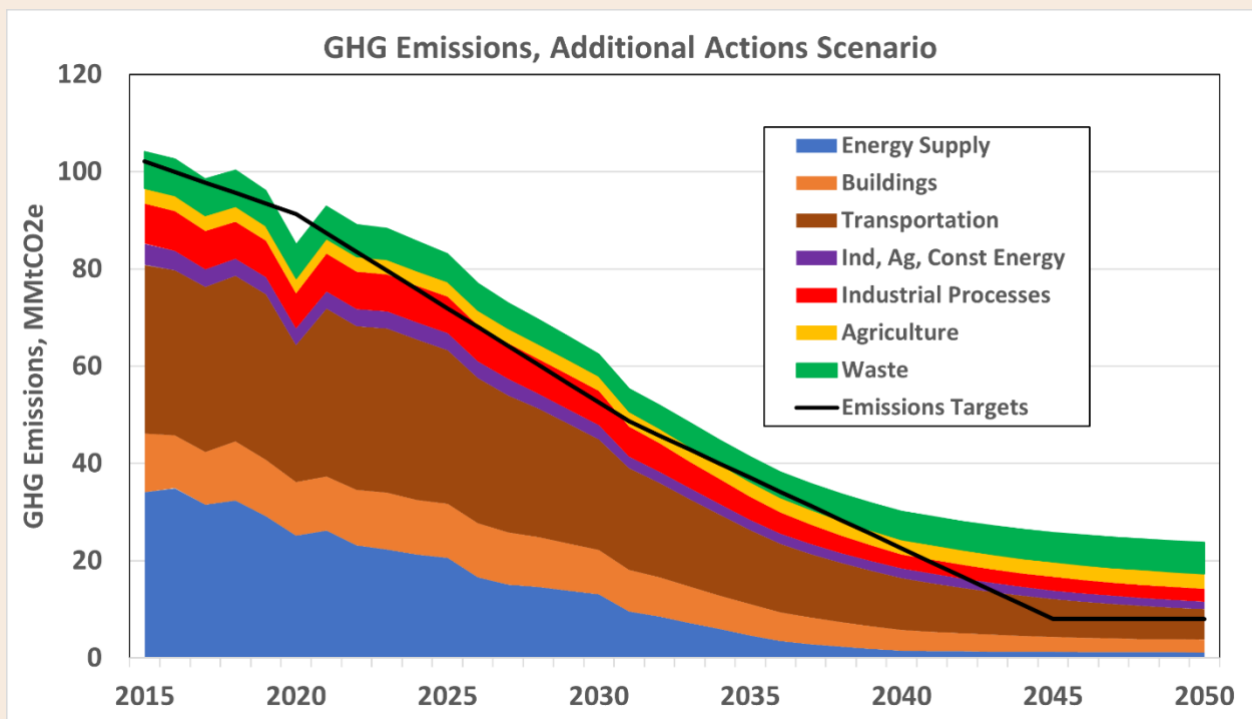
These recommendations are developed in further detail in the main text of this document.

Summary of Modeled Impact of Recommendations

Climate Partners' recommendations focus on new policies as well as steps necessary to ensure full implementation of existing policies. The above recommended policies, as modeled by Center for Climate Strategies through the combination of the Climate Partners' Recommended Actions and the Recent Policies scenarios, reduce 2031 emissions by more than 10 million metric tonnes of carbon dioxide equivalent (MMtCO₂e).

This leaves a gap of about 6 MMtCO₂e to meet Maryland's 2031 goal of 60 percent reduction relative to 2006 greenhouse gas (GHG) emission levels as estimated by the Maryland Department of Environment (MDE).

As noted above, some recommendations were not modeled, and some policy areas are not covered in Climate Partners' recommendations. We offer this modeling results to complement, not compete with the Pathways report. We are encouraged that our package of recommendations yields such a significant impact on Maryland's GHG emissions and look forward to working with MDE to explore how these ideas can be integrated into Maryland's climate plan.



Equity and Environmental Justice

As Maryland works to reduce its GHG emissions, it must also lift up historically under-resourced and overburdened communities disproportionately impacted by legacy pollution and climate change, ensuring they are at the forefront in receiving the maximum benefits available in this clean energy transition. The Pathway Report does an excellent job demonstrating the tremendous health benefits of reaching the state's emission reduction goals. It should also articulate and apply a comprehensive equity lens in its model to maximize health, economic, and social outcomes for our most vulnerable families facing environmental injustice, like toxic air pollution, exclusion from decision making, and chronic disinvestment in the communities where young children and families live, work, play, learn, and pray.

To address historic injustices, we recommend: a broader definition of environmental justice that encompasses multiple factors such as income, race, legacy pollution, redlining, and racially exclusive zoning policies, among others. EPA defines "environmental justice" as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

To advance environmental justice (EJ), Maryland must make stronger and more explicit commitments to acknowledge and address the legacy of institutionalized racism in the state. The state must adopt an equitable process for baseline improvements that prioritizes EJ communities with a history of legacy pollution, adverse health impacts, and resulting health disparities such as cancer rates, lead poisoning, and respiratory disease. To do this, Maryland must ensure there is a *Just Transition*, where education and professional pathways into the clean energy economy keep a focus on disadvantaged communities who suffer disproportionate exposure to pollution and poor air quality. Using aggregated data, the state can prioritize EJ communities who have multiple social, economic, health and environmental vulnerabilities that are exacerbated by climate change. We strongly recommend that the Maryland Department of the Environment (MDE) prioritize racial equity using an environmental justice (EJ) lens in all aspects of the Plan as follows:

- **Principles of a Just Transition.** Commitment to [principles of a just transition](#) is essential to ensure that State actions and investments reduce harm, guarantee benefits will reach overlooked and under-resourced populations, and institutionalize EJ in reducing GHG emissions by 60% by 2031.
- **Language Justice and Access to Information.** Ensure that in its final form the Pathway Report clearly *prioritizes disadvantaged communities and communities with legacy pollution* in all stages of available benefits and includes language needs like interpretation and translation of materials necessary to engage and serve hard to reach communities who are most often the least able to recover quickly from hazard events associated with or exacerbated by climate change.

- **Transparency.** The state must establish a baseline commitment to transparency at every level for communities to understand how their input and insights have informed plans and will be used to advance equity in the state and in their community.
- **Infrastructure.** Develop resources and systems through a framework of accessibility and cultural competence to ensure all people, regardless of income, education, language, ability, and other equity factors are able to authentically participate and benefit. Efforts should be made, when appropriate and helpful, to use tools like compensation to alleviate burdens to participation.
- **Workforce Development.** Across all sectors, create pipelines of green jobs training, workforce development, and local placement for a Just Transition. These vital training programs and certifications will provide residents in communities of color, disproportionately affected communities, and low-income communities with the skills and credentials necessary to compete in the green economy and create career pathways across entry level, managerial, and executive jobs. Targeted outreach will be needed to ensure access to training opportunities for workers displaced by the transition to clean energy and groups that are underrepresented in these industries including Black, Latino, Indigenous populations, low-income youth, women, and those formerly incarcerated. Providing residents with training and economic opportunity will enable them to contribute to the transformation of their communities by addressing hazardous housing conditions, improving energy efficiency, and creating affordable, climate resilient housing that advances environmental justice across place and space.

With this framework in mind and ensuring that low-income communities and communities with legacy pollution are *not* bearing upfront costs, the state should:

1. **Prioritize the engagement of underserved, overburdened, and communities disproportionately impacted by climate change (all terms defined in the Climate Solutions Now Act)**
 - a. In consultation with the Maryland Commission on Environmental Justice and Sustainable Communities, MDE should host at least ten in-person and virtual listening sessions and public forums in key areas across the state to garner feedback about the top concerns and needs of underserved and overburdened communities. Meeting times, locations, and accessibility should be arranged to enable the fullest participation.
 - b. Implement a data-driven and community-supported methodology for identifying frontline communities ('communities disproportionately affected by climate change'). MDE should adopt the use of comprehensive mapping tools to help make decisions and allocate resources.

Geographically Defined Disadvantaged Communities

The Inflation Reduction Act (IRA) requires funding to “benefit disadvantaged communities, as defined by the [EPA] Administrator.” Disadvantaged communities may be geographically and/or non-geographically defined. Geographically defined disadvantaged communities under MDE should be identified as any community that meets at least one of the following characteristics:

- Identified as disadvantaged by the Climate and Economic Justice Screening Tool (CEJST).
- Any census block group that is at or above the 90th percentile for any of EJScreen’s Supplemental Indexes when compared to the nation or state.
- Any geographic area within Tribal lands as identified in the EPA Environmental Justice Screening Tool.
 - a. MDE must co-develop meaningful strategies with underserved, overburdened, and frontline communities to address environmental injustice, reduce GHG emissions (and co-pollutants), and build climate equity and resilience in those communities.
 - b. The state should ensure that this report is a living document that is revisited at least annually with and for impacted communities.

2. Prioritize climate-related funding and benefits to underserved and overburdened frontline communities, steering away from private-public partnerships that would require communities to partner with polluters.

- a. Apply and align current and future state investments with the federal Justice 40 initiatives across all departments and initiatives.
- b. State agencies, including Maryland’s Departments of the Environment, Health, Natural Resources, Transportation, Agriculture, Planning, Housing, Labor, and Education must coordinate to identify funds and programs with climate and environmental justice-related benefits.
- c. The Maryland Clean Energy Center’s Board of Directors, Fund Oversight Committee, and staff should increase representation of climate and environmental justice experts as well as representation from environmental justice communities or representatives. An equity lens should be utilized to ensure at least 40% of the Oversight Committee members are environmental and climate justice experts and/or community-based representatives.
- d. The state must adopt an accessible technical assistance strategy and formulate a targeted approach to providing technical assistance in isolated rural and urban areas with limited internet accessibility to ensure inclusivity in serving all Marylanders.
- e. The state needs to create a forgivable or very low-interest loan program for energy efficiency, weatherization, and decarbonization improvements in underserved and overburdened frontline communities. Alternatively, the state could create a refundable tax credit that can put cash in the household's pocket

regardless of their tax liability to pay for energy efficiency retrofits and electrification measures.

- f. Maryland Department of the Environment (MDE), Maryland Energy Administration (MEA), and Department of Housing and Community Development (DHCD) must have a coordinated strategy that aggressively pursues funds from the Bipartisan Infrastructure and Jobs Act, the Inflation Reduction Act, and other federal and philanthropic dollars. Funds obtained must be intentionally and strategically directed to ensure underserved and overburdened frontline communities are prioritized for participation in the benefits, including for social housing and energy efficient housing.
- g. Training and workforce development associated with the clean energy transition should be targeted toward Marylanders from underserved, overburdened, and frontline communities to provide economic opportunity and career pathways out of poverty for unemployed and underemployed residents.

Beyond the Report

While the Administration has set strong environmental justice, equity, and climate goals, it must endeavor to embed them in every state agency and institution and require them to address these goals in their policies, practices and priorities.

- Maryland should introduce a policy that allocates resources and establishes an office dedicated to communities with a history of legacy pollution, prioritizing technical support from application to implementation. This would ensure that moving forward, dedicated streams of funding are readily accessible to all families, including multilingual households who want to participate in the zero emissions economy. It would also help ensure ready access to baseline resources so that chronically disinvested communities in Maryland are not only not left behind but prioritized in a deliberate way.
- Maryland should strongly consider eliminating Opportunity Zones tax breaks. Opportunity Zones have turned into a targeting mechanism to establish polluting industries among the most affected low-income communities, compounding environmental justice issues. While the tax breaks are supposed to increase investments in these communities, they frequently end up incentivizing the kind of investment communities don't want and cause disadvantaged communities to shoulder even greater pollution burdens and negative health impacts.
- Maryland should form partnerships with workforce development organizations prioritizing EJ communities for job training and job placement.

Transportation

The Maryland Department of Environment's Climate Pathway Report acknowledges the critical function reducing Vehicle Miles Traveled (VMT) provides in achieving the state's climate targets and the positive environmental impact of incentivizing consumers to drive less and purchase smaller vehicles. The Pathway Report also references important strategies to meet these goals, including improving and expanding public transit, safe biking and walking infrastructure, funding for complete streets, bike-share programs, e-bike and low-speed vehicle rebates, mixed-use development, transit-oriented development, and parking reform. Many of these strategies have the added co-benefits of improving mobility by increasing access to jobs, education, food, healthcare, and recreation. However, it is disappointing that the additional policies modeled in the draft report only yielded a 0.67% reduction in VMT between 2025 and 2030 and annual average VMT growth of 1% between 2020 and 2030, clearly inadequate for enabling Maryland to achieve its greenhouse gas emission reduction goals.¹ Moreover, it is hard to dispute the presented numbers, since the Pathway Report does not identify the specific VMT reduction measures that were modeled.

We are glad to see critical transportation electrification policies in the Pathway Report, including the Advanced Clean Cars II, Advanced Clean Trucks, and the Advanced Clean Fleets regulations as well as a goal for 100% of new bus sales to be electric by 2025 in Maryland's draft Climate Pathway analysis. To support achievement of that goal, the state should identify and model additional state policies that will make electric vehicles and infrastructure sufficiently accessible to communities of color, rural communities, low-wealth consumers, people with disabilities, rental and other residential communities without deeded parking.

We ask that the Maryland Department of Environment work with the Maryland Department of Transportation to prioritize incorporating the following objectives into the climate plan:

- 1. Fix transportation planning modeling and project impact analysis** to emphasize a state of good repair policy that prioritizes alternatives to highway expansion, accounts for induced demand, and requires accounting of (i) greenhouse gas emissions and (ii) VMT impacts of proposed highway projects. Any anticipated increases in GHG or VMT from that project need to be offset by other transportation projects that would reduce GHG and/or VMT by the same amount or more (e.g., more transit, bike and pedestrian infrastructure).

¹ Maryland's Climate Pathway Report Technical Appendix Page 15 (June 2023)
<https://mde.maryland.gov/programs/air/ClimateChange/Documents/60x31%20Plan/Maryland%27s%20Climate%20Pathway%20Report.pdf>

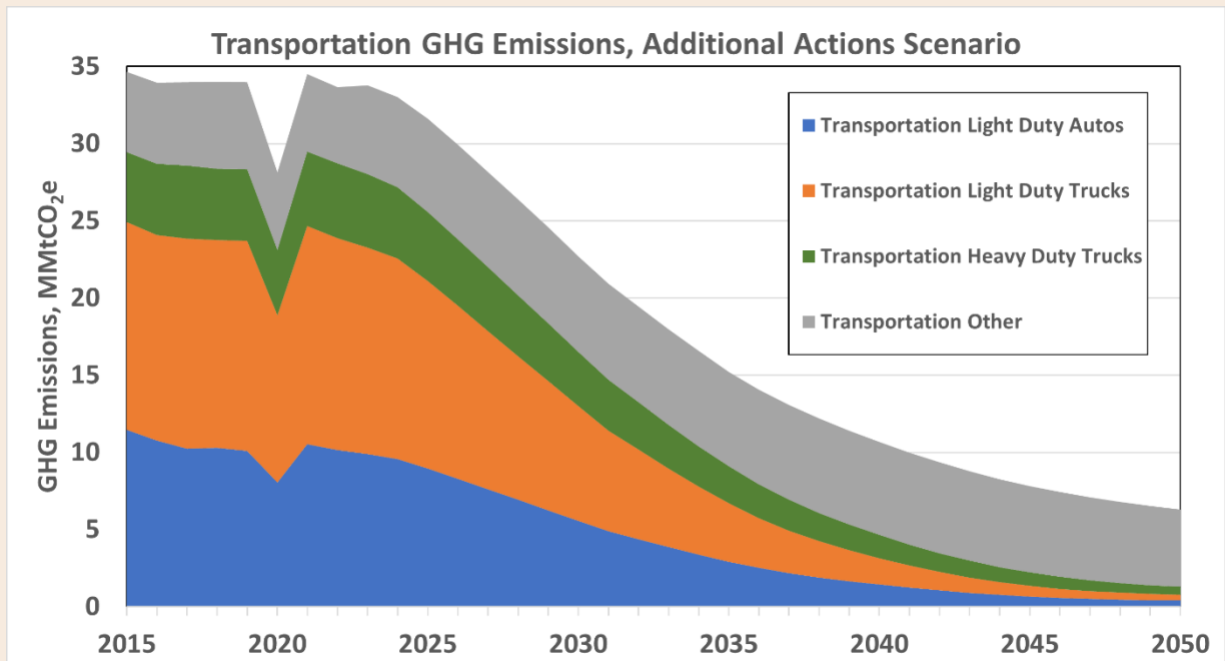
2. **The Maryland Department of the Environment, in conjunction with the Maryland Department of Transportation, should develop a VMT reduction strategy by December 2025 that identifies and models policies, programs, and projects that will lead to a 20% per capita VMT reduction below 2019 levels by 2030.** Strategies, including public transit, transit-oriented development, cycling and pedestrian infrastructure, and transportation demand management, that would lead to a mode shift from single-occupancy vehicles and freight trucks to public transit, freight rail, cycling and walking are listed in the recommendations below and should be included in the VMT reduction strategy.

3. **Adopt the following transportation electrification schedules.** Maryland should take actions outlined in the recommendations to ensure the charging infrastructure, utility transmission, distribution and storage infrastructure, and funding mechanisms are in place to ensure an equitable and smooth transition to electric or other zero-emission vehicles.
 - a. Provide local governmental entities the funding and technical assistance needed to ensure that starting in 2025 the procurement of all new transit and school buses consist of only zero-emission vehicles.
 - b. Require that all sales of medium- and heavy-duty vehicles in the state are zero-emission as of 2036.
 - c. Electrify all MARC trains by 2035 and work with federal leaders to set requirements for CSX and Norfolk Southern train lines to be all-electric by 2035.

MDE and MDOT should work with the Maryland Energy Administration (MEA), Maryland Department of Planning (MDP), Department of Housing and Community Development (DHCD) and other state and local agencies to incorporate the policies, projects, and strategies to meet the state's greenhouse gas goals.

Modeled Impact of Transportation Recommendations

Within the Climate Partners' Recommended Actions scenario, overall emissions from transportation in 2031 fall by 2.6 MTCO₂e relative to the Recent Policies case, to about 21 MTCO₂e total.



Reductions in transportation were driven largely by transition to electric light-, medium-, and heavy-duty vehicles and reduction of VMT (Vehicle Miles Traveled) stemming from growth in transit, smart growth, and alternative transportation modes. Shifts between modes (e.g. personal vehicle to rail) were accounted for when possible, see technical appendix for details. Transition to electric vehicles does shift some emissions to the Electricity sector, which is noted in the energy section.

The Transportation sector in the Maryland LEAP model includes “branches” for Light Duty Autos, Light Duty Trucks (together, light duty vehicles, or LDV), Heavy Duty Trucks (HDV), and “Other”, which includes aviation, bus transport, rail transport, shipping, recreational equipment, outdoor (lawn and garden) equipment, and other categories of (mostly, at present) motor fuels use.

Recommendations

The state should prioritize the communities heavily impacted by transportation pollution and historically excluded from transportation decision making and infrastructure resources (including communities of color, low-wealth communities, rural communities, and people with disabilities) in the development and implementation of solutions, including the recommendations listed below, to meet the state's climate goals.

Fix transportation planning modeling and project impact analysis

Billions of dollars are wasted each year on ineffective freeway expansion justified by outdated and erroneous transportation modeling methods. These methods do not recognize the effects of induced demand, resulting in expensive projects that routinely fail to reduce congestion.² Highway expansion projects also fail to account for and mitigate their adverse impact on GHG emissions, local flooding, air pollution and heat.³ Therefore we encourage MDE and MDOT, in conjunction with partner agencies to:

- 1. Require MPO (Metropolitan Planning Organizations) plans and all state highway and road projects with anticipated costs over \$10 million to include an environmental review that discloses modeling assumptions used to generate data and quantifies GHG and VMT impacts, including operational and full life-cycle CO₂ emissions associated with infrastructure materials and construction.⁴ Any anticipated increases in GHG or VMT from that project need to be offset by other transportation projects that would reduce GHG and/or VMT by the same amount or more (e.g., more transit, bike and pedestrian infrastructure).** The updated models used to quantify GHG emissions should recognize the impact of induced demand (as stated below) when determining the projected growth of GHG emissions caused by highway expansion. Consider provisions from [legislation in Minnesota](#) and the Colorado Department of Transportation's [greenhouse gas rule](#) when developing this policy.
- 2. Establish updated standards for transportation planning modeling** to account for induced travel demand and multi-modal accessibility when comparing alternatives. Updated standards are needed to improve forecasting future traffic, emissions, community exposures, and estimating the benefits of mitigation measures as recommended by a working group of national sustainability, energy and transportation organizations.⁵ Many travel models over-forecast future baseline automobile travel

² Hymel, K. (2019). If you build it, they will drive: Measuring induced demand for vehicle travel in urban areas. *Transport Policy*, 76, 57–66. Science Direct. <https://doi.org/10.1016/j.tranpol.2018.12.006>

³ *Comments on CEQ's NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*. <https://www.itdp.org/wp-content/uploads/2023/04/CEQ-Comments-on-NEPA-Guidance.pdf>

⁴ Caltrans, *When Are VMT Impacts From A Project Acceptable?* Revised November 16, 2023. Retrieved October 15, 2023 from: <https://dot.ca.gov/programs/esta/sb-743/resources/acceptable-impacts>

⁵ *Comments on CEQ NEPA Guidance for Consideration of Greenhouse Gas Emissions and Climate Change*, prepared by Robert Yuhnke and Michael Replogle on behalf of Coalition for Smarter Growth, Elders Climate Action,

demand and underestimate how road capacity expansion increases driving and emissions.

- 3. Anticipate funding needs for transportation infrastructure climate resiliency and adaptation before committing to highway expansion.** In addition to a common-sense fix-it-first policy that prioritizes alternatives to highway expansion, such as transit funding, Maryland needs a fix-it-and-make-it-resilient-first approach to its state highway network. Maryland will need significant green and other infrastructure investments to address coastal and inland flooding and heat impacts on existing road and rail infrastructure. These needs must be prioritized ahead of highway system capacity expansion.
- 4. The Maryland Department of Transportation should work with the General Assembly to update and strengthen the Chapter 30 Scoring Process for its Consolidated Transportation Program so that it directs transportation spending to the projects that best achieve Maryland’s transportation goals, including decreasing greenhouse gas emissions, improving climate resilience, and reducing vehicle miles traveled.**

Reducing Vehicle Miles Traveled

Electrification of vehicles alone will not allow the state to meet the transportation greenhouse gas reductions that are needed. The Pathway Report indicates that “The Climate Change Mitigation Study conducted by the Transportation Planning Board (TPB) revealed that the Greater Washington D.C., region (including Prince George’s, Frederick, and Montgomery Counties) needs to achieve a 15-20% reduction in per capita driving (light-duty VMT) below the 2030 baseline forecast, as outlined in the current transportation plan” in order to reduce transportation emissions 50% by 2030 relative to 2005 levels.

Continued dependence on cars and trucks as a primary source of travel will increase climate and environmental pollution. Avoidable state spending, emergency response, and public health costs will grow each year. Large paved surfaces (roads, highways and parking lots or garages) cause flooding and higher temperatures from heat islands. Toxic tire runoff damages soil and waterway ecosystems. The current approach will also continue to increase congestion, accidents, and require costly road repairs, while exacerbating health, economic and transportation inequity.

Prioritizing investment in transit, and trains for moving people, and far more trains for moving a greater variety of freight will showcase our best effort to ‘future-proof’ the state from preventable effects of climate and environmental pollution. Investing in strategies that reduce Vehicle Miles Traveled will have the added co-benefits of providing access to quality housing, jobs, education, food, healthcare, and amenities. Investments to expand car infrastructure have largely benefited

Equiticity, Institute for Transportation and Development Policy, National Association of City Transportation Officials, RMI, Sierra Club, Transportation for America, the Southern Environmental Law Center, April 2023.

white, affluent communities. The lack of investments in other transportation modes has disproportionately impacted Black and Brown communities, low-income communities, and people with disabilities. A 2018 study found that only 9% of jobs in the Baltimore region—where Black and Brown communities make up the vast majority of transit users—are accessible within one hour by public transit.⁶ A large study by Harvard University indicated that commute time was the single strongest factor in the odds of escaping poverty.⁷

Therefore, to meet Maryland’s climate goals, Maryland should increase investment in public transit, bikeways, pedestrian improvements, transportation demand management, parking and congestion pricing, land use planning, housing policy, and other strategies that reduce VMT through mode shift (from passenger cars to transit, bicycles, other cleaner modes) and reducing trip distances.

MDE and MDOT should increase their proposed target to reduce VMT per capita from 10% to 20% below 2019 levels and develop a VMT reduction strategy that identifies policies, programs, and projects that will lead to this reduction. This goal is consistent with the needs found in the Climate Mitigation Study cited in the Pathway Report and an [analysis from RMI](#) indicating that the United States must reduce VMT by 20% before the end of the decade to limit warming to 1.5°C even if it meets its ambitious EV goals. Funding (both state and federal) should be focused on transit projects that will be affordable to riders.

Below are policies and actions that can be included in a VMT reduction strategy:

- 1. MDOT should flex 50% of transportation funds it receives from the federal government (including from the Surface Block Transportation Grant Program and National Highway Performance Program) towards eligible public transit, bike, and pedestrian projects.** Most of the federal formula transportation grants that Maryland automatically receives from the federal government each year for transportation programs are used for highway capacity projects. Maryland currently only flexes a very small amount—less than 9%—from federal programs to transit, pedestrian, and cycling infrastructure.⁸ Federal guidance for the IIJA indicates that 50% of funds from these programs can be flexed.

⁶ Owen, A., and Murphy, B. (n.d.). Access Across America: Transit 2019. Center for Transportation Studies. Retrieved September 22, 2023, from

https://ao.umn.edu/research/america/transit/2019/documents/AccessAcrossAmerica-Transit2019_sm.pdf

⁷ Chetty, R., and Hendren, N. (2015). The Impacts of Neighborhoods on Intergenerational Mobility Childhood Exposure Effects and County-Level Estimates. http://www.equality-of-opportunity.org/images/nbhds_exec_summary.pdf

⁸ “Federal Funding Flexibility: Use of Federal-Aid Highway Fund Transfers by State DOTs” at NAP.edu. (n.d.). In nap.nationalacademies.org. National Cooperative Highway Research Program. Retrieved September 22, 2023, from <https://nap.nationalacademies.org/read/26696/chapter/1>

2. The Governor should revoke certain highway and bridge expansion plans.

- a. **Revoke plans to expand all parts of I-495 and I-270 (including the I-495 Southside project) with toll lanes.** The preferred alternative for the I-495 and I-270 expansion could result in an estimated range of an additional 1.1 Million Metric Tons of Carbon Dioxide Equivalent (MMT CO₂e) to 3.4 MMT CO₂e through 2050 from induced travel.⁹ These plans should be modified to focus on Bus Rapid Transit (I-270 Corridor Forward Plan), expansion and improved service of the Brunswick line, increasing frequency of transit service, Innovative Congestion Management on I-495 (as is now working on lower I-270), Transportation Systems Management and Operations (TSMO) (as is being used on the Baltimore Beltway to reduce congestion), and more Transportation Demand Management (TDM) (e.g., telework, car and van pools, subsidized transit passes, etc.). Investing in transit-oriented economic development plans in Prince George's and Montgomery is also critical to addressing the east-west job-housing divide in the DC region that is a source of travel problems.
- b. **Withdraw plans to build a third bridge across the Chesapeake Bay.** The Bay Bridge expansion would also increase greenhouse gas emissions by incentivizing driving. Any work on the Bay Bridge should be limited to State of Good Repair and safety needs. Instead MDOT should work with local governments on comprehensive congestion management plans that will reduce VMT. Incentivize group travel in shuttle vans and buses for seasonal and weekly cycles of peak traffic on Bay Bridge with reduced tolls and flexed HOV lanes. Work with MPOs to develop bus/van pilots to reduce single occupancy vehicle travel.

3. The Maryland General Assembly should take legislative action to encourage transit-oriented development, especially transit-oriented affordable housing, to reduce VMT and household transportation costs and to increase accessibility of workplaces, food, education, and services. Consider the following:

- a. Require a study to evaluate the use and effectiveness of Priority Funding Areas (PFAs) and designated Transit-Oriented Development (TOD) areas. The study should review whether general plans, zoning, affordable housing funding, and other factors are aligned with PFAs and TOD designations.
- b. Create a mechanism to enforce counties' general plan's housing targets and ensure alignment between the general plan's land use and PFAs.
- c. Encourage and allow accessory dwelling units and small multifamily housing in areas near transit centers.

⁹ Comments on I-495 and I-270 Managed Lane Study Supplemental Draft Environmental Impact Statement and Updated Draft Section 4(f) Evaluation, Page 115, Retrieved September 2023 from <https://www.sierraclub.org/sites/default/files/sce-authors/u18365/2021-11-30%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments%20%281%29.pdf>

- d. Remove parking minimums and establish parking maximums for all properties near transit to incentivize transit-oriented development.
- e. Invest in rural bus transit to allow every county and community the ability to utilize the practice of TOD. Include bike carriers on rural transit buses and bike racks at stops to accommodate first and last mile travel.
- f. Invest in Smart Growth goals as outlined by the Department of Planning and Safe Routes to School goals to help shorten drive times, locate housing closer to work, grocery stores and healthy food, education, shopping, and recreation, minimize shopping trips, and give our kids real options to walk and ride bikes to school, parks and playgrounds.
- g. Promote success of minority-owned businesses. Improve and expand public transit options to grant residents exposure and access to minority owned businesses along highly transited routes. Focusing on projects like the Purple Line will increase accessibility of [minority-owned businesses](#) to community members and will in exchange support the success of these businesses.

4. The state should take immediate action to address significant frequency and reliability issues of current transit service to grow ridership.

- a. In order to address the operator shortage, MTA, WMATA, and the Locally Operated Transit Systems (LOTS) should actively recruit, hire, and train additional transit operators with necessary incentives including signing bonuses, increase operator safety barriers inside of transit, and support affordable housing initiatives for employees near their workplace.
- b. Fund transit operating budget increases as a strategy to grow ridership throughout the state in conjunction with increasing frequency of service, including weekend and evening service on transit service.
- c. Increase frequency of service, including weekend and evening service, on transit systems (WMATA, MTA, LOTs, rural transit) throughout the state. Fund and implement the WMATA's visionary bus network that will provide [300% more routes in Maryland within 12-20 minutes of service and 85% more routes with 12 minutes or better service.](#) MTA should increase evening/weekend service on the 18 high frequency lines to every 15 minutes or better and increase local link service frequency to 30 minutes or better. Invest in more frequent service in rural communities.
- d. As consistent with the Regional Transit Plan for Central Maryland, MTA should increase the on-time performance of Core bus service to 85% and paratransit service to at least 95% by 2025 and strive for 100%. Direct MTA to develop a service reliability improvement plan to improve service reliability to at least 80% for on-time buses along student routes. Pilot tactical transit lanes (TTL) during peak demand times to improve bus and paratransit reliability.¹⁰

¹⁰ UCLA Institute of Transportation Studies (2019). *Best Practices in Implementing Tactical Transit Lanes*. UCAL ITS with support from SB1. <https://www.its.ucla.edu/wp-content/uploads/sites/6/2019/02/Best-Practices-in-Implementing-Tactical-Transit-Lanes-1.pdf>.

- e. The state legislature should strengthen WMATA's ability to provide rail and bus service, contingent on parallel action in DC and Virginia, by allowing WMATA to increase year-over-year operating expenditures by more than three percent so as to keep up with inflation. Maryland should also work with DC and Virginia to address the \$750 million operating budget deficit for FY 2025 and identify dedicated funding streams for WMATA.
- f. Ensure funding and completion of the Frederick Douglass Tunnel Project that will dramatically reduce bottlenecks and speed up MARC and Amtrak Service on the Northeast Corridor.
- g. Formulate a plan to prevent storm damage to wires (and subsequent service disruptions) along the Baltimore light rail line.

Taking Public Transportation Should Not Be A Gamble

For the past three weeks, I have not gone to my preferred grocery store. I have been on tight deadlines, and I cannot take the chance of not returning on time.

I do not own a car, so I walk and use public transportation to reach my destinations. My preferred grocery store is too far to walk to, so I rely on the bus to get there. However, I have learned that the bus itself is not reliable. Previously, while on a 24-hour deadline, I ventured out for lunch, assuming I'd get back in time. The bus that took me to the restaurant arrived on schedule. However, the bus that was supposed to take me back arrived and left the stop four minutes early. I was close enough to see the bus passing but not close enough to run to the stop in time. The next bus was scheduled to arrive in 40 minutes. I waited in a store for a while, then headed out to reach the stop ten minutes early. I waited there until 15 minutes past the scheduled time, but it didn't matter: the bus never arrived. I could have waited for the next bus, but then I remembered all the times I waited for two hours at a bus stop because two scheduled buses in a row did not show up. I couldn't take another chance. Ultimately, I wound up taking Lyft. It was my only guaranteed ride back.

My preferred grocery store has better produce for cheaper prices than the store I've been going to recently. But, for now, I'll settle for slightly wrinkly green peppers that are each ten cents more than the fresher ones at my preferred store. The current store is in walking distance, so I know I'll never be stranded. I'll start using the bus again when my schedule lightens up enough that I can take a chance on two buses in a row not showing up. Right now, I'll only go to places in walking distance.

Everyone's time is valuable, whether they own a car or not. The Maryland Transit Administration must ensure that all buses actually arrive as scheduled. Taking public transportation should not be a gamble.

- Shilpa, Baltimore County

Read also "Federal Funding Flexibility: Use of Federal-Aid Highway Fund Transfers by State DOTs" at NAP.edu. (n.d.). In *nap.nationalacademies.org*. National Cooperative Highway Research Program. Retrieved September 22, 2023, from <https://nap.nationalacademies.org/read/26696/chapter/1>

5. The state should take the following actions to expand transit service, bike and pedestrian access to grow ridership and reduce vehicle trips.

- a. Collaborate with the federal government to secure an updated plan, re-evaluation of the National Environmental Policy Act process, Record of Decision, and funding needed to complete the Red Line that will connect underserved neighborhoods in East-West Baltimore.
- b. Expand transit from Southern Maryland (i.e. southern Prince George's County and Charles County) via Branch Avenue and Crain Highway. Microtransit will help connect exurban neighborhoods with the Southern Maryland Rapid Transit Line to Branch Avenue metrorail.
- c. Ensure the completion of the Purple Line. Fund a study on expanding the Purple Line from Bethesda into Virginia and from New Carrollton into Fairfax County. The long-term goal would be to circle the DC region, connecting numerous suburbs and Metro stations. The right of way for a possible future purple line extension over the American Legion Bridge should be reserved now for this potential use.
- d. MTA should improve and provide statewide transit access, especially from Baltimore and the D.C. metropolitan region to the Maryland government complex in Annapolis.
- e. Fund planned Bus Rapid Transit (BRT) projects throughout the state. Invest in existing rural bus transit to expand routes to more communities, and provide WiFi for rural commuters.
- f. Help local governments fund construction of physically-separated safe bike-only lanes, eliminating disappearing bike lanes and shared-modal turn lanes.
- g. Undertake an educational campaign about the viability of families owning fewer cars—or perhaps no car at all—as better public transportation, e-bikes, and other options come online. Consider instituting a tax credit or other incentive for residents that do not own cars.
- h. Provide/publish MDOT's plan for achieving Vision Zero by 2030, as enacted by law.

A Student's Experience of Public Transit

As a high school student who travels mainly through public transport, a lot of public transport doesn't overlap in areas where you'd think it would. So, major metro centers aren't connected to every form of buses or the light rail. So, to get to Mondawmin from the light rail, you'd have to go all the way down to the Harbor. Kids who are coming from Western or Poly, if they live anywhere outside of that little area where they can take the light rail and get home efficiently, where you have to get on a bus that doesn't connect directly there, it's really hard for them to get home. So it's like, the way traveling is set up, it's really difficult for a lot of us to travel, but especially people like teens and young adults who don't yet have licenses or cars.

- Janna, Student at Bard High School Early College Baltimore

6. Increase access to transit, bike, and pedestrian infrastructure.

- a. Invest in safe walk and bicycle access to all transit stops and stations and school bus stops with a complete network of buffered sidewalks, protected bicycle lanes and paths, and safe crossings. Whenever possible, plant trees to separate car lanes and pedestrian and bike lanes to improve safety, address heat islands, and improve rider experience.
- b. Increase accessibility to public transportation for people with disabilities by maintaining escalators, elevators, ramps and lifts to make sure they are functioning properly and prevent unsafe conditions. People with disabilities need to be able to rely on safely boarding and exiting public transportation and are put into dangerous situations when accessibility features onboard or at the station are out of service, and could end up injured or stranded. Reliable accessibility features help people with disabilities actively choose public transportation rather than private options.
- c. Provide more shelters and secure bicycle parking facilities at bus and rail stations. Provide bike racks on rural buses to facilitate first and last mile access to transit.
- d. Pilot free bus and/or other transit service for youth up to age 18 and low-income riders and track/report ridership and reliability data. Depending on results of the pilot, securing long-term public and private funding to support free transit—including free, unlimited MTA access for youth up to age 18 and low-income riders.

7. Expand and modernize heavy passenger and freight rail. MDOT should incentivize local and regional shippers to move their goods by rail, instead of trucks. Higher speed, reliable passenger rail—Amtrak and MARC—on resilient tracks are needed.

- a. Secure funding needed to implement the MARC Cornerstone Implementation Study and Investment Program, expansion of MARC Service to Western Maryland and MARC run through service to Virginia and Delaware.
- b. By 2024 the Maryland Department of Transportation should develop a plan to purchase the right of way and upgrade selected heavy rail tracks and infrastructure, including but not limited to, ports, rail yards, tracks and trains, for a pivot to solar and wind power. By 2027, Maryland should initiate two pilot programs to deploy safe, clean-energy electric trains and acquire the right of way of heavy rail tracks for passengers, and local freight in Curtis Bay, Baltimore, and in the Southern Maryland region for a connection over the Potomac River through Virginia, via electrification from a modernized grid. Explore using catenary lines over electric tracks for energy transmission. Such updates will enable expanded passenger rail and state-run regional freight shipping.

Case Study on Heavy-rail Expansion in Virginia

For a couple decades, Virginia transportation planners have understood that they have no pathway to paving their way out of gridlock connecting all of Virginia to the Mid Atlantic centers.

Virginia became perhaps the first state in the nation to develop a stable state-sponsored dedicated funding for passenger and commuter rail and now have a number of state-sponsored passenger trains run by Amtrak that would otherwise be unfunded. With the opening of the improved Panamex Canal that opened the era of bigger and bigger cargo ships, the state set out to make the ports of Virginia among the few that can accommodate those vessels and get their cargo quickly onto double stack trains through the region. That meant millions of dollars to improve the infrastructure to accommodate those trains even in DC and Maryland. Virginia has sponsored track expansions and other crucial infrastructure work. But most importantly, Virginia has negotiated the purchase of critical north-south right of ways from CSX that were in danger of abandonment or deterioration.

Today because of this, over 80 percent of Virginians have access to a rail head and more and more expansion and improvement of the network. Every Virginian has benefited from this in budget line items as well as intangibles in health, economy, and safety. In fact, the state-sponsored takeover of the CSX properties benefited everyone in the region by making off-highway transport more and more possible.

It should be clear that there is a one-two punch for climate and pollution. First punch is removing some of the worst of the polluters, namely single occupant fossil fuel vehicles. But the important second punch is moving towards a mode of transport that has a clear path transitioning even more transport to green energy.

A robust revitalized rail network provides us an excellent opportunity to expand our electric grids safely and quickly.

- Fritz Edler, a Maryland-raised 40+ year railroad worker, transportation policy advocate, and international Special Representative for Railroad Workers United

8. Increase active transportation options for people across the state.

- a. Increase investment in the Kim Lamphier Maryland Bikeways Program and coordinate this state funding with investment from the federal Transportation Alternatives program and other federal programs, while prioritizing funding toward connected trails and active transportation networks around Maryland. Invest over \$1 billion to complete the Capital Trails Network, and \$30 million for the completion of the Baltimore Greenway Trails Network. Consider providing expansion and improvements of additional trail systems including the Cross/South Island Trail in Queen Anne's County, the Frederick Douglas Rail Trail that extends from Delaware through Caroline and Talbot County.
- b. Prioritize active transportation projects submitted by Disadvantaged Communities (as identified by USDOT) in the Consolidated Transportation Plan where federal funds can be maximized, often with no match requirement.
- c. Engage Rural Regional Councils to facilitate and assist with development of regional strategies to increase active transportation connections that enhance workforce, economic development, and public health especially in and between disadvantaged communities.
- d. Develop and fund a purchase subsidy or rebate program for low-speed vehicles like e-bikes, adaptive e-bikes, e-trikes, and e-scooters with provisions that prioritize low/moderate-income Marylanders and students and help them effectively participate. Consider a program like "cash for clunkers" that allows Maryland residents to turn in older high-polluting vehicles for these low-speed non-polluting vehicles.
- e. Maryland should include requirements for inclusion of safe, long-term bike parking in developments that include charging infrastructure so that people can safely store and charge e-bikes.
- f. Develop an Office of Trails within MDOT that would collaborate with the Department of Natural Resources, Department of Planning, and Department of Housing and Community Development as well as local governments to aid in the planning and development of multimodal trails.

9. Provide incentives and requirements for commuter benefit programs.

- a. MDOT should make major changes to the Maryland Commuter Choice program to increase the number of employers participating from 10 employers (in 2021) to at least 500 starting in 2024, including Maryland's top 32 employers that each employ over 2,500 people. The commuter choice program includes a reimbursement of 50% of employers' costs (up to \$100 per employee) per month for offering employees qualified commuting benefits programs like transit, cash in lieu of parking, telework and more

- b. Maryland should consider a mandate, similar to what [Washington D.C.](#) and [New Jersey](#) have, that employers of a certain size must offer sustainable commuter benefit options.
- c. Consider an incentive program that awards employers based on how much VMT reductions a company can demonstrate through telework policies. Telework policies should incorporate certain [parameters](#) that have been proven to reduce driving overall.

Electrify light, medium and heavy-duty vehicles

On-road passenger vehicles are the largest source of greenhouse gas emissions from the transportation sector, followed by medium- and heavy-duty vehicles. State officials should make reducing gasoline use a primary metric for all programs to promote EVs. Maryland should plan for the rapid transition for zero emission light-, medium-, and heavy-duty vehicles and the charging infrastructure, utility programs, and funding mechanisms needed to support an equitable transition to these vehicles. As Maryland deploys these electric vehicles it must also make changes to increase electricity capacity and ensure the grid is increasingly powered by wind and solar energy and not by fossil fuels. Maryland should encourage federal partners to develop standards that allow for universal availability of charging ports that minimize charging infrastructure costs and that support maximizing charging availability. Consider funding vehicle electrification solutions with the National Electric Vehicle Infrastructure grant programs, Charging and Fuel Infrastructure Discretionary Grants, Clean School Bus Program, Clean Heavy-Duty Vehicle Program, and the Department of Energy's Loan Program.

To accelerate the transition to electric vehicles we recommend the following:

- 1. Adopt regulations and legislation to accelerate the sale and procurement of light-, medium-, and heavy-duty vehicles.**
 - a. **By the end of 2023, Maryland should adopt the Advanced Clean Truck rule** which will require manufacturers to increase the sale of zero-emission trucks and school buses in Model Year 2027 through 2035.

The Impact of Dirty Diesel Trucks

When I was younger, when I was about in the age range of 10-14, my family lived in the Quebec Terrace Carroll Apartments as well as Northwest Parks apartments. And both of those apartment complexes are close to major roadways that are heavily trafficked, especially during rush hour, like bumper to bumper cars just pumping emissions into the air. And when my cousins and I would go out and play, I didn't make the connection when I was young, because that was all that I had known at that time but, it was hard to breathe. We would be playing soccer next to the street in a little park area. And it wasn't as easy and when big

trucks would come by, it would stink. You could actually smell the difference, like when the cars were stalled and it was just blowing into the air. But when I was about 15 years old, my family moved to Frederick. Particularly to a very low trafficked subdivision and the difference was so obvious. I would go outside, I would longboard, skateboard, play soccer, and the fatigue and the shortness of breath I would feel was more so from physical activity, not from the pollution in the air. With this little story, I just want to emphasize how important it is for roads to be smaller and for there to be greater considerations in terms of putting major roads next to where a lot of people live.

- Jose Coronado Flores, CASA

- b. **Maryland should implement and enforce California’s Advanced Clean Cars II standards** which require that an increasing percentage of new vehicles sold are zero-emission starting in Model Year 2027 through 2035.
 - c. **By the end of 2023, Maryland should adopt the Heavy-Duty Omnibus (low NO_x) Regulation** that would require a 90% reduction in NO_x emissions from diesel trucks by 2027.
 - d. **Adopt the Advanced Clean Fleets rule** which would require that all sales of medium- and heavy-duty vehicles are zero-emission in 2036 and would set requirements for high priority, state and local government fleets to purchase a certain percentage of zero-emission medium- and heavy-duty vehicles.
 - e. **Starting in 2025, require the procurement of zero-emission buses for locally operated transit systems (LOTS)**, and either provide grants to help fund this or provide the administrative support for LOTS to secure grants from other sources such as the federal IIJA programs. The same training and worker protections contained in the legislation governing the transition for new MTA buses should apply to the LOTS.
2. **Provide equitable access to electric vehicle charging stations for all Maryland homes and residents that require the use of vehicles including under-served urban and rural communities and homes with people with disabilities.**
 - a. Programs, funding, and laws should be created to require and provide equitable access to charging stations for electric vehicles for residents of communities and residential buildings without private parking and without the ability to install charging stations themselves. These include non-deeded community parking or public parking around multi-family dwellings, townhomes, apartments, or within HOAs and condominium associations that don't permit the improvement of parking spaces with charging stations and for residents who don't have dedicated parking spaces adjoining their homes that they can modify to add charging stations.

Climate Change, Clean Energy, and Electric Vehicles

Climate change is here, it's very real, and it's already impacting our lives and ecosystems. We can see the impacts in my Chesapeake Bay peninsula townhome community of Stoney Beach with sea level rise, accelerated erosion and loss of shoreline due to more severe storms, the death of native species of plants and animals in our community, and increased aggressiveness of invasive non-native plants and insects. This year, several mature oak trees suddenly died in our community due to climate stress and we've lost 70 feet of shoreline in low-lying areas.

Our community is also challenged with living directly next to two coal-, oil-, and gas-powered electricity generation stations. Our health has been directly impacted by the burning of these noxious fossil fuels. For many years, we suffered with coal ash fallout on our homes.

In order to support a healthy future for both our planet and our future generations, it's essential that we begin moving towards clean sustainable power generation and in a way that allows our homes and automobiles to be powered by that clean energy. However, as a townhome community without deeded parking, we are challenged in adopting electric cars along with all of the state's multi-family communities, condos, apartments, and detached homes without driveways in that we don't have the ability to install electric vehicle charging stations in front of our homes. Nor can our community afford to install them in every parking space in the community. So, we simply don't have the choice to choose electric vehicles.

We hope that this important gap will be addressed so that we can move towards clean sustainable energy across the board in Maryland. And we hope that this important shift will be done in a thoughtful way that ensures that there is sufficient clean energy to support increasing electricity demands as we shift towards use of electricity-powered heating, appliances, and vehicles.

- John Garofolo, Stony Beach, Maryland

- b. Maryland should adopt amendments to the 2021 IECC (International Energy Conservation Code) as soon as possible that require at least one space in single-family home parking areas to be EV Ready and at least 20% of multifamily new construction parking spaces to be EV Ready and the remaining percentage to be EV capable. For non-residential buildings, the percentages of parking spaces with installed EVSE (electric vehicle supply equipment), EV Ready or EV Capable should be as high or higher than indicated in the 2024 Commercial IECC second public comment draft. Buildings should be incentivized to offer EVSE installed spaces above code requirements.
- c. Maryland should require the same EV readiness levels for existing buildings as those for new buildings under specific circumstances: where owner-initiated

retrofit, addition, or alteration work area exceeds 50% of the original building area or more than 10 parking spaces are substantially modified.

- d. If the Building Code Administration will not act on the above recommendation in the absence of a mandate, the General Assembly should pass a bill setting the above requirements and provide funding to help existing buildings meet these requirements. Installing EV charging infrastructure is considerably more cost-efficient and less disruptive at the time of new construction or major alteration than as a later retrofit.

3. The state should support and enforce the 2025 electric-school bus mandate.

- a. As codified in the Climate Solutions Now Act of 2022 (SB528), allocate funding over a multi-year period to the Maryland Department of the Environment Zero-Emission Vehicle School Bus Transition Grant Program, prioritizing schools with the greatest needs (schools located or serving students from an underserved community as defined by Maryland statutes, Title 1 schools, and schools in counties with the highest school-age rates of emergency department visits for asthma).
- b. The state should create a multi-agency and stakeholder working group (including utilities, Public Service Commission, parent-teacher-student organizations, worker organizations, and school districts) to support the 2025 electric school bus mandate and to accelerate deployment of electric school buses by providing technical assistance and supporting the ability of Maryland entities to take advantage of federal funds, such as the National Electric Vehicle Infrastructure Formula Grant and the Clean School Bus program, including by providing administrative support for public entities' grant applications.

4. Maryland should make an EV purchase rebate available at point-of-sale for low-income consumers.

- a. Income eligibility can be demonstrated through participation in an income-based assistance program, or income ranges can be used to establish tiered incentives for moderate-income purchasers. Income and vehicle eligibility limitations allow funding to stretch further to help more consumers. Rebates and other incentives should include further incentives based on the gasoline use (gasoline-burden) of lower income drivers. MSRP limits in other states range from \$50,000 to \$60,000 for new vehicle purchases, and Rhode Island has a \$40,000 purchase price limit for its used vehicle rebate. Low-income rebate programs elsewhere range from \$1,500 (Massachusetts) to \$7,500 (Oregon) for new vehicles and \$2,500 (Rhode Island, Maine) to \$5,000 (Oregon) for used vehicles. In Vermont and Massachusetts, trading in an internal combustion engine for an EV offers consumers an additional \$5,000 or \$1,500 respectively. In some states, those living in environmental justice communities are also eligible for the program. In determining rebate caps and other mechanisms to encourage fair, equitable, and

wide adoption of EVs, the complexities of vehicle pricing, inflation, rebate funding pool, and potential impacts on public adoption of EVs and dealer and manufacturer ability to meet these needs should be carefully considered.

- b. The rebate application process should be accessible and transparent, where the applicant prequalifies their eligibility before purchasing their vehicle at a participating dealer (including direct to consumer dealers). Dealers must opt-in to participate in the program, submit applications as part of a vehicle transaction, and then get reimbursed. A discount of the vehicle price must be made in good faith. MDE should engage dealers in robust education and outreach for the success of an incentive program, such as with annual training, as well as increasing access to electric vehicles for Maryland residents. Resources for and about participating dealers, eligible vehicles, and related to EVs generally should be made abundantly available on the rebate website along with real-time funding availability.

5. EV incentives for all drivers should consider gasoline use and should prioritize switching high fuel consuming drivers first.

- a. The proposed “superuser” bonus pilot program is a good first step. But, the state should consider incorporating into the Maryland clean vehicle credit for drivers of light-duty vehicles using more than 800 gallons/year, which account for approximately 10% of drivers.¹¹ The state should consider some income limits pegged at, or around, the median household income. Additionally, low income drivers trading in a used ICE vehicle for a new or used electric vehicle should be allowed to stack the gasoline superuser bonus on top of the low-to-moderate income bonus

6. Maryland should adopt an EV Make ready grid strategy for utilities to help accommodate the growth of EVs.

- a. The General Assembly should pass a bill allocating funding to build the charging system network needed to meet Maryland’s transportation commitments and regulations or otherwise direct the PSC to authorize utility EVSE programs to this effect. This money should be used to deploy charging stations in a way that recognizes the power levels and physical needs of light-, medium-, and heavy-duty vehicles, and any financial incentives to accelerate charging space turnover once charging is complete, and should identify public and private charging locations that will meet the needs of commercial drivers, while also ensuring strong workforce and equity provisions. The PSC should also approve prudent proposals for publicly and privately funded public chargers, incentives for off-peak/managed charging where feasible in conjunction with other mechanisms for load management, pass through requirements for fuel cost savings, and adoption

¹¹ Forthcoming Coltura Gasoline Use Data; See also Coltura Gasoline Superusers Report, July 2021, page 28 Accessible [here](#), citing Maryland as having 10% Superusers.

of an open system for payment. There should be a PSC docket/hearing on different utilities', transit agencies', and school boards' applications for funds to electrify their fleets and provide state-issued tax credits, rebates or vouchers for LMI customers to purchase EVs, electric bicycles and other low-speed vehicles, and/or trade in ICE cars for EVs.

- b. Maryland should require utilities to conduct ongoing distribution system forecasting to assess capacity needs on a 3-, 5-, and 10-year time horizons that explicitly considers both known and anticipated EV adoption in a service territory, as well as generation capacity gaps that may arise. Forecasts should be sufficiently granular and localized to anticipate needed substation and feeder upgrades. Utilities should be authorized to build to meet 10-year grid needs.
- c. Maryland should set up a formal interagency coordination effort to facilitate proactive planning for the physical and electrical infrastructure necessary to support EV adoption, including deliberative opportunities for industry, affected communities, and local/regional stakeholders to contribute to needs assessments, forecasting, locationally specific planning, and accountability to equity objectives.
- d. Maryland should set firm timeline requirements for utility interconnection or energization of charging stations to ensure utilities are matching a reasonable pace of deployment. This should be paired with appropriate accountability measures, reasonable incentives, and reporting to track utility performance.
- e. Maryland should work with relevant stakeholders to streamline state and local permitting and zoning approval processes for EV infrastructure projects. This can involve coordinating with local authorities, utilities, and transportation agencies to establish standardized processes.
- f. Maryland should authorize utilities to identify “no-regrets” locations for distribution capacity upgrades and to deploy capital in advance of these anticipated congestion points. This could include freight hubs, such as ports, bus depots, and highway corridors that will electrify to meet federal programs like the National Electric Vehicle Infrastructure program (NEVI).
- g. Maryland should require utilities to improve visibility and sharing of information on existing spare grid capacity down to address level for potential charging site developers, to help expedite project timelines, reduce regulatory concern, and support long-term planning.

7. Accelerate the use of electric vehicles in ridesharing and car-sharing programs.

- a. Adopt a rule to set requirements for ridesharing companies to electrify their fleets. This regulation should include provisions that protect low-and moderate-income drivers in this transition. Maryland should consider adopting policies from [New York](#) and [California](#) that have adopted similar policies. Consider applying regulations to taxi services as well as Transportation Networking Companies.
- b. Employ an EV car sharing program that could be sponsored by the state and metropolitan regions, or utilities and that would help improve access to electric

vehicles in low-income communities. Consider these examples in [San Joaquin Valley](#), [Minneapolis](#) and [California](#).

8. Electrify heavy-rail by 2035.

- a. MTA should transition from diesel-fueled trains running on the MARC lines to electric powered trains for completion by 2035.
- b. Maryland should work with the federal government and neighboring states to set requirements—with consequential environmental or justice compensation to impacted Maryland communities for noncompliance—for CSX and Norfolk Southern to have all train lines and related infrastructure (tracks, rail yards and ports) they own or operate in the state to be electrified with distributed solar and/or wind power, for completion by 2035. Amtrak is already electrified in the Northeast, and clean energy electrification of all Maryland's passenger and freight rail is necessary to further reduce greenhouse gas emissions.

9. Establish Zero-Emission Loading and Freight Zone pilots in Maryland cities and ports, prioritizing areas with impacted environmental justice communities. This should incentivize less truck traffic and/or zero-emissions vehicles in these high pollution areas.

10. The Port of Baltimore should draft a port electrification plan and set a target for full port electrification by 2040, including drayage trucks, dockside hoteling, shore power connections, and cargo handling equipment.

Additional Policies

1. The Maryland General Assembly should authorize the creation of a Baltimore Regional Transportation Authority.

Of the 50 largest transit agencies in the United States, MTA is the only one that is part of a state department of transportation without a board of directors and where decision-making lies solely with a governor. The lack of local participation in planning and funding decisions has been a contributing factor to the maintenance problems and lack of significant expansion or improvement in the last two decades.

2. Increase transparency of MDOT spending.

- a. MDOT's Consolidated Transportation Plan should include a breakdown of what percentage of total spending goes toward transit, walking and biking and other metrics as discussed by the Commission on Transportation Revenue and Infrastructure Needs.
- b. Include a breakdown of spending on new capacity versus system preservation.
- c. MDOT's future budget should show sources of all income including federal grants.

- d. MDOT should adopt and publish a definition of system preservation that excludes projects that extend left-turn lanes, widen shoulders, widen lanes, add lanes, or otherwise expand the capacity of transportation facilities.

3. Maryland should follow Washington, DC in instituting an annual registration fee of \$500 for passenger vehicles weighing more than 6000 pounds, with a smaller fee on vehicles from 3500 pounds to 6000 pounds.¹²

Larger cars have a greater environmental and climate impact, from production through use, and cause two to three times the fatalities to pedestrians. The policy should be designed to minimize impacts on small businesses and wheelchair accessible vehicles. Consider instituting a lower fee for those who purchased vehicles prior to the new fee. In conjunction with this effort, Maryland should also institute an educational campaign about the environmental impact of larger vehicles.

It is important for MDE and MDOT to work with other agencies to conduct comprehensive, meaningful inclusive public engagement to ensure communities can shape the development of these and additional policies. MDE should partner with municipalities and county governments and rural councils to ensure that adequate resources are available to implement local climate action plans. For resilience planning, communities should be consulted about their local needs and ideas for solutions to local problems.

Because achieving the ambitious climate emissions reduction goals requires community-wide transitions to clean energy, clean public transportation and alternative technologies, appropriate community engagement would include listening sessions to learn about barriers to change as well as community-wide education and social marketing. Schools and libraries should be provided with augmented resources to provide more information to the general public about their roles in mitigating and adapting to climate change.

¹² Segraves, M. (2022, May 27). DC Vehicle Registration Will More Than Triple for Some SUVs, Trucks by 2024. *NBC Washington, News4*. <https://www.nbcwashington.com/news/local/dc-vehicle-registration-will-more-than-triple-for-some-suvs-trucks-by-2024/3063961/>.

Case Study: The True Cost of the CSX Transportation Coal Piers

CSX operates an open-air coal terminal in the south Baltimore neighborhood of Curtis Bay, known as CSX Transportation Coal Piers, making Baltimore City the second largest coal exporter on the east coast. The terminal moves up to 14M tons of coal per year through south Baltimore, with an estimated value of \$2B. The coal is stored in the open air without covering, 1,000 ft from the Curtis Bay recreation center and homes on Curtis Ave. The coal is transported in uncovered rail cars just 60-100 feet from homes in the Mt. Winans and Cherry Hill neighborhoods. According to the Environmental Protection Agency, the Curtis Bay neighborhood is in the 99th percentile nation-wide for proximity to hazardous facilities that are required by the federal government to create Risk Management Plans, including 38 sources of PM, 20 of volatile organic compounds, 18 of NO_x, and so on.

The South Baltimore Community Land Trust (SBCLT) has estimated the local health and environmental costs of the coal terminal at \$182.67/ton stored and \$202.51/ton transported [based on a 2017 study](#); nearby residents [can literally wipe coal dust off their homes](#) and suffer from high rates of cancer. In December 2021 there was [an explosion at the coal pile](#) within sight of a playground—residents escalated their calls for accountability to local and state officials while also initiating a class action lawsuit to hold CSX responsible for damages to their health and homes. This summer, in partnership with Johns Hopkins University, Towson University, and the Community of Curtis Bay Association, youth from SBCLT set up a study with strips of double-sided tape at regular distances from the coal yard; in this way they are working to respond to residents' concerns with scientific evidence. Preliminary findings are corroborating resident testimonies linking dark dust to the coal terminal.

CSX's operating permit for the facility is expected to be up for renewal in late 2023; MDE Secretary McIlwain [stated in April 2023 at a community meeting](#) that it was time for action but does not seem poised to act on the community's specific demands. Residents of Curtis Bay, neighboring south Baltimore residents, and community-based organizations including SBCLT and the SB7 Coalition, are calling for a just transition to a safer material at the terminal along with four immediate steps in relation to the permit renewal:

- Reject the request to renew the permit as-is
- Require full enclosure of the coal terminal
- Set enforceable limits on pollution coming from the terminal
- Set per-ton community mitigation fees

Energy and Electricity

Introduction

The electricity sector is a major source of greenhouse gas pollution in Maryland, as well as other pollutants that harm human health and the natural environment. Currently, coal and gas generation comprise nearly two thirds of Maryland's electricity generation, accounting for 21% of statewide emissions.

Looking forward, the Moore-Miller Administration is aligned behind reaching 100% of in-state electricity generation from clean energy by 2035. Transitioning from dirty energy to clean renewable energy is one of the most promising ways to reduce Maryland's greenhouse gas pollution and other harmful pollutants. This effort will require major changes to Maryland policy, including the removal of significant barriers, development of new statewide planning processes, and resources for Maryland agencies to take full responsibility to achieve this ambitious goal.

Electricity use accounts for 21% of the state's GHG emissions ([2020 GGRA Progress Report](#)). Maryland produces about half the electricity it consumes, and we import the rest from states that share our electricity grid, known as PJM. With the necessary rapid electrification of homes, buildings, appliances, and vehicles, Maryland's Pathway Report projects an electricity demand increase of more than 20% by 2031 and about 50% by 2035. So, as we look to decrease emissions from electricity generation, we must do so in a way that rapidly expands the amount of clean energy available on the grid.

Past environmental and climate policy has caused harm, concentrating pollution disproportionately in communities of color and low-income communities. Thus, it is imperative that revising current policies and crafting new policies are rooted in justice, in order to undo past harms and promote health and build equity. Currently, electricity production is a major source of climate pollution like carbon dioxide and methane and also co-pollutants like nitrogen dioxide and particulate matter, which can cause acute respiratory harm for people in nearby neighborhoods. Examples of the impacts concentrating these facilities in areas that already have existing pollution and disease burden include the Wheelabrator trash incinerator, where nearby residents in Baltimore City suffer higher rates of asthma and bronchitis, which costs tens of millions of dollars a year in healthcare costs, and the placement of an additional gas fired power plant in Brandywine in Prince George's County resulted in a [Title VI discrimination complaint](#) brought against the state. Climate and clean energy policies in addition to reducing harmful pollution also provide a framework to achieve racial, economic, and health equity for people who have been disenfranchised and bear the brunt of climate impacts. Policies need to target communities overburdened by pollution and historically underserved so that these community members can play a prominent role in decision-making and gain actual health, economic, and environmental benefits.

It is important to ensure that overburdened communities are prioritized in receiving the health, environmental, and economic benefits of clean energy resources. The recently passed federal Inflation Reduction Act (IRA) includes large incentives to ensure that the energy transition not only improves environmental and health conditions in disproportionately impacted communities, but also provides economic benefits to communities that have borne the brunt of the impacts of our fossil fuel dependency. State agencies should take advantage of the incentives available to further reduce the cost of clean energy by constructing projects with well-paying jobs and domestically sourced materials, and building them in energy communities.

Community Outreach and Education about Clean Energy in our Communities

I have lived in Montgomery County for 28 years and am a proud Promotora of Environmental Justice with CHISPA Maryland, a program of the Maryland League of Conservation Voters. Members of my community care deeply about the environment, and are active in climate solutions because we know the benefits to our health and our children's health. But the state can do more to help and include the Latino community in the transition to clean energy and electricity. We have questions like, "How reliable are solar panels? How do we apply for solar panels? What can we do so families who live in apartments or are renters like myself do to have clean energy in our homes?" What we need is better outreach and education to our communities about clean energy IN our communities.

- Maria, 48, White Oak

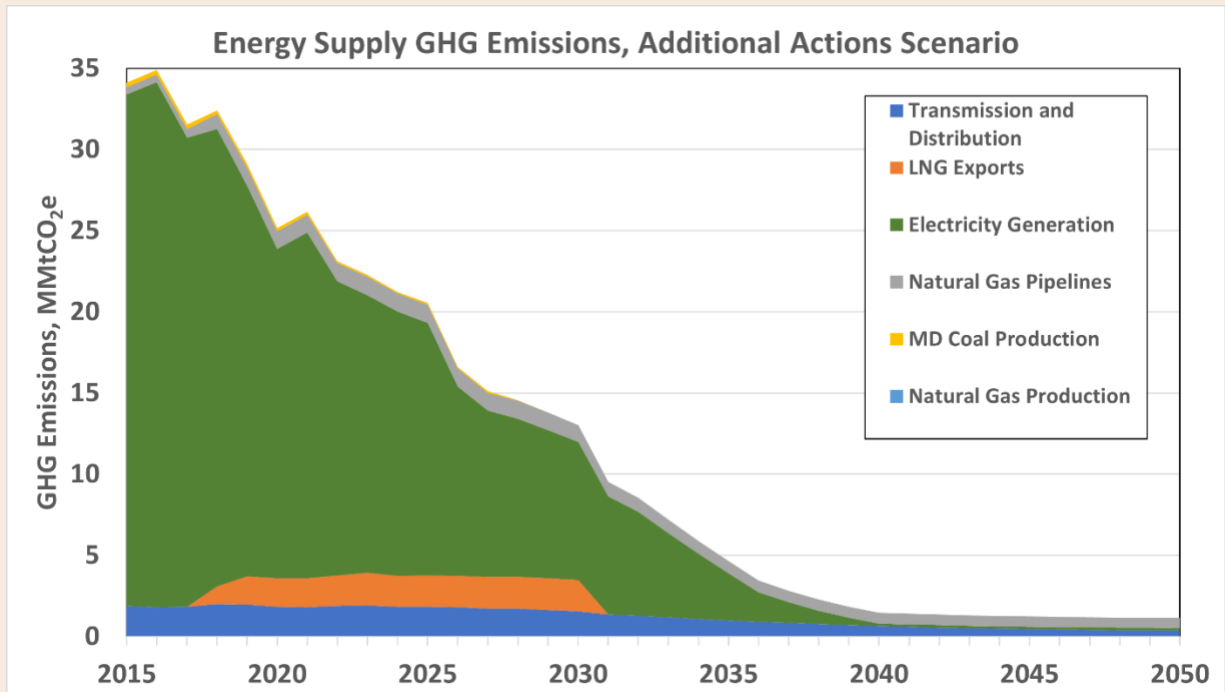
We urge the state to continue to invest in and consider creative solutions for state procurement of energy, such as power purchase agreements, equivalents of offshore wind energy credits (ORECs) for other types of renewables, and state-issued backstops that would guarantee payments to energy producers even if the private market does not purchase the energy they produce. We also urge state agencies to consider financing and payment mechanisms that are more accessible for lower-income communities, such as the federal incentives for low-income solar provided by the IRA, and rapidly deploying the consolidated billing regulations for community solar, which would fully implement the 2023 legislation instituted, making community solar accessible for those on energy assistance.

Explicit focus on phasing out fossil fuel generation in Maryland includes transitioning away from gas and gas infrastructure investments. This could include the General Assembly sunseting the STRIDE program, which locks in the costs of stranded assets (gas) that ratepayers will pay, and replace it with STRIDE-like accelerated investment in electric grid readiness.

Maryland state agencies should also adopt a cumulative impacts approach to climate policy, which will help ensure undue burden is not placed on communities who are already overburdened and underserved, which have historically been the unwilling hosts of environmental pollution.

Modeled Impact of Energy and Electricity Recommendations

Within the Climate Partners' Recommended Actions scenario, overall emissions from energy supply fall from over 25 MMtCO₂e in 2021 to less than 10 MMtCO₂e by 2031, led largely by reductions in emissions from electricity generation, which in turn are due to increases in renewable generation and reduction of fossil generation.



The primary driver for reducing emissions is the phasing out of coal by 2025 and gas, oil, and trash incineration by 2035, paired with the growth of in-state renewable generation. The scenario assumes that achieving and exceeding the state solar generation goal and meeting the offshore wind goal allow for the state to maintain and eventually reduce its electricity imports. We assume imported electricity will be effectively carbon-free by 2040, though note that this is not achievable by Maryland alone. Emissions associated with increased transmission necessary for renewable growth were included using standard assumptions.

The energy supply sector in the Maryland LEAP model includes “modules” for Rooftop Solar PV (outputs not subject to transmission and distribution losses), District Heat Provision, Hydrogen production, electricity and gas transmission and distribution, LNG (liquefied natural gas) Exports, Electricity Generation (central grid), Natural Gas pipelines, and Coal Production and Natural Gas Production specific to Maryland.

Comments on the Pathway Report

In crafting Maryland's climate plan, it is important to recognize the limitations of the model informing the Pathway Report, and assess whether the assumptions underlying that model are reliable in reality. In certain places, policy intervention will be needed to turn those assumptions into reality. One of the main limitations with the model used by the University of Maryland Center for Global Sustainability (CGS) team is that it relies on an underlying assumption that Maryland is meeting and will continue to meet its current renewable energy goals, per the Renewable Portfolio Standard (RPS). The model appears to over-project future solar adoption while under-projecting OSW buildout. Under Maryland's Climate Pathway, both wind and solar generation increase fivefold by 2031, with solar accounting for 33% of in-state generation. This projection ignores the present reality that Maryland is well below the trajectory needed to meet even the present RPS solar target of 14.5% of electricity consumption by 2031. The report also projects that 2.2 GW of power would be coming from OSW by 2035 and 6 GW by 2045, which does not reflect the state's more ambitious goal—set forth in legislation and reaffirmed by the Moore-Miller administration—of producing 8.5 GW of energy from OSW by 2031.

Further, because of the way the model is structured, several of the recommended policies included do not include details on optimal implementation measures. The type of model CGS used started with the CSNA target of 60% emissions reduction by 2031 and worked backwards, modeling policies that would reduce emissions in each major sector and then using an economy-wide cap and invest program to make up the difference. The report does not include details on any pricing structures or any aspect of the cap and invest program, which was outside the scope of this report. The report relies on the cap and invest program to eliminate 4.8 million metric tons of CO₂ equivalent (MMT_{CO₂e}) that are not otherwise addressed; however, it vaguely refers to this cap and invest program as a “theoretical program that does not exist today.” Similarly, the report includes a clean electricity standard for clean energy generation by 2035, but no details on any pricing structures nor a definition of clean energy. (The report also does not reconcile the consumption-based clean electricity standard it proposes with the state's generation-based 100% clean electricity by 2035 goal.) Combined, these issues create a significant information gap in the report. There are more detailed and holistic models for energy system planning, which can aid in planning for equitable retirement, reliability, and grid infrastructure, that MDE should employ in planning for decarbonizing its electricity sector.

Carbon capture and sequestration/storage (CCS) appears in the model within the definition of clean energy, but should not be included in the state's definition of clean energy. CCS relies on the continued production of non-clean, non-renewable energy sources, resulting in continued fuel combustion emissions and the prolonging of historic environmental and land use injustices. Discussion of inviting “natural gas with CCS” into Maryland in this proposal has implications for proposals to produce methane (natural gas) at large scale from anaerobic digestion of agricultural wastes, which have been opposed by environmental justice groups for its consequences for local pollution. Further challenging its viability to serve as a clean technology, CCS is unable to address non-CO₂ pollution. Current CCS technology has not reached 100% efficiency, and in many reports has significantly underperformed. The underperformance of CCS

will preclude vital environmental health targets. A policy of incentivizing CCS and clean energy sources equally would be in direct opposition to the ultimate aim of the just transition.

Finally, the model also assumes an expansion of the state's RPS Renewable Portfolio Standard with the current Tier 1 sources included, despite the RPS's inclusion and subsidization of environmentally harmful energy sources.

Creating A 100% Clean Energy Strategy

We support the Moore-Miller Administration's goal of 100% clean energy generation by 2035. Reaching this visionary goal will require strong action on the part of multiple state agencies, including rapidly accelerating the deployment of in-state energy storage and clean energy sources, especially wind and solar; revising which energy resources qualify as renewable; phasing out the use of fossil fuel-powered electricity generation; proactively planning for upgrades to Maryland's electric grid, including its transmission system; and improving existing energy efficiency programs.

To achieve this goal, Maryland must first develop plans to successfully achieve our existing wind, solar, and storage goals. Second, Maryland needs to reform or replace the RPS to make sure the state is incentivizing truly clean and renewable energy. To move this agenda forward, Governor Moore should start by issuing an executive order outlining the state's clean energy goals, identifying key incremental milestones toward reaching these goals, and assigning various state agencies responsibility for reaching desired outcomes. Governor Moore should include a commitment to dedicate incentives and subsidies only to 100% clean energy sources and none to any combustion fuels.

While clearly delineating a set of specific pathways for reaching 100% clean energy would require additional information gathering, policymaking, and modeling, this section sketches out a preliminary blueprint of recommended actions aimed at reaching the 100% target. State investments must reflect these priorities. At a high level, we recommend targeting a goal of obtaining 20% of Maryland's electricity consumption from solar energy, building 8.5 GW of offshore wind (OSW), and installing at least 3 GW of storage by 2030, and using a combination of market incentives and power purchase agreements to drive the rapid transition this goal requires.

1. Advancing Existing Renewable Energy Goals

Solar Energy

Solar energy is one of the fastest growing generating resources in the United States, accounting for 54% of all new generation capacity additions in the first quarter of 2023.¹³ Solar energy is currently the cheapest renewable resource.¹⁴ Distributed solar not only provides renewable energy, but also improves grid stability. Ground mounted solar offers alternative income streams for farmers and other businesses, and solar is a great way to utilize brownfields like closed landfill sites. However, the lack of proper policies and presence of barriers to solar buildout are hindering progress.

Maryland is behind in its progress towards meeting the present RPS solar target of 14.5% of electricity consumption by 2030, and will need significant policy intervention to reach the existing goals, and to support a recommended increase in these goals. There should be a clear framework and incentives for accelerating deployment across utility scale, community, distributed, and residential solar, including the following policies:

- Provide state level leadership on siting of solar installations and clear parameters on that limit overly restrictive and onerous local solar siting, considering the approach to statewide parameters established by Illinois through Public Act 102-1123 (Illinois HB4412 Enrolled).
- Streamline Certificate of Public Convenience and Necessity (CPCN) permitting processes, especially for community solar, to ensure they are quicker and less burdensome for applications.
- Remove arbitrary PSC-imposed 3 MW limit on new solar installations that can be connected to existing circuits on the distribution grid.
- Ensure Marylanders are aware of and able to use “SolarAPP,” a tool developed by the National Renewable Energy Laboratory to streamline the interconnection process for rooftop solar installations.
- Work with PJM and the PSC to address the interconnection queue backlog and interconnection delays, including by prioritizing renewables and storage projects that are closer to being deployable and are stuck in the queue. There are currently around [4.5 GW of solar projects](#) in Maryland that are active in the interconnection queue.
- Engage in public outreach on federal and state incentives for businesses and homeowners to install or subscribe to solar power, and strengthen existing incentives, such as solar renewable energy credits (SRECs), which are substantially lower in Maryland than many other states.

¹³ U.S. Solar Market Insight (Updated 2023, September 7). *SEIA: Solar Energy Industries Association*. <https://www.seia.org/us-solar-market-insight>

¹⁴ Levelized Costs of New Generation Resources in the Annual Energy Outlook 2022 (2022 March). *U.S. Energy Information Administration*. www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

Community Solar Pays

Several years ago, I signed up for community solar. In April I got my first check from PEPCO. They actually owed me money, because I produced more solar last year than the amount of electricity I used. And this year, so far, my bill, despite air conditioning—I don't have a heat pump yet and live in a very old house—my bill is negative. We live in an energy conscious household, and I do also go around turning out the lights in any room we're not actually using. PEPCO continues to owe me money because I am producing more energy from my share of community solar than I am actually using so it pays.

- AI, 78, North Chevy Chase

Wind Energy

Maryland passed a significant offshore wind bill (the POWER Act) in 2023, and it is critical that state policies and regulations support full implementation of this ambitious legislation. These recommended policies include:

- Ensure the federal government is supporting the state's OSW goals by identifying enough lease acreage for development.
- Accelerate the timeline of the transmission study that the POWER Act requires the PSC to conduct in conjunction with PJM, such that the study is completed and a request for proposals for transmission solutions is executed before the July 1, 2025 deadline provided in the POWER Act.
- Ensure the Department of General Services (DGS) conducts an expedited request for proposals for the 5 million megawatt-hours of OSW annually that it is authorized to procure under the POWER Act, before the statutory deadline of July 31, 2024, and that DGS enters into power purchase agreements immediately following that request for proposals.
- With the new Central Atlantic OSW lease areas expected to be auctioned in early 2024, Maryland's legislature should establish a new procurement model for the state to purchase this next round of OSW power. The POWER Act was innovative in its approach to procurement, proposing a state power purchase agreement for new OSW energy generation. Maryland should continue to support clean energy infrastructure with these more progressive funding mechanisms. In the event that OSW companies are deterred from investing in OSW projects due to economic uncertainty, the state should consider creative incentives and financial guarantees to incentivize OSW buildout in the face of uncertainty. For example, the state could serve as a financial backstop that will provide funding for a project even if private investors are hesitant to supply sufficient loans or equity to enable the project to move forward.

- Initiate collaboration with other states to address supply chain crunches. Host at least two interstate meetings in 2024 to discuss and resolve supply chain limitations, with a schedule of annual meetings beginning in 2025.

2. Reforming the Renewable Portfolio Standard

As state and federal resources available for clean energy investments become more available, including substantial quantities of investment and production tax credits under the IRA, it is becoming even more urgent and critical to address Tier 1 of the Renewable Portfolio Standard (RPS) so state and federal incentives are targeted toward the production of truly clean renewable energy. Trash incineration, biogas, and biomass should be eliminated from any tier of the RPS.

- The General Assembly should reform the RPS to support a 100% clean energy policy that limits qualifying resources to only those that are truly renewable and are non-emitting, non-combustible resources.
 - The RPS should increase the carve-out for solar production to 20%.
 - The RPS should maximize "additionality" (more subsidization of recent and new, rather than long-existing, clean renewable energy sources).
 - The RPS should also remove limits on the amount of qualifying ORECs and incentivize long-term power purchase agreements to purchase OSW energy so that Maryland can reach the POWER Act's 8.5 GW OSW target.
 - The General Assembly should design RECs so they do not benefit the biomass industry. Biomass is a costly, largely commercially untested energy source, it accelerates deforestation eliminating our most important carbon sinks, and releases particulate matter, sulfur dioxide, and toxic micro-pollutants. Relatedly, the biomass industry should not be permitted to skirt this limitation on RECs by creating thermal renewable energy credits (TRECs) for heat derived from biomass combustion.

Storage

During the 2023 legislative session, the legislature passed a bill to establish a Maryland Energy Storage Program with a goal of 3,000 MW available on the grid by 2033.

- Support the PSC as it takes steps to establish storage targets and builds the Maryland Energy Storage Program. Storage established through this program must be consistent with and supportive of the state goal of achieving 100% in-state generation of clean energy by 2035.
- Develop safety and siting standards, model fire codes, and community engagement requirements for battery storage and H2Hub facilities. We can learn from the residents of Oxon Hill, Maryland, who opposed a battery storage facility proposed there because it

was a residential location, without a proper fire plan, poor communication with the community, and the storage served a location far away.¹⁵

- Incentivize adoption of distributed behind the meter storage.
- The PSC should develop or recommend distributed battery storage programs that can be used to meet local distribution and transmission needs (e.g., similar to Green Mountain Power's Bring Your Own Device program).
- Develop policies that encourage the co-location of renewables and battery storage to reduce interconnection costs and increase utilization of the facility.
 - FERC Order No. 2023 directs Transmission Providers to incorporate planned operating assumptions for the proposed charging of a battery. Maryland PSC should develop analogous interconnection rules for distribution-connected hybrid units (such as community solar).
 - Apply for the federal funding that is available to support locating solar and storage on former coal sites, and additional co-location funding.

Energy Efficiency

The cleanest energy is the energy we do not use. See the Buildings section for specific recommendations on improving energy efficiency.

Workforce Development and Just Transition

Clean energy represents an opportunity for better health through air quality improvements, but also through well-paying jobs that can support an individual or family.

- Work with the Maryland Clean Energy Center, unions, and organizations working with underserved and minority communities to recruit and train a much-needed clean energy workforce.
- Grow and foster partnerships with community/technical colleges, high schools, skills centers, trade unions, and community organizations that prepare youth and adults for green jobs, including in the solar, wind, waste management (composting, recycling) industries, etc.
- Bolster minority involvement in non-construction and manufacturing clean energy jobs, including in clean energy policy, law, site assessment, plant design, permitting, financing, project management, and research and development.
- Establish community outreach programs in conjunction with local organizations that connect overburdened and under resourced communities with climate financing options including grants/loans from MCEC, MDE, etc.

¹⁵ Azhar, A. (2023, April 14). "Md. Residents Oppose Planned Lithium Battery Storage System Near Their Homes." *Inside Climate News*. Retrieved from Society for Environmental Journalists. <https://www.sej.org/headlines/md-residents-oppose-planned-lithium-battery-storage-system-near-their-homes>

Job Opportunities in a Clean Energy Future

With one of the most aggressive goals to reduce greenhouse gas emissions in the US, Maryland can create clean energy jobs for a clean energy economy. We at Strum Contracting Co. Inc. believe we can play a role in creating these jobs, in welding and fabrication, for the Maryland offshore wind projects at Tradepoint Atlantic and the surrounding Baltimore Metropolitan area. We will continue to play our part in port enhancements and look to transition into the fabrication of secondary metals, which will provide job opportunities for men and women in the local communities, supporting families and building generational wealth.

- Teaera, 39, Baltimore

Regional Greenhouse Gas Initiative (RGGI)

The Pathway Report includes in its model a regional CO₂ emission cap that decreases to zero by 2040. The Administration should encourage the other (RGGI) states to introduce this cap, along with interim targets for 2030 and 2035. While we support strengthening RGGI, Maryland should also be cautious in its assumptions about the growth of the clean energy mix of our imported electricity, as it is not a policy that the state has complete control over.

Transmission, Grid, and Interconnection Improvements

Maryland's Pathway mentions but does not provide details or clear recommendations on transmission, interconnection, or overall grid improvements. Transmission is really the lynchpin in clean energy deployment. Maryland must be more coordinated and aggressive in addressing the PJM interconnection queue and building out the grid and transmission to enable the rapid deployment of clean energy.

- Ensure Maryland's grid has sufficient transmission and distribution infrastructure to achieve the state's GHG reduction and clean energy targets.
 - Assure that utilities' Distribution System Planning meets the requirements established by the Climate Solutions Now Act (Maryland Annotated Code, Public Utilities Article, § 7-801 *et seq.*).
 - Ensure that MEA or other state agencies are proactively planning (and pushing PJM to plan) for transmission impacts of retiring fossil plants.
- Maryland should consider significantly increasing staffing and resources dedicated specifically to addressing transmission planning and implementation, both within Maryland and in coordination with neighboring states. One option could involve creating an "Office of Transmission, Interconnection and Siting," either as an independent agency or within MEA.

- Maryland should incorporate Grid Enhancing Technologies (GETs), such as dynamic line rating (DLR), power flow controls, or advanced reconductoring, in transmission planning processes, as GETs allow for Maryland to get more out of *existing* transmission systems, improving the reliability of the grid by increasing capacity and flexibility, and allowing for better integration of renewable sources.
- Maryland should actively participate in or convene PJM's stakeholder discussion to address interconnection issues and contribute to the development of policies, guidelines, procedures, processes, and regulations that impact the state.
- Maryland should actively participate in the development and implementation of PJM's Regional Transmission Expansion Plan (RTEP), which identifies transmission system additions and improvements needed to maintain grid reliability and efficiency.

Additional Considerations

- **Distributed Energy Resources (DERs)**
 - The PSC should fully implement policies that support the use of DERs to meet the state's goals for distribution system planning and improvements, as set forth in the CSNA. In particular, the Distribution System Planning Working Group should be directed to take aggressive action to accommodate the operation of DERs in line with CSNA.
 - The PSC should develop and implement regulations and rules to support the ability of DERs to be aggregated into PJM's wholesale electricity markets according to FERC Order No. 2222. These rules need to be in place prior to the planned implementation of Order No. 2222 in PJM in February 2026.
 - The PSC should implement policies that require Maryland's distribution utilities to cost-effectively modernize the distribution grid to accommodate bidirectional flows, improve visibility into the operation of DERs, and increase the use of DERs as non-wires alternatives.
- **Time of Use Rates**
 - As we electrify the buildings and transportation sectors, demand for electricity in Maryland will increase, particularly in the morning on cold days, late this decade. To avoid buying expensive energy at peak times, utilities can offer time of use pricing. Lower pricing would be offered during late night hours, encouraging electric vehicle owners to charge their cars then. Prices would increase from about 6 AM to noon. Then, prices would come down to a mid-level rate in the afternoon. To protect low income families, a modest, base level of electricity use would be priced lower. The total revenue to the utility would be unchanged. Utilities in California and Hawaii have implemented aggressive time of use pricing (their peak use time is early evening when the sun doesn't shine and air conditioning use is highest).

- **Remove the manufacturing exemption from GGRA**

- The 2009 Greenhouse Gas Emissions Reduction Act (GGRA) of 2009 prohibits the state from requiring greenhouse gas emissions reductions from the state's manufacturing sector or causing a significant increase in costs to the state's manufacturing sector. The GGRA required an independent study of this exemption and in 2022 the University of Maryland conducted such a study. They concluded that “reducing emissions from the manufacturing sector not only offers economic opportunities but also solidifies Maryland’s position as a climate leader. By including the manufacturing sector in state climate targets and regulations, and taking advantage of federal support, policymakers can facilitate the sector’s low-carbon transition through market- and non-market-based policy mechanisms.” In 2023, the Maryland’s Climate Pathway Report shows that reducing emissions from the manufacturing sector is critical for achieving the state’s emissions reduction goals.

Buildings

Statewide, direct fossil fuel combustion in buildings is responsible for 16% of statewide greenhouse gas emissions, the majority of which are from space and water heating.¹⁶ In addition, more than half of natural gas delivered to customers in Maryland is sent to residential and commercial buildings as residents employ space and water heating systems and stoves, among other natural gas end-uses.¹⁷

Buildings are more than just consumers of energy and emitters. Americans spend an estimated 87% of their time indoors and the built environment has significant influence over health and well-being.¹⁸ ¹⁹ Building retrofits are also an opportunity to improve living conditions and affordability in the state by remediating health hazards and reducing energy burdens. A well-executed building decarbonization strategy will provide the state with critical opportunities to center equity, improve health outcomes, update building stocks, and improve quality of life for its residents. Our policy recommendations look holistically at these opportunities.

¹⁶ Maryland Department of the Environment. (2020). *Greenhouse Gas Inventory*. Maryland.gov. <https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx>

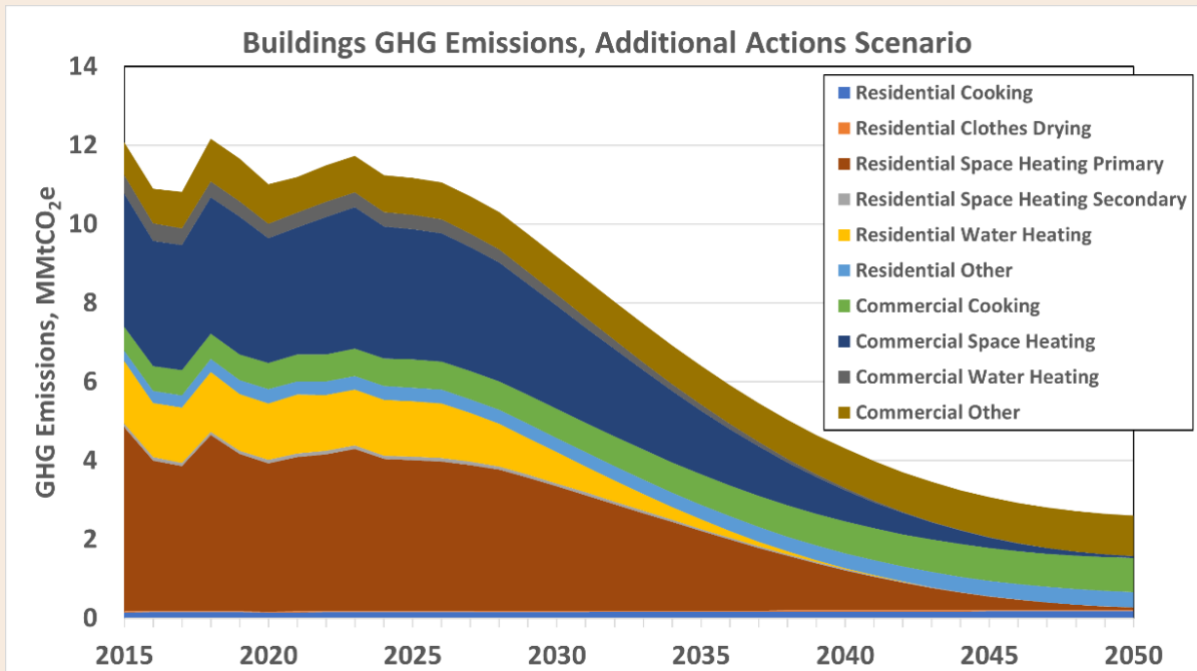
¹⁷ U.S. Energy Information Administration. (2023, September 29). Natural Gas Consumption by End Use: Maryland. https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_SMD_a.htm

¹⁸ U.S. Environmental Protection Agency. (1989). Report to Congress on indoor air quality: Volume 2. EPA/400/1-89/001C. Washington, DC.

¹⁹ Buonocore, J. J., Salimifard, P., Michanowicz, D. R., and Allen, J. G. (2021). A decade of the U.S. energy mix transitioning away from coal: Historical reconstruction of the reductions in the public health burden of energy. *Environmental Research Letters*, 16(5), 054030. <https://doi.org/10.1088/1748-9326/abe74c>

Modeled Impact of Building Recommendations

Within the Climate Partners' Recommended Actions scenario, overall direct emissions from buildings in 2031 fall by 2.5 MTCO₂e relative to the Recent Policies case, to about 8.6 MTCO₂e total.



Emissions gains are initially driven by targeted policies such as the Building Energy Performance Standards (BEPS) and federal and state incentives for efficiency and new appliances. After phase-in of the Zero NO_x Appliance Standards, most of the reductions in direct emissions in the Buildings sector are a result of natural turnover of fossil fuel space and water heating equipment replaced by heat pump equipment. However, the other Buildings actions help accelerate turnover of equipment, especially in the years prior to the Zero NO_x standards.

The Buildings sector is represented in the LEAP model by 14 residential sector energy end-uses, and 8 commercial sector energy end uses. Each of the end uses include different devices, varying in technology (for example, heat pumps versus electric resistance heating), fuel types (electricity, natural gas, oil), or level of efficiency.

Comments on the Pathway Report

Below are three considerations pertaining to the Climate Pathway Report. The buildings section of the Pathway Report considers ambitious policies and is a strong start to meeting greenhouse gas emission reductions targets. We recommend future buildings policy analysis take a more holistic, comprehensive, and long-term approach.

- **Building policy considerations need to include a comprehensive strategy for building electrification, especially for retrofits of existing buildings.**

We are calling on MDE to develop a more comprehensive strategy for the transitioning of existing buildings, which includes support for the retrofit of existing buildings to fuel-switch and increase efficiency. Many buildings—especially older homes, homes in disinvested communities such as communities of color, and homes in low-income communities—will require a holistic approach to rehabilitation, efficiency upgrades, and electrification. Further, the state will need to include effective renter protections and support systems for property owners. Without this, investments in rental properties can risk displacing tenants and reducing the accessibility of affordable housing. A comprehensive strategy with coordination across agencies will ensure that building electrification is technically feasible, affordable, and aligned with related programs.

- **Buildings policy considerations should prioritize utility transition planning to ensure energy delivery is reliable and affordable for end-users.**

Utility customers pay to maintain and develop utility infrastructure through fees and distribution charges. To create an environment that facilitates fuel switching and equitable sharing of costs, the state must be proactive in managing the transition from fossil fuels to electrification and renewable fuel options. We call on MDE to present policy related to utility transition planning so it does not become a barrier to fuel-switching or harm Marylanders with unnecessary costs.

The electric system will need to be affordable, reliable, and accessible. At the same time, the fossil-fuel infrastructure must continue to safely and affordably meet the needs of those who remain dependent on it during the transition. Investments in the fossil fuel infrastructure such as gas pipes should be aligned with state climate goals. The current policies for replacement and expansion of fossil fuel infrastructure risk creating sunk costs and stranded assets that will be paid back by the subset of customers that remain on the fossil fuel system as others transition away. This presents a significant financial risk and equity risk if lower-income and disadvantaged communities are last to transition.

- **Buildings policy considerations should prioritize improving health outcomes and reducing energy burdens.**

The building transition should achieve more than just meeting the state greenhouse gas emission reductions. It should also be designed to ensure that Marylanders benefit by improvements upon the status quo, especially for those that have the highest needs. We call on MDE to closely tie building decarbonization efforts to strategies to reduce energy burden and improve building-related health outcomes. An estimated 18% of Maryland residents pay over 6% of their income to energy bills, a threshold that makes a household “energy-cost burdened.” Even more stark, among 440,000 Maryland households below 200% of the federal poverty level, around 80% of those households are energy-cost burdened.²⁰ The Maryland Office of People’s Council estimates that statewide gross energy cost-burden among low-income households is 12%.²¹

Further, building emissions contribute to outdoor air pollution including ozone and particulate matter. Indoor air pollution from gas appliances is also a significant health risk for asthma.²² The state should pursue policies designed to maximize the benefit across multiple metrics. Embracing this approach intentionally will improve the path the state takes towards greenhouse gas emission reductions.

Policy Recommendations

In addition to the above three policy analysis considerations, we recommend Maryland work toward three broad policy goals:

1. Introduce a suite of policies that provide clear building decarbonization market signals to key stakeholders.
2. Design comprehensive strategies to promote the equitable adoption of electrified technologies in existing buildings.
3. Align gas and electric utility planning with Maryland’s climate needs.

In the below section, we provide specific policy recommendations that move Maryland towards these goals and equitably transition the state to a highly-electrified building sector.

²⁰ Makhijani, A., Kinkhabwala, Y., Jaeger, J., Bilsback, K., Hill, L. A. L., Peltier, L., Lukanov, B., and Krieger, E. (2023). *Energy Affordability in Maryland: Integrating Public Health, Equity, and Climate*. PSE Healthy Energy and Institute for Energy and Environmental Research. Retrieved from <https://www.psehealthyenergy.org/wp-content/uploads/2023/02/Energy-Affordability-in-Maryland-2023-Final-Report.pdf>.

²¹ Maryland Office of People’s Counsel (report prepared by Applied Public Policy Research Institute for Study and Evaluation). (2022). (rep.). *Maryland Low-Income Market Characterization Report: 2022 Report Update*. Retrieved from https://opc.maryland.gov/Portals/0/Files/Publications/Reports/Maryland%20Low-Income%20Market%20Characterization_September%202022%20final.pdf?ver=7fFmfM9U0mFT8s81cHe6HQ%3d%3d.

²² Gruenwald, T., Seals, B. A., Knibbs, L. D., and Hosgood, H. D., 3rd (2022). Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States. *International journal of environmental research and public health*, 20(1), 75. <https://doi.org/10.3390/ijerph20010075>

1. Introduce a suite of policies that provide clear building decarbonization market signals to key stakeholders

The below policy recommendations are modeled or suggested in MDE's Pathway Report and we have provided details on how they can be implemented. These policies have the added benefit of providing clear market signals to manufacturers, builders, property owners, and utilities and we encourage the state to pass them in order to provide these sectors with guidance as the state moves toward a highly-electrified building sector.

Without these regulations and early policy signals, the state will miss opportunities to appropriately phase-in the building decarbonization transition, catalyze the market, train contractors, adequately design subsidy programs, work in tandem with stakeholders, and ensure long-term affordability of electrified technologies.

1A. Begin phase-in of pollution-free HVAC and water heating equipment in 2027 through a zero-emission equipment standard – *Manufacturers*

Maryland should prioritize zero-emission standards for HVACs and water heaters for both residential and commercial buildings as a primary solution to reduce climate pollution from buildings. These standards would apply primarily to manufacturers, suppliers, and retailers to ensure any HVAC and water heater manufactured, supplied, or sold for use in Maryland is pollution-free starting in 2027.

Because HVAC systems and water heaters last 10–30 years, it is essential that replacements and new installations are zero-emission to avoid locking in decades of additional pollution. These standards will facilitate a gradual transition to clean-powered equipment, like heat pumps, as existing units reach the end of their natural lives, making them a cornerstone policy in the state's building decarbonization strategy.

- The state should swiftly develop and pass zero-emission standards to send an early signal to market actors to prepare for the transition, allowing lead time before the standards take effect.
- It should use the 2027 implementation date modeled in the Pathway Report, as this aligns with the first phase of the Bay Area Air Quality Management District's package of zero-pollution standards, which were the first zero-pollution standards in the nation.²³
- Additionally, as part of the state's commitment toward the US Climate Alliance (USCA) heat pump goal, Maryland joined 10 other states in committing to explore zero-emission appliance standards.²⁴ Maryland has the opportunity to be a leader in this space and we call on state officials to lead a national effort on this policy.

²³ Elwell, J., and Lara, E. (2023). (rep.). *Final Staff Report: Proposed Amendments to Building Appliance Rules -- Regulation 9, Rule 4: Nitrogen Oxides from Fan Type Residential Central Furnaces and Rule 6: Nitrogen Oxide Emissions from Natural Gas-fired Boilers and Water Heaters*. Bay Area Air Quality Management District. Retrieved from https://www.baaqmd.gov/~media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230307_fsr_rules0904and0906-pdf.pdf?la=en.

²⁴ U.S. Climate Alliance announces new commitments to decarbonize buildings across America, quadruple heat pump installations by 2030: U.S. Climate Alliance. US Climate Alliance. (2023, September 21). <https://usclimatealliance.org/press-releases/decarbonizing-americas-buildings-sep-2023/>

- Finally, the state should approach zero-emission equipment standards as one part of a suite of equitable building decarbonization policies. The standards importantly drive the market toward pollution-free equipment, but the state must also adopt complementary policies to ensure the transition is equitable and affordable.

1B. Implement zero-emission new construction by 2027 – Builders and developers

Zero-emission new construction is a simple strategy to advance Maryland’s climate goals, and analysis indicates that it will save residents and businesses money on energy bills without increasing home prices.²⁵ New construction standards can also drive market transformation toward decarbonization of existing buildings, as they influence builders and developers to update their workforce training, designs, and inventories towards technologies and know-how needed for all buildings to meet the state’s climate goals.

- Maryland should enact building codes consistent with its decarbonization goals, including fully zero-emission new construction requirements by 2027. The Pathway Report models zero-emission construction standards by 2030, so this recommendation would result in accelerating this policy by one code update cycle.
- Additionally, as part of its commitment to the USCA national heat pump goal, Maryland committed to phase out fossil fuels in new construction by 2027. However, Maryland is the only state to make that commitment without an existing policy to advance that goal in place today.
- Over \$1 billion in federal funding will be available in coming years for energy code adoption, training, implementation, and enforcement; Maryland should vigorously pursue its share of that funding.²⁶ Maryland should also support efforts of localities, including Howard and Montgomery counties, that choose to advance zero-emission new construction policies.

1C. Develop Building Energy Performance Standards that will support an equitable transition for all buildings – Building owners and operators

MDE is currently in the process of drafting and refining the state’s BEPS rules. We encourage the adoption of the below recommendations in order to ensure as many buildings as possible experience the health and economic benefits of BEPS and that owners and operators of affordable housing have the support and flexibility they need to achieve the standards.²⁷ MDE and other Maryland agencies should also implement BEPS without further delay to fully realize the benefits modeled by the Pathway Report.

²⁵ Tan, L., Fathollahzadeh, M. H., and Taylor, E. (2022). (rep.). *The Economics of Electrifying Buildings: Residential New Construction*. RMI. Retrieved from <https://rmi.org/insight/the-economics-of-electrifying-buildings-residential-new-construction/>.

²⁶ DOE State and Community Energy Programs. (n.d.). *Technical assistance for the adoption of building energy codes*. U.S. Department of Energy. <https://www.energy.gov/scep/technical-assistance-adoption-building-energy-codes>

²⁷ Series of Social Priority Briefs in Building Performance. Institute for Market Transformation. (n.d.). <https://www.imt.org/resource-collections/social-priorities-in-building-performance/>

- MDE should continue to include Site EUI targets in the BEPS alongside the net direct emission targets to ensure that the BEPS drives efficient electrification, rather than increased use of inefficient electric resistance that would negatively impact utility bills. Enforcement mechanisms for violations of benchmarking rules and of BEPS rules with respect to Site EUI targets should be clarified, as clear penalties are critical for reducing market confusion and for driving action in advance of the BEPS deadlines.
- Additional compliance pathways should be developed that serve as alternatives to the "alternative compliance fees." For example, property owners should have the ability to submit a request for an adjusted compliance timeline using a Building Performance Improvement Plan.
- The BEPS program should be expanded through legislation to cover key building groups left out of the current program, including: buildings over 20,000 square feet and K-12 schools. It should be noted that no other BEPS-like program in the U.S. excludes schools. The state legislature should correct this while also ensuring sufficient resource appropriations to upgrade schools.
- The definition of "covered buildings" should be expanded through legislation or regulation to clearly include garden-style apartment complexes.
- For smaller commercial and multifamily buildings 10,000–20,000 square feet, a lighter touch building performance program should be implemented, including audits, and tune-ups to ensure efficient operations and sustained performance.
- The program could also include requirements for electrification at time of equipment replacement, though such requirements might be duplicative of the appliance standards discussed above.
- The state of Maryland should also ensure MDE has sufficient staff capacity to run the best possible BEPS program, rather than the program's flexibility and ambition being constrained by MDE staffing. Sufficient appropriations are required to provide MDE with additional capacity. Maryland should also ensure that BEPS provide adequate technical guidance and support for affordable housing to meet standards.

Additional recommendations from Climate Partners have been submitted for draft BEPS regulations.

1D. Set Clean Heat Standards – Utilities

Reaching Maryland's climate and equity goals can go hand-in-hand with ensuring the long-term resilience of the energy sector and its jobs. A Clean Heat Standard (CHS) is one way to provide utilities with the clear, long-term guidance they need to prepare for a highly-electrified building sector. These standards, which typically create a marketplace and phase out sales of fossil fuel services for utilities, lay the groundwork utilities need to draw up plans to prepare their businesses for the shifting energy landscape, while minimizing impacts on ratepayers.

- As the state considers whether or not to adopt these standards, it should be aware that a CHS has been implemented in various ways in different states and cities. The benefits and drawbacks of each existing policy should be strongly considered as Maryland considers shaping its own. Examples include:

- Vermont: will utilize a marketplace system in which utilities and delivered fuel providers earn credits based on the measures provided to customers, which the state’s Public Utility Commission is currently designing.
- New York City: utilizes electrification incentives directed toward a variety of building types, customers, and contractors to reach state climate and electrification goals. A study in 2021 found that the city’s CHS was effective in reducing local air pollution.²⁸
- Colorado: In addition to setting emissions targets for the gas utility sector, CO requires utilities to create long-term plans detailing actions they will take to meet CHS targets. Utilities are also required to conduct complementary long-term infrastructure planning.²⁹
- Should Maryland adopt a CHS with a credit and marketplace model, it should ensure that credits are only awarded to measures that electrify or weatherize homes. Measures that utilize expensive renewable natural gas (RNG) or other alternative fuels, such as trash, biomass, and biofuels, should not be eligible for credits, as these risk higher monthly operational costs for customers.

2. Design comprehensive strategies to promote the equitable adoption of electrified technologies in existing buildings

To ensure that all Marylanders can meet the requirements of the above policy, the state will need to be proactive in developing a comprehensive strategy on existing buildings in particular. Moving from gas, oil, and biomass systems to electric systems can involve technical, physical, and financial barriers to building owners. These barriers can be overcome with appropriate support, which will be especially important for low-income and disadvantaged communities. It will also be essential that the state develop protections for renters so that the building energy transition leads to adequate affordable housing options and tenants are not displaced. The following policies should be elevated by MDE as essential to ensuring that the state will be able to meet its climate goals in an effective and equitable transition.

Community Spotlight: Action in Montgomery

Action in Montgomery (AIM), established in 2000, is a broad-based community power organization, rooted in Montgomery County’s neighborhoods and congregations. We are non-partisan, multi-faith, multi-racial, and dedicated to making our county and state a better place

²⁸ Zhang, L., He, M. Z., Gibson, E. A., Perera, F., Lovasi, G. S., Clougherty, J. E., Carrión, D., Burke, K., Fry, D., and Kioumourtzoglou, M.-A. (2021). Evaluating the impact of the clean heat program on air pollution levels in New York City. *Environmental Health Perspectives*, 129(12). <https://doi.org/10.1289/ehp9976>

²⁹ Henchen, M., and Overturf, E. (2021, August 11). *Policy win: Colorado’s innovative clean heat standard will force gas...* Canary Media. <https://www.canarymedia.com/articles/policy-regulation/policy-win-colorados-innovative-clean-heat-standard>

to live and thrive. We have over 35 member institutions including congregations from different faiths and Title I Elementary Schools, representing tens of thousands of residents in Montgomery County across geographic, race, socioeconomic, age, and faith differences.

We listen to people in their communities to find out the most pressing issues facing individuals and families. In the past few years, housing, health, and climate change have been identified across geography, socioeconomic, age, and racial background. For many of our members, close family and friends have been personally impacted by climate change. For others, they are deeply concerned about the future for themselves and their children and grandchildren and want to act on climate to live out the values of their faith communities.

For years AIM has been working to address the root causes of chronic respiratory illness in low-income tenants. This has impacts on health and well-being, but also on children's school attendance and adults' ability to work. One middle school student was missing a day a week of school because of her asthma.

We started learning about the impacts of gas appliances and how burning of methane causes asthma and other respiratory illnesses and impacts brain development in young children. Other byproducts of burning methane cause cancer.

AIM acquired measurement tools to learn more. In the past year, we have measured NO₂ levels in over 300 residences, almost all low-income rental apartments. The EPA does not have indoor air quality standards but does have regulations on dangerous levels of NO₂ for outdoor air quality. Well over half of the households we tested had higher levels of NO₂ than the EPA recommends for outdoor air quality, with the measurement taken 20 minutes after starting the gas stove.

We have also started to measure methane in people's homes, finding dangerous gas leaks. Our partners have been measuring methane in the community and have found many instances of explosive levels of methane in our communities.

The communities we work with are concerned not just about gas use but other environmental harms like mold and asbestos, while also struggling with energy costs. We urge the state to streamline the programs to be more people-focused, allowing someone to participate in programs without needing to fill out dozens of different applications.

Moving from toxic fossil fuels to safe, clean, electric alternatives will create an outsized impact on health for low-income residents while ensuring that we reach our bold climate goals as a state.

- Action in Montgomery

2A. Require cross-agency collaboration to set statewide electrification targets in the next decade, including a sub-goal for low-income households.

Relevant Maryland agencies should work together to establish clear statewide electrification targets and interim targets, including how many commercial and residential buildings—and, in particular, low-income homes—should be electrified by a certain year. Doing so would encourage cross-agency collaboration toward a shared goal.

- As state agencies set a statewide electrification target, we suggest consideration of Maryland's commitment to the US Climate Alliance's goal of 20 million heat pump installations across 25 states by 2030, with 40% of benefits reaching low- and moderate-income households. To meet its share of the goal, Maryland should install 1.3 million heat pumps and heat pump water heaters by 2030.³⁰
- We encourage the state to include the development of electrified, electric-ready, and climate-friendly homes, alongside the installation of heat pumps. And we encourage an ambitious goal for low-income households: 60% of all low-income homes electrified or electric-ready by 2030, and 100% electrified by 2040.
 - A target specific to low-income households is especially important as gas costs are expected to rise as the number of gas customers declines, which was modeled as a significant concern in Maryland's Building Energy Transition Plan.³¹ A low-income target would provide a framework for logistics and funding coordination across MEA, DHCD, and MEA, among other agencies, to create a whole-home retrofit program to address pre-existing and energy needs in low-income homes.

Concrete electrification goals have been announced in other states, including:

- Maine: originally pledged to install 100,000 heat pumps by 2025, but has since increased it to 175,000 units by 2027.³² The state provides heat pumps free of cost to qualified residents.
- New York: announced a target of 2 million climate-friendly, electrified, or electrification-ready homes by 2030. The plan requires that about 40% of resources be directed to disadvantaged communities.³³

³⁰ This goal is derived from Princeton's 2021 [Net Zero America](#) study, specifically the "high electrification" scenario.

³¹ Maryland Commission on Climate Change. (2021). (rep.). Building Energy Transition Plan: A Roadmap for Decarbonizing the Residential and Commercial Sectors in Maryland. Retrieved from <https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Commission/Building%20Energy%20Transition%20Plan%20-%20MCCC%20approved.pdf>.

³² Takemura, A. F. (2023, July 27). *Heat pumps sold so fast in Maine, the state just upped its target*. Canary Media. <https://www.canarymedia.com/articles/heat-pumps/heat-pumps-sold-so-fast-in-maine-the-state-just-upped-its-target>

³³ NYSERDA. (2022, January 5). *Governor Hochul announces plan to achieve 2 million climate-friendly homes by 2030*. NYSERDA. <https://www.nyserdera.ny.gov/About/Newsroom/2022-Announcements/2022-01-05-Governor-Hochul-Announces-Plan-to-Achieve-2-Million-Climate-Friendly-Homes-By-2030>

- New Jersey: plans to install electric space conditioning systems in 400,000 homes and 20,000 commercial buildings by 2030. And, 100,000 low-and moderate-income homes—approximately 10% of the state’s homes must be made electrification-ready.³⁴
- California: Gov. Newsom has set a goal of 3 million climate-ready and climate-friendly homes by 2030 and 7 million by 2035, supplemented by 6 million heat pumps by 2030, and directing 50% of investments to low-income and disadvantaged communities.³⁵

2B. Ensure weatherization and efficiency upgrades are a key part of the building energy transition and explore additional funding options to expand incentives.

Investing in efficiency is an important supplement to electrification. Improving building efficiency—especially through building shell upgrades—will lead to long term reductions in building energy consumption and also improve indoor air quality.³⁶ Efficient buildings also align better with more efficient appliances, such as heat pumps, that consume less electricity and save users money. Overall, efficiency will also lower the sector-wide demand for electricity, which will reduce the land, infrastructure, and equipment needed to generate and deliver service to buildings.

- Following the guidance in 2023 House Bill 169, which created DHCD low-income savings targets, the state should create a plan to provide efficiency retrofits to all low-income households by 2031. We support this goal, and call for coordinated efficiency and electrification interventions through a whole-home retrofit program, as described in the next recommendation.
- Additionally, policy should ensure that building owners install highly efficient electric appliances and that state programs support building owners with investing in building shell upgrades like insulation and air sealing. Recommended policies include the following:
 - The Building Energy Performance Standards (above) should be designed to drive efficiency in large buildings through Energy Use Intensity (EUI) goals.
 - The state should develop mandatory home labeling programs for single-family homes, condominiums, and rental units, with mandatory efficiency disclosure at time of sale. Work with listing services to ensure these disclosures are displayed to residents looking to buy or rent homes at the earliest stages of the process.
 - Align the guidance in existing efficiency programs, such as EmPOWER, with electrification goals to ensure highly efficient electrification takes place (described for EmPOWER below).

³⁴ Walton, R. (2023, August 2). *New Jersey BPU advances building electrification over opposition from fossil fuel supporters*. Utility Dive. <https://www.utilitydive.com/news/new-jersey-bpu-advances-building-electrification-over-gas-stove-fears/689674/>

³⁵ *Governor Newsom calls for bold actions to move faster toward climate goals*. Office of California Governor. (2022, July 22). <https://www.gov.ca.gov/2022/07/22/governor-newsom-calls-for-bold-actions-to-move-faster-toward-climate-goals/>

³⁶ Pigg, S., Koolbeck, M., Nye, L., Stendel, S., Lord, M., and McLeod, H. (2021.). *Addressing Non-Energy Impacts of Weatherization*. Oak Ridge National Laboratory.

Currently, the major efficiency programs in Maryland are the ratepayer-funded EmPOWER program, and the US Department of Energy funded Weatherization Assistance Program (WAP). Additional grants through Maryland Energy Administration's Strategic Energy Investment Fund (SEIF) are funded with the proceeds of the annual Regional Greenhouse Gas Initiative (RGGI) auction and alternative compliance payments from the Maryland Renewable Portfolio Standard.³⁷ Programs have been successful, but are not designed to reach homes at the scale needed for the building energy transition.

In setting efficiency goals, the state should explore opportunities to dedicate additional funding to efficiency initiatives. There are potential equity concerns with relying on a ratepayer-funded program compared to more progressive revenue generation options. For a further discussion of revenue generation, see the earlier section of this report.

2C. Develop a statewide, whole-home retrofit program for low-income households to holistically deliver housing rehabilitation, efficiency upgrades, and electrification.

A whole-home program aligns, braids, and coordinates housing intervention funding to deliver streamlined health and safety interventions, weatherization, and electrification measures to low-income households across the state. This approach minimizes program deferrals, reduces energy consumption, and reduces administrative costs from siloed programs. Electrification at the scale required to meet the challenge of climate change and Maryland's climate goals will require significantly expanding this approach to encompass housing programs within DHCD, MEA, and MDE and increasing the effectiveness of administration, outreach, and delivery.

Whole home approaches have been piloted in Maryland with a more limited scope through programs such as DHCD's Homeowner Assistance Fund Whole Home Grant program, the Baltimore City Department of Housing and Community Development LIGHT program, and the recently announced DHCD Whole Home Pilot in six jurisdictions. These programs help match applicants with state and city DHCD programs from which they are eligible to receive services, but do not yet include electrification measures and also do not yet have full cross department coordination to braid all relevant state resources.

This comprehensive approach is necessary because existing conditions like lead, mold, or structural issues in the home can disqualify households from receiving energy services. For example, between Jan 2018 and March 2022, approximately 30% of households that applied for services from EmPOWER's low-income weatherization program were deferred due to existing conditions in the building.³⁸ For electrification, risks such as inadequate panel size, wiring, or electrical capacity also can present similar barriers.

³⁷ Maryland Energy Administration, Strategic Energy Investment Fund Report 2022 Vol. 1, <https://energy.maryland.gov/Reports/FY22%20SEIF%20Report%20Vol%201%20Final.pdf>.

³⁸ Maryland Department of Housing and Community Development, 2021- 2023 DCHD Limited Income Program Plan filing to the Public Service Commission, https://webapp.psc.state.md.us/newIntranet/Casenum/NewIndex3_VOpenFile.cfm?filepath=/Coldfusion/Casenum/9600-9699/9648/Item_3/2020.08.31DHCD_LimitedIncome_ProgramPlan2021-2023FINAL8-31-2020.pdf

An effective whole home program will have the following components:

- A common application for housing programs across agencies.
- A coordinated intake process across agencies providing multiple pathways for clients to apply for housing programs and receive comprehensive services, also known as a “no wrong door” policy.
- A comprehensive audit including electrification considerations.
- Coordinated delivery of multiple programs into projects.
- Adequate flexible funding for services to minimize program deferrals.
- Adequate administrative funding to coordinate projects.
- An informed community engagement strategy with staff such as community navigators for support.

To ensure equity, the program should also be guided by the following principles:

- Improve health, safety, and economic conditions for residents.
- Align with CSNA greenhouse gas emission reduction goals.
- Work with impacted communities through the process of planning and program delivery.
- Prioritize reducing energy burdens and avoid raising energy bills as often as possible.

A One-Stop-Shop Solution

Ms. Corrillis is a Baltimore City homeowner and a retired Maryland state government employee. She purchased her 1941 constructed home in 2006. Being on a fixed income, it was difficult for Ms. Corrillis to keep up with home maintenance. Over the years, the home developed significant plumbing and heating issues. As a result, Ms. Corrillis was unable to use the bathtub and shower and she also had a malfunctioning boiler in the home. Due to the plumbing repair, high energy loss, and other maintenance issues in the home, Ms. Corrillis was considering moving into senior housing rather than remaining in the home where she wanted to reside.

Ms. Corrillis was referred to Green & Healthy Homes Initiative (GHHI) for services as part of the collaborative Baltimore City Housing Upgrades to Benefit Seniors (HUBS) Program. GHHI braided funds from the HUBS Program, Baltimore City, Maryland state, and private philanthropy to develop a holistic scope of work that included health and safety, efficiency, and electrification interventions.

Ms. Corrillis received a comprehensive electrification retrofit including:

- Health and Safety Upgrades: Functioning tub and shower with grab bars improving health and safety. Trip and fall hazards and other hazards remediated.
- Energy Efficiency Upgrades: Functioning heating and air conditioning system improving comfort in home and reducing impact on occupant health. Home weatherized with air sealing and insulation upgrades.

- Electrification: Electrification interventions to convert from gas appliances to heat pump space heating, heat pump water heater, electric induction stove, and other electric appliances.

The end result is a home that is more comfortable, safe, affordable, and climate-friendly. In the months after the interventions were completed, Ms. Correllis' utility bills declined dramatically due to decreased energy usage and competitive electric utility prices.

2C(a). Direct federal funds to low- and moderate-income households

In order to support a whole-home retrofit program that meets the state-wide need, the state must prioritize directing as many federal energy efficiency funding streams to low-income households as possible. Though the funding need is significant, a program like this is necessary to make electrification feasible for the entirety of the Maryland building stock. Additional benefits would include: 1) improving the health, safety, and quality of life for residents in low-income households in need of significant repairs; 2) reducing household energy burden by reducing energy consumption and avoiding the gas infrastructure costs; and 3) ensuring federal funding is equitably distributed and reaches Marylanders that need it most.

For details on how Maryland could fund and coordinate across agencies to set up and fund a \$2 billion whole-home retrofit program please read [Charting a Pathway to Maryland's Clean Energy Future](#) (Appendices A and B).

2D. Align EmPOWER with state climate goals and ensure all residents have access to these programs.

EmPOWER touches hundreds of homes each year through utility programs, the DHCD Whole Home Efficiency Program, and the DHCD Multifamily Energy Efficiency Housing Affordability Program (MEEHA) program.³⁹ EmPOWER program has a \$250 million annual budget and provides the state with a valuable tool and infrastructure to reach its climate goals.⁴⁰ However, EmPOWER programs are not currently designed to support fuel switching, and the statutory requirement to reduce electricity consumption presents a barrier to changes.

³⁹ In 2022, DHCD weatherized approximately 21,00 homes, and 2,200 multifamily properties—. The EmPOWER Maryland Energy Efficiency Act Report of 2023. Filed with Public Service Commission of Maryland. June 2023. <https://www.psc.state.md.us/wp-content/uploads/2023-EmPOWER-Maryland-Energy-Efficiency-Act-Standard-Report.pdf>

⁴⁰ Maryland Department of Human Services, Fiscal Year 2021 Electric Universal Service Program Annual Report to the Maryland Public Service Commission, Tables 1 and 2. <https://www.psc.state.md.us/wp-content/uploads/2021-EUSP-Report-FINAL.pdf>

Several changes will be required to ensure the program is utilized equitably and in favor of the state's goals. These include:

- Ensure that no less than 40% of EmPOWER's funds be directed to whole-home or whole-building retrofits in low-income communities, in line with President Biden's Justice40 targets. Without adequate funding going toward low- and moderate-income households, current inequities will worsen as more affluent residents leave the gas system and less affluent Marylanders will be left shouldering increasing gas system costs. Current efforts to implement low-income savings targets will drive significant increased investment in low-income homes, but more change will be needed to enable and encourage fuel-switching and to phase out subsidies for gas.
- Allow and encourage fuel-switching from fossil fuels to electric appliances by requiring incentives for electrification. Should EmPOWER funds continue to be utilized for gas and fossil fuel appliances, Marylanders with fossil fuel systems installed today will be locked into fossil fuels for the next several decades, making it difficult for the state to meet its climate goals and exacerbating health impacts of fossil fuel combustion.
- Phase out subsidies for gas appliances in the EmPOWER program.
- The Public Service Commission and/or the legislature will need to adjust the program targets to include greenhouse gas emission reductions and also likely adjust program incentives to enable deep energy retrofits towards electrification. This can be a part of a coordinated effort to develop a whole-home retrofit program.

3. Align gas and electric utility planning with Maryland's climate needs

As Maryland executes on its goal of net-zero by 2045, the state's utilities need to plan for servicing a highly-electrified building sector. Electric utilities must offer accessible energy across the state, and gas utilities must safely and affordably provide fuel to a shrinking customer base. It would be beneficial for gas utilities, and for their ratepayers, to begin planning for a decreased demand for gas. In particular, as Maryland households are able to electrify with greater frequency (a group that skews towards affluent residents), the state and gas utilities must ensure that increasing gas infrastructure costs are not shouldered by residents with high energy burden who are left on the gas system. The Public Service Commission (PSC) should also develop a plan to explore the role for additional energy systems. For example, network geothermal technologies have the potential to reduce STRIDE spending if installed in areas with the largest gas leaks and could reduce peak demand on the coldest days. While the attractiveness of these potential investments is uncertain, experiments would give us insights into the attractiveness of this alternative to gas service.

3A. Open a PSC proceeding to address long-term gas transition planning and STRIDE.

Specifically, the state must address the long-term financing of gas system infrastructure costs and address the risk of stranded assets.

- Given the ambitious climate goals in Maryland, a transparent, long-term gas planning proceeding would provide guidance and structure as the state's utilities restructure to succeed in the state's shifting energy environment.
 - Earlier this year, the Office of People's Counsel (OPC) filed a petition with the PSC calling for a long-term planning proceeding for the state's gas companies.⁴¹ The petition requests that the utilities answer how they plan to mitigate stranded asset costs and maintain gas infrastructure as investments decline, and how utility business models will change in a shifting energy landscape.
 - Other states have opened similar proceedings, including Massachusetts, New Jersey, and New York.
- A long-term gas planning proceeding would also help curtail ongoing investment in gas infrastructure. For example, the STRIDE program, a financing mechanism that promises utilities a high rate of return for preemptive gas line replacements, poses a risk to ratepayers and the state as it is currently operating. Continued investments in the gas system through STRIDE will increase monthly bills for consumers on the gas system. As wealthier Marylanders electrify their homes and leave the gas system, lower-income residents risk being left to shoulder the increasing financial burden of the state's gas infrastructure.

3B. Explore new models for electric utility pricing that facilitate equitable electrification.

It is important that the clean energy transition is equitable. Utility payment structures that reduce energy burden for low-income households should be explored. One option we recommend exploring is a Percentage of Income Payment Plan (PIPP) for electric utilities, which caps utility bills based on household income. A PIPP rate structure would need to be approved by the PSC, but ensure that utility rates allow households to electrify without creating undue energy burden on low-income households.

⁴¹ *Maryland Office of People's Counsel*. State of Maryland Office of People's Counsel. (2023, February 9). <https://opc.maryland.gov/Portals/0/Files/Publications/Others/02092023%20-%20OPC%20Gas%20Planning%20Petition%20FINAL.pdf?ver=kbag13uAvAkFRI2hvFiQZw%3d%3d>

The Power of a (Federal) Dollar

Federal dollars are a powerful tool at a state level. They supplement state and local funding and can be used to cover needs the state is not immediately able to address. In regard to buildings, federal funding can increase capacity to provide transformational health, safety, and energy retrofits to low- and moderate-income households—creating safer and healthier homes. The recent passage of the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL), will provide Maryland with over \$250 million toward program funding and incentives for weatherization, health and safety upgrades, and electrification. These funds are a rare opportunity to jumpstart residential energy programs, and Maryland should ensure a significant portion is directed toward low- and moderate-income households.

The power of equitable distribution of federal funding is highlighted by Vintage Gardens, an affordable housing complex in Baltimore. In 2011, Vintage Gardens and the National Housing Trust utilized a \$1.5 million grant from the American Recovery and Reinvestment Act to provide the complex with comprehensive energy efficiency upgrades, as well as federal Weatherization Assistance Program funds. [Services included:](#) weatherization and air sealing, Energy Star-rated windows and appliances, LED lighting, efficient space conditioning systems, and new toilets and faucets.

Despite these upgrades being installed more than a decade ago, residents still feel their benefits. Just last year, residents of Vintage Gardens welcomed Department of Housing Secretary Marcia L. Fudge along with Department of Energy Secretary Jennifer M. Granholm to explain how the retrofits have provided long-term comfort and utility bill benefits.

As the state of Maryland applies for and distributes buildings-related federal funding, it can look to Vintage Gardens as an example of how federal dollars can improve lives long after the funds end.

Natural Resources

Introduction

Natural resources, which are covered in the Pathway Report in the “2.8. Agriculture” and “2.9. Forest and Land Use” sections, represent an important opportunity for implementing climate solutions with various co-benefits that extend beyond reducing emissions. Natural resources already play a major role in mitigating the United States’ contribution to climate change. According to the EPA’s National Greenhouse Gases Inventory, the categories of land use, land use change, and forestry, removes the equivalent of 11% of annual economy-wide GHG emissions in the United States. The overall trend is replicated at the state level. In Maryland (2020),⁴² agriculture was a net emitter in the state, accounting for 3.07 MMT CO₂e, whereas forestry and land use was a net sink, responsible for sequestering 8.34 MMT CO₂e (listed with a negative sign in the 2020 Maryland State GHG Inventory, since it represents a carbon sink).

Although natural resources contribute a relatively small percentage of Maryland’s total GHG emissions, their relevance resides in their potential to remove carbon dioxide from the atmosphere. This makes natural resources a unique area for policy development and implementation for carbon sequestration. These policies can also have effects over several co-benefits that are associated with natural resources management and restoration. These co-benefits take the form of improved resilience to climate impacts, myriad health benefits to communities, strengthening local economies, and safeguarding critical ecosystems (both in public and private lands).

Co-benefits of Natural Resources Solutions

So, one thing that I really focus on are co-benefits of the things that we do, and personally I feel like we need to look for solutions that have the greatest number of co-benefits given the enormous amount of work that’s in front of us, so for example, planting one tree on your property in the right location can reduce your energy bill by 20% once it gets to the size, and it’ll keep returning benefits over and over again every year as opposed to putting in a new heat pump system which you keep having to pay for every year. Both are really important, but I think it’s essential that we look at natural resources as equal to all the other solutions. Also equal to the climate crisis, almost equal, is the biodiversity crisis. Nature is collapsing around us, so returning our investments directly into nature is important.

- Ashley Traut, Greater Baltimore Wilderness Coalition

⁴² *Emission Inventory*. (n.d.). Maryland Department of the Environment. <https://mde.maryland.gov/programs/air/ClimateChange/Pages/GreenhouseGasInventory.aspx>

These opportunities are not free of challenges. Natural resources policies demand understanding the interconnections between natural and human systems, lingering uncertainties about the current state of affairs and their evolution into the future, and complexities associated with multiple stakeholders with a say on the matter. These obstacles, however challenging, are not insurmountable. These issues demand deep interagency coordination, particularly between MDE, MDA, and MDNR. Maryland must make sure that coordination and cooperation across agencies lies at the core of natural resources solutions. Similarly, meaningful engagement with independent scientists, environmental organizations, local communities (especially structurally marginalized communities) and affected stakeholders and landowners will be fundamental for long-lasting changes to happen.

Natural resources present a unique opportunity for improving resilience (both from natural and human systems) as well as providing opportunities to ensure a just access to nature across the state. The state should emphasize this dimension and incorporate it directly into decision making when weighing in different policy actions that could affect multiple communities. For this, the state should ensure the adoption of an equity lens, as it can inform different strategies of remediating degraded lands or improving access to nature in underserved communities. This point is very important: there are multiple health benefits associated with nature-based recreation that must not be overlooked, such as improvements in affect, cognition, restoration, and well-being, and decreases in anxiety and depression symptoms.⁴³ These positive impacts can also be directly included in policy decisions through ecosystem service assessments.⁴⁴

The Pathway Report demonstrates the Department's understanding of the need for a multi-pronged approach to addressing climate change. Critical emission sources as well as potential levers to mitigate them are recognized in the document. We are also pleased to see that MDE is adopting a conservative approach to modeling the time-effect of methane and its warming impacts. This is particularly important in its association to agriculture, as it directly impacts the emission estimates from this sector. There is also a recognition of interconnectedness of human and nature systems, as well as the need for multi-benefit solutions. Finally, there is a recognition that there is a need for comprehensive data and methods, with some of these already in the works.

These recognitions are a good starting point. However, MDE's approach regarding natural resources policies can be improved. Given the urgency of the climate crisis and the existent information gaps that define both the "Current Policies" as well as the "Climate Pathway" scenarios, much more is needed to understand the role and potential of natural resources as a climate solution, and to develop policies that leverage this potential for mitigation and adaptation. We group our recommendations into four categories. The first relates to available

⁴³ Lackey, N. Q., Tysor, D. A., McNay, G. D., Joyner, L., Baker, K. H., and Hodge, C. (2019). Mental health benefits of nature-based recreation: a systematic review. *Annals of Leisure Research*, 24(3), 1–15.

<https://doi.org/10.1080/11745398.2019.1655459>.

⁴⁴ Bratman, G. N., Anderson, C. B., Berman, M. G., Cochran, B., de Vries, S., Flanders, J., Folke, C., Frumkin, H., Gross, J. J., Hartig, T., Kahn, P. H., Kuo, M., Lawler, J. J., Levin, P. S., Lindahl, T., Meyer-Lindenberg, A., Mitchell, R., Ouyang, Z., Roe, J., and Scarlett, L. (2019). Nature and mental health: An ecosystem service perspective. *Science Advances*, 5(7). <https://doi.org/10.1126/sciadv.aax0903>

data and methods, while the second, third, and fourth, focus on agriculture, forestry and land use change, and wetlands and blue carbon, respectively.

Modeled Impact of Natural Resources Recommendations

Due to uncertainties around appropriate modeling assumptions, policy recommendations in the Natural Resource section were not integrated in the LEAP model at this time.

Comments on the Pathway Report

There are still important shortcomings with regard to available data and methodologies to estimate sinks, emissions, and fluxes. The Pathway Report highlights some areas in which work is underway, but there are others in which data simply does not exist or modeling limitations don't allow for incorporating these data in their estimations. As soon as time allows, Maryland must develop a comprehensive and credible plan for achieving targets, including a plan to improve estimates and reduce overall error in measurement across all types of natural working lands.

1. Maryland should strive for developing (or improving when possible) an updated methodology for estimating sinks and fluxes.

This will help:

- Set concrete and achievable goals in GHG reduction goals for Natural Resources related policies.
- Measure progress toward these GHG reduction goals.
- Inform policy development and implementation towards adaptive management.
- Track performance of existing programs and projects.
- Communicate and coordinate with stakeholders.

Improvements in the methodology to quantify sinks and fluxes should aim to maximize:

- Reducing uncertainty in GHG sink and flux estimates.
- Improving timeliness of data production, availability, and use.
- Enhancing spatial and/or temporal data resolution of data products, particularly in areas that change rapidly.
- Expanding inventory scope to additional land uses, carbon pools or functionalities.
- When possible, improvements should aim to link GHG fluxes to specific causes or activities.

This last item is critical, as it will allow MDE to link causes and effects, tracking the impact of management interventions and disturbances (overlying activity data and ideally being spatially explicit) and informing projection of future trends.

2. In those cases in which MDE is already developing estimates or conducting studies that will feed into the models, the department must, in coordination with MDA and MDNR, develop credible timelines for the measurements and estimates, data acquisition, and provide this information to the public.

Agriculture

1. There is an agriculture-specific data gap in the Pathway Report.

Page 76 of the report states (emphasis added) “Due to lack of available data to adequately represent the impact of current Maryland policies on GHG emissions from the agricultural sector, no agricultural emission reductions are included in the Current Policies scenario.”

- a. MDE (in coordination with MDA) must incorporate up-to-date data and measurement techniques to fill the existing data gaps in their models.
- ### 2. The majority of cost-effective reductions in agriculture that are identified are attributable to methane from enteric fermentation in ruminants, along with a small contribution from manure management.
- a. There is a lack of details on how MDE/MDA plans to achieve the expected reductions. For example, a 5% decrease in methane emissions from livestock is modeled as part of the Pathway scenario, but there is no justification for the value nor the potential policies to achieve such reduction.
 - b. One option to achieve this reduction is relying on commercially-available cattle feed additives that cut enteric methane production (the exact value varies depending on the specific diet of the animals, cellulose-rich diets such as grass or hay or carbohydrate-rich diets such as corn or distillers grains). However, the success or failure of a policy like this relies single-handedly on the uptake rate among farmers and ranchers. MDE must make explicit the incentive structure they are relying on (mandatory, voluntary, subsidized, etc.) when modeling reductions from this sector.
 - c. When designing a policy like this, MDE (in coordination with MDA) should explore options that do not rely only on voluntary mechanisms.
 - d. MDE (in coordination with MDA) must ensure that these practices account for the full carbon cycle of policies aimed to reduce methane from enteric fermentation.
 - i. For example, animal feed aimed at reducing methane can be an additional source of emissions, especially if associated with land-use changes, like clear-cutting forested land or degrading wetlands or prairie to replace it with corn or soy.

- ii. The accounting process should account for emissions that are a direct result of the feed, even if these were imported from abroad. Soy is a major driver of deforestation in Brazil, Bolivia, Paraguay, and Argentina, thus any estimation of the GHG reductions must take this into account. If a farmer in Maryland claims an X percent reduction in emissions from additives, while switching to a cheaper feed imported from a country in which the feed is tied to deforestation, then the overall impact of the additive can be negligent or non-existent. These cases should not be counted as reduced emissions from the agriculture sector.

3. MDE/MDA/MDNR must expand the incentives for the implementation of regenerative agriculture practices.

- a. **Expansion of funding.** Although MDA provides funding for regenerative agriculture practices via the New Healthy Soils Competitive Fund, the program consists of a competitive funding scheme in which 16 projects were funded in 2023, for a grand total of \$650,000. This is unlikely to make a substantial contribution towards broader climate and environmental goals. We urge Maryland to expand this funding pool.
- b. **Maryland should promote and support farmers and landowners to take advantage of federal public funds** like the USDA Natural Resources Conservation Service (NRCS) Conservation Stewardship Program.
- c. **Conservation buffers**
 - i. Forest buffers represent an important multi-objective tool for sequestering carbon as well as reducing nitrogen and phosphorus leaching, river bank stabilization, improved biodiversity, and more.
 - ii. Although Maryland has a high rate of goal achievement (86% of past commitments have been met, according to the Farm Forward Report⁴⁵), the state's initial commitments were *very* low. The state can (and should) reassess its commitments and be more aggressive with its buffer goals.
- d. **Cover cropping**
 - i. Cover crops (planting crops in soil that would otherwise be bare after a cash crop—like soy—is grown and harvested) help reduce soil erosion, decrease nutrient leaching, increase water retention, improve soil health, and increase biodiversity.
 - ii. MDE (in coordination with MDA) must establish ambitious quantitative goals (such as the total number of acres with cover crops) and track the progress towards the objective.
- e. **Intensive rotational grazing**
 - i. This is the practice of managing intensive, multi-paddock grazing systems where livestock are systematically moved to fresh forage to increase forage growth, improve manure distribution, wildlife cover, and soil health.

⁴⁵ Chesapeake Bay Foundation (2022). Farm Forward. Retrieved September 21, 2023, from <https://www.cbf.org/document-library/cbf-reports/farm-forward-report.pdf>

- ii. MDE (in coordination with MDA) must establish ambitious quantitative goals (such as the total number of farmers enrolled or head of cattle) and track the progress towards the objective.
- f. **No-till farming**
 - i. No-till farming is the practice of growing crops or pasture without disturbing the soil through tillage.
 - ii. MDE (in coordination with MDA) must establish ambitious quantitative goals (such as the total number of acres under no-till farming) and track the progress towards the objective.
- g. **Agroforestry**
 - i. Agroforestry is the practice of integrating trees and shrubs into crop and animal farming systems. These can take several forms such as alley cropping, forest farming, silvopasture, and others.
 - ii. MDE (in coordination with MDA) must establish ambitious quantitative goals, such as the total number of acres or farms implementing agroforestry systems, and track the progress towards the objective.
 - iii. Agroforestry incentives should not be linked to permanent easements but rather differentiate between the two as to avoid deterring landowners from participating.

4. MDE/MDA/MDNR must incentivize and promote the role of agrivoltaics and other co-siting opportunities (parking lots, brownfields, and landfills).

- a. The Pathway Report recognizes multiple opportunities for reducing competition with other land uses, such as agricultural or other working lands.
- b. The adoption of dual use solar-agriculture can yield multiple co-benefits if implemented in combination with other agricultural practices (improve soil regeneration, aid certain produce production that cannot grow in full sun, ensure that ‘agland’ remains as such, and it provides energy security and a better income to farmers).
- c. MDE (in coordination with MDA) should promote and take advantage of recently approved funds for the development of renewable energy in rural areas. Available funds include provisions in the IRA as part of the Rural Energy for America Program.⁴⁶

Forestry and Land Use Change

While forestry and land use policies are essential components of a climate plan, the Pathway Report on page 79 states that “In the Current Policies scenario, no specific policies were modeled for this sector due to modeling constraints and lack of data.” Under modeling assumptions for forestry and land use, it explains further that “While this sector will play a crucial

⁴⁶ Notice of Solicitation of Applications for the Rural Energy for America Program for Fiscal Years 2023 and 2024, Correction, 88 Fed. Reg. 34823 (May 31, 2023).

role in maintaining and expanding natural sinks to help meet Maryland's 2045 net-zero goal, negative emissions are not included in the 2031 target, which is a gross emissions goal.”

1. In order to minimize carbon emissions from forestry, Maryland should establish policies aimed at minimizing forest disturbances. This could mean more clearly

differentiating between preserving forest ecosystems, conserving newly afforested areas, and logging tree farms and plantations.

- a. Overall, only about 10% of the forestland is held in reserves where trees are not removed for use.⁴⁷ MDE/MDNR should expand forested areas under the category of ‘preservation’ as opposed to ‘conservation’, and include forest preservation incentives and subsidies programs for private landowners.
- b. A study reviewing the impacts of forest disturbances (including harvesting) throughout the US found that usually the forest did not return to its status as a carbon sink for a period between 10 and 20 years, partly due to the large soil carbon losses associated with the event.⁴⁸ Scientists have found that the highest rate of carbon uptake and storage is achieved simply by leaving the forest alone.⁴⁹ This does not account for the additional environmental impacts of timber harvesting.
- c. 82% of all acreage designated as state forests are found in Allegany and Garrett counties. The state of Maryland should extend forest conservation protection to Allegany and Garrett County forests by amending the 1991 Forest Conservation Act.
- d. MDE should implement policy oriented at increasing preservation of state-owned forested land, particularly of mature and old-growth trees, for protection through enforcement of the Irreplaceable Natural Areas Act, designation of Wildlands, and amending the Old-Growth Forest Act to include all provisions as originally introduced in 2022.

2. MDE/MDNR must incorporate forest and ecosystem fragmentation goals and

metrics directly into policy, in addition to overall forest cover measures. The fragmentation of remaining forested lands is an issue that must be addressed via executive or legislative means. Special attention should be given to mature trees and remaining old-growth forests.

- a. Fragmentation of forested lands (mostly tied to urban and suburban development) is a real threat for ecosystem function and services.

⁴⁷ Forest Products Utilization and Marketing, Maryland Department of Natural Resources.

<https://dnr.maryland.gov/forests/Pages/programs/fpum.aspx>. Accessed on September 21st, 2023

⁴⁸ Amiro, B. D. et al. (2010), ‘Ecosystem carbon dioxide fluxes after disturbance in forests of North America’, Journal of Geophysical Research, 115:G4, DOI: 10.1029/2010JG001390.

⁴⁹ Nunery, J.S., and Keeton, W.S. (2010), ‘Forest carbon storage in the northeastern United States: Net effects of harvesting frequency, post-harvest retention, and wood products’, Forest Ecology and Management, 259:8.

<http://dx.doi.org/10.1016/j.foreco.2009.12.029>

- b. Forest retention goals are a positive development, but equally important is forest fragmentation (i.e., the division of continuous habitats into smaller, isolated patches).
- c. The Maryland Forest Technical Study (2022) found that the state is approaching the goal of achieving no net forest loss. It also found that related trends associated with fragmentation were worrisome and likely to continue.
- d. MDE/MDNR should incorporate these criteria as part of development evaluation and approvals (for example, by defining metrics that incorporate absolute forest area as well as percentage of the landscape, the number of isolated patches, patch density, existing forest corridors, etc.).

3. Overreliance on net forest loss as the only metric to measure progress is inappropriate.

- a. Urban tree canopy or tree farm gains do not offset forest canopy loss. Although they might offset part of the carbon stored in trees, the overall loss of biomass and soil carbon loss associated with forest loss and the associated loss of ecosystem services makes the analysis of net forest gain/loss inappropriate to capture the overall impact of the forest sector.

4. Maryland must expand urban canopy goals, especially in areas where structurally marginalized communities and historically underserved populations reside.

- a. The state can take advantage of IRA funding⁵⁰ to expand access to trees and green spaces in disadvantaged urban communities.
- b. Maryland cities should aim to build green infrastructure with an emphasis on climate change resilience. Projects might include new trails and transit lines, tree canopy to increase shade and reduce heat islands, parkland and playgrounds that can serve to mitigate flooding and other weather-related events.

5. Maryland must be careful about the overall carbon storage potential of mass timber (as a building strategy and overall economic activity).

- a. Important considerations⁵¹ in whole-building life-cycle assessment must include how much CO₂ would be emitted in the logging, manufacture, and transport of the wood products used in the construction, as well as end-of-cycle steps.
- b. Should Maryland decide to support the expansion of mass timber as an 'environmentally sound' alternative to building that does not rely on concrete and steel, then MDE/MDNR must appropriately certify that the wood is logged

⁵⁰ Press Toolkit - Urban and Community Forestry Inflation Reduction Act Grants. (2023, April 7). US Forest Service. <https://www.fs.usda.gov/managing-land/urban-forests/ucf-ira-press-toolkit>

⁵¹ Greene, J. M., Hosanna, H. R., Willson, B., and Quinn, J. C. (2022). Whole life embodied emissions and net-zero emissions potential for a mid-rise office building constructed with mass timber. *Sustainable Materials and Technologies*, e00528. <https://doi.org/10.1016/j.susmat.2022.e00528>

sustainably from dedicated tree farms (accounting for the full carbon cycle of the wood in addition to its associated impacts).

- c. This approach can create perverse incentives for shortening logging rotations (with biologically poor forests) and more aggressively clear-cut healthy forests. MDE/MDNR should discourage the use of healthy forests for industrial uses such as mass timber.

6. Role of private forest owners. MDE/MDNR must establish robust mechanisms to collaborate, coordinate, and assess progress towards the Pathway's goals with various levels of government and landowners, including federal and local governments, land trusts, and private landowners.

- a. In contrast to western states, from the approximately 1.87 million acres of forests in Maryland, 76% of them belong to private landowners, while 24% belong to the public, including the state.
- b. For small forest owners, conservation and preservation goals create a challenge if they rely on their land for a living.
- c. The state must take advantage of federal programs, like the Inflation Reduction Act Forest Landowner Support, which provides financial assistance grants for projects that support underserved and small-acreage forest landowner participation in emerging private markets for climate mitigation and forest resilience.
- d. The state must develop programs targeting private landowners that incentivize forest preservation for carbon capture, wildlife corridors, and biodiversity.

7. The Pathway Report does not differentiate between the raw materials that could be used as biomass (such as wood, agricultural products, or solid waste), bundling them under the umbrella term of 'biomass'. This approach is problematic, because it does not allow performance of robust life cycle assessment of emissions and assessment of wider environmental impacts associated with forest management.

- a. When assessing the appropriateness and potential for biomass as a source of energy, MDE must coordinate with MDA and MDNR and provide individual assessments based on the main source. The same applies for policy development and implementation.

8. MDE/MDNR should explore alternative uses for woody biomass beyond burning (or biochar), such as using woody biomass to improve soils in gardening, farming, and livestock bedding, bioplastics, pressed building materials and flooring, pallets and crates, or as flooring for playgrounds.

9. Maryland should establish robust life-cycle accounting mechanisms for measuring the impact of woody biomass for energy production.

- a. Woody biomass—due to combustion and processing efficiencies for wood that are less than coal—produces an immediate increase in atmospheric CO₂ relative to coal.⁵²
- b. The payback⁹ time for this carbon debt ranges from 44–104 years after clearcut, depending on forest type—assuming the land remains forest, which increases carbon emissions in the short term.
- c. Woody biomass for energy emits benzene, benzo(a)pyrene and dibenz(a,h)anthracene, carbon monoxide, formaldehyde, organic gasses (including aldehyde gasses and other respiratory irritants), nitrogen oxides, polycyclic aromatic hydrocarbons (PAHs), and dioxin, which are known to have negative health effects.
- d. There are additional GHG and volatile organic compound emissions associated with Pellet Factories.⁵³ They could conflict with the Clean Air Act and they’re located in Opportunity Zones compounding environmental justice effects.
- e. Some Opportunity Zones are being touted in the Maryland Forestry Economic Adjustment Strategy⁵⁴ for turning Veirs Luke Mill into a pellet factory; the AES Warrior Run—a coal fired power plant in Garrett County slated for retirement in 2025, now is being tested to burn woody biomass; MFEAS suggests another “hydrophobic pulp mill” in Western Maryland, which would use palmitoyl chloride, trifluoroacetic anhydride, and hexamethyldisilazane⁵⁵ (which cause cancer, non-Hodgkin lymphoma, and cardiac defects)⁵⁶ in addition to the known contamination from paper mills.⁵⁷

Wetlands and Blue Carbon

1. As the website of the MDE’s Water and Science Administration states in the opening sentence of their website, “Climate Change is Water Change.”

This is especially true for a coastal state like Maryland. Some of the most consequential areas for natural resource policy are areas along the shoreline where natural habitats,

⁵² Sterman, J. D., Siegel, L., and Rooney-Varga, J. N. (2018). Does replacing coal with wood lower CO₂ emissions? Dynamic lifecycle analysis of wood bioenergy. *Environmental Research Letters*, 13(1), 015007. <https://doi.org/10.1088/1748-9326/aaa512>

⁵³ Environmental Integrity Environmental Groups Sue Texas Wood Pellet Plant for Toxic Emissions. (n.d.). Retrieved September 21, 2023, from <https://environmentalintegrity.org/news/environmental-groups-sue-texas-wood-pellet-plant-for-toxic-emissions/>

⁵⁴ Maryland Forestry and Wood Product Resources. (n.d.). Maryland-Forestry-Resources-Salisburyu.hub.arcgis.com. Retrieved September 21, 2023, from <https://maryland-forestry-resources-salisburyu.hub.arcgis.com/>

⁵⁵ Wulz, P., Waldner, C., Krainer, S., Kontturi, E., Hirn, U., and Spirk, S. (2021). Surface hydrophobization of pulp fibers in paper sheets via gas phase reactions. *International Journal of Biological Macromolecules*, 180, 80–87. <https://doi.org/10.1016/j.ijbiomac.2021.03.049>

⁵⁶ Material Safety Data Sheet Trifluoroacetic anhydride sc-213113 Section 1-Chemical Product and Company Identification Product Name Statement of Hazardous Nature Considered a Hazardous Substance According to OSHA 29 CFR 1910.1200. NFA Supplier Product Use. (n.d.). Retrieved September 21, 2023, from <https://datasheets.scbt.com/sc-213113.pdf>

⁵⁷ Torén, K., Hagberg, S., and Westberg, H. (1996). Health effects of working in pulp and paper mills: exposure, obstructive airways diseases, hypersensitivity reactions, and cardiovascular diseases. *American Journal of Industrial Medicine*, 29(2), 111–122. [https://doi.org/10.1002/\(SICI\)1097-0274\(199602\)29:23.0.CO;2-V](https://doi.org/10.1002/(SICI)1097-0274(199602)29:23.0.CO;2-V)

such as marshes and coastal forests, provide extensive services to reduce the impact of climate change to the coastal communities by dampening waves, stabilizing sediment, and absorbing water.

2. MDE, in coordination with state and federal agencies, must improve the current state of knowledge about carbon sinks and fluxes associated with wetlands (across wetland categories), the impact of ongoing programs aimed at restoring and preserving wetlands, and future policies that will improve current conditions and create more resilient ecosystems and communities.

- a. There is a lack of comprehensive and updated data to track progress and impact of Healthy Soils Competitive Fund and other related policies towards improving the Chesapeake Bay Ecosystem.
 - i. MDE/MDNR must invest in data collection and assessment efforts. These must rely on a combination of tools (sampling, remote sensing, data collection stations, stakeholder surveys), and should not depend exclusively on self-reporting.
- b. There is a lack of comprehensive and updated data to track progress and impact of policies like the Maryland Wetlands and Waterways Protection Program, which currently works to protect wetlands and waterways from loss and degradation.

3. There is a lack of recognition of the impact of sea level rise.

Despite the projected impact of sea level rise on coastal ecosystems (with the associated impacts on how those ecosystems change as a response to increasing water levels), the Pathway Report does not provide information about how it will be factored in nor policies to fill in informational gaps related to it. In particular, we urge Maryland to address:

- a. Carbon flux estimation in estuarine ecosystems,
- b. Conservation goals of wetlands and marshes (like Blackwater National Wildlife Sanctuary),
- c. Projected shifts in coastal forests and other ecosystems that could shift inlands as a result of increasing water levels and saltwater intrusion, and
- d. Homeowners and public infrastructure damages.

Connecting Children to Nature

Eighteen years ago, I spent ten days in the forest with a group of boys from a low-income housing program in Montgomery County. I'd just graduated with my degree in hearing and speech science, and I taught literacy for an after-school program in DC which ran programs on that forest land in West Virginia. Curiosity for non-indoors formats and environments in which to teach drove me in ... and I was transformed. As we hiked the trails, I easily engaged middle school boys in hard and meaningful conversations about society, culture, and history. As we stared at the Milky Way on a night sleeping out, we discussed the stars, the science of how everything in the universe is connected, and the spirituality that fed them. As we carried our compost out, we directly built our own food system! We spent time dancing, shared meals, and examined watershed systems all in one place. On a high wire on the high ropes course I ugly-cried in front of a group of 11-year-olds and faced my fear of heights as they and the capable senior staff cheered me on. I was hooked. I would do THIS kind of education from now on. I would become those senior staff.

Today I'm a farm to school specialist for Baltimore City Public Schools. While we can't always take kids on a two-hour field trip out to the Eastern Shore or the woods of West Virginia, kids can get the many benefits of interaction with nature and simultaneously connect with their food system by planting a school garden or visiting an urban farm or green space. A telling quote from a rising 4th grader this summer: "This camp made me curious so now I want to explore places like this more." As we adapt our cities and our education system needs to prepare for the impacts of climate change, there is no better "classroom" than our farms, green spaces, and waterways. These spaces—this outdoor infrastructure all around us—are the bridges to understanding the systems thinking that our 21st century curriculum is begging for, to connecting our virtual and physical worlds, and to connecting our bodies and minds.

- Laura Menyuk

Waste

In its Waste Management section, the Climate Pathway Report points to two main policy interventions already underway—enforcement of stronger landfill methane regulations and diversion of organic waste from landfills and incinerators. The report does not recommend any specific additional policies to reduce emissions in the solid waste sector beyond what Maryland has already passed. It omits significant opportunities to reduce emissions and conserve resources through Zero Waste policies. Analyses show that “introducing better waste management policies such as waste separation, recycling, and composting could cut total emissions from the waste sector by 84%. Separate collection and composting of organic waste alone “can reduce methane emissions from landfills by 62%, even with moderate ambition.”⁵⁸

Modeled Impact of Waste Recommendations

Due to uncertainties around appropriate modeling assumptions, policy recommendations in the Waste section were not integrated in the LEAP model at this time.

Composting at Home

My household has been participating in Prince George’s County’s curbside food scrap collection program for the last two years. It’s easy. We just put our food scraps and other compostables in our green bin for pickup on Mondays along with yard waste. Now that food and food-soiled paper products go into the compost and we recycle what we can, we send very little trash to the landfill each week—about two cubic feet that’s mostly unrecyclable lightweight plastic packaging. It’s good to know that making this simple change in our routine helps to decrease landfill methane emissions and contributes important organic material for enriching the soil. I hope that Maryland’s Climate Pathway will include communications to engage more people in participating in programs like this statewide.

- Janet, Upper Marlboro

1. The policies modeled in the Pathway Report

The two main waste interventions modeled in the Pathway Report are: (1) adoption and enforcement of stronger landfill methane regulations; and (2) diversion of organic waste from landfills and incinerators. These policies have been shown to reduce methane

⁵⁸ Global Alliance for Incinerator Alternatives (GAIA). (2022, October). *Zero Waste to Zero Emissions: How Reducing Waste is a Climate Game-Changer*, page 6. https://www.no-burn.org/wp-content/uploads/2022/11/zero-waste-to-zero-emissions_full-report.pdf

emissions, which are more than 80 times more impactful on warming than carbon dioxide emissions. They are definite priorities. It isn't clear to what extent the modeling of the impact of composting takes into account diversion of organics from commercial sources, households, and public institutions, such as schools. This could be explained.

The report also seems to incorporate an assumption that the voluntary statewide goals of Maryland's Sustainable Materials Management policy (in the 2017 executive order) will be reached. Those goals are a: 10% reduction in the amount of waste per capita; a 1.2 MMTCO₂e annual reduction in GHG emissions from material management by 2035; and a 4.3 trillion BTU annual reduction in energy use from materials management by 2035, "and more." There needs to be more explanation here of specifically what policies are involved and whether the state is on track to reach the goals. What is included in "Sustainable Materials Management"?

2. Additional policies to model

There are no additional waste policies modeled in the Pathway Report. Instead, Figure 2.18 simply speculates that annual waste diversion efforts would drive a 10% reduction from the baseline methane emissions through 2050. No specific policies or evidence are provided to support this. In order to meaningfully shape climate policy in Maryland, we encourage MDE to elaborate on or develop specific additional policies for their final climate plan.

There are several other policies that should be included and modeled in the final plan:

- a. **Phasing out trash incineration.** The draft report leaves significant potential to reduce emissions on the table by missing the opportunity to recommend that Maryland end trash incineration. Modeling in the report proves that Maryland's two incinerators produce an outsized proportion of Maryland's greenhouse gas emissions from the waste sector. The Chesapeake Bay Foundation did a study that found that the Wheelabrator incinerator in Baltimore alone causes 55 million dollars a year in health damages.⁵⁹

This is an additional policy that is likely to be adopted and the impact should be modeled. According to a recent report by the Global Alliance for Incinerator Alternatives (GAIA),⁶⁰ "each tonne of plastic burned results in the release of 1.43 tonnes of CO₂, even after energy recovery" and the energy recovered is not sufficient to offset the carbon footprint of the technology. A new peer-reviewed report found that incinerators emit more greenhouse gas emissions per unit of electricity produced than any other power source.⁶¹

⁵⁹ Chesapeake Bay Foundation. (2017, Dec 11). *CBF Study: Baltimore Incinerator Causes \$55 Million in Health Problems Per Year* [Press Release]. <https://www.cbf.org/news-media/newsroom/2017/maryland/cbf-study-baltimore-incinerator-causes-55-million-in-health-problems-per-year.html>

⁶⁰ Global Alliance for Incinerator Alternatives (GAIA). (2022, October). *Zero Waste to Zero Emissions: How Reducing Waste is a Climate Game-Changer*. https://www.no-burn.org/wp-content/uploads/2022/11/zero-waste-to-zero-emissions_full-report.pdf

⁶¹ Tangri, N. (2023). Waste incinerators undermine clean energy goals. *PLOS Clim* 2(6): e0000100. <https://doi.org/10.1371/journal.pclm.0000100>.

Both Montgomery County and Baltimore City have expressed the intent to close the two remaining trash incinerators in the state; Mayor Scott of Baltimore City has already pledged that the City's current contract with the Wheelabrator incinerator will be its last. It is surprising, therefore, that the impact of their closure is not reflected in the modeling in the Climate Pathway report. For the final report, MDE should lay out steps to reduce or eliminate emissions from trash incineration in Maryland.

b. Prohibiting or significantly limiting the provision of single-use plastic products and packaging for which there are more sustainable alternatives.

According to the GAIA report, about 70% of global greenhouse emissions come from the extraction, manufacture, and disposal of products.

In national inventories, these emissions are tallied in the industrial, agricultural, transportation, and energy sectors, as well as the waste sector. Yet curbing waste generation and implementing better waste management strategies avoids emissions throughout the lifecycle of material goods—from extraction to end of life. The mitigation potential of the waste management sector is therefore largely underestimated.⁶²

This underscores the importance of **source reduction** in reducing greenhouse gas emissions. One of the worst perpetrators is single-use items and packaging, particularly made of plastic. Plastic is manufactured from fossil fuels; methane and other greenhouse gasses are emitted at every stage of its production, from extraction to manufacture to transport and disposal. Most plastic is not recyclable and its production, according to the GAIA report, is doubling every 20 years. We'd like to see modeling of greenhouse gas emission reductions arising from prohibiting or significantly limiting the provision of single-use plastic products and packaging for which there are more sustainable alternatives. These items are believed to constitute about 40% of plastic production, and many of these items could be replaced by reusable equivalents.

- c. Adopting a deposit/return system for beverage containers.** 5.2 billion beverage containers were sold in Maryland in 2019, but only an estimated 1.2 billion were recycled. The remaining 4 billion were buried, burned, or littered. According to the Container Recycling Institute, a beverage container deposit/return program with a 10-cent refundable deposit on all aluminum beverage cans and glass and plastic bottles would increase the recycling rate for beverage containers from 23% to 90%, avoiding an additional 198,489 MTCO₂e annually in Maryland. This is the equivalent of removing annual emissions from 43,150 cars (assuming 4.6 MTCO₂e annual emissions/car). These programs

⁶² Global Alliance for Incinerator Alternatives (GAIA), 2022, page 4.

recover high-quality materials that can be used post-consumption to reduce the need for extraction of virgin materials in production.

Reducing Beverage Container Litter

The pervasive beverage container litter on Maryland's roadsides and waterways is evidence of a missed opportunity to reduce greenhouse gas emissions, conserve materials, and reduce litter and plastic pollution. I vacation in Maine every year, where they've had a beverage container deposit-return program since the 1970s. Depending on the container, consumers pay a 5-15 cent deposit on beverages when purchased, and the deposit is refunded when the containers are returned for recycling. About 85% of beverage containers are returned, and there's virtually no roadside litter. Because there's value attached to each empty container, people are less likely to litter and, when they do, others collect and return them. The high return and recycling rates reduce greenhouse gas emissions that would be generated by extraction and production of virgin materials for new beverage containers. A 10-cent deposit per container would raise Maryland's recovery rate for beverage containers from only a quarter to 90%, capturing more than 3 billion containers currently being landfilled, incinerated, or littered.

- Holly, Laurel

- d. **Increasing minimum post-consumer recycled content for plastic beverage containers, rigid food containers, and rigid non-food containers.** Post-consumer recycled content reduces the need for virgin plastic, and thus reduces greenhouse gas emissions (including methane emissions). We suggest the following targets: beverage containers—50% PCR content by 2033; rigid food containers—40% by 2033; rigid non-food containers—40% by 2040.

Overarching Recommendations

Revenue

Achieving Maryland's climate goals will bring enormous co-benefits in the form of improvements to health, economic development, access to clean air, clean water, and natural beauty, and improvements in quality of life that come from living in healthy, sustainable communities. We appreciate that the Pathway Report highlights the significant health benefits of climate action, and we urge the state to quantify the other health, environmental, and economic benefits of climate mitigation and how it will help advance other state goals.

We recognize that many of the important changes recommended in the Pathway Report, and our recommendations, will require up front capital, measuring in the billions of dollars. Below we offer recommendations on how to identify available capital by ceasing counterproductive programming, maximizing federal funding, and assessing fees on international polluters, as well as equity principles to consider when exploring any other type of new revenue generation.

We offer the following principles and guidance for how we recommend that the state approach identifying additional revenue.

1. Save billions of dollars by ceasing counter-productive and harmful spending.

First and foremost, we recommend the state identify areas to avoid spending and save money by ceasing current programs that are counter to Maryland's climate goals. Some of these programs are identified in the Pathway Report, but many are not. The state should audit department spending against these recommendations and proactively and quickly amend or eliminate programs.

- Eliminate or redirect millions of dollars of rate-payer funded subsidies for trash incineration, biomass, and other polluting of electric generation.
- Freeze rate-payer funded expansion of gas infrastructure, including through the STRIDE program, which currently finances new gas infrastructure with a lifespan of "over 100 years," according to Washington Gas & Light's Director of Construction Program Strategy and Management,⁶³ even as the climate plan requires Maryland to transition off gas in around 25 years.
- Avoid investments in new highway construction that will increase vehicle miles traveled.

2. Maximize federal funding

⁶³ Case No. 9708 - Washington Gas Light STRIDE 3 - Evidentiary Hearing, at 55:01 to 55:06 (Accessed 2023, Sept. 26). <https://www.youtube.com/watch?v=iXqtUeyALAc>.

To achieve its ambitious GHG emissions reduction goals, Maryland must take full advantage of the unprecedented levels of clean energy and energy efficiency funding, investment tax credits, consumer rebates, environmental justice resources, and workforce development training funds made available by Congress in the November 2021 Bipartisan Infrastructure Law (BIL) and the August 2022 Inflation Reduction Act of 2022 (IRA). While these programs offer some formula grants, the most significant funds will be distributed through competitive grants. To effectively compete for funding, Maryland must transition from concept to action incredibly quickly. Maryland must adopt concrete and compelling goals across all sectors, develop robust implementation plans, improve intergovernmental collaboration, and create an action plan on how to maximize potential federal funding.

There are specific operational steps and best practices that we recommend Maryland take to position itself to take advantage of federal funding, and specific funds we urge the state to pursue.

Solar for All (\$7 billion) provides an opportunity for hundreds of millions in funding for solar development in low to moderate income buildings, commercial and more. The program has 20% carve-out for “enabling upgrades”, also using the Climate Pollution Reduction Grants to address key funding gaps or areas of concern.

National Clean Investment Fund will distribute \$14 billion to 2-3 national nonprofits to support a range of individual, home, business and government clean energy development. States with clear goals and implementation plans will be best positioned to compete for these funds.

Clean Communities Investment Accelerator (\$6 billion) will provide grants to support several national nonprofit organizations, enabling them to “provide funding and technical assistance to public, quasi-public, not-for-profit, and non-profit community lenders working in low-income and disadvantaged communities.”

3. Implement Justice 40 principles in existing and new revenue streams.

For any new revenue stream, ensure Maryland is following the Justice 40 principles which direct that at least 40% of programmatic expenses go to overburdened and underserved communities. State programs providing funding to businesses, such as clean energy developers or housing owners, should also advance other state goals, including paying a living wage, protecting tenants from rate hikes.

4. Avoid or minimize impacts on low- to moderate-income Marylanders

The financing of the clean energy future must avoid disproportionate harm on low- to moderate-income Marylanders. We urge the state to prioritize progressive rate structures, which tier the amount paid based on income levels. We encourage the

Maryland General Assembly, Governor, and PSC to implement a strategy that reduces the energy burden for low income Marylanders. We recommend a Percentage of Income Payment Program that caps the total percentage of a household income that will pay for utilities.

5. Make historic polluters pay for solutions

We endorse the concept of assessing a one-time fee on the largest historic polluters, such as oil companies, which have profited from decades of pollution while funding misinformation about the severity of the climate crisis.

Require all companies who sell their product in Maryland and have cumulatively emitted more than 1 billion tons of greenhouse gas emissions in recent decades to pay into a fund to be used for mitigation and adaptation in Maryland. These companies would cumulatively pay \$9 billion, and these costs would not be able to be passed on to consumers.

6. Carbon pricing concerns

The Pathway Report recommends a “Cap and Trade” policy. Members of Climate Partners have a range of views on Cap and Trade and carbon pricing overall. We recommend that as the state explores any revenue strategies, it solicits broad input, especially from overburdened and underserved communities.

Monitoring and Accountability

We believe that Maryland's plan should be robust, transparent, self-correcting where there are shortfalls, prioritized, and politically sustainable. It would help state officials, legislators, and the general public for the plan to have a performance monitoring and accountability framework. For example, the plan should indicate, in a manner that is clear to policy makers and the public, which elements have the biggest effects on emissions.

There should also be a process to monitor whether those steps are implemented. The plan should also contemplate appropriate policy and administrative responses if there are shortfalls in actions. In particular, the plan should rely upon realistic assumptions that are periodically revisited, rather than on a best-case scenario that may not occur. We also should aim for a plan that achieves its goals and provides widespread benefits to Marylanders so that the plan sustains political support. Co-benefits (such as cleaner air, shorter commutes, better access to greenspaces) could be an important strategy for helping to sustain that support.

We urge the state to set up an online dashboard charting progress on the state's overall progress on GHG reduction and progress on specific elements, similar to BayStat or StateStat.

Conclusion

We commend Maryland for setting this ambitious goal and for its commitment to equity and environmental justice. We are encouraged by the bold ideas and ambition in the Climate Pathway Report and hope that ideas and recommendations from Climate Partners will be incorporated into the state's climate plan and future state policies and implementation strategies.

We recognize that implementing a plan of this magnitude does not happen overnight. We encourage the state to develop consistent systems for transparency and ongoing participation to ensure the public is able to continue to engage and support this process.

Technical Appendix

PRELIMINARY RESULTS

Content and Results of Greenhouse Gas Emissions Reduction Scenarios for Maryland, Geared Toward Addressing the State's "60% by 2031" Reduction Goal Actions Implemented to Date

Center for Climate Strategies, 10-13-23

Note: The scenario descriptions and results provided below, in aggregate and by sector, describe the estimated greenhouse gas (GHG) emissions reductions, energy demand impacts, and energy supply changes from implementing a set of additional actions beyond recent policies in Maryland, which we refer to as "Climate Partners' Recommended Actions". Most of these actions are based on policies suggested by organizations participating in discussions with Climate Partners and other climate change policy dialog in Maryland, but some, as noted below, have been added provisionally by the Center for Climate Strategies modeling team based on additional technical input and expertise as consistent with and/or beneficial to reaching Maryland's emissions reduction goals. Although these results focus on non-cost impacts of the scenarios, a set of provisional results summarizing some cost impacts are provided as an Annex to this document.

This document is meant to provide graphic results and summary narrative for review and feedback to the modeling team and as working estimates, not as a final polished document. Note that these results are preliminary and may be revised based on review and input for published use. A report with full modeling results, including additional actions not described here, will be made available by Center for Climate Strategies later. The Center for Climate Strategies (CCS, 2023) should be cited as the source of any data used from this document used for information sharing, report, or publication purposes.

1. Summary Results

- As shown in the Figure 1-1 and Figure 1-2, below, the combination of the Climate Partners' Recommended Actions beyond the Recent Policies case reduces 2031 emissions by more than 10 million metric tonnes of carbon dioxide equivalent (MMtCO₂e). This leaves a gap of about 6 MMtCO₂e to meeting Maryland's 2031 goal of 60 percent reduction relative to 2006 greenhouse gas (GHG) emission levels as estimated by the Maryland Department of Environment (MDE). This scenario does, however, meet the 2031 goal by 2033.
- The model results show impacts out to 2050, often by extending impacts of proposed policies through 2050. However, it should be noted that Climate Partners focused primarily on recommendations to achieve the 2031 target.

- The Climate Partners’ Recommended Actions included here, although not exhaustive of all the actions Maryland could take to reduce emissions, do include reduction measures across virtually all sectors, and begin the process of substantial transformation of a number of sectors in Maryland towards environmental sustainability.
- There are sectors where additional reductions in GHG emissions are possible by 2031. The degree to which actions in those sectors beyond those reflected here could be implemented is difficult to assess and may in many cases be limited by the logistical difficulties associated with funding, mounting, and staffing aggressive programs in time to achieve the 2031 goal. This does not mean that these programs cannot be done or should not be done. Rather that it seems to us logistically challenging for such additional programs to be mounted in time to meet the 2031 goal. Examples might include very extensive deployment of building energy efficiency and electrification in low-income and other homes, implementing additional electrification in the transportation fleet by actively retiring internal combustion vehicles or repowering existing vehicles with battery electric systems, and/or much more stringent control of methane emissions from waste management and fossil fuel infrastructure. For some energy end uses, key examples being aviation, international marine shipping, and, to a lesser extent, rail freight, it will be difficult for Maryland to make inroads on emissions reduction without more aggressive regional and/or national and/or international efforts to “decarbonize” those sectors, although such efforts are possible.
- Note that the modeling of Maryland’s energy and non-energy GHG emissions described here has focused on transitions in the physical stocks, technologies, and usage of devices and processes, including devices such as residential appliances, commercial equipment, and vehicles, and processes such as industrial manufacturing and different types of electricity generation. This modeling, to date, has not tried to estimate the impact of primarily economic tools and policies, such as carbon dioxide cap-and-trade systems, carbon taxes, or other options that use economic levers to affect the behavior of individuals and organizations, and thus reduce GHG emissions. These economic tools and policies could certainly be used to encourage the sorts of transitions included in the options explored in the modeling described in this document, but are not modeled directly, as is done in other modeling approaches.
- While electrification of demand sectors reduces direct emissions, the reductions in economy-wide emissions become greater as renewable energy added to the grid reduces the electricity carbon intensity. Therefore, electrification reductions achieved per unit of equipment replaced are smaller in the near term than they are in the long term.
- Figure 1-3 shows the substantial reduction in fossil fuel use—including of gasoline, diesel, and natural gas—and the increase in electricity use beyond the recent policies case (which already includes substantial reductions in transport fossil fuel use through implementation of the Advanced Clean Cars program).
- As shown in Figure 1-4, a substantial shift to clean electricity production, and more electricity production, in Maryland is well underway by 2031, with natural gas and imports being reduced, and renewable generation increased over time.

Figure 1-1

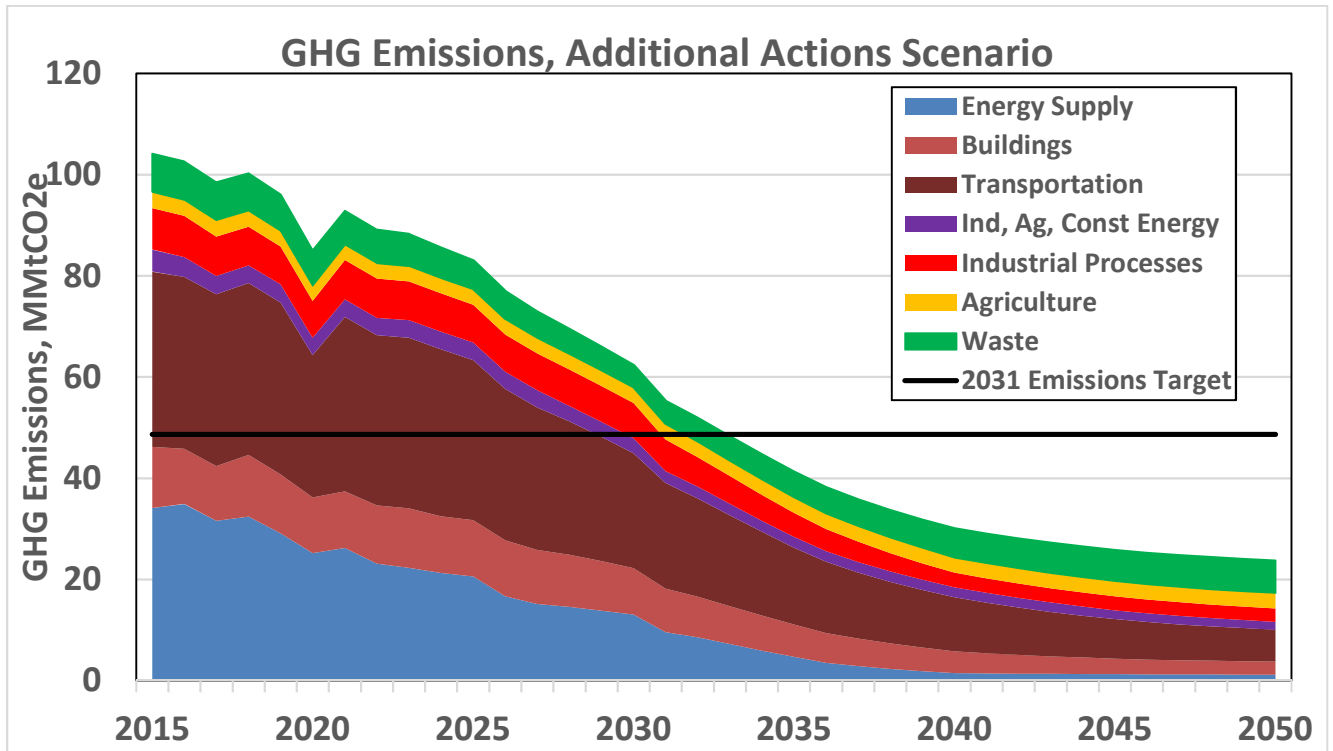
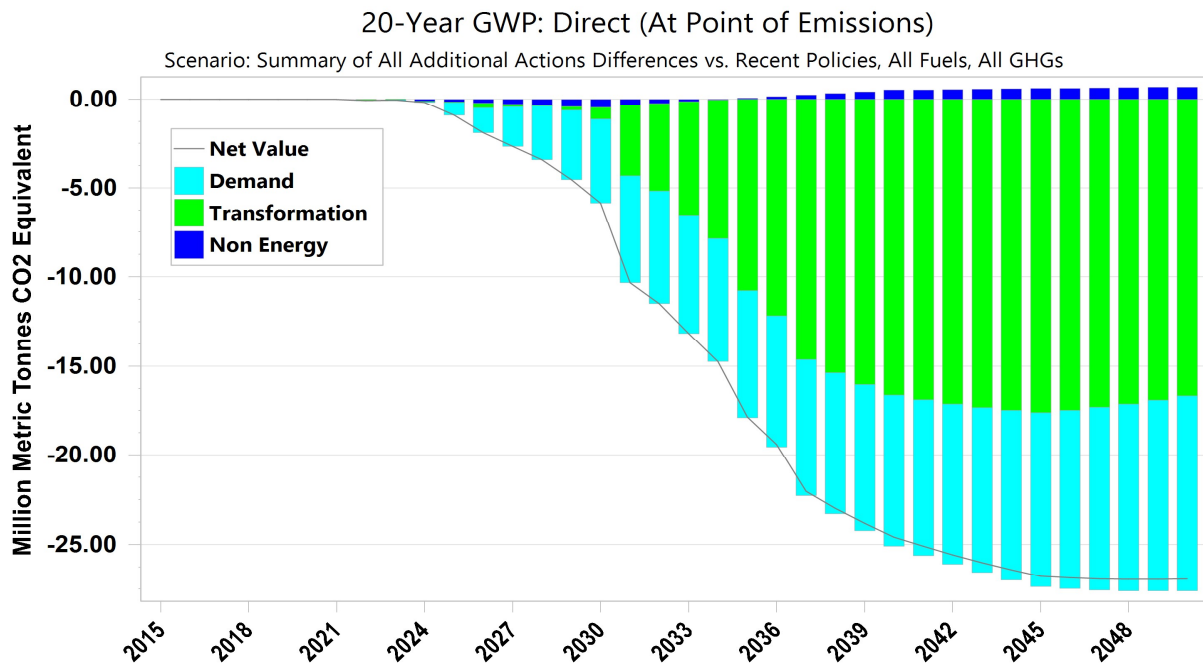


Figure 1-2



Note: 20-Year GWP refers to global warming potentials—measures of the degree to which a unit (one kilogram, for example) of a particular greenhouse gas affects climate relative to the climate effect of a kilogram of carbon dioxide—that are considered over a 20-year time horizon. GWPs are used to place the emissions of all of the different GHGs—CO₂, methane, nitrous oxide, and many others—on the same “CO₂ equivalent” basis, so that their impacts on climate can be summed. 20-year GWPs are used in this modeling instead of 100-year GWPs, consistent with the Climate Solutions Now Act of 2022 and the Maryland Department of Environment’s GHG Inventories. The use of 20-year GWPs principal effect on the modeling described here is that it tends to amplify the impact on total CO₂e of methane emissions relative to CO₂ emissions, as the IPCC (Intergovernmental Panel on Climate Change) 20-year GWP used for methane is 85, whereas the 100-year GWP for methane is 30.

Figure 1-3

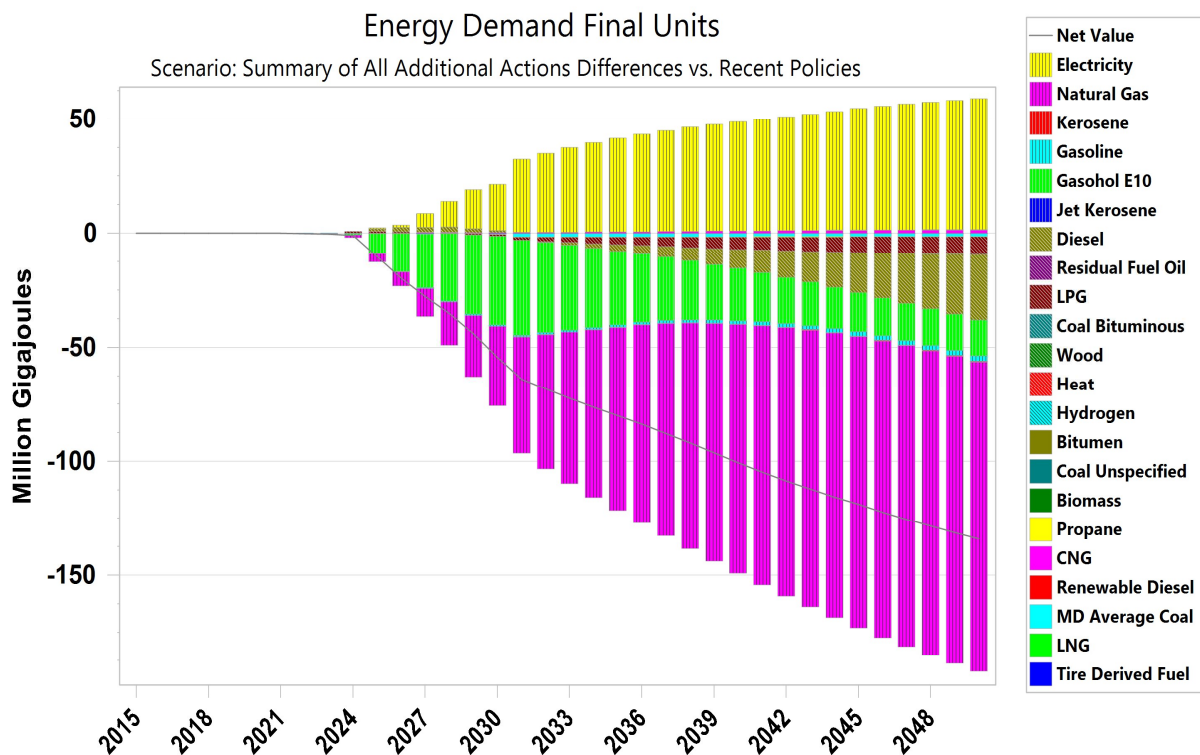
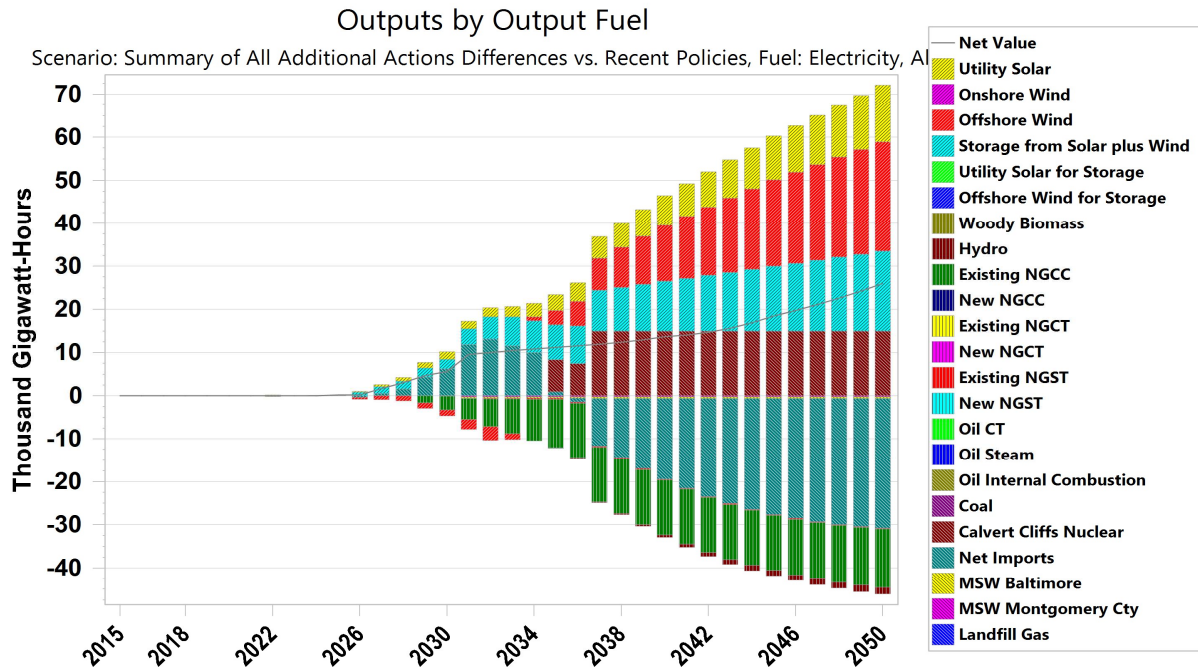


Figure 1-4



2. Transportation Sector

The Transportation sector in the Maryland LEAP model includes “branches” for Light Duty Autos, Light Duty Trucks (together, light duty vehicles, or LDV), Heavy Duty Trucks (HDV), and “Other”, which includes aviation, bus transport, rail transport, shipping, recreational equipment, outdoor (lawn and garden) equipment, and other categories of (mostly, at present) motor fuels use. Most of these branches include multiple types of technologies, such as conventional gasoline and/or diesel, battery electric, and plug-in hybrid vehicles. Actions related some but not all of these Transportation segments are reflected in the list of individual “scenarios” below, the results of which are compiled into an overall Transportation Summary scenario, which itself is a component of the full Summary of Climate Partner’s Recommended Actions case.

Key assumptions for the Transportation sector in the Climate Partners’ Recommended Actions case are as follows:

- The scenario incorporates on the considerable expansion in deployment of electric LDVs (essentially all sales are electric by 2035), and HDVs (near 50 percent of sales by the late 2030s) by extending electrification in the HDV class, incorporating diversion of 20 percent of vehicle miles traveled (VMT) to other powered transit modes (trains, buses, and e-bikes) as well as to foot and bike traffic, and avoidance of about half of the VMT target through denser development, carpooling and other approaches.
- Electrification of buses, rail travel (passenger and freight) and other transport equipment, with the notable exception of the aviation and marine shipping sectors, also builds on the Recent Policies case.

Key results for the Transportation sector in the Climate Partners’ Recommended Actions case, emphasizing results in 2031, are as follows:

- Overall emissions from transportation in 2031 fall by 2.6 fall by MTCO₂e relative to the Recent Policies case, to about 21 MMtCO₂e total (Figure 2-1 and Figure 2-2).
- Emissions gains from the Climate Partners’ Recommended Actions case decrease, non-intuitively, in future years, largely because the bus fleet is not electrified as fast as the LDV fleet, and as a result there is a shift of some LDV from electric cars to diesel buses (see Figure 2-3).
- HDV energy use decreases markedly as the subsector is electrified (Figure 2-4).
- Emissions from the aviation sector (with the exception of airport operations) and from the marine shipping sector follow the RPL case, as those sectors are difficult to decarbonize without a national/international effort and was beyond the scope of the current Climate Partners effort (Figure 2-5).

Figure 2-1

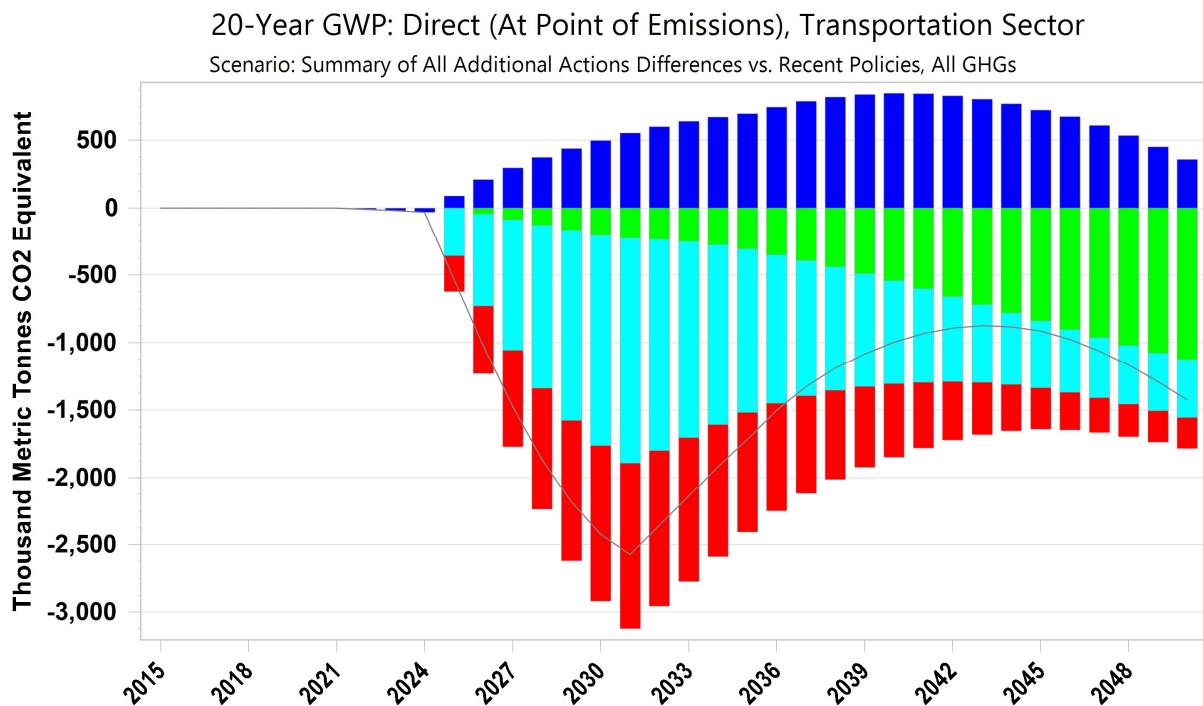


Figure 2-2

20-Year GWP: Direct (At Point of Emissions), Transportation Sector

Scenario: Summary of All Additional Actions, All Fuels, All GHGs

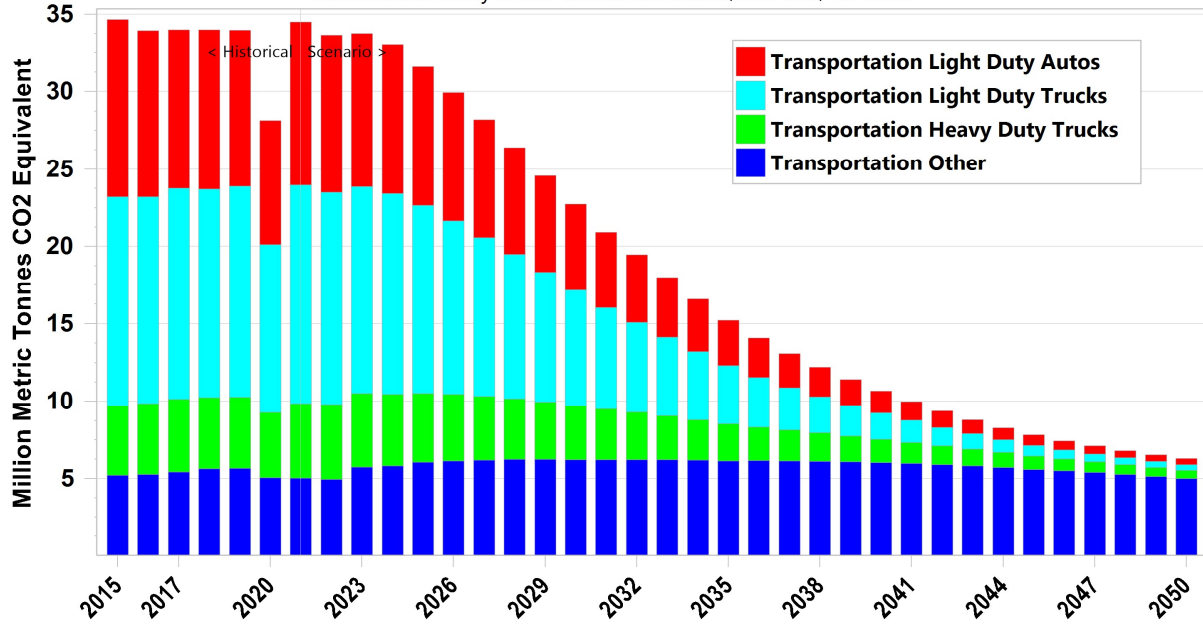


Figure 2-3

Energy Demand Final Units

Scenario: Summary of All Additional Actions No Comparison, All Fuels

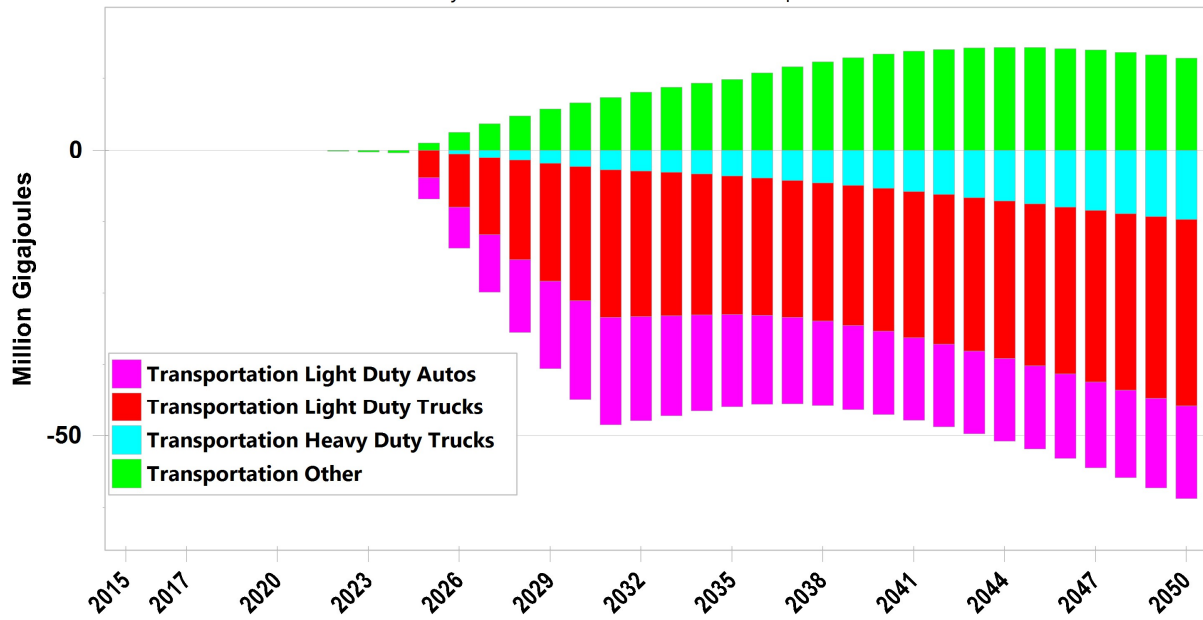


Figure 2-4: Energy Demand for HDV

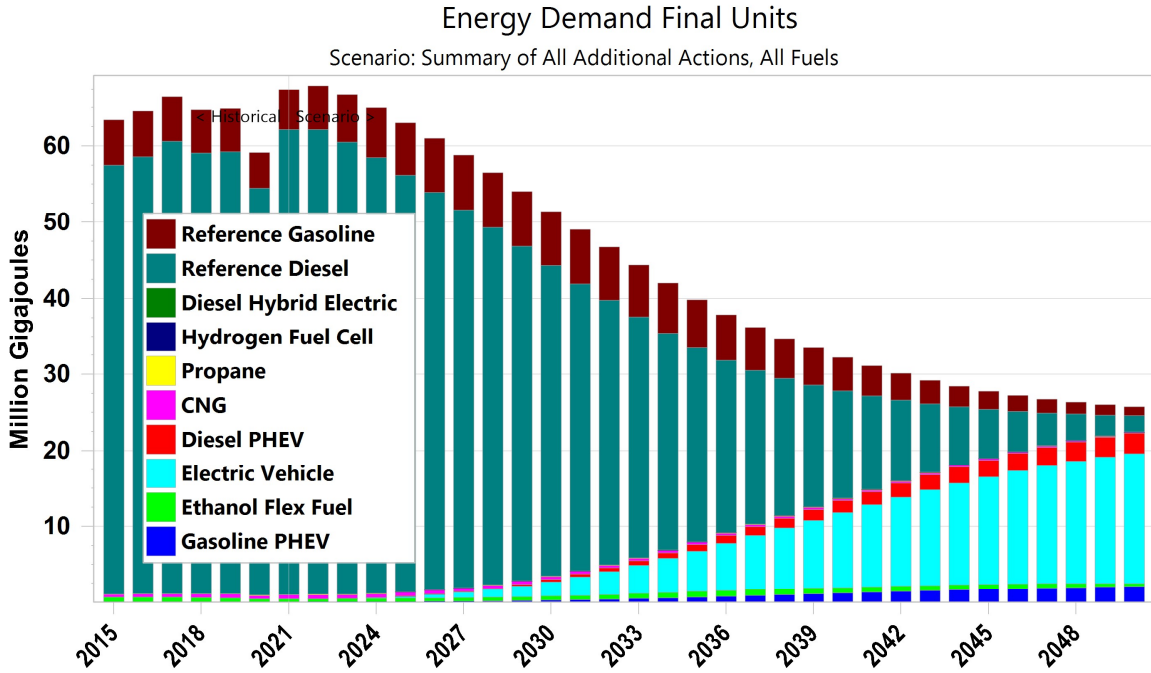
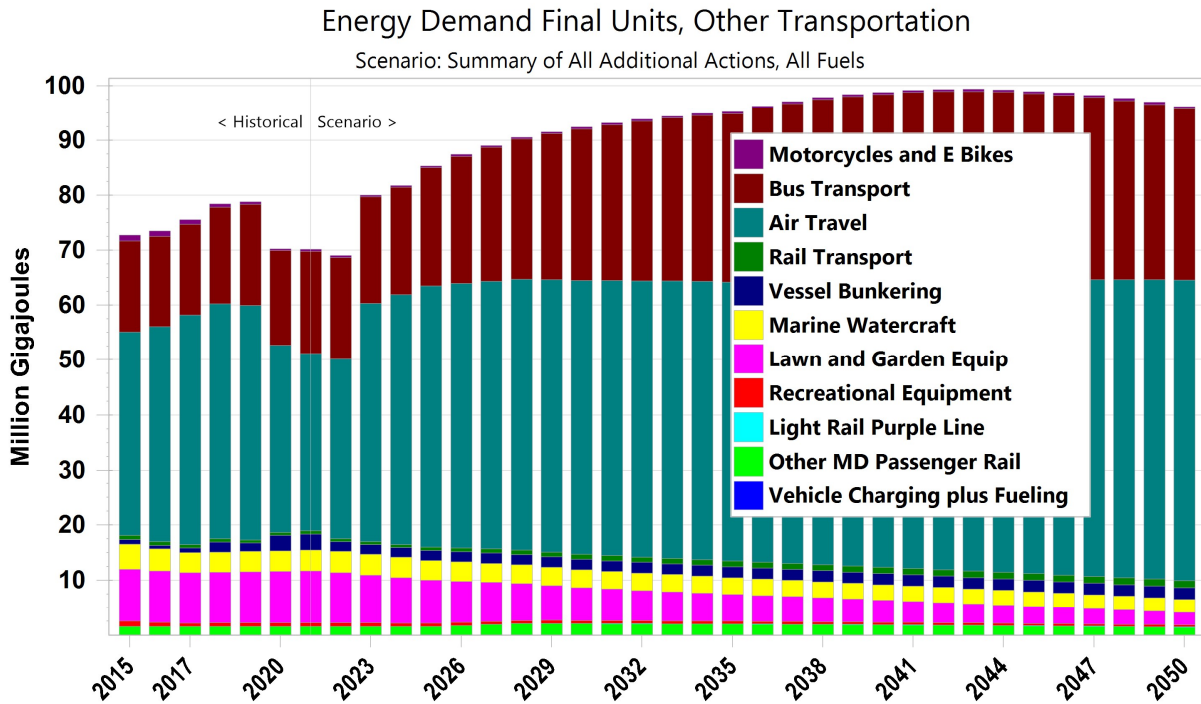


Figure 2-5



Additional details on each of the individual scenarios that sum to yield the Transportation actions results are provided below:

1. The **VMT Reduction (VMR)** scenario assumes that LDA and LDT VMT (but not HDV VMT) are reduced by 20% relative to the RPL case as of 2031, starting in 2025. Of the 20% VMT reduction, a small portion (less than one percent by 2031) are shifted to passenger rail (Amtrak, MARC, Purple Line) and e-bikes, about 10% of the total VMT to buses, and the remainder of the 20% are assumed to be accounted for by more trips on foot or (non-E) bike, in part due to denser development, increased vehicle occupancy (carpooling), and other changes that do not add to energy use. Assumptions for moving VMT are as follows:
 - Increase occupancy of MARC and the Purple Line by a factor of two by 2031 and increase the number of MARC and Purple Line trains by a factor of two by 2031 and three in 2050, with only the latter affecting energy use. This shifts about 0.45 percent of VMT (very roughly) by 2031. Passenger-miles traveled on MARC are estimated very roughly at this point.
 - Increase the rate of growth of e-bike VMT such that E-bike VMT more than double by 2050, and increase by about 40% by 2031, relative to the reference case. This shifts about 0.30 percent of VMT (very roughly) by 2031 and could come from a fraction of increased e-bike purchases and increased usage of bikes purchased in the Reference case.
 - Shift additional LDV VMT to buses by doubling the capacity factor of buses in service now by 2031, and doubling the number of buses (overall, which means slightly more than a doubling of transit bus VMT, assuming the number and travel of school buses—about 20% of all buses by number—remain roughly as they are now) by 2035, and a quadrupling of the number of buses by 2050.
 - Initial estimates suggest that the combination of additional rail, e-bike, and bus passenger travel will account for about half of the 20% VMT reduction by 2031, meaning that the other half will need to come from a combination of non-motorized transport, additional carpooling, and reduction of transportation needs by a variety of land-use and other measures. A comprehensive VMT study would be needed to develop more accurate estimates.
2. **Additional HDV Bus Heavy Equipment Electrification** (new **HVE** scenario) assumes that truck electrification, rather than plateauing in 2035 as in the Recent Policies case, reaches 80 percent in 2036, and continues through 2050, reaching 100 percent (sum of BEV, diesel PHEV, gasoline PHEV) by that year. Note that this particular assumption will not affect 2031 results. This scenario also includes an increase in the fraction of buses that are electric to 70 percent in 2050 (from 30% in the reference case), and the stock of construction equipment to 60% electric by 2050 (from 20% in the reference case), and the stock of airport operations equipment that has in the past been mostly diesel-fueled to 75% electric by 2050. All of these latter elements reduce 2031 emissions modestly (for buses, for example, the stock of electric buses in 2031 increases from 8.2% in the RPL case to 16.6% in the HVE case), because the rate of electrification occurring before 2031 increases.
3. **Rail Electrification** (new **RLE** scenario) assumes that 50% of MARC (up from an estimated 28% today on the Penn Line, although that is a very rough estimate that should be revised via research) is electrified by 2031, increasing to 100% by 2050, and that 25% of rail freight is electrified by 2031, increasing to 60% by 2050.

4. In the **Freight Mode Shift and Rail Freight Electrification (FMS)** scenario we assume that 10% of 2021 Maryland road freight is shifted to rail by 2031, and 25% by 2050, starting in 2026. In addition, we assume that 50% of rail freight in Maryland is electrified by 2050, starting in 2028. A key uncertainty here is the extent that Maryland can influence change in what is a national industry (of which Maryland's miles of rail are a small part).

In the Other Transportation Electrification (OTE) scenario, we assume that electrification increases in Marine Watercraft and Recreational Equipment to 15% by 2030 and 50% by 2050, and in Lawn and Garden Equipment to 40% by 2030 and 90% by 2050.

3. Energy Supply Sector

The energy supply sector in the Maryland LEAP model includes "modules" for Rooftop Solar PV (outputs not subject to transmission and distribution losses), District Heat Provision, Hydrogen production¹, electricity and gas transmission and distribution, LNG (liquefied natural gas) Exports, Electricity Generation (central grid), Natural Gas pipelines, and Coal Production and Natural Gas Production specific to Maryland. On the order of 20 different types of electricity generating units are included in the Electricity Generation module. Actions related some but not all these energy supply segments are reflected in the list of individual "scenarios" below, the results of which are compiled into an overall Energy Supply Summary, which itself is a component of the full Summary of Climate Partners' Recommended Actions case.

Key assumptions for the Energy Supply sector in the Climate Partners' Recommended Actions case are as follows:

- The scenario includes considerable expansion in deployment of utility (or independent power producer) solar relative to the Recent Policies case (RPL) and continues the trend in deployment of offshore wind generation and energy storage beyond the levels in the RPL case. For example, offshore wind deployment reaches about 5.3 GW (gigawatts, or thousand megawatts) in the Climate Partners' Recommended Actions case, versus 3 GW in the RPL case. Utility solar rises to nearly 6 GW by 2035 in the Climate Partners' Recommended Actions case, up from about 3 GW in the RPL case. For modeling purposes, storage is assumed to use energy from offshore wind and utility solar for charging, and to store energy for eight hours.
- The scenario includes life extension for the two Calvert Cliffs nuclear units, which will therefore run (at what is assumed to be full capacity) beyond the end of the modeling period (2050).
- All fossil-fueled generation, as well as waste-to-energy plants, are taken offline (although their sites could be used for renewable generation and/or transmission interties) by 2035 or earlier.
- The scenario includes considerable increases in rooftop solar (residential, commercial, industrial, and community solar) relative to the Recent Policies Case, through an assumption of relaxed limits on deployment of net metering, improved procedures for siting and interconnection, homeowner/installer incentives, and other measures.

¹ There is a small amount of green hydrogen produced in the energy supply sector in the Recent Policies and Climate Partners' Recommended Actions scenarios. This fuel is mostly consumed by hydrogen buses, as well as some trucks and other vehicles. This was a modeling design element to provide hydrogen fuel for vehicles already coming into the fleets, but not an explicit policy recommendation.

- Imported electricity is assumed to be effectively carbon-free by 2040, reflecting the achievement of regional goals in the PJM (Pennsylvania/Jersey/Maryland) system through the RGGI (Regional Greenhouse Gas Initiative).
- The powering of the Cove Point LNG liquefaction terminal, a major point source of GHG emissions, is assumed to be electrified in 2030, eliminating natural gas combustion in gas turbines that drive compressors.

Key results for the Energy Supply sector in the Climate Partners' Recommended Actions case, emphasizing results in 2031, are as follows:

- Overall emissions from energy supply fall from over 25 MMtCO₂e in 2021 to less than 10 MMtCO₂e by 2031, led largely by reductions in emissions from electricity generation, which in turn are due to increases in renewable generation and reduction of fossil generation (see Figure 3-1).
- Emissions from LNG exports are reduced to zero in 2031 because of the electrification of LNG liquefaction.²
- Output from Rooftop Solar reaches about 4 TWh (Terawatt-hours) by 2031 at almost 3 GW of capacity, about 6 percent of total requirements in that year (Figure 3-2).
- Renewables become a much larger part of generation by 2031, as coal-fired generation ends in the 2020s, and gas-fired and oil-fired generation are shut down by 2035. By 2045, renewables and nuclear are dominant, and Maryland becomes a net exporter of electricity. Some "Net Imports", meaning imports from other PJM states, are still needed, as shown in Figure 3-3, to balance load. The longer-term net result of the combination of the cases below is that almost all generation is renewable by 2045, and in-state generation is sufficient to meet in-state requirements, even factoring in demand-side (and some supply-side) electrification. Figure 3-4 shows the evolution of generation capacity in the Summary case. For reference, Figure 3-5 shows generation capacity in the Recent Policies case.

² In practice, it is unlikely that emissions from the LNG plant will actually fall to zero—a better understanding of plant processes and fugitive emissions is required to more accurately estimate net reductions—but electrification will cause most GHG emissions from the plant to be avoided.

Figure 3-1

20-Year GWP: Direct (At Point of Emissions): Energy Supply

Scenario: Summary of All Additional Actions, All Fuels, All GHGs

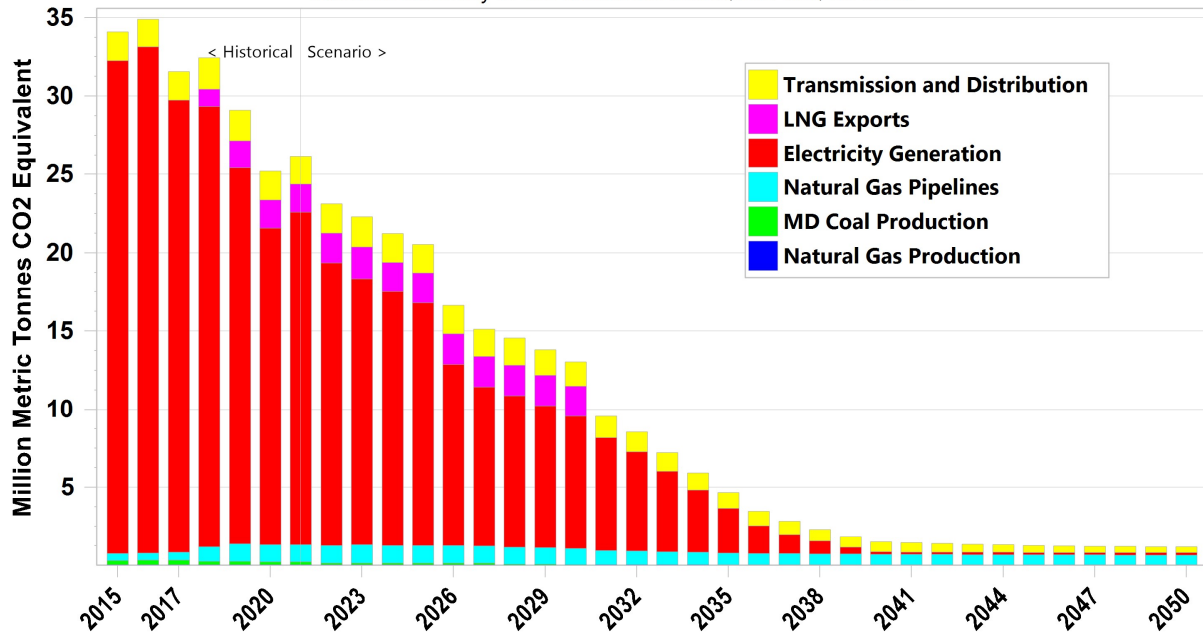


Figure 3-2

Rooftop Solar Outputs by Output Fuel

Scenario: Summary of All Additional Actions, All Fuels

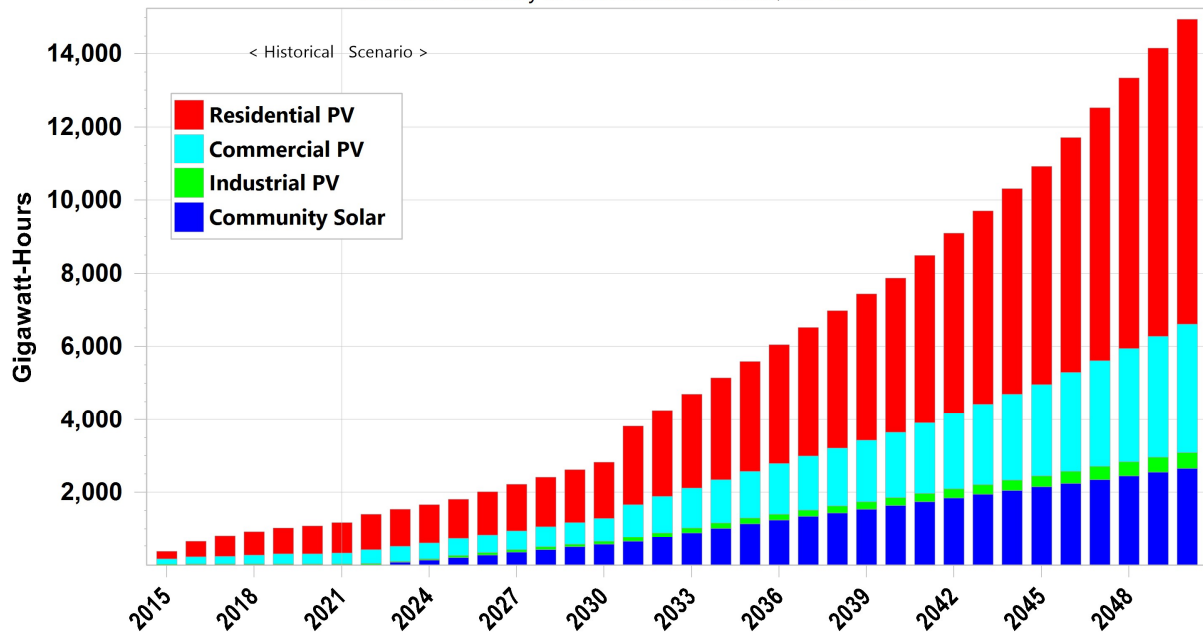


Figure 3-3

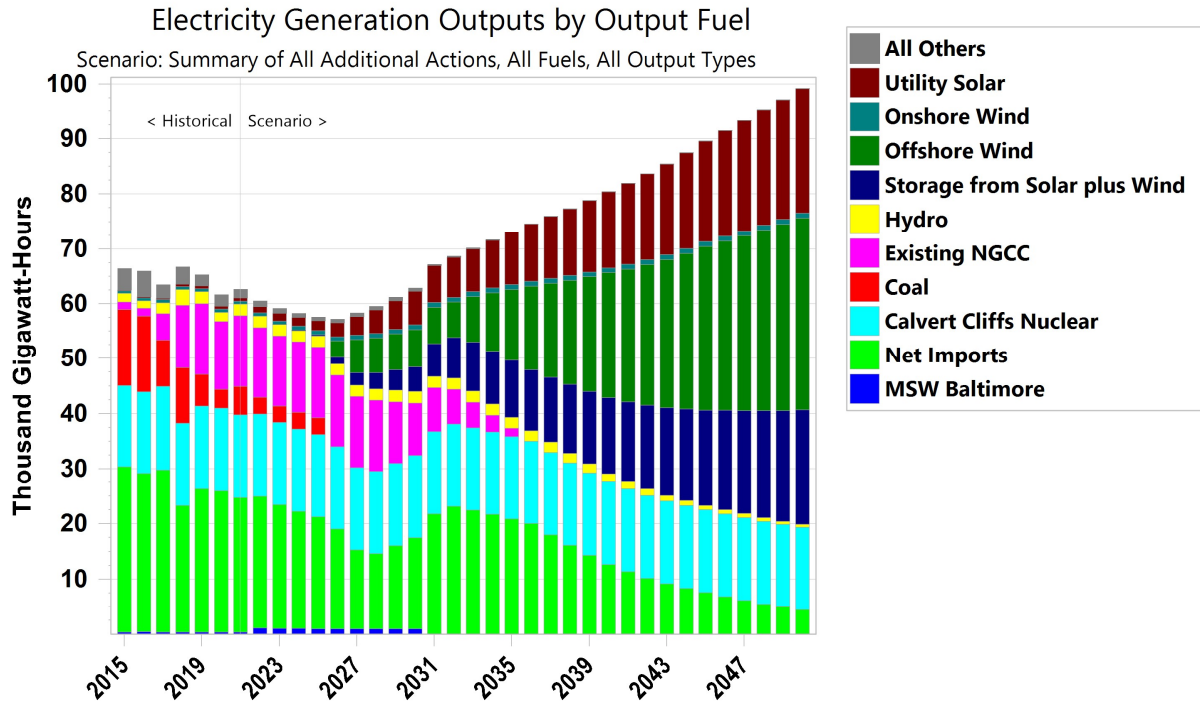
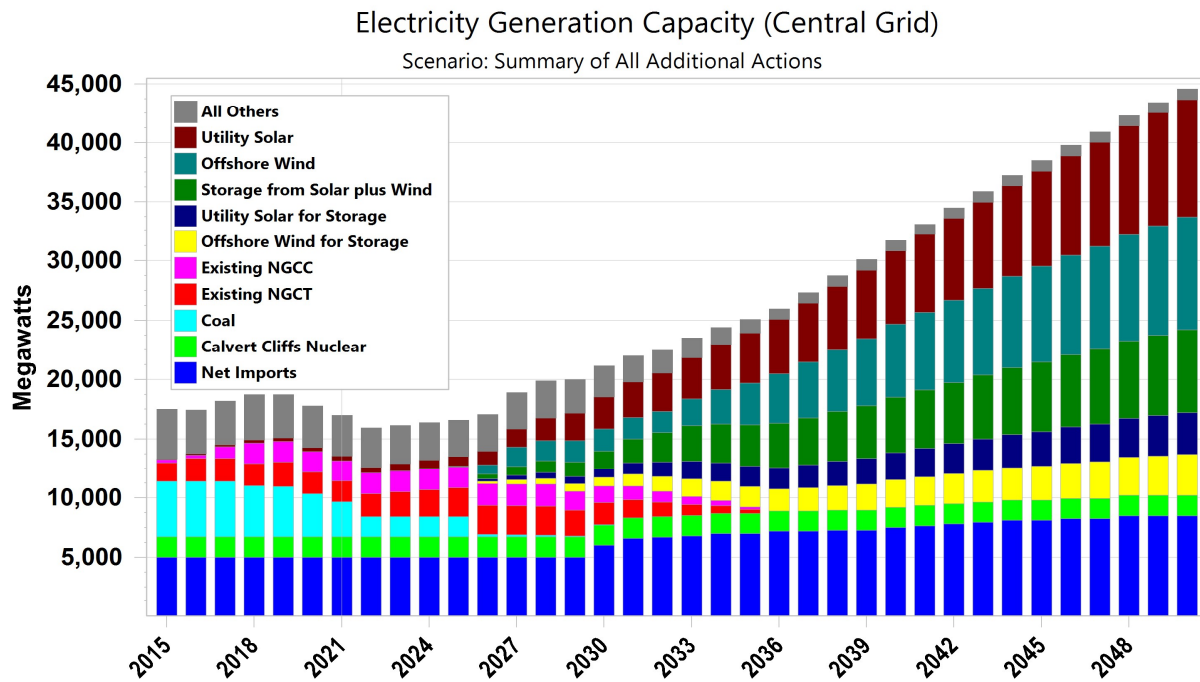
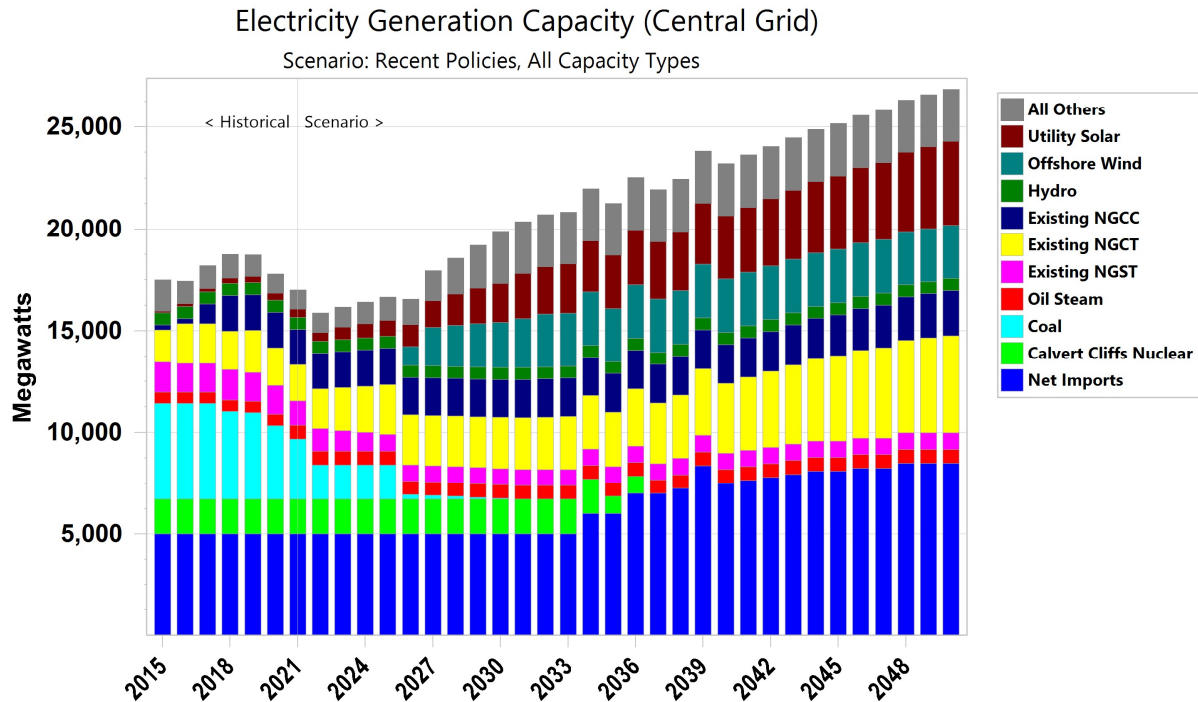


Figure 3-4



Note: NGCC refers to natural gas combined cycle; NGCT refers to natural gas combustion turbine.

Figure 3-5



Additional details on each of the individual scenarios that sum to yield the Energy Supply actions result are provided below:

1. **Expanded Offshore Wind (OWX) scenario** assumes that offshore wind power development proceeds as per existing state goals, that is, rises to 8500 MW by 2040, but then continues to rise to 11,000 MW by 2045 and 13,000 MW by 2050.
2. For the **USX scenario (Utility Solar Expansion)**, we use a trend of capacity additions that assumes that restrictions on approval of PJM (and local) solar capacity expansion are lifted such that the amount of capacity listed in the current PJM queue as "Active" (a little less than 4000 MW, including existing capacity) is deployed by 2031, and that capacity continues to increase, more or less linearly based on annual deployment in 2025-2031 (500 MW added/year), through 2050, to over 13,000 MW by 2050.
3. In the **Calvert Cliffs Life Extension (NLX)** case, we assume that both units at the Calvert Cliffs Nuclear Plant will have their lifetimes extended through at least 2050. No additional CAPEX or operating costs are currently assumed for the life-extended units, that is, we assume that average national costs for nuclear fuel and non-fuel (assumed fixed) O&M remain at average national 2011-2021 levels as derived from USDOE EIA data (about \$7/MWh for fuel and \$150 kW-yr for non-fuel O&M).
4. For the **RGGI Net Zero Generation by 2040 (RGZ)** case, we assume that a zero CO₂e emissions goal from generation is reached by the RGGI states and thus by the states exporting power to Maryland, and as a result the emission factor for CO₂e per MWh of imported electricity falls to zero by 2040, with a phase-in period starting after 2025. Note that the emission factor trend is

entered as a “Key Assumption” in LEAP. It is possible that this scenario should be associated with an increase in import costs, although a review of the USDOE’s AEO2023 for non-reference scenarios suggest that it is not clear that a shift to renewables actually *will* result in higher costs. but it is not necessarily the case that costs will rise—for example, in AEO2023 (the USDOE’s Annual Energy Outlook model) results, a scenario with low renewables (CAPEX) costs but high deployment of renewables in PJM yields lower overall generation and transmission costs in 2050 than in the Reference case. Note that because the implementation of this particular action depends on policy implementation in other states, as well as Maryland, it is only partially under Maryland’s control.

5. For the **Rooftop Solar Expansion (RSX)** case, we assume that a combination of incentives, falling CAPEX for rooftop and community solar, willingness to raise net metering caps, support for siting of rooftop and community solar, and increased effort at developing the rooftop solar industry in Maryland results after 2025 in annual growth in rooftop solar roughly a third higher than projected in the AEO2023 reference case over 2021-2050. This results in total solar rooftop capacity (including community solar) of nearly 6000 MW by 2040, and over 10,000 MW by 2050.
6. In the **Expanded Electricity Storage (ESX)** case, we assume that policies are implemented such that current state targets for storage deployment (3000 MW by 2033) are reached, and that decreasing electricity storage costs, state and federal incentives for deployment, and active assistance with siting results in a total of 7000 MW deployed by 2050. Note that this scenario also includes the assumptions of the OWX and USX cases, as renewables charging capacity is otherwise insufficient to charge this much storage. CAPEX and Fixed O&M costs are set at the average of NREL ATB 2023 costs for 8-hour utility battery storage systems.
7. In the **Natural Gas Generation Retired (NGR)** case, we assume that natural gas-fired capacity in the state (combined cycle, steam turbine, and combustion turbine) are trended from their existing levels in the RPL case to zero as of 2036, starting in 2028. Oil-fired plants, which operate at very low-capacity factors even in the RPL case, are assumed to be retired on the same schedule as well
8. **Retirement of Baltimore WTE (RWE)** The state’s two major WTE (Waste-to-Energy) plants, Wheelabrator Baltimore, and the Montgomery County plant, are retired from in the Electricity Generation module at the end of 2030, with the heat demand now provided by the Baltimore plant to be provided by a new electric heat-pump driven district energy plant in the District Heat Provision module. As currently modeled, in this scenario the wastes no longer used in the WTE plants is treated with a combination of landfilling and composting, with about 80 percent of landfill emissions captured and used as fuel gas. Note that this option also provides important non-GHG pollutant emissions reductions, including for low-income communities.
9. **LNG Liquefaction Electrification (LNE)** assumes that starting in 2031 the Cove Point LNG plant uses electricity for its liquefaction train rather than burning natural gas in combustion turbines that drive compressors. Electrification is implemented all at once, just before 2031, as Cove Point has just one liquefaction train, but there may be ways of phasing in electrification. Cost will be significant, perhaps on the order of \$40 million, but natural gas savings (or additional LNG exports) will be substantial, and there will also be offsetting O&M savings.

4. Buildings Sector

The Buildings sector is represented in the LEAP model by 14 residential sector energy end-uses, and 8 commercial sector energy end uses. Each of the end uses include different devices, varying in technology (for example, heat pumps versus electric resistance heating), fuel types (electricity, natural gas, oil), or level of efficiency. Major actions for reducing emissions in the Buildings sector beyond those reductions provided by actions in the Recent Policies case, are electrification of key end uses, especially water heating and space heating and cooling, with the related phasing out of the use of natural gas and other fossil fuels, plus building performance improvements.

Key results for the Buildings sector are as follows:

- GHG emissions from Building sector actions are reduced by about 2.5 MMtCO₂e by 2031, and by about 7 MMtCO₂e by 2050, relative to the RPL case (Figure 4-1). These changes result in the Buildings sector emitting roughly 25 percent of its 2021 emissions by 2050 (Figure 4-2).
- Commercial sector reductions account for about 40 percent of the total, with the rest being Residential sector reductions.
- After phase-in of the Zero NO_x Appliance Standards, most of the reductions in direct emissions in the Buildings sector are a result of natural turnover of fossil fuel space and water heating equipment replaced by heat pump equipment. However, the other Buildings actions help accelerate turnover of equipment, especially in the years prior to the Zero NO_x standards.
- Electrification results in greater overall emission reductions per device in the later years of the forecast period than in the near term due to greater renewable energy deployment.

Figure 4-1:

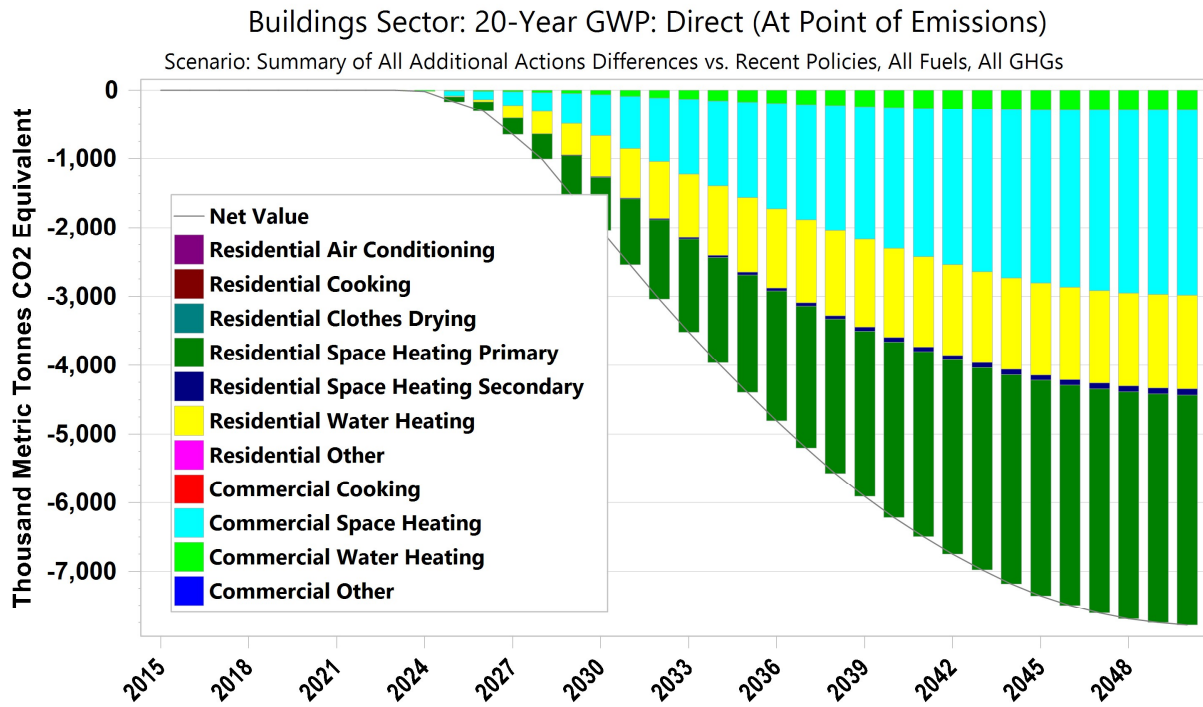
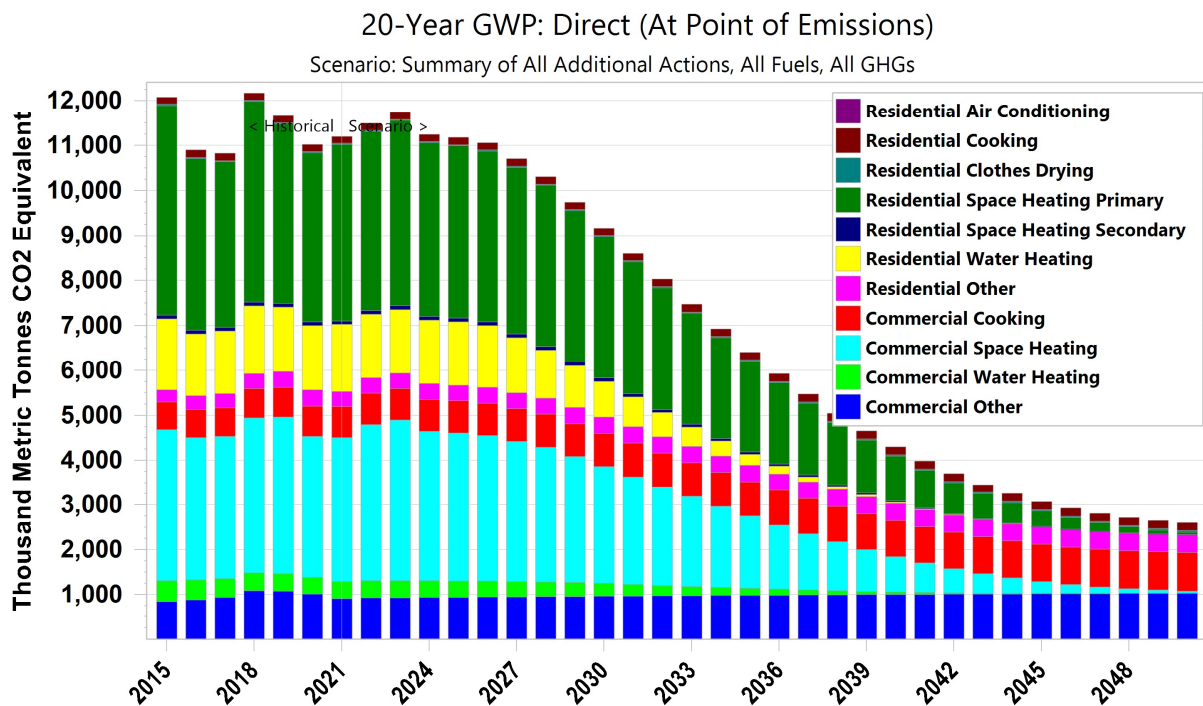


Figure 4-2:



Additional details on each of the individual scenarios that sum to yield the Buildings actions results are provided below:

1. **Low Income Electrification (LIE):** Replaces fossil fuel space heating and water heating devices with heat pump devices in low-income households. 60% electrified by 2030 (starting from baseline of 31%), 100% by 2040. Assumes the following estimates for low-income households from MD DHCD: 263,489 single-family and 184,374 multi-family for a total of 447,863 households.
2. **All Electric Building Code Expansion (AEC):** Assumes all new buildings and major renovations (assumed as 1% of building each year) have electric appliances. This increases the sales of heat pump space and water heaters by a factor proportional to the number of new buildings in each year.
3. **Building Energy Performance Standards Expansion (BEP):** Assume that the full 20% reduction in direct emissions in buildings over 35,000 square feet is achieved by 2030 (instead of only partial achievement of goal, as assumed in the Recent Policies Scenario). As in the Recent Policies Scenario, 40% of reductions in commercial buildings is assumed to come from building re-tuning, 12% is assumed to come from building envelope improvements, and 48% is assumed to come from electrification of space heating and water heating equipment. For residential buildings, 80% comes from electrification and 20% from building envelope improvements. Buildings down to 10,000 square feet are assumed to be electrified by 2045.
4. **Empower Restructuring (EMP):** Starting in 2025, fossil fuel equipment stocks are reduced by 1.9% each year, replaced by equivalent electric equipment sales. Electricity energy efficiency reductions assumed in the Recent Policies Scenario are removed, except for the reductions achieved prior to 2024, plus the following reductions in low-income household mandate for 2024-2026:
 - 2024: 36,899 MWh
 - 2025: 50,127 MWh
 - 2026: 69,621 MWh
5. **Zero NO_x Appliance Standards (ZNX):** Assumes sale shares of all fossil fuel residential and commercial space heaters and water heaters go to zero on the following schedule:
 - 2027: residential water heaters
 - 2029: space heaters
 - 2031: commercial water heaters
6. **Combined Buildings Policies (CBG):** Combines all the above actions. Includes all early retirements from above actions. Before ZNX phase in dates, sales are adjusted for the heat pump sales estimated in the AEC, BEP, LIE, and BEP scenarios. After the 2029-2031 phase in dates for ZNX, all fossil fuel sales space heating and water heating sales are converted to heat pump sales. (Electric resistance heater sales are kept at baseline levels).

5. Industrial Sector

As Maryland has a relatively limited heavy industrial sector, with, for example, no remaining primary steel production plants, the industrial sector is not a major GHG emitter in Maryland, accounting for less than 3 MTCO₂e in 2021. The sector is modeled in LEAP in two subsectors, the cement sector and all other industrial energy use. The major emissions reductions strategies implemented in the LEAP model for the sector are electrification of the cement sector, expanded use of “clinker” (the main component of cement) substitutes in cement blending, and energy efficiency improvements and electrification in non-cement industries. Other options for reduction of industrial emissions are possible, including switching to production of CO₂-absorbing cement and/or the use of carbon capture and storage in conjunction with cement sector electrification, but are not yet included in the Climate Partners’ Recommended Actions scenario, in part because they would require significant input from cement industry stakeholders.

Key results for the industrial sector are as follows:

- Industrial sector GHG emissions decline by about 1 MMtCO₂e from 2021 levels by 2031, and by about 800 thousand T CO₂e from RPL case levels (Figure 5-1 and Figure 5-2).
- Additional emissions reduction of about 124 thousand T CO₂e in 2031, and about 0.5 MMtCO₂e by 2050, from the use of clinker substitutes in cement, as shown in Figure 5-3.

Figure 5-1

20-Year GWP: Direct (At Point of Emissions)

Scenario: Summary of All Additional Actions, All Fuels

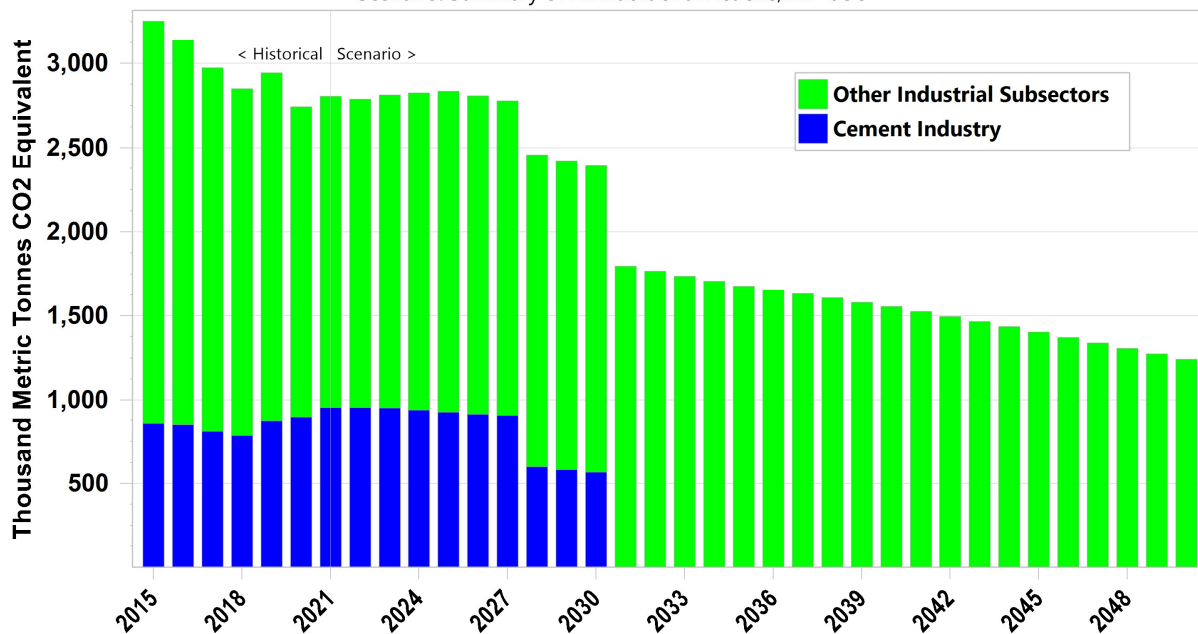


Figure 5-2

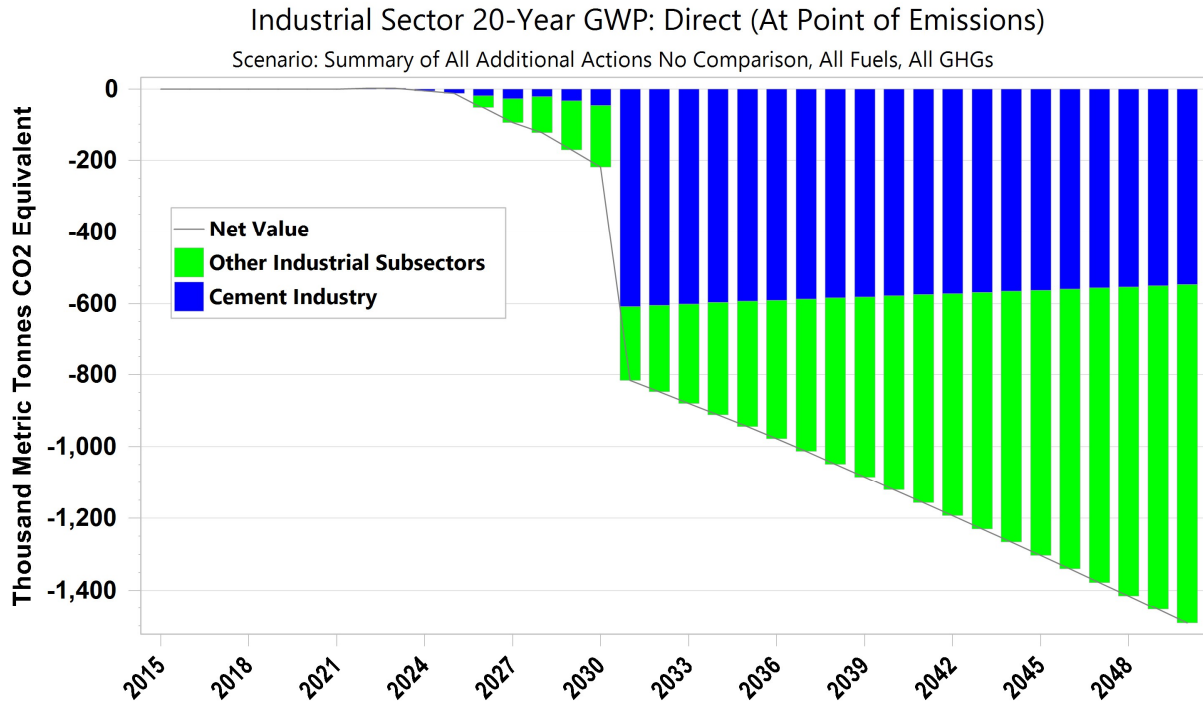
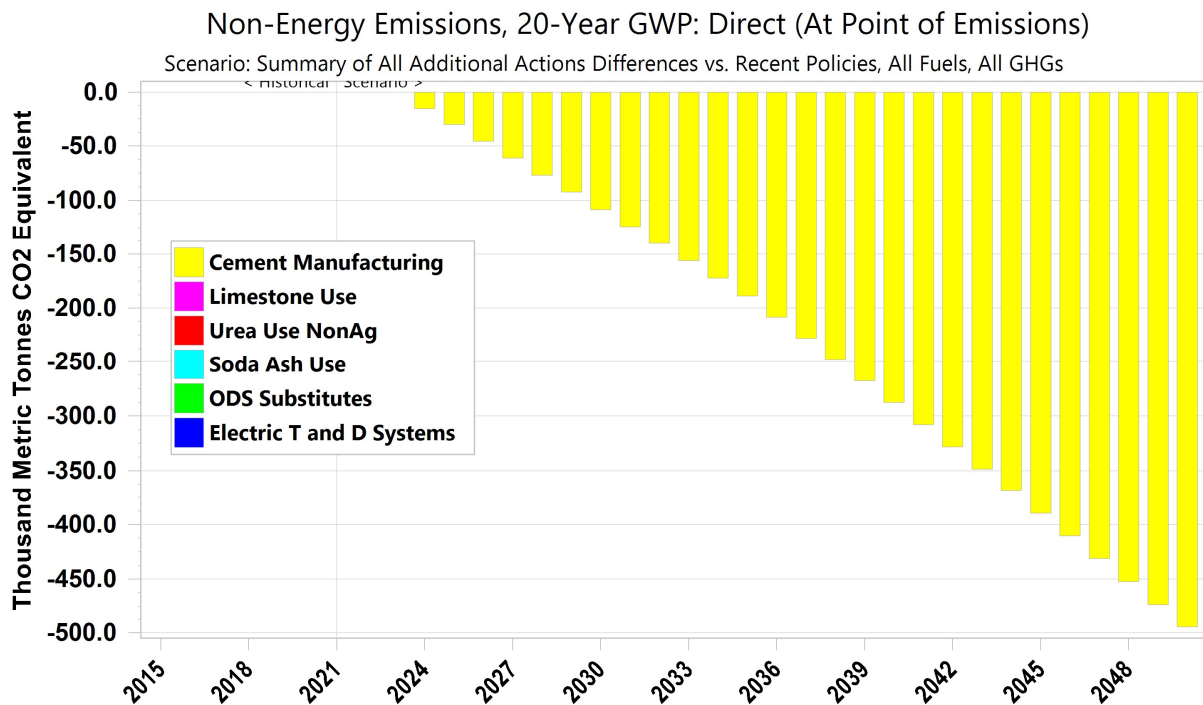


Figure 5-3



Climate Partners did not focus on policies for the industrial sector. Center for Climate Strategies offers for consideration some additional steps in this area. Additional details on each of the individual scenarios that sum to yield the Industrial actions results are provided below:

1. **Cement Electrification (CEM):** Decarbonize energy inputs to cement as a part of the future/Climate Partners' Recommended Actions scenario, with conversion complete by 2031.
2. **Industrial Energy Efficiency and Electrification (IEE):** Industrial electricity use intensity improvements (Other Industry and Cement non-thermal energy uses) of 10% relative to RPL case, 50% (by 2050, starting 2025) shifting from motor fuels (diesel and gasoline) in industry to electricity use, and 50% shifting from natural gas in industry to electricity for thermal energy use.
3. **Cement Clinker Substitution (CCL):** Reduces the amount of clinker used by cement plants in Maryland by assuming that an additional 10 percent of clinker per ton of cement is substituted for by 2035, and an additional 25 percent by 2050, relative to the reference case, resulting in a proportionate decrease in both CO₂ emissions and thermal energy use in cement-making.