Maryland's Climate Pollution Reduction Plan

Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045

December 28, 2023

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Foreword by the Secretary of the Environment

As Secretary of the Environment, I am pleased to deliver this nation-leading plan to meet the most ambitious greenhouse gas reduction goals of any state.

As outlined in the Climate Solutions Now Act of 2022, the Maryland Department of the Environment was required to develop a strategy to reduce greenhouse emissions 60% by 2031 and stay on track to achieve net zero emissions by 2045. This Administration has not only accepted that responsibility, but we are holding nothing back in our effort to fight the climate crisis while leaving no one behind.

The climate crisis is not a far off threat. It's already here. Maryland's Climate Pollution Reduction Plan will counteract the effects of climate change by decreasing the amount of carbon in our atmosphere. It will also position our state to win the decade by producing jobs, innovation, and healthier communities.

Implementing this plan will deliver lower energy costs, cleaner air, better transportation options, new clean industries, green jobs, and a brighter future for Marylanders. But it does not stop here. While this plan has a strong regulatory foundation, it will take more investment and commitment from all of us to reach the finish line.

We will meet this moment united and build a better, more sustainable, more resilient, and more equitable future for everyone. We will show the world that our state can lead in the fight to save our planet.

Serena McIlwain
Maryland Secretary of the Environment

Executive Summary

This is Maryland's plan to achieve its near-term climate goals and place the state on a path to achieve net-zero emissions by 2045. New policies will transition the state from the fossil fuel era of the past to a clean energy future. Marylanders will benefit from cleaner air, improved public health, lower energy costs, and more jobs with higher wages. As detailed in the plan, new policies will generate up to $1.2 billion in public health benefits, $2.5 billion in increased personal income, and a net gain of 27,400 jobs between now and 2031 as compared with current policies. Average households will save up to $4,000 annually on energy costs. Air quality and public health outcomes will improve for everyone, especially people living in historically underserved and overburdened communities.

Maryland has already reduced greenhouse gas (GHG) emissions - also called climate pollution - faster than almost any other state, achieving a 30% reduction in statewide GHG emissions from 2006 levels by 2020. The Climate Solutions Now Act (CSNA), passed into law in 2022, advances the most ambitious GHG reduction goals of any state in the nation. The law requires Maryland to reduce statewide GHG emissions 60% from 2006 levels by 2031 and achieve net-zero emissions by 2045 but does not outline a dedicated funding source to implement the plan. The Maryland Department of the Environment (MDE) is responsible for producing the plan to achieve the state's GHG reduction goals but achieving the goals will require a whole-of-government approach.

Implementing this plan will require significant new investment in challenging fiscal times. As of December 2023, state revenues were projected to fall short of anticipated expenses for the next few fiscal years. Meanwhile, initial estimates show that achieving an equitable transition to a clean energy future could require a public sector investment of approximately $1 billion annually. The federal government's historic investment in climate solutions, through the Inflation Reduction Act and other legislation, greatly bolsters Maryland's chances of achieving its climate goals. However, more investment will be needed. Additional funding will enable more Marylanders to buy electric vehicles (EVs), install electric heat pumps, and otherwise switch to zero-emission devices that eliminate fossil fuel use and shield consumers from volatile fossil fuel prices.

Specific investments proposed by this plan include:

- **Home electrification incentives** - Covering up to 100% of project costs for low and moderate-income households and 50% of project costs for middle-income households to convert to heat pumps, heat pump water heaters, and other home energy efficiency and electrification products.
- **EV incentives** - Providing simple point-of-sale rebates to consumers to make EVs even more affordable to buy and own.
- **Commercial building incentives** - Reducing the cost of energy efficiency and electrification projects in commercial, multifamily, institutional, and other types of buildings .

- **Infrastructure investments** - Building out critical infrastructure, including EV charging stations, and supporting projects that reduce GHG emissions from Maryland's industrial and waste sectors.
- **Natural and working lands investments** - Supporting tree plantings, forest management, wetland management, soil management, and other projects that are critical for storing carbon and helping the state achieve its net-zero emissions goals.

New investments will complement Maryland's existing, substantial investment in renewable energy and energy efficiency programs through the EmPOWER Maryland program, Regional Greenhouse Gas Initiative, Renewable Portfolio Standard, and other existing programs.

While developing this plan, MDE held a series of seven listening sessions and obtained thousands of comments from the public that were taken into consideration. One consistent theme reflected in this plan is that the transition to a net-zero economy should be intentional but also practical and methodical. This plan lays out a sustainable path where incentives are provided at key decision points to consumers. For example, when a furnace needs to be replaced, a homeowner would have access to incentives that make the decision to electrify economical. When it is time to replace a gas-powered vehicle at the end of its useful life, consumers would have affordable options to purchase an EV and easy access to a reliable charging network.

The following are the state's current and new policies that, when taken together and fully implemented, could achieve the 2031 emissions reduction goal.[1]

Economywide

- **Clean Economy Standard** (new) - Directs the state to provide incentives, set sectoral standards, and set economywide standards to reduce GHG emissions.
- **Expanded Strategic Energy Investment Fund** (current, modified) - Distributes funding from Maryland's participation in the Regional Greenhouse Gas Initiative and other programs to provide incentives for decarbonization projects across different sectors of Maryland's economy.
- **New Funding Sources** (potential) - Provides approximately $1 billion annually for new state investments in equitable climate action. See chapter 5 for more information.

[1] "Current" means a policy that is adopted and does not need to be modified. "Current, modified" means a current policy that needs to be modified. "New" means a policy that must be established through legislative or executive action. "Potential" means a policy that requires additional consideration prior to adoption.

Electricity

- **Renewable Portfolio Standard** (current, modified) - Requires approximately 50% of electricity consumed in Maryland to be generated by renewable resources by 2030 and modifies definitions of qualifying resources.
- **POWER Act** (current) - Sets a goal for the state to build 8,500 megawatts of offshore wind energy capacity by 2031.
- **Energy Storage Act** (current) - Sets a goal for Maryland to have 3,000 megawatts of energy storage capacity by 2033.
- **Regional Greenhouse Gas Initiative** (current, modified) - Maryland's existing cap and invest program, which limits emissions from fossil fuel power plants and invests proceeds in Maryland communities, generated $151 million in 2022. Maryland is advocating for a stronger regional pollution cap aligned with Maryland's and partner states' 100% clean energy goals in ongoing multistate deliberations and planning to remove offsets and certain exemptions.
- **Clean Power Standard** (new) - Requires 100% of the electricity consumed in Maryland to be generated by clean and renewable sources of energy by 2035.
- **State Incentives for Renewable Energy** (current) - Provides robust incentives for a wide range of renewable energy projects.

Transportation

- **Zero-Emission Vehicle Infrastructure Plan** (current) - A comprehensive plan to further develop Maryland's charging infrastructure for zero-emission vehicles (ZEVs).
- **Advanced Clean Cars II** (current) - Requires 100% of new cars, light-duty trucks, and sport utility vehicles (SUVs) sold in Maryland to be ZEVs by 2035.
- **Advanced Clean Trucks** (current) - Requires certain types of medium and heavy-duty trucks sold in Maryland to be ZEVs in certain years.
- **ZEV Transit Buses** (current) - Requires state-owned transit buses to transition to ZEVs.
- **ZEV School Buses** (current) - Requires school districts to purchase or contract for the use of ZEV school buses starting in 2024, provided that federal, state, or private funding is available to cover incremental costs, relative to non-ZEV buses.
- **Advanced Clean Fleets** (potential) - Requires specific high-priority fleets of medium and heavy-duty vehicles to transition to ZEVs.
- **Maryland Transportation Plan** (new) - Aims to reduce vehicle miles traveled per capita by 20% through infrastructure and programmatic investments.
- **State Incentives for Purchasing EVs** (current, modified) - Provides a point-of-sale rebate to lower the upfront cost of buying new and used EVs and provides bonus rebates to low and moderate income Marylanders.

Buildings

- **Energy Codes and Standards** (current) - Requires the state to adopt the latest version of the International Energy Conservation Code, with possible amendment, within 18 months of issuance.
- **EV-Ready Standards for New Buildings** (current, modified) - Requires EV charging equipment to be installed during the construction of single-family detached houses, duplexes, and townhouses, and extends new requirements to multifamily buildings.
- **Building Energy Performance Standards** (current) - Requires certain buildings 35,000 square feet or larger to achieve specific energy efficiency and direct emissions standards, including achieving net-zero direct emissions by 2040.
- **State Government Lead by Example** (current) - Requires all-electric new construction and other emission reduction measures for state-owned buildings.
- **EmPOWER** (current, modified) - Requires utility companies and the state government to help customers improve energy efficiency and reduce GHG emissions, including through beneficial electrification.
- **Zero-Emission Heating Equipment Standard** (new) - Requires new space and water heating systems to produce zero direct emissions starting later this decade.
- **Clean Heat Standard** (new) - Requires clean heat measures to be deployed in buildings at the pace required to achieve the state's GHG reduction requirements.
- **Gas System Planning** (new) - Requires natural gas utility companies to plan their gas system investments and operations for a net-zero emissions future.
- **State Incentives for Building Decarbonization** (current, modified) - Provides substantial new funding for projects that improve energy efficiency and reduce emissions from residential, commercial, and institutional buildings statewide.

Industry

- **Hydrofluorocarbon Regulations** (current) - Prohibits the use of certain products that contain particular chemicals with high global warming potential.
- **Control of Methane Emissions from the Natural Gas Industry** (current) - Requires methane emissions from natural gas transmission and storage facilities to be mitigated through fugitive emissions detection and repair.
- **Buy Clean** (current) - Requires producers of cement and concrete mixtures to submit environmental product declarations to the state and for the state to establish a maximum acceptable global warming potential values for each category of eligible materials.
- **State Incentives for Industrial Decarbonization** (current, modified) - Supports decarbonization activities in Maryland's industrial sector.

Waste

- **Landfill Methane Regulations** (current) - Requires landfills to detect and repair landfill gas leaks and operate emission control systems to reduce methane emissions.
- **Food Residuals Diversion Law** (current) - Requires businesses that generate at least one ton of food residuals per week to separate the food residuals from other solid waste and ensure that the food residuals are composted.
- **Sustainable Materials Management** (current) - Sets goals for GHG emissions reductions, material-specific recycling rates, and overall statewide recycling and waste diversion rates.
- **State Incentives for Waste Sector Decarbonization** (current, modified) - Provides substantial funding for waste sector decarbonization activities.

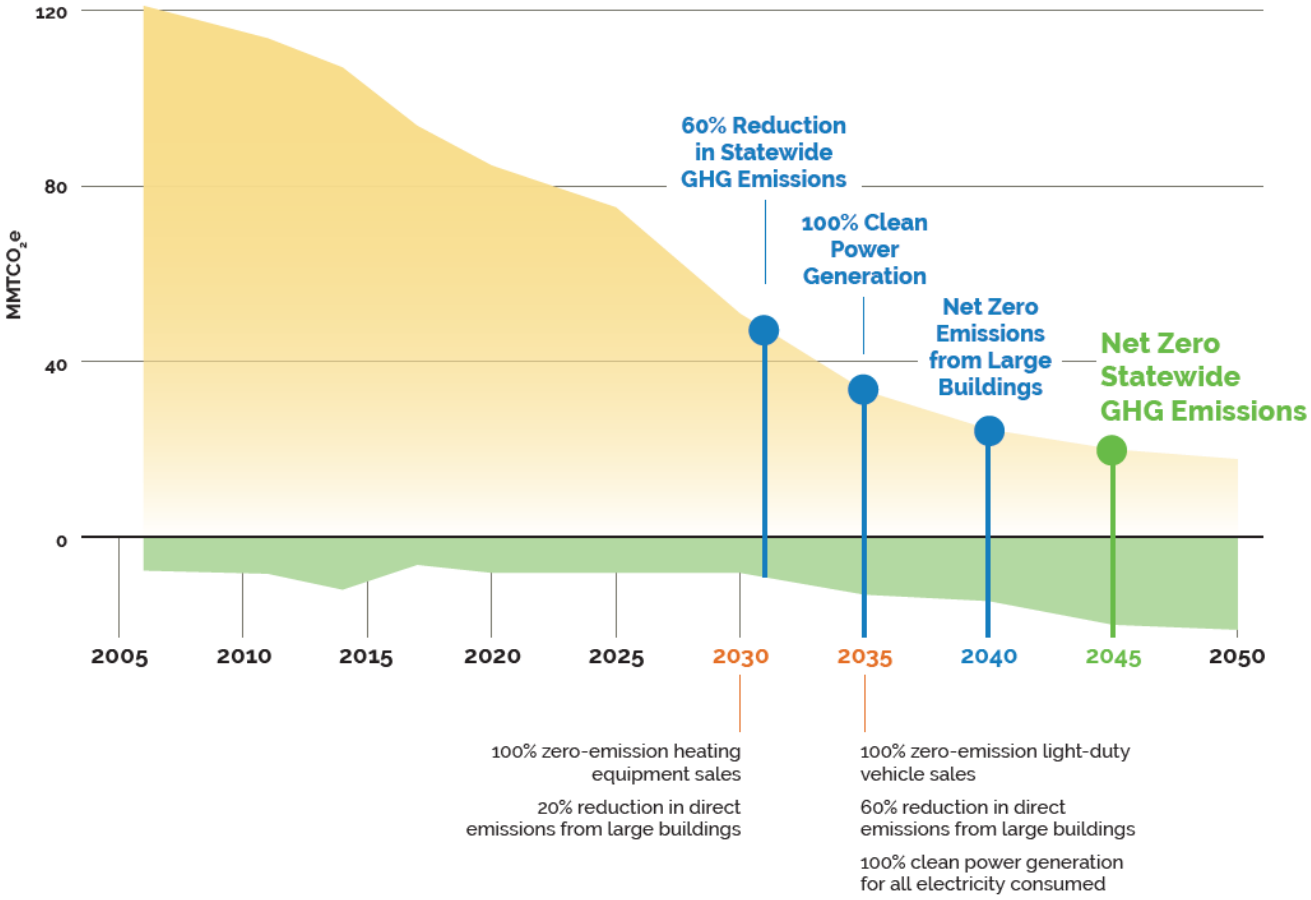
Agriculture

- **State Incentives for Agricultural Decarbonization** (current, modified) - Provides additional funding for decarbonization activities in Maryland's agricultural sector.

Forestry and Land Use

- **Maryland 5 Million Trees Initiative** (current) - Requires the state to plant and maintain five million native trees in Maryland by 2031, with at least 10% of these trees located in urban underserved areas of the state.
- **Sustainable Growth** (current) - Supports sustainable growth and land use/location efficiency to minimize GHG emissions from future land development; fosters transit use, walking, and biking; and reduces travel distances for daily mobility needs.
- **Forest Management** (current) - Promotes sustainable forestry management practices on public and private forest lands in Maryland.
- **Coastal Wetland Management** (current) - Maximizes carbon sequestration and coastal resilience benefits by protecting and restoring coastal wetlands.
- **Agricultural Resource Conservation Programs** (current) - Supports farmers in adopting practices that improve soil health and increase carbon sequestration on agricultural lands.
- **Forest Preservation and Retention Act** (current) - Requires that when forested land is lost to development, it is either replaced through planting new trees or compensated for through conserving existing forest.
- **State Incentives for Forestry and Land Use** (current, modified) - Provides additional support for activities that promote enhanced carbon sequestration in Maryland's forestry and land use sector.

Figure 1: **Major Milestones on Maryland's Decarbonization Timeline**



The new policies in this plan are modeled to reduce statewide GHG emissions by 646 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $135 billion based on estimates for the social cost of GHG emissions. As detailed in the plan, Maryland will add thousands of jobs and grow its economy while delivering on its status as a global leader in addressing climate change.

Household energy costs will decrease significantly under this plan. Today, the average household that uses heat pumps and drives EVs spends around $2,600 less annually in energy costs than those with natural gas heating and gasoline-powered cars. Savings for the all-electric household increase to around $4,000 annually compared to homes that are heated with oil or propane. Those savings are projected to increase over time as fossil fuels become more expensive and electricity rates remain comparatively stable. Robust federal and state incentives, paired with education, technical assistance, and training for building owners, contractors, automobile dealers, and other market actors, can help ensure that everyone can transition from fossil fuels and become part of the clean energy economy.

This plan includes detailed economic and public health impacts, workforce development opportunities, a funding plan, and implementation details such as the executive and legislative actions that are needed for implementation. Much of the regulatory implementation falls on MDE, which has the existing authority and legal obligation to adopt regulations to achieve the state's GHG reduction requirements, but all of Maryland state government has a role to play in implementing the programs outlined. Importantly, the work ahead requires all Marylanders to work together. The results will benefit us all and Maryland's future for many years to come.

Maryland's Climate Pollution Reduction Plan

Policies to Reduce Statewide Greenhouse Gas Emissions 60% by 2031 and Create a Path to Net-Zero by 2045

Chapter 1: The Big Picture

Introduction

Maryland has long been a leader in addressing the cause of climate change, reducing greenhouse gas (GHG) emissions faster than most other states while cleaning the air, improving public health, and growing the economy.

In 2022, the Maryland General Assembly passed the Climate Solutions Now Act (CSNA), establishing the most ambitious GHG reduction goals of any U.S. state. Maryland is now required to reduce statewide GHG emissions 60% from 2006 levels by 2031 and achieve net-zero emissions by 2045 while creating jobs and net economic benefits.[2] Net-zero emissions means that the total GHG emissions from Maryland's economy will be equal to the GHGs removed from the atmosphere through natural and technological systems annually.

The policies in this plan, if fully implemented, are projected to achieve the 2031 goal and put Maryland on a path to achieve net-zero emissions by 2045. The policies will nearly put an end to the fossil fuel era and accelerate the transition to a clean energy economy. In turn, the state will experience improved air quality, health, wealth, and the prospect of keeping our planet habitable for future generations.

An all-of-society approach is needed to achieve these goals. Many Marylanders are still dependent on fossil fuels. Until now, cost barriers to cutting ties with oil and gas have kept the clean energy transition out of reach for too many. As innovation drives advancement that leads to lower prices, more reliability, and more options, this plan includes protections for Marylanders with limited resources, to ensure that everyone has access to a clean energy future.

Clean air, a stable climate, and more green jobs are opportunities for the state to prosper. The policies in this plan not only constitute action to avert disaster; they place Maryland in a better position to compete economically.

[2] Maryland Senate Bill 528. Climate Solutions Now Act of 2022. https://mgaleg.maryland.gov/2022RS/bills/sb/sb0528E.pdf.

From the Dirtiest Air to the Cleanest

Air pollution became a public health crisis over the last century as buildings, power plants, vehicles, and industry released massive amounts of harmful chemicals into the atmosphere. Marylanders suffered the effects of air pollution more than other Americans. In fact, Maryland once held the dubious distinction of having some of the worst air quality east of the Mississippi River.

Maryland's air is much cleaner today. In 2022, the state met all national air quality standards for the first time since the Clean Air Act (CAA) and National Ambient Air Quality Standard (NAAQS) were established over 50 years ago.[3] This is a huge milestone.

Studies show that poor air quality creates public health issues and environmental consequences. Even at low concentrations, certain air pollutants can trigger a variety of health problems, such as asthma attacks, coughing, lung irritation, and increased susceptibility to longer-term illnesses such as cardiovascular diseases. The U.S. Environmental Protection Agency (EPA) calculates that the benefits of clean air are up to 90 times greater than the costs of reducing air pollution.[4]

Maryland has made tremendous progress in achieving cleaner air over the last few decades. Despite this progress, there are still too many days when haze settles over our cities and towns and air quality warnings are issued. Too many children and adults are still hospitalized each year with respiratory issues that are triggered by air pollution. Too many cars, trucks, buildings, factories, and power plants are still emitting harmful pollution.

The policies in this plan are primarily designed to address climate change, but they will also improve the health of Marylanders and make Maryland's air some of the cleanest in the country. We will also grow our economy by creating more green jobs and reducing energy costs for businesses, homes, schools, and commercial buildings. The transition to a clean energy economy requires millions of fuel-burning devices to be replaced with efficient, zero-emission alternatives. The jobs we need are local. Replacing a boiler in someone's basement can't be outsourced.

Maryland's Climate Pathway

The University of Maryland (UMD) Center for Global Sustainability was contracted by MDE to evaluate options for achieving the state's requirements to reduce GHG emissions and, with supplemental analysis from the Regional Economic Studies Institute at Towson University (TU),

[3] The Maryland Department of the Environment. 2022 Air Quality Progress. https://mde.maryland.gov/programs/workwithmde/Documents/AQCAC/2023MeetingMaterials/AQCAC%20AQ%20Progress%202022%20FINAL.pdf.

[4] The U.S. Environmental Protection Agency. Benefits and Costs of the Clean Air Act 1990-2020, the Second Prospective Study. https://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act-1990-2020-second-prospective-study.

identify economic impacts from these actions. In June 2023, MDE and UMD released Maryland's Climate Pathway, a report showing a package of policies that could achieve the state's climate goals.[5] The report found:

- **Current policies will reduce emissions 51% by 2031** - Current policies include Advanced Clean Cars II, Advanced Clean Trucks, Building Energy Performance Standards, EmPOWER, Renewable Portfolio Standard, etc., also federal policies and investments such as those made possible by the Inflation Reduction Act.
- **Adding new sectoral policies could reduce emissions 56% by 2031** - New sectoral policies include Advanced Clean Fleets, Clean Power Standard (100% clean power by 2035), Zero-Emission Heating Equipment Standard, etc.
- **Adding economywide policies to new sectoral policies could reduce emissions 60% by 2031** - New economywide policies, such as a cap and invest program, could be necessary for Maryland to achieve its emissions reduction goals.

MDE and UMD hosted seven public listening sessions from July to September 2023. The community was invited to participate in policy-making by testifying and submitting comments. Thousands of people participated in the sessions or submitted written comments. Feedback was carefully considered and often included in this report.

The Moore-Miller Administration, through MDE and other state agencies, is advancing the actions in this plan based on the findings of, and public response to, Maryland's Climate Pathway, findings of countless other studies, and the state's long history of developing and implementing policies to achieve the state's GHG reduction goals. Maryland will continue leading the transition to a clean energy economy by using the best science, data, and practicality.

Investing Now for a Bright Future

This plan presents a significant expansion of existing programs aimed at helping Marylanders, Maryland businesses, and state and local governments convert to energy-efficient systems. In the long run, these conversions will result in significant cost savings. In the near term, they require a significant infusion of up-front funding at a time when the Department of Legislative Services is projecting a $418 million budget shortfall for the state's Fiscal Year 2025 that could grow to $1.8 billion by FY28.[6]

The Administration and the General Assembly have some options for how and when to implement this plan to generate the additional funding needed to implement all of the policies and achieve the

[5] The Maryland Department of the Environment and University of Maryland Center for Global Sustainability. 2023. Maryland's Climate Pathway. https://www.marylandsclimatepathway.com/.
[6] The Maryland Department of Legislative Services. Effect of the 2023 Legislative Program on the Financial Condition of the State. https://mgaleg.maryland.gov/pubs/budgetfiscal/2023rs-fiscal-effects.pdf.

climate goals. Chapter 5, "Funding the Transition," introduces a few options that will be further developed and vetted in 2024.

The state is serious about leaving no one behind in this transition. This plan proposes to help Marylanders ramp up purchases of EVs, heat pumps, and other zero-emission devices that eliminate fossil fuel use and shield people from fossil fuel price impacts. The majority of state spending would focus on providing financial support to Maryland's low, moderate, and middle income households and small businesses. Improving equity and affordability would be the primary objectives of these investments. In short, the state would provide:

- **Home electrification incentives** - Covering up to 100% of project costs for low and moderate income households and 50% of project costs for middle income households.
- **EV incentives** - Making EVs the lowest-cost vehicles to purchase and own, and making them accessible to everyone.
- **Commercial building incentives** - Reducing the cost of energy efficiency and electrification projects in commercial, multifamily, institutional, and other types of buildings.
- **Infrastructure investments** - Supporting projects that reduce GHG emissions from Maryland's industrial and waste sectors, and building out critical infrastructure including EV charging stations.
- **Natural and working lands investments** - Supporting tree plantings, forest management, wetland management, soil management, and other projects that are critical for storing carbon and helping the state achieve its net-zero emissions goals.

As decisions must be made in light of projected budget challenges, the state will increase the focus on funding transportation projects that reduce dependence on single-occupancy vehicles. The Maryland Department of Transportation's (MDOT) initiatives include enhancing existing transportation infrastructure such as transit lines and clean buses, programs to reduce single-occupancy trips, and actively catalyzing transit-oriented development to help support housing and economic development. MDOT will ramp up investments and policies to accommodate bicyclists and pedestrians routinely and safely on our extensive road network by retrofitting streets with bike lanes, sidewalks, and traffic calming measures.

MDOT has already made significant investments to help reduce vehicle miles traveled (VMT), however, additional VMT reduction measures are necessary to meet GHG reduction goals. MDOT's draft 2050 Transportation Plan includes an objective to reduce VMT per capita by 20%, which will guide transportation project selection and development.[7] Additional investments and sources of funds, such as federal programs, may be necessary to meet these VMT reduction goals.

[7] The Maryland Department of Transportation. 2050 Maryland Transportation Plan. https://www.mdot.maryland.gov/tso/pages/Index.aspx?PageId=22.

Transitioning Away from Fossil Fuels

Billions of dollars in investments from the Inflation Reduction Act and other sources are already converging with current federal and state policies to transition to zero-emission vehicles, buildings, electricity sources, and more. New policies and investments will quicken the pace of decarbonization. Maryland is systematically and responsibly replacing antiquated fuel-burning systems including coal-fired power plants, internal-combustion engines, and gas-fired heating equipment with cleaner technologies that have lower operating costs than their fuel-burning alternatives. An analysis of the policies in this plan finds that fossil fuel use in Maryland will decrease around 80% between now and 2045. The state will continue to develop policies, beyond those included in this plan, to meet the global ambition to fully transition away from fossil fuels.[8]

What this Plan Is and Is Not

This plan meets the legal requirements under Maryland Code, Environment Article, Title 2, Subtitle 12, § 2-1205, § 2-1206, and § 2-1207, which requires MDE to adopt a final plan including current and new policies that, if fully implemented, will reduce statewide GHG emissions 60% by 2031 and create net economic benefits for the state. This plan does not include every detail of new policies or funding sources. Many details of this plan must be worked out by the agencies and legislative committees responsible for developing new policies and through the extensive stakeholder processes often required to adopt new legislation or regulation. While striving to meet these goals, the legislature and implementing agencies should continue to consider ways to manage and mitigate cost impacts to Marylanders.

This plan focuses on how to reduce emissions. While some of these same actions can support climate change adaptation and resilience, this plan is not offered as a comprehensive strategy to make Maryland more resilient to climate change impacts. In the near term, Maryland's climate will continue to get warmer, wetter, and wilder regardless of how this plan is implemented. Sea levels will continue rising. Maryland's low-lying farms will be increasingly affected by saltwater intrusion. Islands throughout the Chesapeake Bay and much of Dorchester County will be lost to the sea by the end of this century. Maryland's climate in 50 years could resemble Mississippi's climate today. The impacts of climate change will be a defining feature of the 21st century. This plan focuses on how to stop digging the hole we are in. Other efforts, including Maryland's forthcoming Next Generation Adaptation Plan and State Resilience Strategy, will address how to climb out as the walls of the hole start crumbling.

[8] United Nations, Framework Convention on Climate Change, Conference of the Parties serving as the meeting of the Parties to the Paris Agreement. First Global Stocktake. Released December 13, 2023. https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf.

Chapter 2: The Policies

This chapter includes current and new policies that MDE and other state agencies have committed to implement or explore. Some of the policies require additional legislative action. A summary of the executive and legislative actions that are needed to implement the new policies in this chapter is provided in Chapter 6.

Maryland has just seven years to transform its economy to achieve the 2031 goal and just 21 years to finish the transformation to achieve net-zero emissions. There is no time for delay.

Economywide

Clean Economy Standard (new)

Maryland's Clean Economy Standard is an umbrella policy that directs the state to:

1. **Provide Incentives** - Target investments in clean electricity, clean buildings, clean vehicles, and clean industry in communities throughout the state, especially overburdened and underserved communities.
2. **Set Sectoral Standards** - Establish regulatory standards to ensure critical actions are taken in each sector of the economy.
3. **Set Economywide Standards** - Consider expanding Maryland's cap and invest program or developing new revenue-generating policies to complement targeted investments and sectoral standards, while providing a sustainable revenue source for state-funded community investments.

The Clean Economy Standard is the framework for Maryland's comprehensive approach to decarbonizing the entire economy. The incentives, sectoral standards, and economywide standards covered by the Clean Economy Standard are explained in more detail below.

Expanded Strategic Energy Investment Fund (current, modified)

The existing Strategic Energy Investment Fund (SEIF),[9] used to allocate proceeds from the Regional Greenhouse Gas Initiative and other sources, will be used to distribute revenues from new or expanded climate pollution reduction programs. New investments from SEIF will stimulate Maryland's economy and help consumers, businesses, local governments, farmers, and foresters invest an estimated $1 billion annually into measures that reduce reliance on fossil fuels, deploy clean energy solutions, and sequester more carbon in Maryland's natural and working lands. New investments will support:

[9] The Maryland Energy Administration. Strategic Energy Investment Fund (SEIF). https://energy.maryland.gov/Pages/Strategic-Energy-Investment-Fund-(SEIF)-.aspx.

- **Home Energy Efficiency and Electrification Incentives**
- **Commercial, Multifamily, and Institutional Building Incentives**
- **EV and Charging Infrastructure Incentives**
- **Industry, Public Infrastructure, and Nature-Based Solutions Incentives**

Public sector investments will leverage additional private sector investments, adding billions of dollars to the state's economy this decade. This will be a major economic stimulus for Maryland once the state determines the best funding mechanism to make these investments.

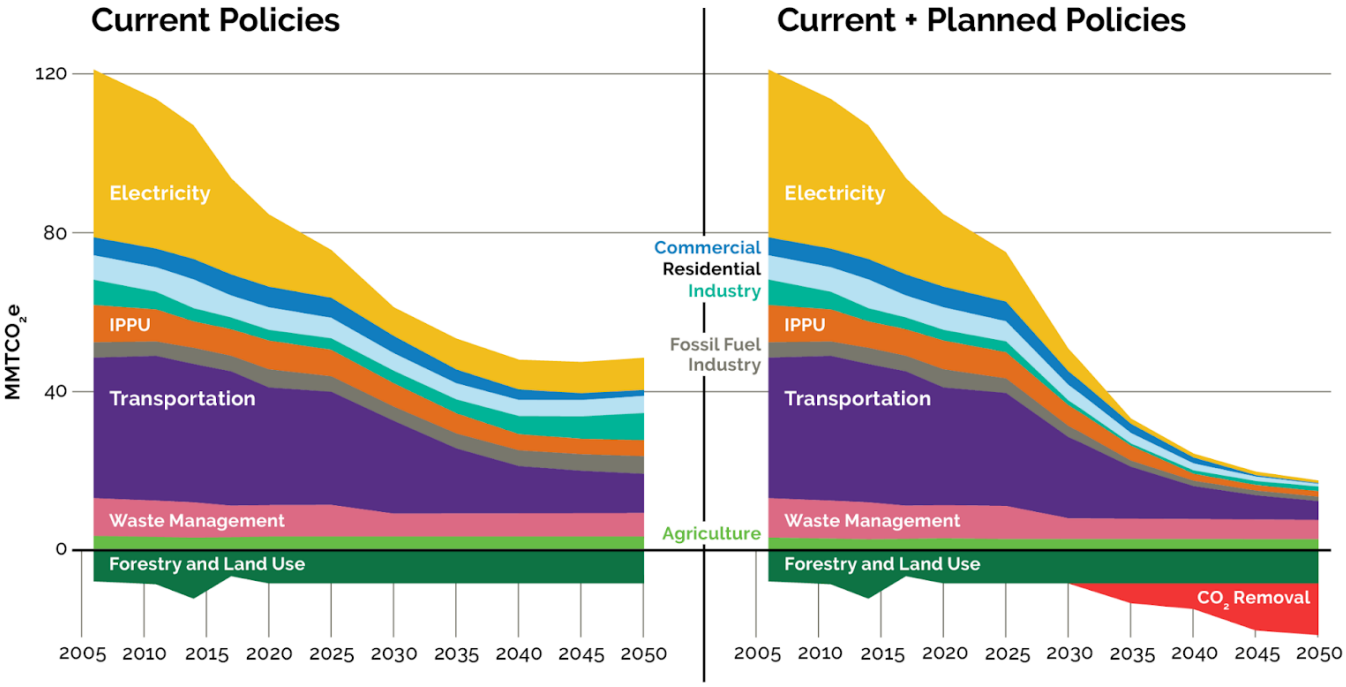
New Funding Source (potential)

Emissions and economic modeling conducted by UMD and TU for Maryland's Climate Pathway and this plan show that a new economywide policy could be necessary for the state to achieve its goals. A cap and invest policy was modeled for the Pathway report and this plan to establish a regulatory cap on climate pollution from certain sources and use revenue from the sale of carbon allowances for investments in clean energy projects, consumer rebates, and other decarbonization programs. The state must further consider if cap and invest or another policy is best for Maryland. Modeling shows that a policy that would require polluters to pay for their pollution and provide at least $1 billion per year for clean economy investments could be critical for Maryland to achieve a 60% reduction in GHG emissions by 2031. Chapter 5 provides a few options for the state to consider. To achieve the state's emissions goals, the new policy would need to reduce annual GHG emissions by 3.5 million metric tons of carbon dioxide equivalent (MMTCO2e) in 2031, and 15.6 MMTCO2e in 2045.

Impact of Economywide Policies

The economywide policies listed above work with the sectoral policies listed below to achieve Maryland's GHG reduction goals. In the aggregate, the economywide and new sectoral policies are projected to reduce statewide GHG emissions by 646 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $135 billion. Figure 2 illustrates the change in GHG emissions and sequestration based on historical and modeled trends.

Figure 2: **Maryland's statewide GHG emissions and sequestration trends**, historical and projected, from 2006 to 2050 based on current and new policies



Electricity

In 2020, electricity consumption accounted for 21% of Maryland's gross GHG emissions.[10] While this may seem like a large amount, the electricity sector has made significant progress since 2006, when it accounted for 35% of emissions. The GHG reductions in this sector can be attributed to programs that reduce total electricity demand, programs aimed at reducing the carbon intensity of the electricity consumed, and wholesale electricity market trends, including the large-scale replacement of coal-fired power plants with cleaner sources of electricity.

Reduced energy demand results from energy efficiency and conservation, which is driven in Maryland by the EmPOWER Maryland program,[11] building energy codes and standards, and other policies. To reduce the carbon intensity of the electricity generated, the state relies on the Renewable Portfolio Standard (RPS)[12] and other clean energy initiatives to incentivize renewable energy generation. In addition, RGGI and other pollution control programs reduce carbon dioxide

[10] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.
[11] The Maryland Energy Administration. EmPOWER Maryland. https://energy.maryland.gov/pages/facts/empower.aspx.
[12] The Maryland Public Service Commission. Maryland Renewable Energy Portfolio Standard Program - Frequently Asked Questions.

(CO_2) emissions from fossil fuel-fired energy generation, also impacting the carbon intensity of the electricity. The combination and interaction between these programs lowers the emissions intensity of both in-state electricity generation and imported electricity.

To achieve deeper reductions in emissions from the electricity sector, Maryland intends for 100% of the electricity consumed in-state to be clean by 2035. This goal will be achieved through the deployment of grid-scale and rooftop solar panels, offshore wind, hydropower, nuclear power, and energy storage technologies that incorporate load flexibility and dispatchability into the electric grid as sectors electrify to create a more manageable system. Additionally, new statewide transmission and distribution infrastructure must be built while existing infrastructure is updated to enhance the electric grid, improve the efficiency and delivery of electricity, and facilitate the integration of renewable energy with a priority on clean resources. Ultimately, emerging technologies in the electricity sector must be identified and evaluated to develop solutions for zero-emission dispatchable technologies to meet demand and maintain reliability.

Reaching Maryland's clean energy goals is made easier with incentives funded through the Inflation Reduction Act (IRA)[13]. The Renewable Energy Production Tax Credit is an IRA-funded program providing a per kilowatt-hour tax credit for electricity generated by solar and other qualifying technologies for the first 10 years of a system's operation. The Investment Tax Credit reduces federal income tax liability for a percentage of the cost of an eligible renewable energy system that is installed during the tax year. Importantly, the IRA also expanded the eligibility for these tax credits, so they can now be utilized by tax-exempt entities and local governments through direct pay provisions, by homeowners installing rooftop solar or residential wind systems, and by more traditional commercial entities. Both tax credits also receive bonuses for domestic content and siting in an energy community.

Renewable Portfolio Standard (current, modified)

Maryland's Renewable Portfolio Standard (RPS) requires Maryland electric suppliers to provide increasingly large proportions of Maryland's electricity from renewable energy sources like solar, wind, hydropower, and qualifying biomass.[14] The program is implemented through the creation, sale, and transfer of Renewable Energy Credits (RECs). The current RPS goal is for 52.5% for non-municipal utilities and 20.4% for municipal utilities of Maryland's electricity to come from renewable sources by 2030 through increases in solar power, deployment of new offshore wind energy off the Atlantic coast, and geothermal energy.

To effectively decarbonize Maryland's electricity supply, the state intends to increase the deployment of clean and renewable energy resources through the RPS and other clean energy

[13] White House. Inflation Reduction Act Guidebook. https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/
[14] Public Service Commission. Renewable Energy Portfolio Standard Program. https://www.psc.state.md.us/electricity/maryland-renewable-energy-portfolio-standard-program-frequently-asked-questions/.

initiatives while reducing CO_2 emissions from energy generation through RGGI and other pollution control programs. Maryland's 2030 Greenhouse Gas Emissions Reduction Act (GGRA) Plan advanced measures to accelerate the deployment of clean energy that have not been enacted, including a proposed Clean and Renewable Energy Standard (CARES), to achieve 100% clean electricity in Maryland by 2040.[15] The 2030 GGRA Plan projected substantial increases in the rate of clean energy deployment as a result of those measures and a coincident decrease in fossil fuel-fired generation. Maryland will need to increase its deployment of clean energy resources to reach the projections in this plan and achieve the new goal of a 60% reduction in statewide GHG emissions by 2031. This plan calls for the CARES proposal to be replaced with a Clean Power Standard that would achieve 100% clean electricity by 2035, as described later in this chapter.

The state is not meeting the RPS goals and more challenges remain. Maryland has seen setbacks to deploying solar and wind energy for various reasons, namely delays in offshore wind development and siting and supply chain issues creating impediments to solar development. The achievement of changes in Maryland's generation mix will be impacted by the federal agencies that oversee the power markets from which Maryland procures electricity. A backlog of projects awaiting approval by the PJM Interconnection, the regional transmission organization in which Maryland participates, has contributed to the issue.

Offshore wind will be a reliable clean energy resource available to the state. The Maryland Offshore Wind Energy Act of 2013 created an offshore wind carveout of Tier 1 resources under the RPS of a maximum of 2.5% of electricity sold in Maryland in 2017, and later.[16] The Clean Energy Jobs Act (CEJA) added a second round of offshore wind procurement for a minimum of an additional 1,200 megawatts (MW) with a residential cap of annual bills to protect ratepayers.[17] The Maryland Public Service Commission (PSC) has approved four major wind projects to be built more than a dozen miles off the Maryland coast between the first and second rounds of applications.

To support the growth of a healthy offshore wind industry, the state must continue to work with neighboring states, federal agencies, and local municipalities to design and deploy offshore and onshore transmission systems to integrate the large number of offshore wind projects anticipated in the waters of the East Coast. To do so, Maryland will continue to lead in the discussions of the Regional SMART-Power partnership with other coastal states.

Under the CEJA and through the SMART-Power partnership, Maryland aims to expand education and training programs to grow a new offshore wind workforce, expand local supply chains, support

[15] The Maryland Department of the Environment. 2030 GGRA Plan.
https://mde.maryland.gov/programs/air/ClimateChange/Documents/2030%20GGRA%20Plan/THE%202030%20GGRA%20PLAN.pdf
[16] The Maryland Energy Administration. Offshore Wind Energy in Maryland.
https://energy.maryland.gov/Pages/Info/renewable/offshorewind.aspx.
[17] Maryland Senate Bill 516. Clean Energy Jobs.
https://energy.maryland.gov/Pages/Info/renewable/offshorewind.aspx.

the redevelopment of and improvements to critical port infrastructure, and advance research and innovation. In addition, Maryland will work with the U.S. Department of the Interior Bureau of Ocean Energy Management to explore the expansion of offshore wind lease areas in federal waters.

Under this plan, RPS will continue to require that approximately 50% of electricity consumed in Maryland will be generated by renewable sources by 2030. RPS will also link with a new Clean Power Standard to achieve the Administration's goal for 100% of the electricity consumed in-state to be clean by 2035. This plan calls for the definitions of qualifying resources in the RPS program to align with definitions of clean power resources under the forthcoming Clean Power Standard, including the elimination of eligibility for municipal solid waste incineration. Legislation will be needed to change the RPS definitions, which are set in the state's statute.

POWER Act (current)

The Promoting Offshore Wind Energy Resources (POWER) Act became effective June 1, 2023.[18] The POWER Act sets a state goal of reaching 8,500 megawatts (MW) of offshore wind energy capacity by 2031 and anticipates the issuance of sufficient wind energy leases in the central Atlantic region to satisfy that goal. Offshore wind can provide clean energy at the scale needed to help achieve Maryland's economywide net-zero GHG emissions reduction goal. The POWER Act intends to upgrade and expand the transmission system to accommodate the buildout of at least 8,500 MW of offshore wind energy from qualified projects and maximize the opportunities for obtaining and using federal funds for offshore wind and related transmission projects.

PSC, in consultation with MEA, is required by the POWER Act to request that PJM Interconnection analyze specified offshore wind transmission system expansion options. Either the PSC or PJM must issue and evaluate competitive solicitations for proposals for related projects. The PSC may then accept one or more proposals, subject to specified criteria. Additionally, the POWER Act provides an alternative procurement mechanism to finance the remaining space in the original two lease areas owned by Orsted and US Wind. Through that procurement approach, the Maryland Department of General Services (DGS) must issue a procurement and may enter into at least one long-term power purchase agreement for up to 5 million megawatt-hours annually of offshore wind energy. Round 1 and 2 offshore wind developers may apply to PSC for a full or partial exemption from the requirement to pass along certain federal benefits to ratepayers.

Energy Storage Act (current)

The Energy Storage Act of 2023 established a goal for Maryland to have 3,000 megawatts of energy storage by 2033. Energy storage devices include thermal storage, electrochemical storage, virtual power plants, and hydrogen-based storage. The law requires PSC to implement a Maryland

[18] Maryland Senate Bill 781. Offshore Wind Energy - State Goals and Procurement (Promoting Offshore Wind Energy Resources Act). https://mgaleg.maryland.gov/2023RS/bills/sb/sb0781E.pdf

Energy Storage Program to cost-effectively procure energy storage over the next decade. PSC issued Order No. 90823 on October 2, 2023, initiating a workgroup to develop a Maryland Energy Storage Program and docketed Case No. 9715 to develop this program.

Community Solar Act (current)

The Community Solar Pilot Program was established in 2015. This pilot program limited overall community solar capacity to 583 megawatts, including 52.5 megawatts dedicated for low and moderate income (LMI) customers, which amounted to only a small percent (<5%) of the state's electricity load.[19] House Bill 908 of 2023 passed with the Governor's signature making the Community Solar Program permanent. It requires community solar projects constructed under the permanent program to dedicate 40% of energy output to LMI subscribers. In addition, House Bill 908 removes the cap on the amount of community solar capacity that Maryland can deploy, constraining it only by the state's statutory net energy metering limit of 3,000 megawatts. PSC is implementing the permanent program through its Net Energy Metering Workgroup and upcoming rulemaking. PSC discusses the current state of Community Solar and Net Metering in its Net Metering Report, which is filed annually with the Maryland General Assembly.

Regional Greenhouse Gas Initiative (current, modified)

RGGI is a collaborative program among 11 East Coast states to reduce CO_2 emissions from power plants through a regional cap and invest program. These states adopted market-based CO_2 cap and invest programs designed to reduce emissions from fossil fuel-fired electric power generators with a nameplate capacity of 25 megawatts or greater. Thanks to its success, RGGI has grown substantially in recent years, with New Jersey renewing its participation in the program in 2020, Virginia joining in 2021, and Pennsylvania proposing regulations in 2022 to begin participation.[20] RGGI is currently composed of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia. Participating RGGI states require fossil fuel-fired electricity generators to have acquired, through a regional auction or secondary market transactions, one CO_2 allowance for every short ton of CO_2 emitted over a three-year compliance period. Maryland has participated in RGGI since the program's inception in 2007. Through RGGI, the participating states have cut power plant emissions in half while enjoying billions of dollars of economic benefit and creating thousands of jobs.

As a RGGI participating state, Maryland caps and reduces CO_2 emissions from in-state fossil fuel electricity generators. The 2030 GGRA Plan identified the expansion of the RGGI partnership to additional states, especially Maryland's neighbors in PJM territory, as a priority measure to reduce the emissions intensity of Maryland's imported power. RGGI has successfully welcomed new members to the program in recent years, substantially improving its coverage of the PJM region and dramatically improving the impact on carbon pollution in the region, including cleaning

[19] The Maryland Energy Administration. Maryland Community Solar. https://energy.maryland.gov/Pages/MarylandCommunitySolar.aspx.
[20] Pennsylvania's program is currently on hold pending litigation.

Maryland's imported power. RGGI states largely recognize that all participating states can benefit from a broader market with more participants. Larger markets increase economic efficiency and cost-effectiveness, align more closely with the regional nature of the PJM transmission grid and can help drive even greater consumer savings.

RGGI participating states reinvest the proceeds from the quarterly CO_2 allowance auctions in consumer benefit programs to improve energy efficiency and accelerate the deployment of renewable energy technologies. Maryland allocates proceeds from the sale of CO_2 allowances into SEIF - a special, non-lapsing fund administered by MEA. MEA deploys SEIF funds to promote affordable, reliable, and clean energy across Maryland's diverse regions and communities while reducing energy bills, creating jobs in growing industries, helping to reduce GHG emissions, increasing resiliency, and promoting energy independence.

RGGI sets a binding cap on CO_2 emissions from power plants in the region that reduces every year. The 2030 GGRA Plan proposed to reduce the RGGI cap to zero by 2040, with cost controls. Due to Maryland's new statewide GHG emissions reduction requirements and the historic investments made by the federal government in clean energy development, Maryland has upped its ambition for RGGI. In the current RGGI Program Review process, where the RGGI participating states convene to establish the program's future goals, Maryland is now advocating for the RGGI cap to be strengthened to be consistent with states' 100% clean energy goals. The participating states are expected to reach an agreement on a new program structure in 2024. If the outcome of the multistate agreement is not sufficiently stringent to meet the goals of the Climate Solutions Now Act, MDE will consider additional complementary regulations.

MDE, which enforces Maryland's regulations for RGGI participation, will also eliminate underutilized components of the program including offsets and the Limited Industrial Exemption Set Aside when it updates its CO_2 Budget Trading Program regulation in 2024.

Clean Power Standard (new)

To achieve Governor Moore's commitment to achieve 100% clean power by 2035, strengthen Maryland's status as a climate leader, and support the goal of reducing statewide GHG emissions, the Administration and state agencies are developing a Clean Power Standard (CPS).

CPS is a policy that will complement the RPS to ensure that all electricity consumed in the state is generated by clean and renewable sources of energy by 2035. Although the policy is still in development, it will likely allow for solar, wind, hydro, nuclear, energy storage, and other zero-emission technologies to qualify as clean energy sources, while eliminating existing eligibility and subsidies for municipal solid waste incineration.

MEA, MDE, the Maryland Department of Natural Resources (DNR) Power Plant Research Program (PPRP), the Maryland Public Service Commission (PSC), and the Office of People's Counsel (OPC) will determine the best approach to a potential rulemaking. The state agency

partnership will design requisite components, timing, and milestones for outcomes of a potential regulation, including responsible agency; designing supportive and/or complementary policy; identifying the relevance of existing and proposed federal policy; and identifying key stakeholders for their perspectives on a potential rule framework.

The partnership will also address any economic and ratepayer impact. Ideally, a CPS would have minimal impact on electricity rates and promote public and private investment within the state. The goal is to design a program that mitigates potential ratepayer impacts, ensuring that existing inequities are remediated while stimulating economic growth within the state. Challenges related to generation deployment within the RPS will likely apply to CPS implementation as well.

CPS, as modeled for this plan, would avoid annual GHG emissions of 0.9 $MMTCO_2e$ in 2031, and 2.5 $MMTCO_2e$ in 2045.

State Incentives for Renewable Energy (current)

Over the years, Maryland has hosted a wide range of incentives to encourage the new development of renewable energy projects. The Maryland Clean Energy Center (MCEC) provides public-private and public-public partnerships, including through leading Commercial Property Assessed Clean Energy (C-PACE),[21] the Maryland Clean Energy Capital Program (MCAP),[22] and the Clean Energy Advantage (CEA) Loan Program.[23] The state also administers the Maryland Energy Storage Income Tax Credit Program and the Maryland Solar System Sales Tax Exemption.[24] Local governments have created Green Banks, Finance Authorities, and Energy Conservation Tax Credits.

One of the primary entities responsible for incentivizing renewable energy is MEA, which manages various renewable energy programs under SEIF using revenue from RGGI and RPS alternative compliance payments, which are incurred when insufficient RECs are available to meet the RPS requirements, as well as other targeted non-SEIF renewable energy funds. Through grants, rebates, loans, technical assistance, and education efforts, MEA is actively advancing solar, offshore wind, land-based wind, and geothermal heating and cooling in Maryland. The eligibility per program varies and may include individual homeowners, private businesses, municipal, local, and state governments, and nonprofit organizations.

In Fiscal Year 2022, MEA hosted the following solar programs: the Solar Resiliency Hubs Grant Program, Solar Canopy and Duel Use Technology Grant Program, the Community Solar Low-to-Moderate Income Power Purchase Agreement Grant Program, the Community Solar

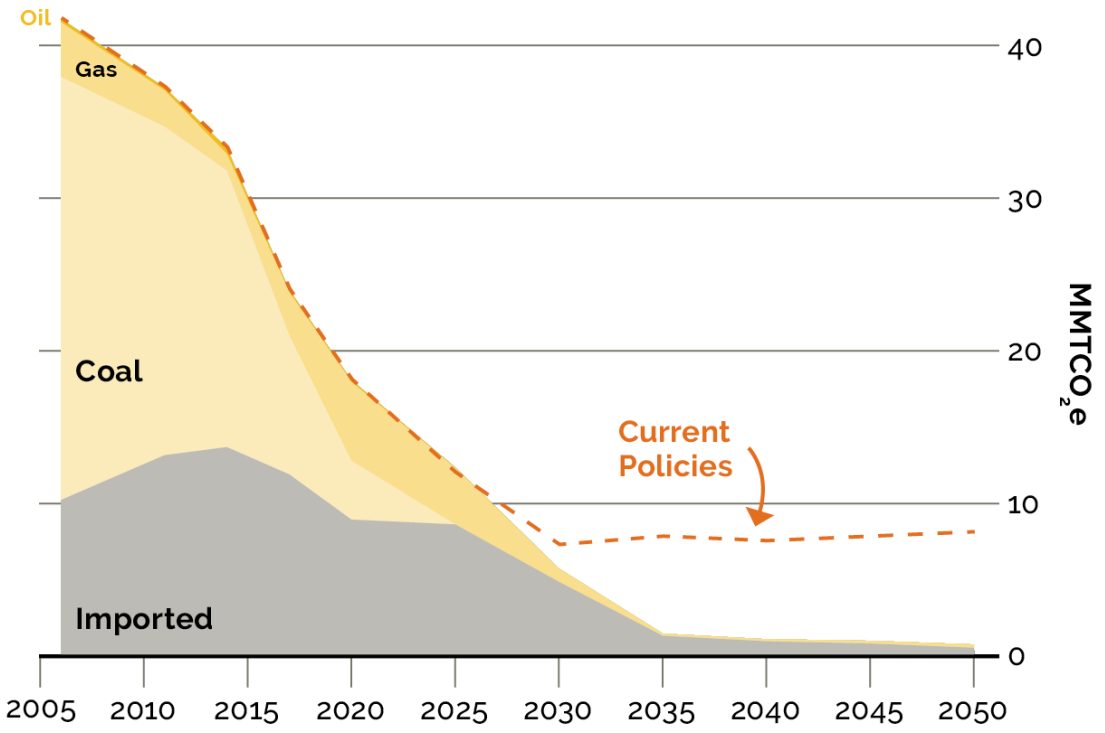
[21] Maryland Clean Energy Center. MDPACE. https://www.mdcleanenergy.org/finance/md-pace/.
[22] Maryland Clean Energy Center. Maryland Clean Energy Capital Program. https://www.mdcleanenergy.org/finance/mcap/.
[23] Clean Energy Advantage. https://cealoan.org/.
[24] The Maryland Energy Administration. Maryland Energy Storage Income Tax Credit - Tax Year 2023. https://energy.maryland.gov/business/Pages/EnergyStorage.aspx.

Guaranty Grant Program, the Public Facility Solar Grant Program, the Low-Income Solar Grant Program, and the Solar Technical Assitance Program. The Clean Energy Rebate Program also provided incentives to residential and commercial customers to install solar photovoltaic (PV) systems, as well as solar water heating, geothermal heating and cooling, and wood and pellet stoves. The Offshore Wind Program includes the Capital Expenditure Program and the Workforce Training Program, funded both by SEIF and the Offshore Wind Business Development Fund, thereby providing support for research and building a supply chain.

Impact of Electricity Sector Policies

The new policies are modeled to reduce electricity sector GHG emissions by 128.9 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $29 billion. Figure 3 illustrates the change in GHG emissions from this sector based on historical and modeled trends.

Figure 3: **Maryland's electricity sector GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies



Transportation

The transportation sector accounted for 35% of Maryland's GHG emissions in 2020 with most emissions (82%) in this sector coming from on-road vehicles powered by gasoline or diesel.[25] Non-road and other emissions, which are relatively minor compared with on-road emissions, come from vehicles, including airplanes, trains, marine vessels, farming equipment, recreational vehicles, and other motorized vehicles that do not operate on public roads.

On-road gasoline and diesel emissions have decreased steadily and will continue to decrease with the influx of vehicles meeting federal Corporate Average Fuel Economy (CAFE) standards[26] and increased demand for EVs. Emissions from heavy-duty diesel vehicles have remained consistent since 2006 but the U.S. Environmental Protection Agency's (EPA) more stringent heavy-duty engine and vehicle GHG standards will be fully implemented by model year 2027.

To achieve deeper reductions from the transportation sector, it will be necessary to transition much of the light-duty fleet to ZEVs by 2031 and increase the use of other modes of transportation, including public transportation and micro-mobility options. New charging infrastructure will need to be developed and installed in conjunction with the retrofitting of existing gas stations to support charging stations. Public transportation and mobility alternatives must be enhanced, with an emphasis on promoting sustainable growth and other transit and mobility-oriented development.

Zero-Emission Vehicle Infrastructure Plan (current)

To accomplish Maryland's goal for rapid growth in the number of ZEVs on Maryland's roads, building out a robust ZEV infrastructure network is critical. As such, the Maryland Department of Transportation's (MDOT's) National Electric Vehicle Infrastructure (NEVI) Plan, which was developed in partnership with MEA, serves as the foundational first step for this strategic network buildout.[27] MDOT submitted the Maryland State Plan for NEVI Formula Funding Deployment to the Federal Highway Administration (FHWA) in 2022, and the 2023 Update of the 'NEVI Plan' in August 2023. The 2023 Plan Update, approved by FHWA in September 2023, describes Maryland's activities that support the successful deployment of charging infrastructure.

The NEVI Plan details the strategy for awarding $63M of NEVI funds to build out and certify Maryland's 23 EV Alternative Fuel Corridors (AFCs). This ensures that there will be reliable EV infrastructure accessible to the traveling public, with a minimum of two stations per AFC capable of charging four EVs simultaneously and located no more than 50 miles apart. MDOT anticipates the addition of 40-48 charging sites along Maryland AFCs to achieve corridor build-out and

[25] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.
[26] The U.S. Department of Transportation National Highway Traffic Safety Administration. Corporate Average Fuel Economy. https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy.
[27] Maryland Department of Transportation. Maryland Zero Emission Vehicle Infrastructure Plan. https://evplan.mdot.maryland.gov/?doing_wp_cron=1701708265.2618820667266845703125.

certification by FHWA. The NEVI Plan is updated annually. In its 2024 update of the NEVI Plan, MDOT will address potential applications of NEVI funding to support MHDV/Trucking infrastructure and investments in community charging to increase equitable charging access across diverse locations in the state. Throughout this deployment, MDOT will prioritize disadvantaged and rural communities, support workforce development, and collaborate closely with public and private stakeholders. The remaining NEVI funds will then be invested in community charging to increase equitable charging access across diverse locations in the state.

Advanced Clean Cars II (current)

Governor Moore took swift action in the first few months of his Administration to adopt regulations that require car manufacturers to offer more zero-emission cars to consumers in Maryland. This policy alone may do more than any other to reduce GHG emissions in Maryland.

Vehicles sold in the United States must be certified under one of two certification programs: the federal program administered by EPA or the California program. Section 177 of the Clean Air Act Amendments of 1990 provides states with the ability to adopt the California program instead of the federal program as long as the adopted state program is identical to the California program and the state allows two model years lead time from adoption to implementation.

The Maryland Clean Cars Act of 2007 required MDE to adopt regulations implementing the California Advanced Clean Cars I (ACC I) program in Maryland. Maryland's implementing regulations adopted, through incorporation by reference, the applicable California regulations. The ACC I program is a dynamic, changing program in which many of the relevant California regulations are continuously updated to stay current with vehicular technology advancement and environmental science. To retain California's standards, Maryland must remain consistent with their regulations, hence when California updates its regulations, Maryland must reflect these changes by amending our regulations. The ACC I program included requirements for vehicles through model year 2025.

The Advanced Clean Cars II (ACC II) program requires that by 2035 all new passenger cars, trucks, and SUVs sold will be ZEVs.[28] The ACC II program takes the state's already growing ZEV market and robust motor vehicle emission control rules and augments them to meet more aggressive tailpipe emissions standards and ramp up to 100% ZEV. The ACC II program adopts new requirements for model year 2026 and later vehicles. Maryland's implementation of the ACC II program will begin with the 2027 model year.

The ACC II program will result in significant additional emission reductions in Maryland as compared to the program currently in effect. Between 2027 and 2040, the updated program will deliver additional vehicular reductions of 5,978 tons of nitrogen oxides (NO_x) and 585 tons of fine particulate matter 2.5 micrometers in diameter and smaller ($PM_{2.5}$), as well as additional vehicular

[28] The Maryland Department of the Environment. Advanced Clean Cars II. https://mde.maryland.gov/programs/air/MobileSources/Pages/Clean-Energy-and-Cars.aspx.

and power plant CO_2 emission reductions of 76.7 million metric tons. By 2040, these reductions provide net health benefits equal to about $604 million annually due to decreases in respiratory and cardiovascular illness and associated lost work days.

The ACC II program applies to automobile manufacturers that produce new motor vehicles for sale in Maryland. All vehicle types that have a gross vehicle weight rating of less than 14,000 pounds are affected.

Although there are a substantial number of conforming revisions, the major revisions associated with the ACC II program consist of a requirement that vehicle manufacturers continue to offer more ZEVs for sale, culminating in a 100% sales requirement by model year 2035, and a requirement that internal combustion engine vehicles meet increasingly stringent pollutant standards during the period in which they continue to be sold.

ZEVs consist of all-electric EVs with a minimum range of 150 miles and plug-in hybrid electric vehicles (PHEVs) with a minimum all-electric range of 50 miles. PHEVs are allowed to satisfy 20% of overall ZEV sales requirements. Additional flexibility options are available in model years 2027 through 2030. Vehicle manufacturers are also allowed to carry forward and use compliance credits generated before model year 2027. To ensure that vehicles sold under the program are reliable and perform as well or better than their internal combustion engine counterparts, stringent requirements related to vehicle (and battery) durability, vehicle charging capability, on-board diagnostics, warranty, and reporting are established to ensure that ZEVs perform as designed throughout their full useful life.

Advanced Clean Trucks (current)

The Clean Air Act established the framework for controlling harmful emissions from mobile sources. At the time, California had already established its own emission standards for mobile sources, and so was granted the sole authority to continue adopting vehicle emission standards, so long as they were at least as protective as the standards set by EPA.

The harmful emissions from medium- and heavy-duty trucks pose a serious threat to both public health and climate change. Recognizing this, California has adopted the Advanced Clean Trucks (ACT) regulation that aims to reduce on-road emissions from the medium- and heavy-duty truck sector to a greater extent than the current EPA standards.

Section 177 of the Clean Air Act allows other states to adopt the California standards if they are identical. Maryland's Clean Trucks Act of 2023 requires MDE to exercise this authority and adopt regulations implementing the California ACT program in Maryland. MDE adopted regulations in 2023 through incorporation by reference of the applicable California regulations.

The Clean Trucks Act of 2023 reinforces the state's ongoing commitment to reducing climate pollutants to reach the nation-leading goal of achieving a 60% reduction in GHG emissions by

2031. Medium- and heavy-duty trucks account for about a third of Maryland's transportation emissions. On-road diesel trucks are the largest contributor to NO_x emissions in Maryland.

Adopting ACT in Maryland will result in a significant reduction of harmful emissions associated with medium- and heavy-duty trucks and help Maryland attain its air quality goals. The ACT program will reduce NO_x, $PM_{2.5}$, and GHG emissions from the mobile source sector as cleaner, zero-emission trucks replace older internal combustion vehicles.

Zero-Emission Transit Buses (current)

Maryland is investing in transitioning its public transit bus fleet to ZEVs. The first seven electric buses were delivered to the Maryland Transit Administration (MTA) in the Fall of 2023, and MTA is contracting for up to 350 more over the next five years. In addition, MTA is working closely with its electric utility provider, electric charging and power distribution suppliers, transit labor unions, and employees to ensure a seamless transition to zero emissions that maintains reliable bus service. Technology advances that increase the range of electric transit buses and increase hydrogen fuel availability will be important components to successful transit fleet conversions in Maryland.

Zero-Emission School Buses (current)

Transportation contributes more GHG emissions than any other sector, and the nation's 480,000 school buses make up its single largest public transportation fleet — a fleet that millions of children rely on to get to school safely (and far more efficiently than if every student were to drive on their own). Approximately 90% of buses run on diesel fuel.

Switching over to electric fleets has become a goal for many cities and school districts. As of June 2023, there were 2,277 electric buses either on the streets or on order for school districts in the U.S., according to the World Resources Institute. More than double that number are committed, meaning that school districts plan to continue electrifying their fleets.

Federal funding from the 2021 Bipartisan Infrastructure Law has been crucial to this trend, largely because one of the biggest barriers to electrifying school bus fleets is the price tag. The cost of an electric bus can be about three times the cost of a diesel bus.

Montgomery County has the largest electric school bus project in the country, and it offers a different model for the switch to electric buses. Rather than purchase its own buses, the county partnered with a private contractor, which works with municipal partners to help manage the process of adopting this new technology. This contractor works with Montgomery County to secure funding — by applying to EPA grants, for instance — and then buys the buses from EV manufacturers. The company essentially provides electrification as a service, from the hardware of the buses themselves to the software that optimizes charging schedules. It is also responsible for all repairs and maintenance, although the company offers training so that cities can keep their

existing staff and contracts. Montgomery County has set its sights on a fully electric fleet within 10 years. For its initial pilot, the county has committed to swapping 326 of its buses to electric by 2025, and 86 are already running.

Last fall, Baltimore City received $9.4 million from EPA's Clean School Bus Program.[29] It was one of nearly 400 school districts from across the country selected to receive funding for new buses, with a focus on underserved areas and those overburdened by pollution, in keeping with President Biden's Justice40 goals. For Baltimore, going electric wouldn't have been possible without the help of the EPA grant.

The CSNA includes school bus electrification as a goal for the state. Under the CSNA, beginning in fiscal year 2025, a county board of education may not enter into a new contract for the purchase or use of any school bus that is not a zero-emission vehicle. There are exemptions for lack of sufficient funding or availability of a vehicle that meets the performance requirements. The CSNA also permitted electric utilities to provide rebates for school buses subject to certain limitations.

Baltimore is now preparing to launch its own pilot, following its neighbor's model and partnering with a private contractor. A depot with 25 charging stations was constructed in the summer of 2023. Twenty-five electric school buses are scheduled for delivery by the end of 2023. Baltimore City's contractor will offer training for the drivers on best practices for things like maximizing energy efficiency, and then the buses can hit the road.

Advanced Clean Fleets (potential)

The California Advanced Clean Fleets (ACF) regulation applies to fleets performing drayage operations (freight from an ocean port to a destination), those owned by state, local, and federal government agencies, and high-priority fleets.[30] High-priority fleets are entities that own, operate, or direct at least one vehicle in the state, and that have either $50 million or more in gross annual revenues, or that own, operate, or have common ownership or control of a total of 50 or more vehicles (excluding light-duty package delivery vehicles). The regulation affects medium- and heavy-duty on-road vehicles with a gross vehicle weight rating greater than 8,500 pounds, off-road yard tractors, and light-duty mail and package delivery vehicles. Under the ACF program, covered fleets are required to make an increasing amount of their new purchases be ZEVs. These ZEV purchase requirements are phased-in beginning in 2025. Between 2035 and 2042, all covered fleets are required to make 100% of their new vehicle purchases ZEVs. This regulation would work in conjunction with the ACT regulation, which helps ensure that ZEVs are brought to market.

[29] The U.S. Environmental Protection Agency. Clean School Bus Program. https://www.epa.gov/cleanschoolbus.
[30] California Air Resources Board. Advanced Clean Fleets. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets.

ACF is modeled to avoid annual GHG emissions of 1.8 $MMTCO_2e$ in 2045, however, more detailed analysis is needed to determine the incremental emissions impact of ACF compared with ACT. MDE would be responsible for developing, adopting, and implementing regulations to enact and enforce ACF in Maryland. MDE intends to work with stakeholders in 2024 to analyze and determine if adopting ACF would result in emissions reductions beyond those expected by Maryland's adoption of the ACT regulation.

Maryland Transportation Plan (new)

Vehicle miles traveled (VMT) is a major indicator of transportation sector GHG emissions. VMT has steadily increased in Maryland since 2014, with over 60 billion VMT in 2019. VMT dropped in 2020 due to the COVID-19 pandemic but had mostly rebounded to pre-pandemic levels. While MDOT anticipates that VMT will return to 2019 levels over the next five years, there is uncertainty regarding the exact timeline and pace of the recovery.

Reducing projected traffic on Maryland's roads is crucial to reducing GHG emissions from the transportation sector. This is why MDOT's draft 2050 Maryland Transportation Plan (MTP) includes an objective to reduce VMT per capita by 20%, which will guide transportation project selection and development.

MDOT has a track record of investments and measures that help reduce VMT. For example, the Kim Lamphier Bikeways Network Program identifies and funds projects that maximize bicycle access, fill missing gaps in the state's bicycle network, and enhance last-mile connections to work, school, shopping, and transit. MDOT also administers the statewide transportation demand management (TDM) program Commuter Choice Maryland, which works collaboratively with 12 local government agencies that implement localized TDM programs. Commuter Choice works with employers across the state to implement commuter benefits and administers statewide incentives for commuters and employers, including the incenTrip app, Employer Partner Program, and the Maryland Commuter Tax Credit.

New VMT reduction measures will include investments to deliver more transportation choices as well as incentives to encourage the use of such options. Specifically, MDOT initiatives include launching new public transportation infrastructure such as rail and clean bus lines, making transit safe, efficient, and easy to use, and actively catalyzing Transit-Oriented-Development (TOD) to help increase transit ridership and support housing and economic development. MDOT will ramp up investments and policies to accommodate bicyclists and pedestrians routinely and safely on our extensive road network by retrofitting streets with bike lanes, sidewalks, and traffic calming measures. MDOT will also increase our commitment to TDM measures. For example, Commuter Choice Maryland has helped expand IncenTrip statewide and is exploring options to implement a statewide vanpool incentive and support the Maryland Jobs Access Reverse Commute (MD-JARC) program.[31]

[31] The Maryland Department of Transportation Maryland Transit Administration. Maryland Job Access Reverse Commute Program (MD-JARC).

State Incentives for Purchasing Electric Vehicles (current, modified)

The state will increase its investment to help people purchase EVs and install electric vehicle supply equipment (EVSE). This investment will significantly reduce GHG emissions and transportation costs for individuals, businesses, and other entities in Maryland.

Maryland currently offers an EV excise tax credit, administered through the Maryland Vehicle Administration (MVA). New point-of-sale rebates will lower the upfront cost of buying new and used EVs. Several EVs are now priced below the national average price of new cars but the options of EVs are still limited and many EVs are still priced above levels that are affordable for low and moderate income consumers, so state incentives in the near term will help accelerate the adoption of EVs. The proposed new incentives, presented here, were recommended by the Maryland Commission on Climate Change in 2023 with input from consultants, automotive dealers, and other stakeholders.

A new Maryland Clean Vehicle Rebate program will provide a point-of-sale rebate of $2,500 for a new EV and $1,000 for a used EV to all Marylanders who meet the criteria to qualify for the federal Clean Vehicle Credit. The state incentive will stack on top of the federal incentive, which offers up to $7,500 for a new EV and $4,000 for a used EV. Combined, qualifying Marylanders would save $10,000 on a new EV and $5,000 on a used EV, making it even easier and less expensive for all low, moderate, and middle income individuals, businesses, and tax-exempt organizations to purchase EVs.

Low and moderate income Marylanders will be eligible for an additional bonus rebate of $5,000 for a new EV and $3,000 for a used EV, which brings the combined federal and state incentives for low and moderate income households to $15,000 for a new EV and $8,000 for a used EV. These stacked rebates roughly cut in half the purchase price of the more affordable new and used EVs currently available for sale. The new state rebate is designed to reduce a low and moderate income household's transportation costs to around 10% of annual income, which could significantly reduce the energy cost burden for many Maryland households.

A Superuser Bonus program will provide additional incentives for Marylanders, including individuals and businesses/tax-exempt organizations located in Maryland, that commute the farthest and consume much more than the average amount of fuel for drivers in the state. Superusers in Maryland consume approximately two or more times the amount of motor fuel used by average drivers and tend to drive long distances for work. Helping superusers, who represent roughly 10% of Maryland drivers, switch from internal combustion vehicles to EVs would reduce on-road gasoline emissions by 30% or more.

The state will also provide technical assistance grants to owners of small fleets (with 10-199 vehicles) to help develop fleet electrification plans. Fleet vehicles are typically driven more miles annually than average vehicles, so they have an outsized impact on transportation sector

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https://www.baltometro.org/sites/default/files/bmc_documents/committee/presentations/brtb/BRTB190226pres_MD-JARC.pdf.

emissions and an outsized opportunity to reduce emissions through electrification. Additional details on these incentives can be found in the 2023 Annual Report of the Maryland Commission on Climate Change.

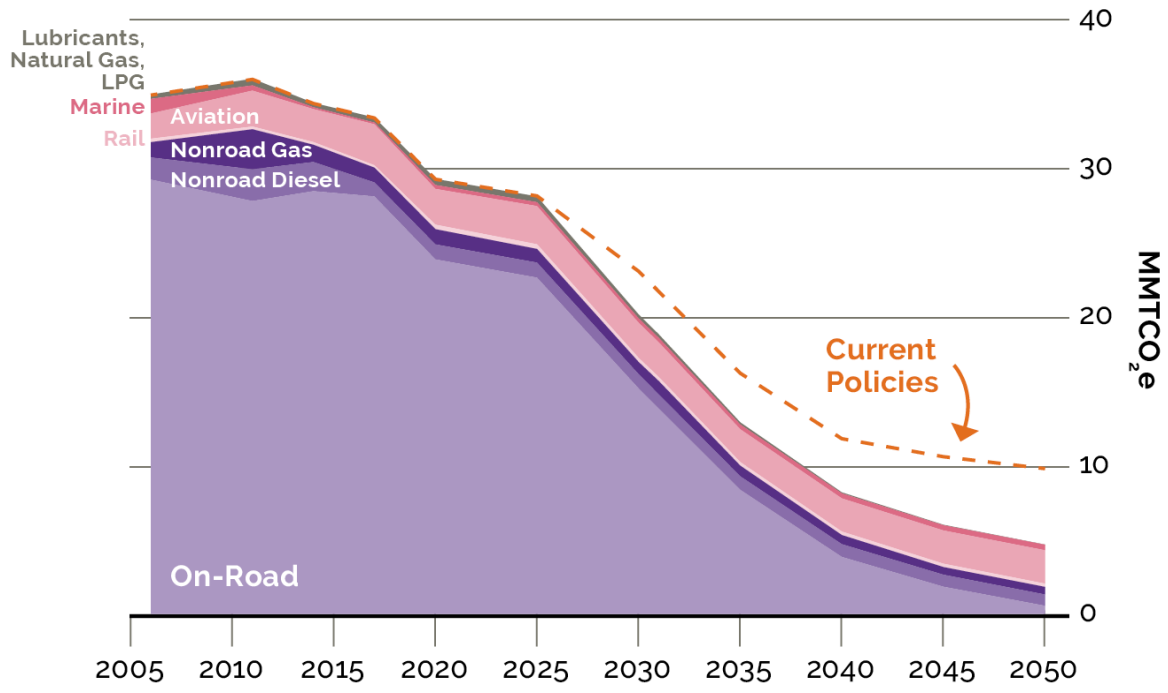
Table 1: **Maryland's potential new EV incentive programs** (contingent on funding)

		New EV	Used EV
Federal Clean Vehicle Credit *Existing (included here for reference)*	Incentive	**Up to $7,500** (can be a point-of-sale rebate starting in 2024)	**Up to $4,000** (can be a point-of-sale rebate starting in 2024)
	Eligibility	Individuals, businesses, and tax-exempt organizations	Individuals
	Income Limits	$300,000 for married filing jointly; $225,000 for heads of households; $150,000 for all other filers	$150,000 for married filing jointly; $112,500 for heads of households; $75,000 for all other filers
	EV Price Limits	$80,000 for a van, SUV, or pickup; $55,000 for other light-duty vehicles	$25,000 for any light-duty vehicle
Maryland Clean Vehicle Rebate *New*	Incentive	**$2,500 point-of-sale rebate (up to $10,000 federal + state)**	**$1,000 point-of-sale rebate (up to $5,000 federal + state)**
	Eligibility/Limits	Same as federal but all EVs under the price caps qualify (i.e. new EVs do not need to meet the Federal Clean Vehicle Credit manufacturing requirements)	
	Implementation	The income qualification forms used for the federal incentive would also be accepted for the state incentive. The state would refund the car dealer.	
Low and Moderate Income Bonus *New*	Incentive	**$5,000 point-of-sale bonus rebate (up to $15,000 fed + state + bonus)**	**$3,000 point-of-sale bonus rebate (up to $8,000 fed + state + bonus)**
	Eligibility	Individuals only	
	Income Limits	Up to 80% of Area Median Income (~$0-$90k/year for a 4-person household)	
	EV Price Limits	Same as federal	
	Implementation	The state would mail instant rebate coupons to qualified households based on the previous year's tax returns. Dealers would accept a coupon if the address printed on the coupon matches the address on the buyer's driver's license. The state would refund the car dealer.	
Superuser Bonus *New*	Incentive	**$5,000 point-of-sale bonus rebate (up to $15,000 fed + state + bonus)**	**$3,000 point-of-sale bonus rebate (up to $8,000 fed + state + bonus)**
	Eligibility/Limits	Same as federal (if buyers qualify for federal, then they qualify for state)	
	Implementation	An applicant would demonstrate with a CARFAX report that they use at least 800 gallons of fuel annually based on the average miles driven over their ownership of the trade-in vehicle multiplied by the fuel efficiency (miles per gallon) of the trade-in vehicle. The state would scrap trade-in vehicles that get less than 30 miles per gallon. The state would provide trade-in vehicles that get at least 30 miles per gallon and pass Maryland vehicle safety inspection with no/minor repair work to low-income families in need.	

Impact of Transportation Sector Policies

The new policies are modeled to reduce transportation sector GHG emissions by 88.1 MMTCO2e between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $20 billion. Figure 4 illustrates the change in GHG emissions from this sector based on historical and modeled trends.

Figure 4: **Maryland's transportation sector GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies



Buildings

Direct fuel use in the building sector accounted for 16% of Maryland's GHG emissions in 2020.[32] This includes emissions from burning fuel for space heating, water heating, cooking, and industrial heating processes. Buildings also use almost all of the electricity consumed in the state, so improving energy efficiency to reduce electricity consumption and fuel use is a key strategy for addressing climate change and reducing energy costs for consumers.

[32] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.

Maryland's 2030 GGRA Plan called for the state to accelerate the transition of fossil fuel heating equipment in buildings to efficient electric equipment that can be powered by clean electricity. Using electric, zero-emission appliances for applications like space heating, water heating, and cooking is common throughout Maryland and the rest of the nation. Several current policies described below already support reductions in fossil fuel combustion from these end-uses as well as the transition from fuel-burning to zero-emission equipment in buildings. New policies will accelerate those efforts while minimizing impacts on the electric grid, preparing for future EV charging needs, managing a transition of the natural gas system, and reducing household and business energy costs. Fuel use for high-temperature applications in the industrial building sector is harder to electrify but new technologies and incentives are expected to help achieve deep decarbonization of Maryland's building sector over the next 21 years.

Energy Codes and Standards (current)

Building energy codes have supported a wide array of environmental, energy, and health policy goals such as improvements in indoor air quality, promotion of less-emitting appliances, structural resilience, and reductions in peak energy load demands. The Maryland Department of Labor includes the Building Codes Administration, and the purview of this Administration includes the implementation of Maryland Building Performance Standards (MBPS) and building energy codes.[33] The MBPS requires that Maryland jurisdictions implement the latest edition of building code requirements, including those pertaining to the International Building Code (IBC),[34] the International Residential Code (IRC),[35] and the International Energy Conservation Code (IECC).[36] In Maryland, the Codes need to be considered for new construction as well as major renovations. According to Maryland law, the state may not adopt energy conservation requirements that are less stringent than the requirements in the IECC. Upon the MBPS being released, local jurisdictions are responsible for the modification and adoption of codes.

The CSNA required the state to adopt the IECC (2018 Edition) by January 2023 and to adopt each subsequent version of the IECC within 18 months after it is issued. Each local jurisdiction must implement and enforce the most current version of MPBS and any local amendments to MPBS. In addition, any modification to MBPS adopted by the state must be implemented and enforced by a local jurisdiction no later than 12 months after the modifications are adopted by the state. The building energy codes apply to all building owners undergoing new construction or large renovations, and the MBPS applies to all buildings and structures within the state for which a building permit application is received by a local government. Maryland's 23 counties are responsible for the adoption of new building energy codes and related operational impacts.

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[33] The Maryland Department of Labor. Maryland Building Codes - Building Codes Administration. https://www.dllr.state.md.us/labor/build/buildcodes.shtml.
[34] The International Code Council. 2021 International Building Code (IBC). https://codes.iccsafe.org/content/IBC2021P2.
[35] The International Code Council. 2021 International Residential Code (IRC). https://codes.iccsafe.org/content/IRC2021P2.
[36] The International Code Council. 2021 International Energy Conservation Code (IECC). https://codes.iccsafe.org/content/IECC2021P1.

Impacted entities may include local governments, state governments, schools, residential property owners, and nonresidential property owners.

EV-Ready and Solar-Ready Standards for New Buildings (current, modified)

Beginning in October 2023, homebuilders in Maryland are required to include EV charging equipment during the construction of single-family detached houses, duplexes, and townhouses. Specifically, each new housing unit in Maryland must include one EVSE-installed or EV-ready parking space capable of providing level-2 charging in a garage, carport, or driveway. EVSE-installed means having an EV charging device that is fully installed and ready to use at a parking space. EV-ready means having electrical panel capacity and wiring in place to easily install a level-2 EV charger in the future.

Multifamily residential buildings are expressly excluded from the enabling legislation. MEA is studying the cost, barriers, and impacts of requiring multifamily residential buildings to include EV-ready and EVSE-installed parking spaces. Pending the findings of MEA's study, this plan calls for the Maryland General Assembly to introduce legislation requiring EV-ready and EVSE-installed parking spaces in new multifamily buildings. Legislation should also require solar-ready standards for new buildings.

Building Energy Performance Standards (current)

MDE is in the process of adopting Building Energy Performance Standards (BEPS) for covered buildings to achieve a 20% reduction in net direct GHG emissions on or before January 1, 2030, as compared with 2025 levels for average buildings of similar construction, net-zero direct GHG emissions on or before January 1, 2040, and improve overall energy efficiency.[37] BEPS applies to buildings in Maryland that have a gross floor area of 35,000 square feet or more (excluding the parking garage area). Historic properties, public and nonpublic elementary and secondary schools, manufacturing buildings, agricultural buildings, and federal buildings are exempt. There are approximately 9,000 covered buildings in Maryland located across all counties. Buildings covered by BEPS accounted for approximately 5 $MMTCO_2e$ in 2020. This policy is modeled to reduce emissions by approximately 18 $MMTCO_2e$ between 2025 and 2050.[38]

Covered buildings will be required to benchmark energy use utilizing EPA's ENERGY STAR Portfolio Manager tool, which is a free tool that enables the benchmarking of energy use of any type of building.[39] Covered buildings are subject to interim performance standards before 2040 and to a final performance standard that must be achieved on an annual basis in 2040 and beyond.

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[37] The Maryland Department of the Environment. Building Energy Performance Standards. https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx.
[38] Lawrence Berkeley National Lab. Maryland Building Energy Performance Standards Impact Analysis. https://mde.maryland.gov/programs/regulations/air/Documents/BEPS/C%20-%20Maryland%20BEPS%20Impact%20Analysis%20Methodology%20FINAL%20%2812-5-2023%29.pdf.
[39] Energy Star. Benchmark Your Building Using ENERGY STAR Portfolio Manager. https://www.energystar.gov/buildings/benchmark.

The combination of direct GHG and site energy use intensity (EUI) standards delivers efficient electrification, manages grid impacts, and makes it easier for the state to achieve its GHG reduction goals. A study by the U.S. Department of Energy's Lawrence Berkeley National Laboratory found that the Maryland BEPS will reduce peak electricity demand 6% by 2040 whereas a policy that excludes site EUI standards would increase peak demand 24% by 2040. By reducing peak electricity demand, BEPS prevents the need for additional electricity generation capacity and makes it more achievable for Maryland to hit its requirements to achieve net-zero statewide GHG emissions by 2045.

In July 2023, Maryland joined the White House National Building Performance Standards Coalition, which is a nationwide group of state and local governments that have committed to inclusively design and implement building performance policies and programs in their jurisdictions[40]. Maryland's development of BEPS has been supported by federal agencies, labor, and non-governmental organizations that provided resources for workforce engagement, technical analysis, equity strategies, policy design, and stakeholder engagement.

State Government Lead by Example (current)

Maryland state government has several programs in place that set an example for large institutions to reduce their carbon footprint. State government operations and buildings, including the University System of Maryland (USM), have reduced their carbon footprint by nearly 20% since 2018 through energy savings initiatives, green purchasing, renewable energy purchases, and replacing internal combustion engine vehicles with EVs. The state government accomplished the overall carbon reduction in one hundred million square feet of facilities across several agencies and university campuses throughout the state.

The Department of General Services (DGS) is responsible for procuring and managing construction projects for over 15 different state agencies. In 2022, DGS adopted an all-electric policy for planning and implementing new construction and major renovations. One of the first new all-electric buildings will be the Supreme Court of Maryland located in Annapolis. The building is approximately 215,000 square feet, will include electric vehicle charging infrastructure, and will attain Leadership in Energy and Environmental Design (LEED) Silver certification. Since 2020, DGS has also managed the replacement of nearly fifty thousand fluorescent light fixtures in state-owned buildings with high-efficiency LEDs and controls. Due to a strong focus on energy efficiency, overall energy use in state-owned buildings has declined nearly 12% since 2018.

DGS's Energy Office partnered with USM to purchase over $165 million of electricity in FY 2023. Included in the energy commodity purchases are three 20-year Power Purchase Agreements (PPAs) of renewable energy from two utility-scale wind installations and one solar installation. In

[40] National BPS Coalition. About the National BPS Coalition. https://nationalbpscoalition.org/.

FY 2023, the state government spent approximately $19 million on renewable electricity, which accounted for 11.5% of the electricity cost for state operations.

The state is in its third year of transitioning its 4,000-vehicle fleet to EVs. In parallel with purchasing EVs, DGS installs EV charging infrastructure across the state at all agencies. The goal is to install at least 2,000 EV charging ports by 2030.

EmPOWER (current, modified)

In response to concerns relating to sufficient electricity supply and reliability, the Maryland General Assembly passed the Maryland Energy Efficiency Act of 2008, thereby establishing the EmPOWER Maryland Program. The EmPOWER energy efficiency programs are managed by the five largest electric utility companies and the Department of Housing and Community Development (DHCD). As reported in PSC's 2015 annual report to the General Assembly, the EmPOWER programs were successful at meeting initial goals relating to the reduction of per capita consumption and per capita demand. This first phase of EmPOWER was shown to have provided customer bill savings, lower wholesale energy prices due to the reduced need for infrastructure investments, and a reduction in GHG emissions.

In 2015, PSC established a new target for the five participating electric utilities: 2% annual incremental energy savings based on gross electricity sales by 2020. In 2017, this percentage goal was codified into law by the General Assembly. The percent target is based on a rolling baseline using the data from the year before the current three-year program cycle. Not only does the PSC consider aspects of its general authority to regulate utilities, such as public safety and climate change in approving programs, but over time the Public Utilities Article has also required that the PSC consider cost-effectiveness to encourage and promote the efficient use and conservation of energy. Through a rigorous evaluation process, the PSC reviews progress on EmPOWER on a semi-annual basis and may request program and budget changes.

As of 2023, the EmPOWER Program is concluding its fifth three-year cycle (2021-2023) and includes both electric and gas utility companies and DHCD. EmPOWER programs are managed by the following companies: Baltimore Gas and Electric Company (BGE), Potomac Edison Company (PE), Delmarva Power & Light (Delmarva), Potomac Electric Power Company (PEPCO), Southern Maryland Electric Cooperative, Inc. (SMECO), and Washington Gas Light Company (WGL). DHCD also provides EmPOWER programs and is aiming to increase annual energy savings across all limited-income households.

The CSNA required that the utility companies' EmPOWER programs meet increasingly higher energy savings goals: 2.25% annually in 2025 and 2026, and 2.5% annually in 2027 and thereafter. Additionally, in 2023, legislation was enacted that established energy savings goals for DHCD requiring energy savings of 0.53% in 2024, 0.72% in 2025, and 1% in 2026 for limited-income households. However, the PSC's Future Programming Work Group recommended that a GHG

reduction goal be established as the central goal under EmPOWER.[41] This plan calls for legislation to establish GHG reduction goals and require EmPOWER programs to include beneficial electrification. Beneficial electrification refers to the use of electricity to replace the direct use of fossil fuels in buildings in a manner that reduces overall lifetime GHG emissions or customers' energy costs. In addition to the continuation of efficiency efforts for electric utilities, EmPOWER will likely evolve in alignment with other GHG reduction policies, the PSC's program processes, and in response to cost implications.

Zero-Emission Heating Equipment Standard (new)

The Zero-Emission Heating Equipment Standard (ZEHES) is a new state policy that will require new heating systems installed in Maryland buildings to produce zero on-site emissions beginning later this decade. Zero-emission heating equipment including electric water heaters and heat pumps for space heating and cooling are already widely used across Maryland. New technologies, falling prices, and robust federal, state, and utility-sponsored incentives for heat pump water heaters and space heating/cooling systems make heat pumps the preferred solution for energy-efficient, low-cost, zero-emission buildings. Marylanders can currently take advantage of a federal tax credit providing up to $2,000 off the cost of installing a heat pump. Starting in 2024, MEA will offer rebates that provide up to $8,000 off the cost of installing a heat pump for some low, moderate, and middle income households.

Maryland is among several states moving to adopt zero-emission appliance/heating equipment standards. In September 2023, Maryland joined with 24 other states in the U.S. Climate Alliance in committing to quadruple the number of heat pumps installed by 2030.[42] With ZEHES, new buildings will be constructed with zero-emission heating equipment and the existing building stock will transition to having almost all space and water heating demand provided by zero-emission heating equipment by 2045. Cooking equipment is not covered by this policy but incentives will be provided to help Marylanders upgrade to electric cooking appliances, which can significantly improve indoor air quality compared to cooking with combustible fuels.

ZEHES will not require anyone to remove a working furnace, boiler, or other piece of heating equipment. Existing fuel-burning equipment can continue to be serviced and remain in place until the time the individual decides to replace their fuel-burning equipment. It is at this time of replacement that new equipment will need to meet the zero-emission standard. The effect of this policy will be, over time, to replace one-way air conditioning (AC) units with two-way heat pumps, which function as efficient AC and can reverse cycle to provide efficient heating. Modern heat pumps are more than capable of meeting 100% of the heating demand of Maryland buildings, as evidenced by the fact that heat pumps are already commonly used in buildings statewide.

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[41] Public Service Commission of Maryland. Recommendations on the Future of EmPOWER Maryland. https://www.psc.state.md.us/wp-content/uploads/EmPOWER-Recommendations-to-General-Assembly_Final.pdf

[42] United States Climate Alliance. States United for Climate Action. https://usclimatealliance.org/.

ZEHES will eventually transition almost all buildings to zero-emission heating equipment but ZEHES plus current policies will not decarbonize buildings fast enough to achieve Maryland's GHG reduction goals. ZEHES and current policies also do little to decarbonize fuels that are used for high-temperature applications and other energy end-uses. Switching to lower-impact combustible fuels for limited applications could be critical for achieving the state's net-zero emissions goal. Thus, ZEHES will be coupled with a Clean Heat Standard, described below.

ZEHES is modeled to avoid annual GHG emissions of 0.8 $MMTCO_2e$ in 2031, and 3.4 $MMTCO_2e$ in 2045. MDE is responsible for developing, adopting, and implementing regulations to enact and enforce ZEHES in Maryland. MDE will initiate a rulemaking process in 2024 to propose draft regulations based on existing statutory authority before 2025.

Clean Heat Standard (new)

A Clean Heat Standard (CHS) is a performance-based approach to reducing GHG emissions from the building sector.[43] CHS is designed to broadly decarbonize covered sectors in a manner that is market-based and friendly to customer choice in coordination with other programs. It complements and supports the achievement of other policies including energy codes and standards, EmPOWER, BEPS, and ZEHES. As a sector-specific policy, it ensures that decarbonization proceeds at the pace needed to achieve the state's goals.

CHS requires natural gas utility companies and heating oil and propane importers to reduce the GHG emissions associated with their businesses following a schedule set by MDE. As a market-based performance standard, obligated parties can meet the requirements in several ways including but not limited to helping their customers save energy, helping their customers install heat pumps, and replacing fossil fuels with lower-impact fuels. Obligated parties can also work with third parties to deploy a range of clean heat measures that reduce emissions. Anything that reduces emissions from buildings helps the obligated parties meet the CHS requirements, so as customers take advantage of federal, state, and EmPOWER incentives for energy efficiency and electrification upgrades or take any other actions to reduce emissions from buildings, the customers' actions help the obligated parties achieve their requirements.

Importantly, CHS and ZEHES can work together to deliver the lowest-cost pathway for decarbonizing buildings. While ZEHES, electrification incentives, and other policies will transition almost all of Maryland's fuel-burning buildings to be all-electric by 2045, CHS layers on top of these policies to increase the pace of building sector decarbonization while improving building shells and transitioning the last bit of fuel demand to lower-impact fuels, especially for high-heat applications.

[43]The Regulatory Assistance Project. Meeting the Thermal Challenge: A Clean Heat Standard for Maryland November 3, 2023.
https://www.raponline.org/knowledge-center/meeting-thermal-challenge-clean-heat-standard-maryland/.

CHS is also an important tool for incentivizing new technologies that are demonstrated to have low lifecycle emissions. For example, networked geothermal systems, which are in use on some campuses to efficiently share heating and cooling loads between buildings, are starting to be developed in non-campus settings such as residential neighborhoods. The lifecycle emissions benefits of networked geothermal, which could be significant when avoided electricity generation emissions are included, can be acknowledged and rewarded under the CHS program. The lifecycle emissions impacts of biomethane, biodiesel, woody biomass, hydrogen, and other alternative fuels that can be useful for high-heat applications can also be evaluated fairly under a CHS framework.

CHS is modeled to avoid annual GHG emissions of 0.8 $MMTCO_2e$ in both 2031 and 2045. MDE is responsible for developing, adopting, and implementing regulations to enact and enforce CHS in Maryland. MDE will initiate a rulemaking process in 2024 to propose draft regulations based on existing statutory authority before 2025.

Gas System Planning (new)

The Maryland Commission on Climate Change recommended when it released its Building Energy Transition Plan in 2021 that the electric and gas utility companies operating in the state should submit plans to the PSC showing how the companies are making utility infrastructure investments that align with the state's climate goals.[44] In 2023, OPC filed a petition asking PSC to open a docket to consider near-term priority actions and comprehensive long-term planning for gas companies. PSC subsequently opened a public comment period on OPC's petition and, as of the writing of this plan, is reviewing the comments to determine the next steps. Respecting PSC's status as an independent state agency, MDE supports the call for PSC to oversee the development and implementation of gas system planning to achieve a structured transition to a net-zero emissions economy in Maryland.

State Incentives for Building Decarbonization (current, modified)

The state will substantially increase its current investments to reduce GHG emissions and energy costs for the millions of residential, commercial, and institutional buildings in Maryland. Using $137 million from the IRA, MEA will begin in 2024 offering two new rebate programs to reduce energy costs for people living in single-family and multi-family buildings. The Home Efficiency Rebates program will provide homeowners and landlords up to $4,000 or 50% of project costs for eligible efficiency upgrades that are projected to save at least 35% of a home's energy use and up to $2,000 or 50% of project costs for projects with modeled energy savings ranging from 20-34%. Higher rebate amounts are available for households with income levels less than 80% of the area median income (AMI).

[44] The Maryland Department of the Environment. Appendix A Building Energy Transition Plan A Roadmap for Decarbonizing the Residential and Commercial Building Sectors in Maryland. https://mde.maryland.gov/programs/air/ClimateChange/MCCC/Documents/2021%20Annual%20Report%20Appendices%20FINAL.pdf

The Home Electrification and Appliance Rebates program will provide rebates to households with incomes up to 150% of AMI or multifamily buildings in which at least 50% of residents have incomes equal to or less than 150% AMI. Rebates will be provided to qualifying homeowners and multifamily building owners for specific electrification measures, which may include:

- Heat pump air conditioning and heating system: not to exceed $8,000
- Electric panel upgrades: not to exceed $4,000
- Electric wiring: not to exceed $2,500
- Heat pump water heaters: not to exceed $1,750

These rebate programs were accompanied in the IRA by significant new efficiency and electrification tax credits that took effect in 2023. Tax credits cover 30% of the cost of certain energy upgrades made by a homeowner or business, up to $1,200 (or $3,200 if an upgrade includes a heat pump installation). Importantly, these credits can be claimed annually. This means that a customer can receive a $1,200 credit one year for installing new insulation and a $2,000 credit the next year for installing a heat pump. The IRA also expanded the energy-efficient commercial buildings deduction under the federal tax code. For commercial property placed in service in 2023 and after, this tax deduction allows a building owner to deduct the lesser of the cost of the installed property or the energy savings per square foot, up to a maximum of $1.00 per square foot for a building with 50% energy savings. This deduction can also be claimed annually.

MEA and other state agencies will work to ensure that Marylanders are aware of these rebate and tax incentive programs and can take advantage of them. Education of contractors, building owners, and customers will be critical to the achievement of these goals, as will the development of rebate application processes that are accessible to all Marylanders, including low-income building owners and occupants. It is also crucial that the new IRA rebate programs be coordinated with utility and DHCD-run EmPOWER programs and DHCD's weatherization and whole home repair programs.

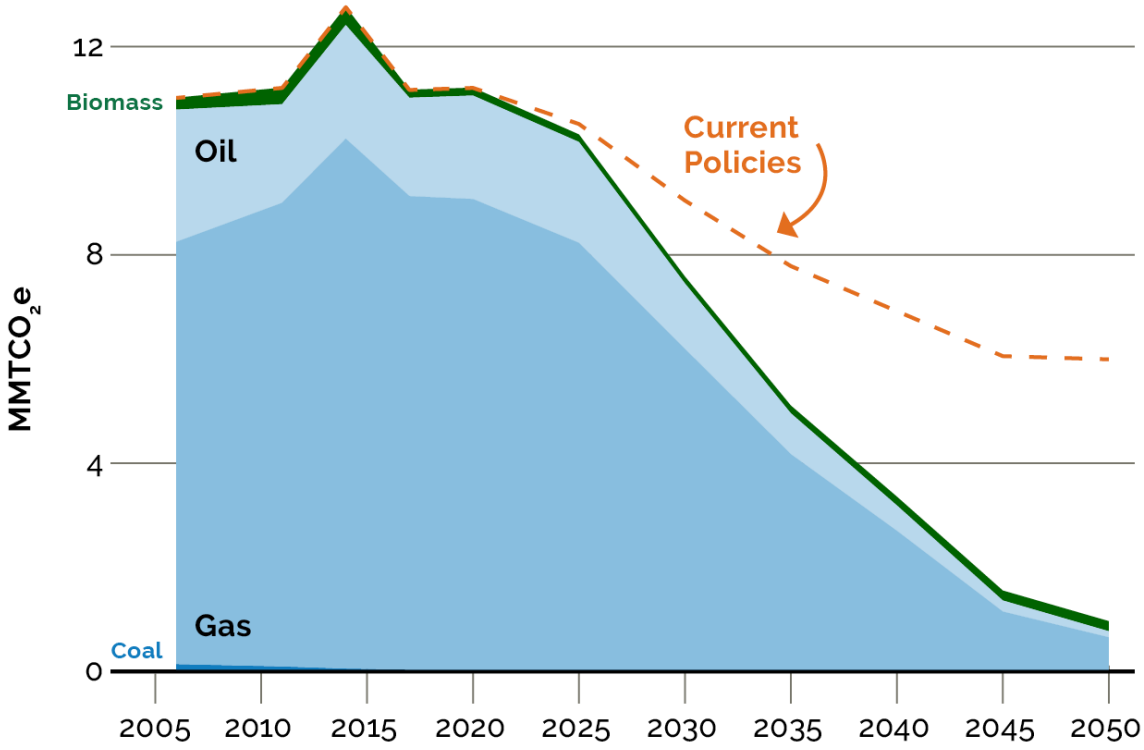
However, even with such education and coordination, additional state funding will be necessary for rapid building decarbonization in Maryland. The IRA rebates are among MEA's residential energy efficiency and electrification programs that will be supercharged with new funding from the state. New programs will be established to support efficiency and electrification projects in commercial, institutional, and industrial buildings, including those covered by BEPS or other state requirements that require building improvements. Some of the funding will also support projects in Maryland's elementary and secondary schools to reduce energy costs for local school districts and improve the health and well-being of students statewide.

Impact of Building Sector Policies

The new policies are modeled to reduce building sector GHG emissions by 75.2 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be

$17 billion. Figure 5 illustrates the change in GHG emissions from this sector based on historical and modeled trends.

Figure 5: **Direct GHG emissions from fuel use in Maryland's building sector**, historical and projected, from 2006 to 2050 based on current and new policies



Industry

Industrial processes and product use (IPPU), industrial fuel use, and direct emissions from the fossil fuel industry, which are three different sectors in Maryland's GHG Inventory, comprised 18.3% of Maryland's GHG emissions in 2020.[45] The five largest sources of industrial emissions are:

- Hydrofluorocarbon (HFC) and perfluorocarbon (PFC) emissions from their use primarily in cooling and refrigeration equipment (5.2 $MMTCO_2e$ in 2020)
- Methane (CH_4) emissions from leaks in natural gas infrastructure (3.1 $MMTCO_2e$ in 2020)
- CO_2 emissions from fossil fuel use in industrial facilities (2.7 $MMTCO_2e$ in 2020)

[45] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.

- CO_2 emissions from the calcination of limestone in the manufacturing of cement (1.8 $MMTCO_2e$ in 2020)
- CO_2 emissions from generators used to produce liquified natural gas (1 $MMTCO_2e$ in 2020)

Within the IPPU sector, approximately 96% of emissions come from two sources: cement manufacturing and the use of HFCs for cooling and refrigeration equipment. A small amount of emissions comes from limestone use, soda ash use, non-fertilizer usage of urea, and sulfur hexafluoride (SF6) use for electric power transmission and distribution systems.

Within the industrial fuel use sector, emissions were evenly split between coal, oil, and natural gas in 2020. Practically all of the coal used in the industrial sector is used by two cement manufacturing plants while almost all of the oil and gas is consumed by non-cement industries. Switching industry to cleaner fuels or electricity is an important part of decarbonizing this sector. The largest of the two cement manufacturing plants in Maryland is currently working to replace coal with natural gas while the other plant is considering a replacement of coal with refuse-derived fuel. These two fuel-switching projects are included in the emissions modeling for this sector.

Within the fossil fuel industry, most of the direct emissions are from the natural gas industry, which includes the in-state emissions from the production, transmission, and distribution of natural gas. A small portion of emissions are from coal mining, which includes underground and surface mines and abandoned mines.

Hydrofluorocarbon Regulations (current)

In November 2020, MDE adopted regulations to prohibit certain hydrofluorocarbons (HFCs) and HFC blends that have a high global warming potential (GWP) and pose a higher overall risk to human health and the environment.[46] The regulations adopted specific prohibitions for HFCs in air conditioning and refrigeration equipment, aerosol propellants, and foam end-uses. The phase-out of HFCs encourages the use of available alternatives with lower GHG emissions.

MDE's HFC regulations apply to any person who sells, offers for sales, installs, or introduces into commerce in Maryland any substance in end-uses identified in the regulations. The requirements focus on end-use prohibitions for the following sectors/categories: Aerosol Propellants, Air Conditioning, Refrigeration, and Foams. The effective prohibition phase-in dates range from January 1, 2021, to January 1, 2024. The regulations include a sell-through provision for products and equipment manufactured before the prohibition date. The regulation also allows continued

[46] The Maryland Department of the Environment. Maryland finalizes regulations to phase out hydrofluorocarbons and reduce methane emissions. https://news.maryland.gov/mde/2020/11/13/maryland-finalizes-regulations-to-phase-out-hydrofluorocarbons-and-reduce-methane-emissions/.

use of existing products and equipment that contain banned substances acquired before the prohibition dates.

The Maryland regulations were modeled after the EPA's Significant New Alternatives Policy (SNAP) program (specifically SNAP 20 & 21).[47] The EPA's SNAP program implements section 612 of the amended Clean Air Act of 1990, which requires EPA to evaluate substitutes for ozone-depleting substances to reduce overall risk to human health and the environment. Through these evaluations, SNAP generates lists of acceptable and unacceptable substitutes for each of the major industrial use sectors. The EPA has modified the SNAP lists many times, most often by expanding the list of acceptable substitutes, but in some cases by prohibiting the use of substitutes previously listed as acceptable.

EPA has moved beyond the SNAP rules and has adopted three new rules for HFC uses and production: the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing Act, the Technologies Transition rule, and the Management of Regulated Substances rule to address existing sources through reclamation.

In July 2023, EPA finalized the Phasedown of Hydrofluorocarbons: Allowance Allocation Methodology for 2024 and Later Years,[48] which spins off of the regulation that was finalized by EPA in 2022 that created a framework to phasedown HFC production and consumption by 85% by the year 2036 through establishing the Allowance Allocation and Trading Program Under the American Innovation and Manufacturing (AIM) Act.[49] On October 19, 2023, a Notice was published for the 2024 Allowance Allocation for Production and Consumption of Regulated Substances Under the AIM Act of 2020, and a Notice of Final Consequences.[50] By October 1 of each calendar year, EPA must determine the quantity of allowances for the production and consumption of regulated substances that may be used for the following calendar year.

In October 2023, EPA finalized the Technologies Transition rule which restricts the use of certain higher-GWP HFCs in aerosols, foams, refrigeration and air conditioning, heat pump products, and equipment.[51] The restrictions are to transition to alternatives listed by sector and subsector and would prohibit the manufacture and import of products containing restricted HFCs by January 1,

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[47] The U.S. Environmental Protection Agency. Significant New Alternatives Policy (SNAP) Program. https://www.epa.gov/snap.
[48] The U.S. Environmental Protection Agency. HFC Allowance Allocation and Reporting. https://www.epa.gov/climate-hfcs-reduction/hfc-allowance-allocation-and-reporting.
[49] The U.S. Environmental Protection Agency. HFC Allowances. https://www.epa.gov/climate-hfcs-reduction/hfc-allowances.
[50] Federal Register. Phasedown of Hydrofluorocarbons: Notice of 2024 Allowance Allocations for Production and Consumption of Regulated Substances Under the American Innovation and Manufacturing Act of 2020, and Notice of Final Administrative Consequences. https://www.federalregister.gov/documents/2023/10/19/2023-22163/phasedown-of-hydrofluorocarbons-notice-of-2024-allowance-allocations-for-production-and-consumption.
[51] The U.S. Environmental Protection Agency. Technology Transitions. https://www.epa.gov/climate-hfcs-reduction/technology-transitions.

2025, in most cases, and would prohibit the sale, distribution, and export of products containing restricted HFCs a year later, which in most cases would be January 1, 2026. To support compliance with the prohibitions on the use of HFCs in specific sectors and subsectors, EPA requires labeling, reporting, and recordkeeping requirements for companies that import, manufacture, sell, or offer for sale products using HFCs.

The EPA's AIM Act HFC Technologies Transition rule covers more end-use categories than Maryland's HFC regulations and lowers the GWP allowable limit significantly from Maryland's HFC regulations. Maryland's regulations help to reduce HFCs with compliance deadlines between 2021 and 2024. The EPA's new rules establish additional reductions from 2025 and beyond.

Additionally, the EPA has just proposed a rulemaking addressing existing sources, the Management of Regulated Substances, under subsection (h) of the AIM Act to maximize reclamation and reduce emissions of HFCs and their substitutes.

The EPA has received funding through the IRA to be used for a variety of different projects and programs. Of the projects, EPA plans to use funding on projects addressing HFCs and the AIM Act. The EPA received $38.5 million from the IRA to use towards the implementation and compliance of the AIM Act. $15 million of the funding will be used for grants on reclaim and innovative destruction technologies.

Maryland supports these national rules to achieve HFC reductions throughout the country. Maryland is exploring opportunities to develop a more robust workforce by offering training for technicians. Implementation would be supported by a CA F-gas Reduction Incentive Program (FRIP).

Control of Methane Emissions from the Natural Gas Industry (current)

Methane is the primary constituent of natural gas and is the second most prevalent GHG emitted by human activity in the U.S. While methane doesn't linger as long in the atmosphere as CO2, it is initially far more impactful to the climate because of how effectively it absorbs heat. The oil and gas energy industry can be divided into four segments: (1) production; (2) gathering and processing; (3) transmission and storage; and (4) distribution. Maryland began taking steps to restrict methane emissions from the value chain by establishing a law in 2017 to ban hydraulic fracturing in the state operations that occur in the production segment. Hydraulic fracturing, a form of drilling to extract natural gas from underground depositories, poses the risk of emitting GHGs into the atmosphere. The ban on hydraulic fracturing eliminates this environmental risk.

With no gathering and processing operations in the state, Maryland then turned to the transmission and storage segment for regulatory action. On October 23, 2020, Maryland finalized regulations to reduce vented and fugitive emissions of methane from both new and existing

natural gas transmission and storage facilities.[52] In the transmission and storage segment, compressors are used to maintain the pressure of the natural gas in transmission pipelines to deliver extracted gas to its eventual end-user. Maryland's Control of Methane Emissions from the Natural Gas Industry regulations affect new and existing natural gas compressor stations, one liquefied natural gas facility, and one underground storage facility in the transmission and storage segment. The regulations set requirements to mitigate methane emissions through fugitive emissions leak detection and repair, and control measure requirements to limit emissions from compressors and pneumatic devices. Facility-wide GHG emission data is required to be calculated and submitted to MDE annually. Additionally, owners and operators are required to notify MDE and the public during "blowdown events," which are the release of pressurized natural gas from stations, equipment, or pipelines into the atmosphere so that maintenance, testing, or other activities can take place.

Maryland adopted regulations as the EPA stalled and reversed direction on the stringency of controls in the oil and gas industry from 2016 to 2021. Maryland regulations to detect and mitigate methane emissions apply to both new facilities as well as existing facilities. This was a more stringent approach than EPA had required in a 2016 New Source Performance Standards (NSPS) rule for the oil and natural gas industry (40 CFR Part 60, Subpart OOOOa or 2016 NSPS OOOOa) emission reduction of volatile organic compounds (VOCs) and methane.[53] Then in 2018 and 2019, EPA proposed relaxation and reconsideration amendments to certain provisions of the 2016 NSPS OOOOa. EPA reduced the sources affected in each sector, rescinded all the methane reduction requirements and kept only VOC requirements, minimized the leak detection requirements, and reduced reporting requirements.

Maryland supports national rules for this industry sector as many states have much more activity in oil and gas production than Maryland. Maryland, along with 14 other states, opposed EPA's reconsiderations and joined litigation against EPA for failing to perform a legal duty to control emissions of methane from existing oil and gas operations.

Beginning in 2021, EPA reversed its direction and announced policies to strengthen the controls required for GHG emissions in the oil and gas industry. In November 2021, EPA proposed New Source Performance Standards Updates and Emissions Guidelines to Reduce Methane and Other Harmful Pollution from the Oil and Natural Gas Industry.[54] The proposal would expand and

[52] The Maryland Department of the Environment. Maryland finalizes regulations to phase out hydrofluorocarbons and reduce methane emissions. https://news.maryland.gov/mde/2020/11/13/maryland-finalizes-regulations-to-phase-out-hydrofluorocarbons-and-reduce-methane-emissions/.
[53] The U.S. Environmental Protection Agency. Crude Oil and Natural Gas Production, Transmission and Distribution for Which Construction, Modification, or Reconstruction Commenced after August 23, 2011 and on or before September 18, 2015: New Source Performance Standards (NSPS). https://www.epa.gov/stationary-sources-air-pollution/crude-oil-and-natural-gas-production-transmission-and-distribution.
[54] The U.S. Environmental Protection Agency. EPA Proposes New Source Performance Standards Updates, Emissions Guidelines to reduce Methane and Other Harmful Pollution from the Oil and Natural Gas

strengthen emissions reduction requirements that are currently on the books for new, modified, and reconstructed oil and natural gas sources and would require States to reduce methane emissions from hundreds of thousands of existing sources nationwide. The proposal encourages the use of innovative methane detection technologies and other cutting-edge solutions. EPA is proposing a comprehensive monitoring program to require companies to find and fix leaks (known as "fugitive emissions") at new and existing well sites and compressor stations and allows for innovative advanced technologies to perform these leak surveys.

The proposed requirements expanded well site monitoring, which EPA projects will require routine monitoring at 300,000 well sites nationwide. All new and existing compressor stations would monitor and repair leaks at least once every three months. Surveys must include inspections of equipment that is most prone to large leaks and malfunctions, including hatches on storage tanks and flares.

EPA's proposal would require all new and existing pneumatic controllers at production, processing, transmission, and storage facilities to have zero methane and VOC emissions, except sites in Alaska that do not have power. The proposal also would regulate emissions from intermittent vent pneumatic controllers for the first time. EPA's proposal would eliminate the venting of associated gas from oil wells and require owners and operators to route the gas to a sales line where available. EPA's proposal would strengthen requirements for storage tanks by adding tank batteries (groups of tanks that are adjacent and receive fluids from the same source) to the definition of facilities that must reduce VOC and methane emissions, as well as establish nationwide requirements to minimize methane and VOC emissions from liquids unloading for the first time.

In November of 2022, EPA proposed supplemental regulations to the 2021 action by adding requirements for abandoned and unplugged wells, improved performance to minimize malfunctions at flares, and improved tank truck loading operations.[55] These proposals align with the current Maryland natural gas industry methane controls and add significant requirements beyond the Maryland rule for the extended gathering and processing of these fossil fuels that will achieve reductions in surrounding States.

Industry.
https://www.epa.gov/controlling-air-pollution-oil-and-natural-gas-operations/epa-proposes-new-source-performance.

[55] The U.S. Environmental Protection Agency. EPA's Supplemental Proposal to Reduce Pollution from Oil and Natural Gas Operations to Fight the Climate Crisis and Protect Public Health: State Planning Process. https://www.epa.gov/system/files/documents/2022-11/EPA%27s%20O%26G%20Supplemental%20Proposal.%20Fact%20Sheet%20for%20States.pdf.

Buy Clean (current)

The Buy Clean Maryland Act was passed by the Maryland General Assembly in 2023.[56] This law requires producers of eligible materials to submit environmental product declarations to DGS by the end of 2024. DGS will work in consultation with MDOT to analyze the environmental product declarations and establish maximum acceptable GWP values for each category of eligible materials used in certain construction projects.

In establishing the GWP for each category, DGS is required by the Buy Clean Maryland Act to base the maximum acceptable GWP on the industry average of GWP emissions for that material and determine the industry average of GWP emissions, which may include transportation-related emissions, by consulting nationally or internationally recognized databases of environmental product declaration. Contractors must submit facility-specific environmental product declarations for each eligible material before any installation. DGS can waive certain requirements if it determines that requiring the relevant eligible materials would be technically infeasible, result in a significant increase in project cost, result in a significant delay in project completion, or result in only one source or manufacturer being able to provide the necessary materials.

Beginning in December 2025 and throughout each following year, DGS is required to submit an annual report to the Maryland General Assembly that includes what DGS has learned about how to identify and quantify embodied carbon in building materials, including life cycle costs. DGS must also report on any obstacles encountered by them, bidders, or offerors in identifying and quantifying embodied carbon in building materials. To ensure that the most appropriate calculations are used in developing the maximum acceptable GWP for each category of eligible materials, DGS must include in its report a detailed description of its methodology.

The Buy Clean Maryland Act includes an Environmental Product Declaration Assistance Fund, administered by the Department of Commerce, that awards grants to producers of eligible materials. This fund supports the development, standardization, and transparency of environmental product declarations for construction materials and products, and consists of money appropriated in the state budget.

Maryland also joined the Federal-State Buy Clean Partnership[57], initiated by the Biden Administration in 2023. Through this partnership, the State will work with federal and other state partners to enhance adoption, implementation, and harmonization of Buy Clean policies and maximize regional, cross-jurisdictional solutions whenever possible.

[56] Maryland Senate Bill 424. Eligible Projects - Procurement of Construction Materials (Buy Clean Maryland Act). https://mgaleg.maryland.gov/2023RS/bills/sb/sb0424T.pdf.
[57] https://usclimatealliance.org/press-releases/buy-clean-partnership-mar-2023/

State Incentives for Industrial Decarbonization (current, modified)

MEA currently provides grants for energy efficiency and decarbonization projects at industrial facilities and, under this plan, the state will provide additional support for decarbonization activities across Maryland's industrial sector. Priority investments could include cement manufacturing decarbonization and HFC reduction. MDE, MEA, and the Maryland Clean Energy Center (MCEC) will increase staff capacity to partner with industry to streamline access to grants and financing for emissions reduction projects.

Impact of Industrial Sector Policies

The new policies are modeled to reduce industrial sector GHG emissions by 181.6 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $34 billion. Figures 6-8 illustrate the change in GHG emissions from this sector based on historical and modeled trends.

Figure 6: **Maryland's industrial processes and product use GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies

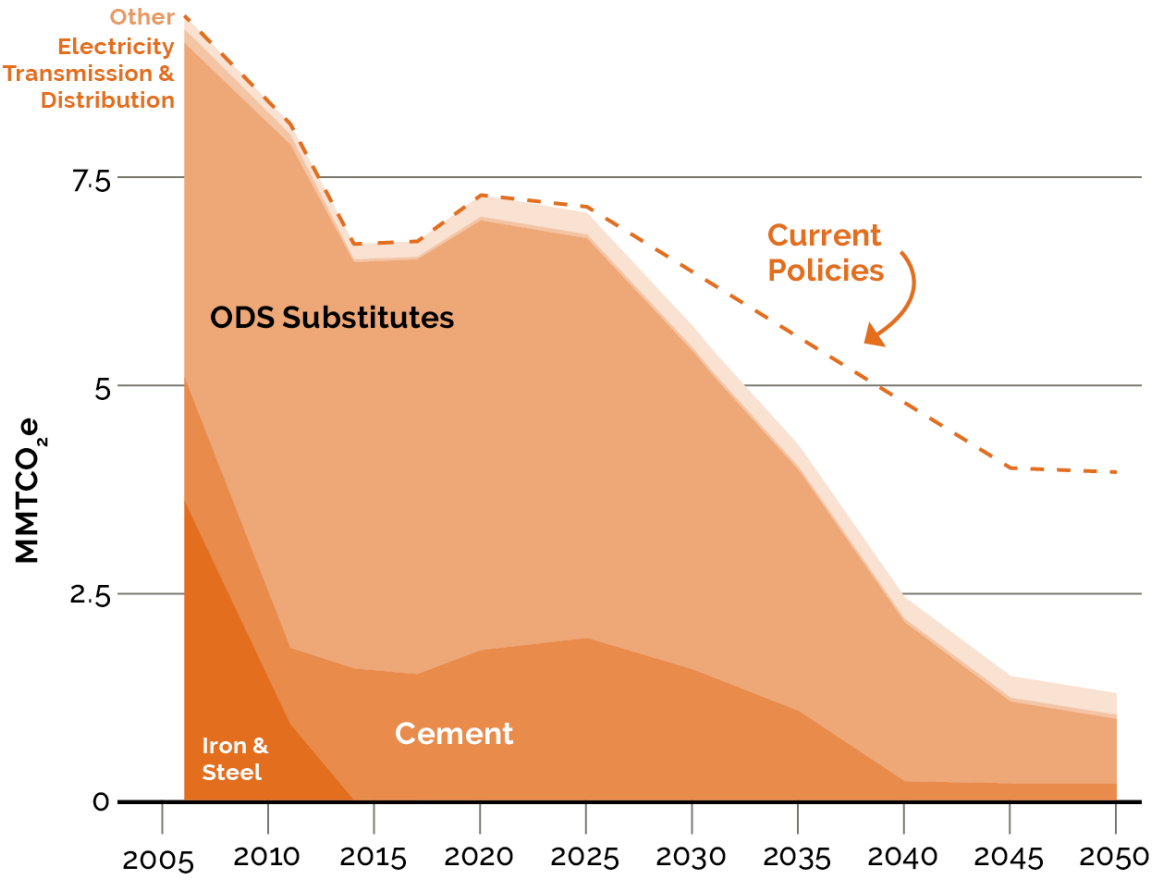


Figure 7: **Maryland's industrial sector fuel use GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies

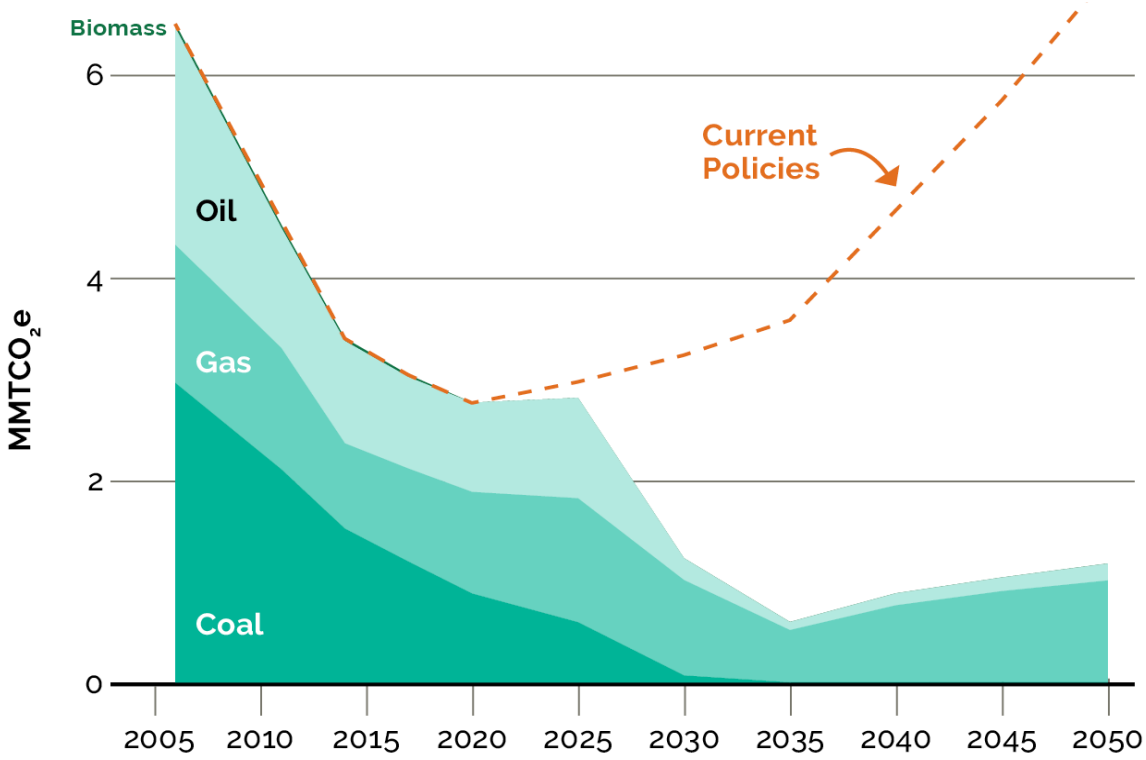
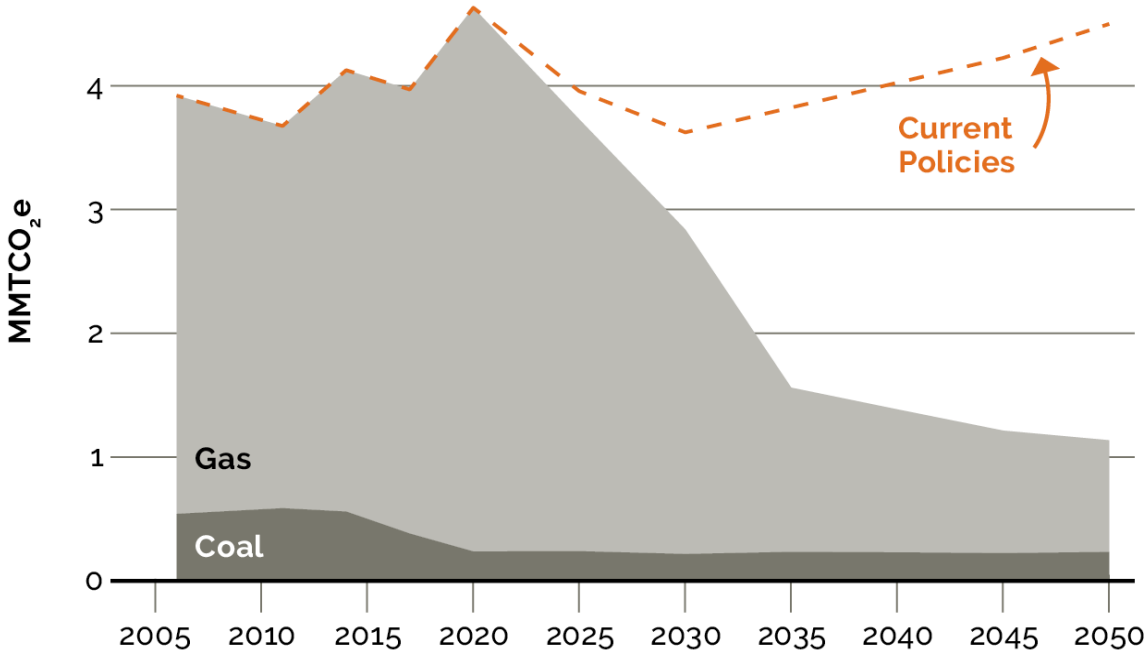


Figure 8: **Maryland's fossil fuel industry GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies



Waste

The waste sector accounted for 10% of Maryland's GHG emissions in 2020.[58] This sector includes emissions from landfills, wastewater management, waste combustion, and residential open burning. Maryland can reduce GHG emissions in the waste sector by implementing waste reduction, reuse, and recycling strategies to fundamentally shift the way businesses and residents currently produce, use, and handle products and materials at the end-of-life cycle. Additional emissions reductions can be achieved by minimizing emissions at solid waste management facilities and wastewater treatment plants, and through the evaluation of the beneficial use of methane captured from landfills.

Landfill Methane Regulations (current)

A municipal solid waste (MSW) landfill is a parcel of land that accepts garbage or non-hazardous residential and commercial wastes. As the waste decomposes it produces landfill gas that is composed of several GHGs. The gases produced at landfills include methane - a short-lived but significant GHG with a GWP more than 80 times that of CO_2. Landfills are the second largest industrial source of methane emissions in the United States. MDE has concurred with recent research findings which show that MSW landfills in Maryland are the single largest source of the state's methane emissions and these emissions are approximately four times higher than previously thought.[59]

In 2021, MDE proposed to implement regulatory requirements for owners and operators of new and existing MSW landfills, which include surface emission monitoring, detecting, and repairing landfill gas leaks, recordkeeping and reporting requirements, and installing and operating emission control systems based upon regulatory applicability.[60]

Additional climate change abatement strategies include MDE forming partnerships with state agencies, local jurisdictions, environmental advocacy groups, and the private and public sectors to limit the amount of methane-generating waste that enters landfills through waste diversion.[61] Waste diversion combines both recycling and source reduction activities. These strategies have been effective in reducing methane emissions from landfills and helping to meet Maryland's climate goals.

MDE has long fostered the use of methane captured from landfills as fuel to generate electricity. Sometimes this is tied to the installation of solar farms at closed landfills, which MDE also

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[58] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.
[59] The Maryland Department of the Environment. MDE Revises GHG Emissions Inventory for Landfills. https://mde.maryland.gov/programs/Air/ClimateChange/Documents/MSW%20Landfill%20Stakeholder%20Meeting%20and%20Revised%20Inventory%20Notice_June%209%202021.pdf.
[60] ***
[61] The Maryland Department of the Environment. Waste Diversion in Maryland. https://mde.maryland.gov/programs/land/RecyclingandOperationsprogram/Pages/index.aspx.

supports. The MDE Air and Radiation Administration recently promulgated regulations imposing more strict monitoring and remedial requirements for methane emissions at landfills that will both dramatically reduce these emissions and encourage methane reuse.

Emissions from MSW landfills are characterized and calculated using accepted industry standards along with some measured and reported figures. The methane and CO_2 generation rates are modeled using EPA's Landfill Gas Emissions Model tool "Land GEM". Additional figures come from the landfill facility reporting to EPA Part 98 GHG reporting and from annual MDE emission certification Reports.

Landfill gas is typically composed of methane, CO_2, and other volatile organic compounds. Landfill gas and potential methane production are unique to each landfill. Temperature, waste components, waste cell size, compaction, liners and covers, rainfall intensity, and more are all factors in methane production and the design criteria to capture and reduce methane. Scientists report landfill generation curves with four phases. Methane generation begins as soon as trash is placed but maximizes between 5–20 years, then tapers off over the next decade or two.

MDE used the 2020 GHG Inventory to calculate a range of anticipated emission reductions that will come from minimizing surface leaks and capturing and converting methane to CO_2. By applying a range of emission reduction factors to the list of affected sources, MDE estimates a 25-50% reduction in CO_2 (CO_2 and CO_2 equivalent – using a GWP of 28) emissions from the affected landfills subject to MDE's latest landfill regulations when fully implemented.

The new requirements and standards for MSW landfills are either equivalent or more stringent than current federal requirements for MSW landfills, such as component leak testing, surface emission monitoring, gas collection and control systems (GCCS), and recordkeeping and reporting schedules. Furthermore, the new requirements and standards for MSW landfills are more stringent than those under Title 26, Subtitle 11, Chapter 19.20 of the Code of Maryland Regulations (COMAR 26.11.19.20) - *Control of Landfill Gas Emissions from Municipal Solid Waste Landfills.*[62] The new regulations result in decreased methane emissions from MSW landfills in the state and MDE will continue to evaluate the emission reductions and benefits.

Food Residuals Diversion Law (current)

In 2021, the Maryland General Assembly passed House Bill 264/Senate Bill 483 entitled Solid Waste Management – Organics Recycling and Waste Diversion – Food Residuals, which requires "persons" that generate at least two tons of food residuals per week as of November 1, 2023, and one ton of food residuals per week as of November 1, 2024 to separate the food residuals from other solid waste and ensure that the food residuals are diverted from final disposal at landfill or

[62] The Maryland Division of State Documents. COMAR 26.11.19.20 Control of Landfill Gas Emissions from Municipal Solid Waste Landfills. - Repealed. https://dsd.maryland.gov/regulations/Pages/26.11.19.20.aspx.

incineration.[63] MDE issued supporting regulations under COMAR 26.04.13 Food Residuals - Organics Recycling and Waste Diversion. The law and regulations follow the traditional food recovery hierarchy: prevent waste before it occurs, provide food for people, animal feed, and/or recycle. The focus is to reduce the amount of GHG emitted from landfills, provide edible food to people at a free or low cost, and improve Maryland's soil and water quality. The law currently does not identify a private residence or restaurant as a "person". MDE will evaluate the benefit of potential expansion of the "persons" definition to include more entities, such as all businesses that generate lower quantities of food residuals than in the current law, and determine if the applicable organics recycler range is a hindrance for diversion.

Sustainable Materials Management (current)

Sustainable materials management (SMM) includes using and managing materials as efficiently and sustainably as possible throughout their entire life cycles. Through source reduction, reuse, and recycling, Maryland can extend existing disposal capacity, reduce the need to construct new or expanded solid waste disposal facilities, conserve natural resources including water and energy, increase the innovative reuse and beneficial use of dredged material, and support a productive economy through the recovery of valuable resources.

Studies have shown that diverting material from disposal to reuse, recycling, and composting results in more jobs and a more sustainable economy. New and emerging materials management technologies provide opportunities to recover more energy, nutrients, and other resources from waste while fostering new businesses in Maryland.

The potential applications for innovative reuse or beneficial use of dredged materials are vast, including transportation, climate change adaptation, publicly-funded site remediation projects, habitat creation, wetland restoration, shoreline stabilization, landscaping, road construction, landfill cover, land reclamation and the manufacture of marketable products such as concrete, bricks, blocks, aggregate, and topsoil. Source reduction, reuse, and recycling reduce GHG emissions relative to disposal and can assist the state in meeting its GHG reduction goals for 2030 and beyond.

In 2021, Maryland's recycling activities reduced the amount of CO_2 equivalent by over 8.3 million tons, on a lifecycle accounting basis. That was with recycling rates below the 2035 goals outlined in the SMM Executive Order 01.01.2017.13.[64]

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[63] The Maryland Department of the Environment. Solid Waste Management - Organics Recycling and Waste Diversion - Food Residuals. https://mde.maryland.gov/programs/land/RecyclingandOperationsprogram/Pages/Solid-Waste-Management---Organics-Recycling-and-Waste-Diversion---Food-Residuals.aspx.

[64] The State of Maryland Executive Department. Executive Order 01.01.2017.13 Waste Reduction Recovery Plan for Maryland. https://mde.maryland.gov/programs/LAND/RecyclingandOperationsprogram/Documents/EO-01.01.2017.13.pdf.

Table 2. **Sustainable Materials Management Targets and Status.**

SMM Goals	2035 Target	Current Status
GHG Emissions Reductions*	Reduction of 1.2 $MMTCO_2e$ compared to 2016	Increase of 4.0 $MMTCO_2e$ compared to 2016
Material-Specific Recycling Rates	Food Scraps – 60% Glass – 55% Metal – 75% Paper Products – 65% Plastic – 25% Yard Trimmings – 85%	Food Scraps – 22.66% Glass – 53.61% Metal – 73.49% Paper Products – 51.75% Plastic – 9.85% Yard Trimmings – 84.4%
Overall Statewide Recycling and Waste Diversion Rate	Recycling – 55% Waste Diversion – 60%	Recycling – 42.46% Waste Diversion – 45.8%

*GHG emissions reductions are calculated using the EPA Waste Reduction Model (WARM), a lifecycle accounting tool that factors in emissions from the entire lifecycle: raw materials extraction, manufacturing or processing, transportation, use, and end-of-life management.

While MDE is responsible for implementing the requirements of Executive Order 01.01.2017.13, Maryland Counties perform all recommended recycling and source reduction activities. The Executive Order defines the SMM policy for the state. MDE provided Waste Reduction and Resource Recovery Plan Goals and Metrics Recommendations in April of 2019.[65] The voluntary statewide metrics and goal recommendations support the Maryland Recycling Act by defining specific material recycling goals for each county.

Through the combined efforts of Maryland's local governments, businesses, and residents, the state has made significant progress in recycling over the past 23 years, more than doubling the recycling rate from 19% in 1992 to 43% in 2015. A recent plateau in the recycling rate and the evolving composition of the waste stream suggest that an updated and more holistic materials management approach is needed to ensure continuous improvement.[66]

Maryland has undertaken key initiatives to strengthen recycling programs, including the establishment of clearer permitting pathways for composting facilities; adoption of more aggressive county and state government recycling rates; coordination of a statewide waste sort study; enhancement of electronics recycling education and outreach; and provision of recycling

[65] The Maryland Department of the Environment. Waste Reduction and Resource Recovery Plan Goals and Metrics Recommendations April 2019. https://mde.maryland.gov/programs/LAND/RecyclingandOperationsprogram/Documents/Waste%20Reduction%20and%20Resource%20Recovery%20Plan%20Goals%20and%20Metrics%20Recommendations.pdf.
[66] The Maryland Department of the Environment. Maryland State, County, and City Recycling. https://mde.maryland.gov/programs/land/recyclingandoperationsprogram/pages/recylingrates.aspx.

opportunities at apartments, condominiums, and special events. MDE recognizes the value of partnerships in achieving statewide recycling and source reduction goals, including cooperative efforts of waste generators, state agencies, local governments, the waste industry, the recycling industry, environmental groups, boards of education, and other interested parties.

MDE continues to consult with relevant stakeholders to assess and improve the state's methodology for tracking waste generation, recycling, and source reduction in Maryland. MDE has pursued numerous partnerships to work towards the recycling and source reduction goals established in the SMM Executive Order 01.01.2017.13 and the recommendations made in April 2019.

As MDE works to develop markets for recyclables in Maryland, key partnerships with other Maryland agencies include:

- MDE and the Maryland Department of Commerce work in cooperation with local and economic development agencies to identify local markets for recycled materials and provide siting, permitting, and technical assistance for innovative recycling and resource recovery businesses.
- MDE and the Maryland Department of Agriculture (MDA) work to support research and demonstration of innovative technologies for recovering nutrient resources in a manner protective of water quality.
- MDE and MEA work to research and promote methods of recovering energy from waste, including anaerobic digestion.
- MDE and the Maryland Port Administration work to develop technical screening criteria and guidance to support innovative reuse and beneficial uses of dredged material removed from the Port of Baltimore's shipping channels and other state-funded dredging projects. State agencies shall consider innovative reuse and beneficial uses of dredged material when economically feasible and in conformance with all appropriate environmental standards.

State Incentives for Waste Sector Decarbonization (current, modified)

The state supports waste diversion programs in several ways. One example includes the School Waste Reduction and Composting Program, which awards grants to schools to reduce food waste and establish composting programs.[67] Additionally, the Maryland Water Infrastructure Financing Administration (MWIFA) provides low-interest rate loans under the two Revolving Loan Fund Programs and grants under the State Bay Restoration Fund Program for water quality point source projects and non-point source pollution control projects, drinking water system upgrade projects, and septic system upgrade projects using best available technology to achieve nitrogen

[67] The Maryland State Department of Education. School Waste Reduction and Composting Program. https://marylandpublicschools.org/about/Pages/OFPOS/GAC/SWRC/index.aspx.

removal on onsite sewage disposal systems.[68] Between FY21 and FY23, the Bay Restoration Fund provided $45 million in revenues for 2,567 Best Available Technology (BAT) installations and 497 connections to public sewer.

The Energy-Water Infrastructure Program (EWIP) was established during the 2016 legislative session through MCCBL 2016, funded through a PSC order that provided $40 million in funding for programs that reduce GHG emissions and conserve energy. Between FY17 and FY20, MDE budgeted and awarded $40 million in grants to water and wastewater systems throughout the state of Maryland for alternative energy generation and upgrading to more energy-efficient equipment. EWIP provided funds for the planning, design, and construction of projects that benefited both the environmental and economic interests of the state. This dual-pronged program provided reliable and resilient infrastructure for communities throughout Maryland by implementing energy efficiencies, and reducing emissions and operating costs at water and wastewater treatment facilities. While EWIP was discontinued due to the lack of ongoing funding, it helped in planting the seeds and jump-starting the concept of energy-water infrastructure throughout the state of Maryland. The projects under this concept are eligible for and continue to be funded under MDE's Revolving Loan Fund Programs, which provide low-interest loans and principal forgiveness (grant). One such project is the WSSC Piscataway Bio-Energy Project, for which MDE has provided $168M in Revolving Loan Funds to date.

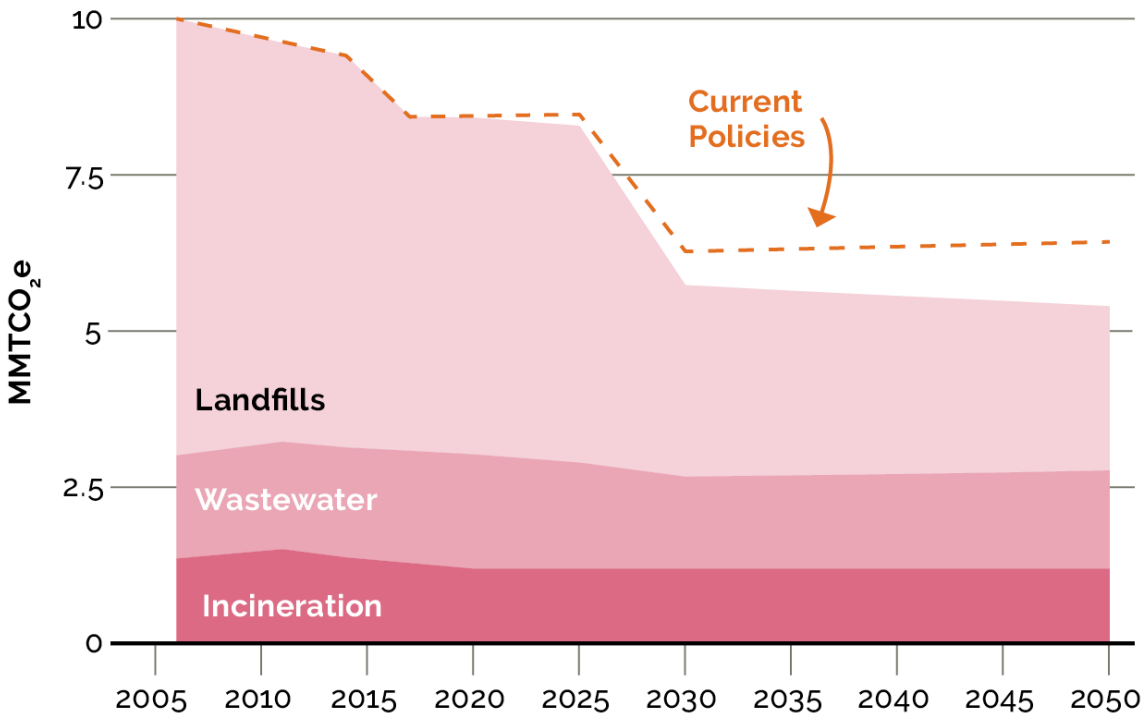
With new funding, the state will support additional decarbonization activities in Maryland's waste sector. Priority investments include landfill and wastewater treatment plant methane capture projects.

Impact of Waste Sector Policies

The new policies are modeled to reduce waste sector GHG emissions by 18.1 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $600 million. Figure 9 illustrates the change in GHG emissions from this sector based on historical and modeled trends.

[68] The Maryland Department of the Environment. Maryland Water Infrastructure Financing Administration. https://mde.maryland.gov/programs/water/wqfa/pages/index.aspx.

Figure 9: **Maryland's waste sector GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies



Agriculture

The agriculture sector represented 4% of the state's GHG emissions in 2020.[69] This sector includes emissions from enteric fermentation (i.e. methane emissions from cattle), manure management, and nutrient application. Emissions from the combustion of fossil fuels in agricultural equipment are not included in this sector as they are already accounted for under building fuel use and non-road transportation. Reductions in atmospheric CO_2 from carbon sequestration in soils are included in the forestry and land use sector along with other emissions sinks.

Agricultural sector GHG emissions can be reduced through mitigation methods involving manure management practices and precision animal feeding.

[69] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.

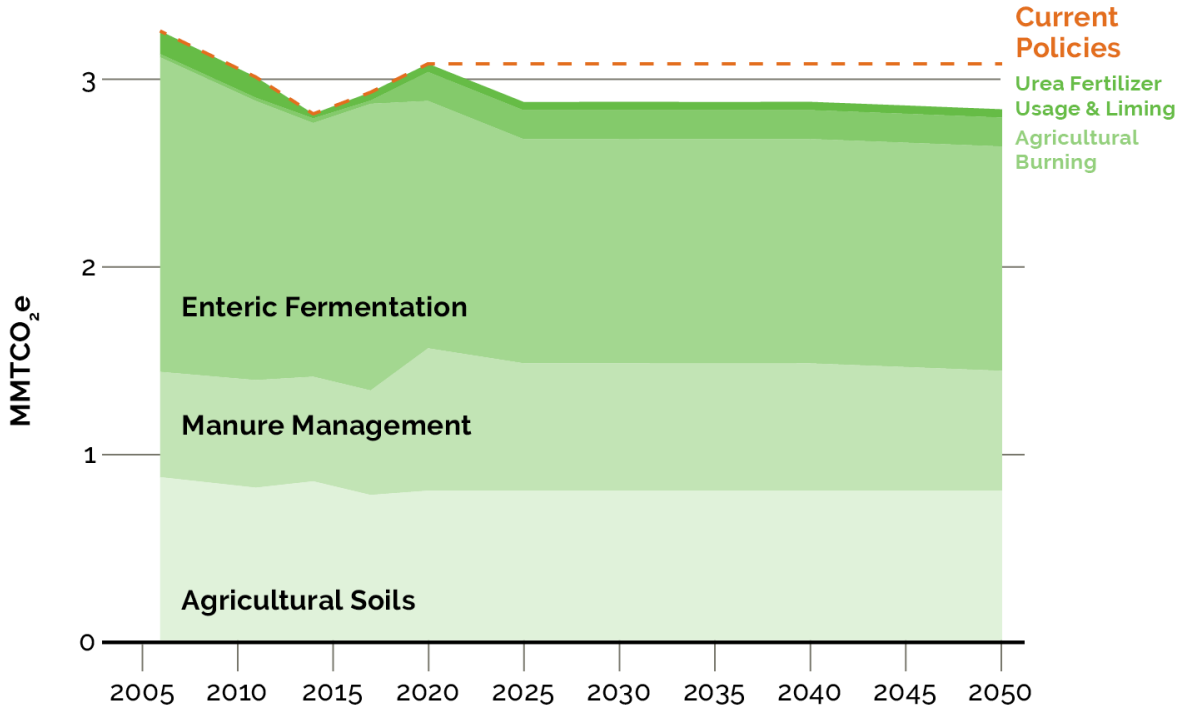
State Incentives for Agricultural Decarbonization (current, modified)

The state currently supports farmers in using best practices to manage manure and nutrients in environmentally preferable ways. The state would expect to increase the adoption of climate-smart agricultural practices with new focused funding to complement federal funds available to farmers from the U.S. Department of Agriculture. Priority investments include manure management and feeding techniques that reduce enteric fermentation (leading to methane production) from livestock.

Impact of Agricultural Sector Policies

The new policies are modeled to reduce agricultural sector GHG emissions by 5.7 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $184 million. Figure 10 illustrates the change in GHG emissions from this sector based on historical and modeled trends.

Figure 10: **Maryland's agricultural sector GHG emissions trends**, historical and projected, from 2006 to 2050 based on current and new policies



Forestry and Land Use

The forestry and land use sector includes a combination of GHG emissions sources and sinks, which makes it unique from other sectors. GHG emissions in this sector include methane (CH4) and nitrous oxide (N2O) emissions from wildfires and prescribed forest burns, N2O from the application of synthetic fertilizers to settlement soils, and CH4 from reservoirs and coastal wetlands. Net emissions sinks (carbon sequestration pathways) in this sector include the carbon flux in forested and treed landscapes; carbon stored in harvested wood products, wood in landfills, and landfilled yard trimmings and food scraps; carbon flux in agricultural soils; and carbon flux in coastal (tidal) wetlands and submerged aquatic vegetation. This sector is not included in Maryland's gross emissions accounting and is instead factored into Maryland's net emissions calculation for 2045.

In 2020, the forestry and land use sector counteracted 9% of Maryland's gross GHG emissions by removing 8.34 $MMTCO_2e$ from the atmosphere.[70] While this number is variable year to year, due to differences in rates of forest growth largely influenced by weather and natural or human-induced disturbance, this value is very similar to the long-term trend. The carbon sequestration potential of the agricultural sector can be maximized through the expansion of MDA's resource conservation programs, which increase the rate of best management practice adoption across Maryland's croplands. Further GHG emissions reductions in this sector can be achieved through the expansion of forestry programs involving forest conservation, improved forest management, and reforestation facilitated by DNR and other agency partners.

To achieve Maryland's 2045 net-zero emissions goal, carbon sequestration must be increased to offset specific sectors that are difficult to decarbonize. This will be a challenge, given recent trends in land-use change and population growth, aging forests that tend to sequester less carbon annually, and climate change impacts like sea level rise and more frequent and intense storms. Ongoing and increased investment in natural climate solutions today will help the state maximize its carbon sink by 2045.

Maryland 5 Million Trees Initiative (current)

The Tree Solutions Now Act of 2021 (TSNA) includes a historic directive to plant and maintain 5 million native trees on public and private land by 2031 (also known as the Maryland 5 Million Trees Initiative (5MT)).[71] To advance equity and environmental justice, 5MT directs that at least 10% (500,000) of these trees be planted in underserved urban areas, improving air and water quality and reducing urban heat island effects. Foundational to this Initiative is support for long-term maintenance and management to ensure trees and forests are healthy and resilient for decades to come.

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[70] The Maryland Department of the Environment. Greenhouse Gas Inventory. https://mde.maryland.gov/programs/air/climatechange/pages/greenhousegasinventory.aspx.
[71] The Maryland Department of the Environment. Maryland's Five Million Trees Initiative. https://five-million-tree-tracking-tool-maryland.hub.arcgis.com/.

MDE coordinates the tracking and implementation of the Initiative in partnership with DNR, MDA, MDOT, and the Chesapeake Bay Trust. Eligible plantings are tracked across all state-funded programs and through the participation of many private planting partners. All carbon outcomes related to 5MT are quantified and integrated within the state's GHG inventory using advanced science capabilities supported by the University of Maryland.

Sustainable Growth (current)

MDP is the lead agency for reducing emissions through sustainable growth and land use/location efficiency, which involves the private sector and various agencies and commissions at all levels of government within Maryland. These efforts and programs are designed to minimize GHG emissions from future land development and foster transit use, walking and biking, and shorter travel distances for daily mobility needs. By managing growth, local communities can minimize sprawl development and contribute to a reduction in Maryland's GHG emissions. Sustainable growth is characterized by compact land use, with neighborhood schools, compatible transit options, walkable streets, mixed-use development, and a wide range of housing choices. Sustainable growth concentrates on new development and redevelopment in areas with existing or planned infrastructure to avoid sprawl, which is generally characterized as the increased development of land in suburban and rural areas outside of their respective urban centers and planned growth areas. This increased development on the outskirts of towns, villages, and metropolitan areas is often accompanied by a lack of development, redevelopment, or reuse of land within the urban centers and designated growth areas themselves, and excessive automobile use results in a marked increase in GHG emissions. Conversion of forests and agricultural lands increases emissions due to land clearing at the time of construction and decreases or eliminates the capacity of that land to sequester carbon.

It should be noted that many local governments in Maryland are already implementing more sustainable land use and transportation policies and programs that are: promoting green building and compact, transit-oriented development; improving walkability; reducing aggregate VMT and auto dependency; preserving vegetated/forested lands, which sequester carbon; and protecting agriculture. In support of these programs, the Smart Growth Subcabinet, led by MDP, makes recommendations to the Governor regarding changes in state law, regulations, and procedures needed to create, enhance, support, and revitalize sustainable communities across Maryland; and facilitates interagency coordination to ensure successful statewide community reinvestment and compact development initiatives are integrated and balanced to achieve multiple benefits that advance equity, economic growth and environmental regeneration.[72]

[72] Maryland Manual On-Line. Smart Growth Subcabinet. https://msa.maryland.gov/msa/mdmanual/08conoff/cabinet/html/smartd.html.

Forest Management (current)

Current state policy promotes sustainable forestry management practices on public and private Maryland forest lands. Enrolling unmanaged forests into forest management plans and implementing sustainable forest best management practices can enhance forest productivity, which increases rates of carbon sequestration in forest biomass and the amount of carbon stored in harvested durable wood products, and decreases the risk of forest pest or disease outbreaks. This can translate to economic benefits for the landowner and the forest products industry in Maryland, which had an annual economic impact of over $3.3 billion in 2019.[73] Over 90% of state forests are dual certified for sustainable forest management and sustainable practices are regularly implemented on other state-owned lands like Wildlife Management Areas and State Parks. Only 40% of privately owned forests in Maryland are enrolled in forest management plans, with the remaining lands representing opportunities to engage these landowners in sustainable forest management.

Sustainable forest management (sometimes referred to as "climate smart forest management") refers to a broad suite of practices that are meant to increase the health of the forest and meet the management objectives of the landowner. In some cases these practices have clear and measurable benefits in terms of increasing carbon sequestration in the forest (e.g. extended rotations and plantings to increase density), some practices are likely to increase carbon capture but are difficult to quantify (e.g. invasive species removal, deer browse control) and some do not increase carbon sequestration, but are likely to increase the resilience of the forest to climate impacts, or improve the quality of wildlife habitat (e.g. timber stand improvement, thinnings).

Coastal Wetland Management (current)

Blue carbon in Maryland refers to the carbon captured by the ocean and coastal ecosystems, including coastal salt marshes and seagrasses. For the Maryland GHG inventory, blue carbon stocks and fluxes comprise the state's estuarine wetlands and seagrasses, otherwise referred to as submerged aquatic vegetation (SAV). Ongoing restoration of SAV in the Chesapeake Bay is primarily advanced through the shared goals of the Chesapeake Bay Program.

Restoration of coastal wetlands has not been widely implemented in Maryland, apart from island restoration projects where dredge material is used to build up islands that are partially composed of wetlands. While coastal wetlands are vital ecosystems that provide important ecosystem services like erosion prevention and wildlife habitat, restoration of these systems is quite expensive, frequently exceeding $50,000 per acre restored. DNR has partnered with The Nature Conservancy and ESA, Inc. to conduct a blue carbon feasibility study of several existing or potential wetland restoration projects in Maryland. The study is ongoing but preliminary results indicate that the sale of blue carbon credits would not be able to support the costs associated with

[73] BEACON/ MARBIDCO. 2020. The Impact of the Forestry Industry on the Maryland Economy. https://www.marbidco.org/_pages/about/beacon_reports/RBI%202022%20report%20BEACON%20Report%20Summary%20-%20Forestry%2009272022.pdf.

project implementation, even if the price of carbon were to rise dramatically. Under certain price points, the sale of credits can fund a portion of the cost of maintaining the project. Given project costs, it is likely that projects will be done for reasons other than blue carbon, like enhancing coastal resiliency or ensuring habitat for endangered species, but blue carbon will remain an important co-benefit of this work.

Agricultural Resource Conservation Programs (current)

Maryland farmers have led the nation in their adoption of soil conservation practices. Building on existing Departmental programs, the 2017 Healthy Soils Act charged MDA with the development of a Healthy Soils Program to improve the health, yield, and profitability of Maryland's soils and promote the further adoption of conservation practices that foster soil health while increasing carbon sequestration capacity.[74] In 2022, MDA rolled out the *Cover Crop Plus* program, to leverage the success of cover cropping in the state and encourage earlier planting, later termination, and multi-year planning for soil health.[75] A second program, the Healthy Soils Competitive Fund, was launched in 2023 to encourage innovative soil health management.[76] This new Fund encourages continued learning in the farming community as Maryland agencies work to bolster agriculture's role as a climate solution. Both new programs capitalize on co-benefits for air and water quality, and carbon sequestration that build upon Maryland's nationally recognized progressive farming practices and programs.

Forest Preservation and Retention Act (current)

In 2023, the state's Forest Conservation Act of 2013 was updated to include a new statewide goal to achieve net forest and tree canopy gain and requires each county to achieve no net forest loss, as measured every four years. One mechanism to achieve this policy is stronger tree loss mitigation requirements for developers to ensure adequate replacement of forested land cleared for new construction. This law also includes increased reviews of local forest conservation plans by DNR to ensure these plans align with state forest protection goals. This policy, coupled with the state's afforestation and forest management programs, is critical for maintaining a healthy forest carbon sink through 2045.

State Incentives for Forestry and Land Use (current, modified)

The state has made significant investments in forest conservation and reforestation. With new funding in place, the state will provide additional support for activities that promote enhanced carbon sequestration in Maryland's forestry and land use sector. Priority investments include tree plantings and forest management. Young trees take several years to establish before they begin

[74] Maryland House Bill 1063. Agriculture - Maryland Healthy Soils Program. https://mgaleg.maryland.gov/2017RS/bills/hb/hb1063T.pdf.
[75] The Maryland Department of Agriculture. Cover Crop Plus. https://mda.maryland.gov/resource_conservation/Pages/Cover-Crop-Plus.aspx.
[76] The Maryland Department of Agriculture. Soil Health Information. https://mda.maryland.gov/resource_conservation/Pages/Soil-Health.aspx.

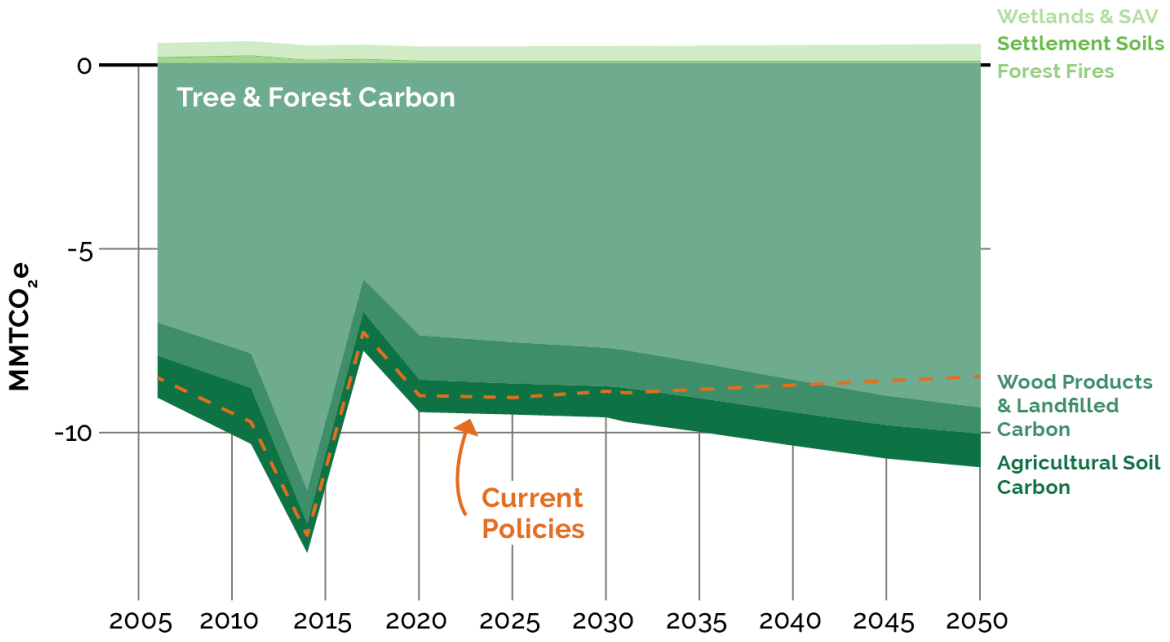
sequestering significant amounts of carbon, so it is important to support tree planting now to offset Maryland's aging forests and maximize the carbon contribution of the forest carbon sink in 2045 when the state is due to achieve net-zero emissions.

Impact of Forestry and Land Use Sector Policies

Building on the policies listed above, the forestry and land use sector collectively has the potential to offset statewide GHG emissions by 238 to 263 $MMTCO_2e$ between now and 2050. Figure 11 illustrates the change in GHG removals from this sector based on historical and modeled trends.

Expanding statewide adoption of agricultural conservation practices and scaling forest conservation and restoration beyond current levels offers an opportunity to increase carbon removal from the atmosphere. Ongoing implementation of current forest policies and programs is expected to remove 7.6 MMTCO2e annually by 2045. However, expanding implementation across 400,000 acres of feasible plantable area could increase the carbon sequestration benefit to an annual removal of 9.1 MMTCO2e.[77] Current levels of adoption in agricultural best management practices, including commitments under the state's Phase III Watershed Implementation Plan, are already expected to remove 0.7 MMTCO2e annually by 2045. Scaling the adoption of practices to 80% of cropland statewide could increase the annual removal to 0.9 MMTCO2e.[78]

Figure 11: **Maryland's forestry and land use sector GHG emissions and sinks**, historical and projected, from 2006 to 2050 based on current policies and future potential



[77] See the appendices for more detail on these estimates.
[78] See the appendices for more detail on these estimates.

Chapter 3: Economic and Public Health Impacts

Global Economic Benefits

Accounting for the societal costs and benefits of state and federal policies and achieving our climate goals is a priority of the state. The new policies included in this plan are modeled to reduce statewide GHG emissions by 646 $MMTCO_2e$ between now and 2050. The societal benefit of this level of emissions reduction is estimated to be $135 billion based on estimates for the social cost of GHG emissions.

The EPA's November 2023 *Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances* provides updated estimated values for the social cost of GHG emissions. EPA's updated approach is particularly timely as policymakers await findings from the Interagency Working Group on the Social Cost of Greenhouse Gases (IWG), reestablished by President Biden in January 2021, whose current interim estimates – based on work conducted between 2010 and 2016 – are outdated and substantially underestimate climate costs. An accurate societal benefit of GHG emissions reduction policy provides a strong foundation to fully assess the benefits of this plan, which are not included in the public health and economic analysis that follows.

State Economic Benefits

Meeting Maryland's climate targets can bring positive economic impacts to the state. Between now and 2031, up to 27,400 additional jobs will be generated under the new policies of this plan; total personal income will increase by $2.5 billion; and Gross Domestic Product (GDP) will increase by $5.3 billion.[79]

The economic impacts of this plan were evaluated with the Regional Economic Models, Inc., (REMI) PI+ model, a high-end dynamic modeling tool used by various federal and state government agencies in economic policy analysis. It allows for the creation of a sophisticated model that is calibrated to the specific demographic features of the study, in this case, Maryland. This model enumerates the economic and fiscal impacts of each dollar earned and spent by the following: employees relating to the economic events; other supporting vendors (business services, retail, etc.); each dollar spent by these vendors on other firms; and each dollar spent by the households of the event's employees, other vendors' employees, and other businesses' employees. The REMI PI+ model also accounts for changes to the economy over time, including tax changes, inflation, recessions, and sequestration.

To estimate the impact of this plan, the difference between the Current Policies and Current + Planned Policies scenarios was calculated in terms of capital costs, electricity generation costs, and energy consumption costs. The results consider three important measures: employment,

[79] Towson University. Economic and Fiscal Impacts of Maryland's Greenhouse Gas Reduction Policies. 2023. See appendices.

personal income, and GDP, which together provide a comprehensive look at how the policies will impact the economy.

On average, over the first decade of implementation (2024 – 2035) roughly 5,505 jobs will be created annually relative to the reference case. Over the long term (2024 – 2050), approximately 10,048 jobs per year can be sustained with gains peaking in 2040 at 20,322 jobs. The majority of job gains are shown in the construction and transportation occupations, followed by installation/maintenance/repair and management.

Personal income (the sum of total wages and salaries, supplements, property income, and personal current transfer receipts) follows a similar but more muted trajectory to employment. Between 2024 and 2035, an annual average of $600 million in personal income is added relative to the reference case. Annual impacts peak in 2040 at $2.5 billion, with impacts generally declining through 2050.

GDP is the value of all final goods and services produced in the state, or the sum of personal consumption expenditures, investment, government spending, and net exports. Over the next decade (2024 to 2035), an annual average of $1.0 billion will be added to the state's economy relative to the reference case, peaking in 2040 at $3.5 billion. Additionally, the cumulative estimated value of avoided mortality benefits is approximately $950 million through 2035, and over $4 billion through 2050.

State Public Health Benefits

In addition to reducing GHG emissions and growing jobs, personal income, and GDP, this plan also yields significant benefits for air quality and public health through emissions reductions of co-pollutants. Overall, this plan delivers additional health benefits of $142 million to $321 million in 2031 compared to current policies.

These impacts were modeled using the EPA's Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA).[80] A screening model used regularly in the research community, COBRA is a free, easy-to-use EPA model employed as a preliminary analysis of health impacts and monetized benefits from environmental policy changes. COBRA models the incidence rate and corresponding economic impact of twelve health outcomes due to five different co-pollutants. These co-pollutants include fine particulate matter 2.5 micrometers in diameter and smaller ($PM_{2.5}$) and precursor chemicals for $PM_{2.5}$, which COBRA converts in its calculations.

The added health benefits of this plan, as compared to a current policies scenario, in 2031 are summarized in Table 3. The largest contributors in terms of monetized benefits across the state are reductions in mortality, nonfatal heart attacks, and minor restricted activity days. More than

[80] CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA). https://www.epa.gov/cobra.

95% of the economic value is from reductions in mortality due to the high value of a statistical life. Reductions in minor restricted activity days have the highest reduction in incidence rate, meaning the benefits are experienced by the largest number of people.

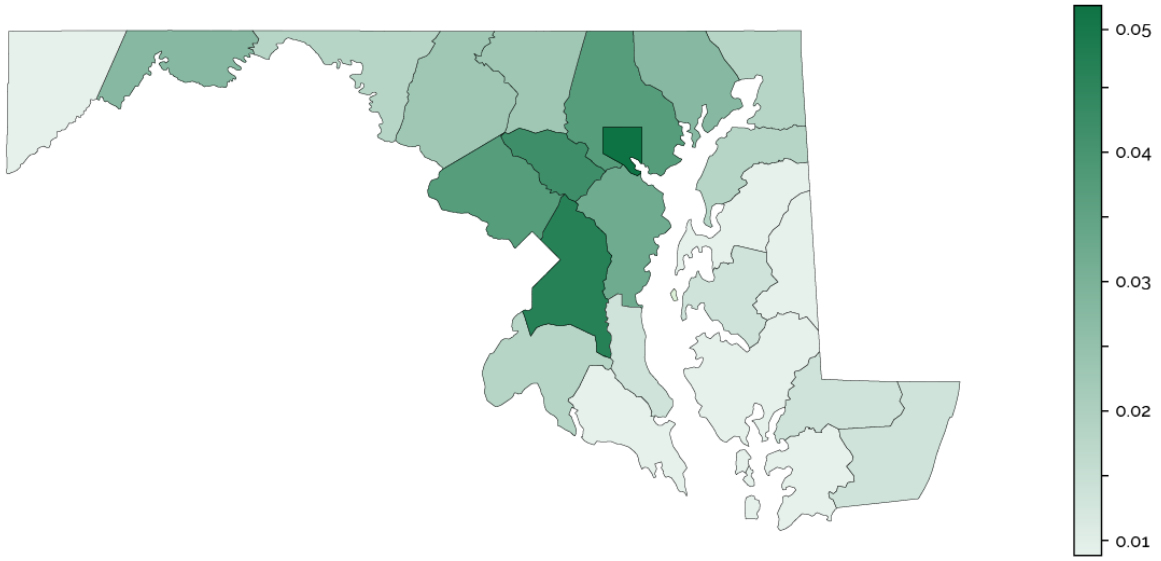
The numbers in Table 3 represent the estimated number of avoided cases for each adverse health impact and the corresponding monetary savings due to the additional policies in this plan, beyond what is already included in current policies. While most incidence values represent impacts occurring in 2031, the avoided mortality is over the next 20 years (2031-2051).

Table 3: **Additional health benefits of this plan compared to current policies in 2031.**

Health Impact		**Annual Incidence**	**Economic Value**
Total Health Benefits	*low estimate*	-	$142,431,000
	high estimate	-	$320,512,000
Mortality (over 20 years, 2031-2051)	*low estimate*	11.0	$139,907,293
	high estimate	24.9	$316,442,114
Infant Mortality		0.06	$883,703
Nonfatal Heart Attacks	*low estimate*	1.1	$186,578
	high estimate	9.9	$1,732,999
All Respiratory Hospital Admits		2.9	$117,978
Cardiovascular Hospital Admits (except heart attacks)		2.5	$140,645
Acute Bronchitis		15.6	$10,988
Upper Respiratory Symptoms		283	$13,807
Lower Respiratory Symptoms		198	$6,122
Emergency Room Visits, Asthma		6.2	$3,939
Minor Restricted Activity Days		8,189	$820,064
Work Loss Days		1,395	$315,169
Asthma Exacerbation		290	$24,547

The health benefits of policy action are not equally distributed across the state due to differences in population density and exposure to pollutant sources. This leads to well-known differences in health outcomes between different communities with implications for environmental equity.[81,82] COBRA uses $PM_{2.5}$ concentration changes, determined within the COBRA model, to estimate the resulting health outcomes at the county level, which allows for a more granular analysis of state-level policies. Table 3 above is the aggregate totals of all the county-level results from the COBRA model. Figure 12 below shows the reduction of $PM_{2.5}$ concentration under this plan versus a current policies scenario in individual counties. For reference, the 2031 COBRA results show the county-level average concentration of $PM_{2.5}$ to be 6.95 $\mu g/m^3$ in the current policies scenario and 6.92 $\mu g/m^3$ under this plan.

Figure 12: **Reduction in $PM_{2.5}$ concentration ($\mu g/m^3$) by county under this plan** compared to current policies. Higher numbers indicate greater reductions and greater resulting health benefits.

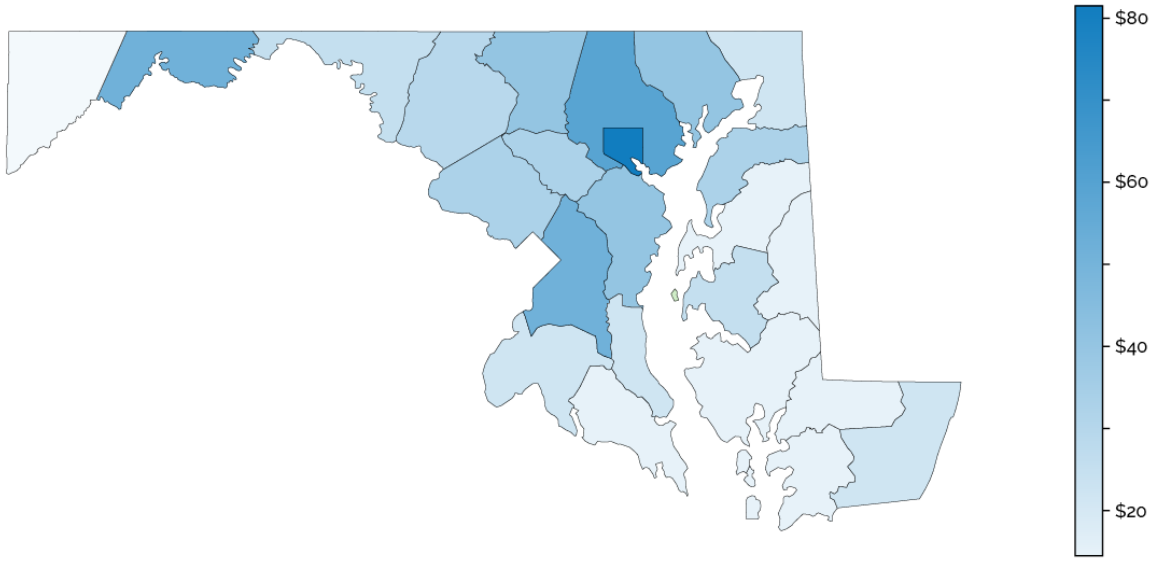


The reductions in $PM_{2.5}$ tend to cluster in population centers where there are more sources of emissions, with particularly significant benefits accruing to communities in the Baltimore City area, which includes many historically disadvantaged communities. This remains true even when adjusted for population, with total health benefits showing a similar pattern. There are also notable benefits in counties along Maryland's Eastern Shore. Specifically, on a per capita basis, Baltimore City, Baltimore County, Prince George's, and Allegany counties have the greatest estimated total health benefits from this plan. However, even Garrett County, a rural county in the

[81] Ringquist, E. J. Assessing Evidence of Environmental Inequities: A Meta-Analysis. J. Policy Anal. Manage. 2005, 24 (2), 223–247. https://doi.org/10.1002/pam.20088.
[82] Banzhaf, H. S.; Ma, L.; Timmins, C. Environmental Justice: Establishing Causal Relationships. Annu. Rev. Resour. Econ. 2019, 11 (1), 377–398. https://doi.org/10.1146/annurev-resource-100518-094131.

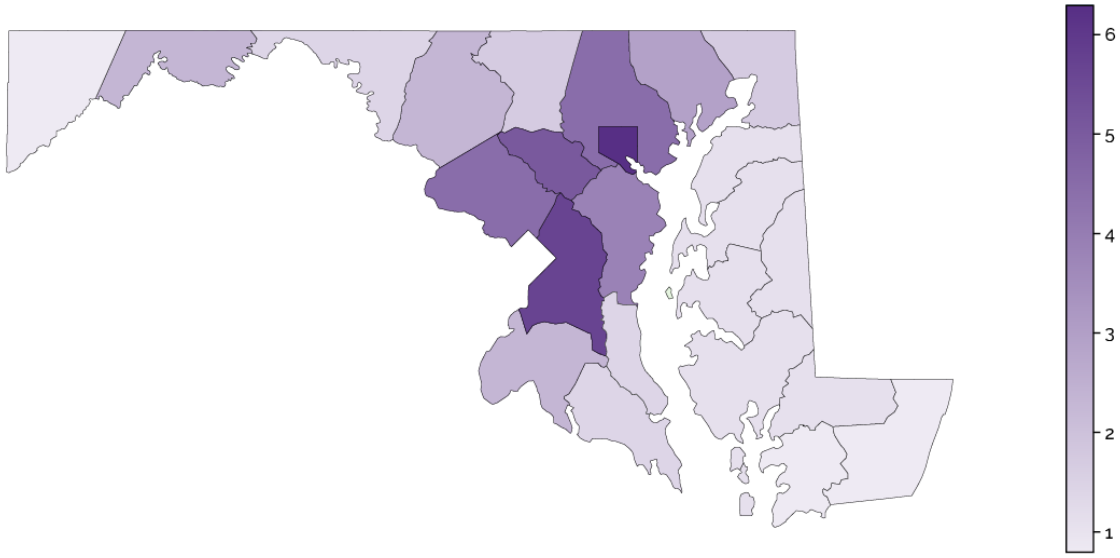
westernmost area of Maryland, is estimated to see significant total health benefits delivered in 2031 ($233,000 - $525,000), despite having the lowest $/person benefit.

Figure 13: **Total monetized health benefits in $/person realized through this plan** compared to current policies. Values are for the high estimate of benefits.



There are also differences in the reduction of incidence rate for various symptoms and outcomes across counties. Prince George's County, a diverse county that is densely populated with an estimated population of 1,031,691 in 2031, is expected to have 289 fewer work loss days in 2031 compared to the current policies scenario. Baltimore City, a focus area for environmental justice issues, is estimated to have 40 fewer incidents of asthma exacerbation in 2031. Additionally, this plan is anticipated to have the largest per capita reduction in asthma exacerbation in Baltimore City. Baltimore City, Prince George's County, and Howard County will see the greatest reduction in minor restricted activity days per capita. Minor restricted activity days are days in which activity is reduced, but not so far as missing work. Howard County, Prince George's County, and Baltimore City are expected to see significant benefits in all categories. As shown in Figure 14, the incidence of upper respiratory symptoms is expected to reduce greatly for Baltimore City and the areas south and west of Baltimore.

Figure 14: **Reduction in the incidence of upper respiratory symptoms under this plan** compared to current policies. Higher numbers indicate larger reductions, and therefore fewer cases of symptoms.



The monetized benefits associated with these health improvements were also used as input for modeling the overall economic impact of this plan.

Chapter 4: Lower Energy Costs and More Jobs

Lower and More Predictable Household Energy Costs

The annual energy cost for a typical all-electric household with EVs is around $2,600 lower than the annual energy cost for a typical gas-heated household with gasoline-powered vehicles. The majority of these savings are due to the lower fueling costs of an EV as compared to a gasoline-powered vehicle. Savings for the all-electric household increase to around $4,000 annually compared to homes that are heated with oil or propane.[83] Consumers should keep these energy cost savings in mind when they consider the cost of purchasing vehicles and heating equipment. Marylanders who have already moved away from fossil fuels and gone all-electric not only enjoy lower energy costs but are also shielded from fossil fuel price fluctuations, which are highly variable and often influenced by geopolitical situations. This plan will help all Marylanders enjoy the benefits of living without dependence on fossil fuels.

Utility Rate Impacts

Electricity prices have historically been much less volatile and more predictable than natural gas, heating oil, and propane prices and that trend is expected to continue. E3's 2021 Maryland Building Decarbonization Study projected that a high-electrification policy scenario that resembles the policies presented in this plan would have a minimal impact on electricity prices through 2050, increasing retail rates by just $0.01 per kilowatt-hour (kWh) per decade, relative to business-as-usual.[84] Federal clean energy investments through the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA), which were authorized after the E3 study concluded, could further reduce electricity rates by increasing energy efficiency and efficient electrification. On the other hand, ongoing developments in PJM's wholesale electricity markets and transmission planning operations could raise electricity prices in the near term. A revised electricity rate impact analysis will be run once the state's new Clean Power Standard is developed. Ultimately, electric rates will be driven by utility investments to meet the needs of the state and are subject to PSC's jurisdiction.

The cost of natural gas utility service has risen dramatically over the past few years for two reasons. First, gas utilities have significantly increased spending on their distribution infrastructure.[85] Second, after a decline during the early years of widespread hydraulic fracturing, gas commodity costs have also risen while becoming more volatile. Gas utility rates are expected

[83] Based on analysis by MDE.
[84] Energy and Environmental Economics. Maryland Building Decarbonization Study. Final Report. October 20, 2021. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MWG_Buildings%20Ad%20Hoc%20Group/E3%20Maryland%20Building%20Decarbonization%20Study%20-%20Final%20Report.pdf. .
[85] OPC Office of People's Council State of Maryland. Maryland Gas Utility Spending. Updated revenue projections and bill impact analysis. November 2023. https://opc.maryland.gov/Portals/0/Files/Publications/Reports/GasUtilitySpending%2011-5-23%20FINAL.pdf?ver=QdfdqphWg8P8SSpjtB29YQ%3D%3D.

to continue to increase significantly over the coming decades. In every scenario that E3 modeled for the Maryland Building Decarbonization Study, gas rates doubled or more by 2035.

Policies such as a Clean Heat Standard could put additional upward pressure on natural gas rates if fossil fuel companies pass their cost of compliance on to their customers. However, the rate impacts of the new policies in this plan are expected to be less than the savings that gas customers will see if natural gas utility companies are directed to scale back plans to rebuild their gas distribution systems. One study shows that if gas utility companies decreased gas system capital investments by 75% relative to projected spending - a reduction that is consistent with a transition away from fossil fuels in the building sector - then gas customers would save approximately $22 billion between 2025 and 2045.[86] That level of savings could more than offset the rate impacts of new policies presented in this plan. These possible impacts highlight the need for comprehensive gas planning, which is currently being considered by the PSC.

Electricity System Impacts

One often-discussed factor that can influence electricity rates is the buildout of the electricity grid to handle periods of system peak demand, when overall consumer demand on the grid is the highest. The electricity grid is constructed to handle peak demand and, to the extent that peak demand increases, then additional investments may be needed to increase grid capacity.

Studies show that electrification paired with energy efficiency and load flexibility can lessen growth in peak demand. E3's Maryland Building Decarbonization Study found that Maryland's grid will shift from summer to winter peaking around the end of this decade and peak demand will grow very gradually through 2045 with efficient electrification.

A study by the Lawrence Berkeley National Laboratory (LBNL) found similar results when looking at the impact of electrification policy on large buildings in Maryland.[87] LBNL found that MDE's Building Energy Performance Standards (BEPS) regulation, due to its combination of energy efficiency and emissions standards, is modeled to decrease peak electricity demand for covered buildings by 6% by 2040, whereas a hypothetical BEPS policy that excludes energy efficiency standards would increase peak demand by 24% by 2040. LBNL's findings are especially relevant in the context of E3's study, which found that commercial building electrification has a larger impact on peak demand growth than residential building electrification. In other words, because BEPS is modeled to decrease, not increase, peak demand, there is even more confidence that peak demand impacts from residential electrification can be similarly managed through the state's new policies.

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[86] OPC Office of People's Council State of Maryland. Maryland Gas Utility Spending. projections and analysis. October 2022. https://opc.maryland.gov/Portals/0/Files/Publications/Reports/Report%20on%20GasUtilitySpending%2010-5-22%20Final%201.pdf.

[87] The Maryland Department of the Environment. Building Energy Performance Standards. https://mde.maryland.gov/programs/air/ClimateChange/Pages/BEPS.aspx.

The CSNA directed PSC to conduct a study "assessing the capacity of each company's gas and electric distribution systems to successfully serve customers under a managed transition to a highly electrified building sector" including the following requirements for this study:

- Use a projection of average growth in system peak demand between 2021 and 2031 to assess the overall impact on each gas and electric distribution system;
- Compare future electric distribution system peak and energy demand load growth to historic rates;
- Consider the impacts of energy efficiency and conservation and electric load flexibility;
- Consider the capacity of the existing distribution systems and projected electric distribution system improvements and expansions to serve existing electric loads and projected electric load growth; and
- Assess the effects of shifts in seasonal system gas and electric loads.

The draft results of the study performed by the Brattle Group were provided to PSC's Electrification Study Work Group in November 2023, and a final report is due by the end of 2023. The following is a summary of the draft results:

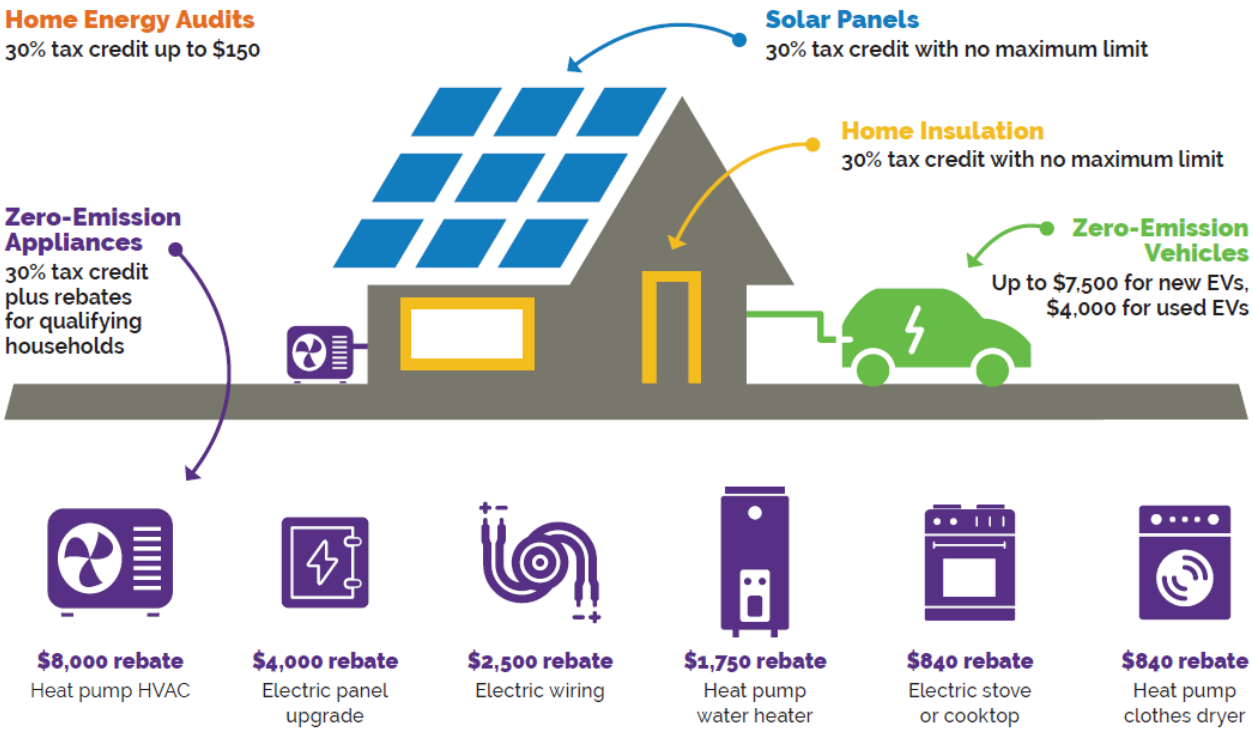
- In aggregate, Maryland's electric systems would see a load growth in the range of 0.6-2.1% per year through 2031 under a high electrification scenario assuming utility energy efficiency plans consistent with the CSNA and existing demand response plans.
- The Maryland electric system, which is currently summer peaking, would switch to winter peaking around 2026-2027.
- Pursuing policies to incentivize efficient electrification, such as using cold climate heat pumps and load flexibility measures, could result in significant mitigation of load growth by 2031 to 0.2-1.2% compound annual growth per year.
- Historically in Maryland, there was significant load growth in the 1980s of 4.9% per year and more moderate growth of 1.2-1.5% from 1990 to 2010. Load declined between 2010 and 2020.
- These results show that peak load growth through 2031 with high electrification of the building sector will be comparable to or less than the growth rate the Maryland system has seen over the past 40 years.

The studies mentioned above by Brattle, E3, and LBNL highlight the importance of energy efficiency and peak-shifting measures to mitigate electric system costs as electrification proceeds. These studies also show that the policies in this plan can be implemented while growing the electric system at rates below historic levels.

Figure 15:

Take Advantage of Existing Incentives for Zero-Emission Devices

The Inflation Reduction Act offers tax incentives and rebates for making improvements around the house. More details at **energy.gov/save**



Technology Development and Deployment

Most of the technologies that are needed to transition to a clean energy economy are not only readily available but they are also the most popular. Renewable energy started being built faster than new fossil fuel power plants in the U.S. in 2014. Heat pumps started outselling gas furnaces in the U.S. in 2022. The best-selling car in the U.S. in 2023 was an EV. The transition is well underway and manufacturers are producing zero-emission devices fast enough to meet demand. Installing all of these new devices requires the work of skilled technicians. Expect continued job growth for electricians, heat pump installers, renewable energy installers, and professionals involved with developing, financing, and managing small and large infrastructure projects.

Some of the technologies that are part of the transition - including electrolyzers for hydrogen production, vehicle-to-grid electronics, industrial heat pumps, and networked geothermal systems - are available today but not at the scale that is needed for the future. Expect job growth related to developing, manufacturing, and installing these and other emerging technologies.

Technologies that are necessary to achieve net-zero emissions - including carbon capture and storage (CCS) and direct air capture (DAC) - need rapid development to be deployed in time for Maryland to hit its goals. Expect job growth related to research, development, manufacturing, and installing these emerging technologies. Modeling for this plan shows that CCS and DAC would need to start being deployed within the next 10 years and that DAC would need to pull around 10 $MMTCO_2e$ out of the air in 2045 for Maryland to achieve net-zero emissions within the state. This challenge is not unique to Maryland; other reports show that CCS and DAC are necessary technologies for the world to achieve net-zero emissions.

Clean Energy Jobs and Workforce Development

The Maryland Department of Commerce's Office of Strategic Industries and Entrepreneurship is focused on the growth and development of the state's strategic industry sectors. The energy sector is a target sector for growth, and Commerce's staff includes an Energy Program Manager dedicated to supporting the industry. Commerce has two primary areas of focus for growing the energy industry sector and supporting the creation of jobs:

- **Encouraging the formation and growth of clean energy startups and technology development** – Innovation in the clean energy sector is one way to grow the industry and spur job creation in Maryland. Commerce works directly with clean energy entrepreneurs and startups to connect them with resources to support their growth. Specifically, Commerce administers the Innovation Investment Tax Credit program, which fosters the growth of Maryland's technology sectors by incentivizing investment in early-stage companies to increase the number of companies developing innovative technologies in Maryland, increasing overall investments in current and emerging technology sectors, and increasing the number of individual investors actively investing in Maryland technology companies.
- **Business attraction** – Commerce actively works to attract clean energy companies to Maryland. Commerce attends several clean energy conferences throughout the year, meeting with companies to pitch Maryland as a location of choice for new business investment. Commerce has several incentive programs available to support the attraction of clean energy jobs to the state, including Advantage Maryland conditional loans, More Jobs for Marylanders tax credit program, Job Creation tax credit program, and Partnership for Workforce Quality workforce training grants.

In December 2021, PSC awarded offshore wind renewable energy credits to two developers who will build off the coast of Maryland. In the decision, PSC attached conditions to the approval that included that developers create a minimum of 10,324 direct jobs during their development, construction, and operating phases of their offshore wind projects. To foster the development of a workforce to support the emerging offshore wind industry, the Department of Labor developed a strong talent pipeline through the Good Jobs Challenge grant. The nearly $23 million grant

supports both entry-level and mid-level training programs to grow and sustain the state's offshore wind workforce.

By investing in high-quality, locally led workforce systems with training in manufacturing, transportation, logistics, and skilled trades, the Maryland Works for Wind program creates and upskills electricians, carpenters, ironworkers, and many other jobs needed for the clean energy transition. With emerging technologies in mind, training programs continue to enhance their curriculum to meet the demands for offshore wind. Upon completion of the grant, over 3,800 individuals will have benefited from a workforce development program related to offshore wind and placed into high-quality jobs.

The Department of Service and Civic Innovation (DSCI) was established by the Serving Every Region Through Vocational Exploration (SERVE) Act of 2023 to promote service and volunteerism in the state of Maryland. The Act also called for the creation of the Maryland Climate Corps to "conserve and restore State and local parks and engage in other climate or environmental projects." In addition to coordinating with existing conservation programs already working in the state, DSCI will work with other state agencies to:

- **Prepare Marylanders for high-demand climate jobs** - Maryland's first of a kind service-to-career pathways (Maryland Corps and Service Year Option) emphasize exposure and skills required for green jobs of the future. In the SERVE Act, the climate is listed as a call-out area to ensure that members are placed in roles aligned with high-demand jobs aligned with the needs of Maryland. The DSCI's service programs will help to recruit, train, and retain talent in careers in the clean energy sector.
- **Partner to braid funding streams to meet shared climate and workforce goals** - The Maryland Climate Corps is an opportunity for interagency collaboration between DSCI and partner state agencies to braid state and federal climate, workforce, and service funds to create workforce pathways for frontline communities into the green jobs of the future. Potential federal grant funding can be braided with existing service and AmeriCorps funding streams to maximize climate workforce preparation.

Chapter 5: Funding the Transition

State Investments

State investments are often intended to leverage private investment and influence behavior by businesses and individuals to achieve the state's goals. State investments are also often directed to public sector projects that do not always receive private investment. The following is a list of potential new state investments and revenue sources that should be considered as the state determines how to fund the investments that are needed to support a rapid and equitable transition to a clean energy economy.

New Investments

This plan calls for at least $1 billion annually in new state spending for investments in the following priority measures:

- **Home Energy Efficiency and Electrification Incentives** - MEA will expand its offerings of consumer point-of-sale rebates and contractor incentives.
- **Commercial, Multifamily, and Institutional Building Incentives** - MEA and MCEC will scale up the distribution of grants and low-interest loans for projects in large buildings.
- **EV Incentives** - MVA and MEA will provide point-of-sale rebates to help consumers purchase EVs and EV charging equipment.
- **Industry, Public Infrastructure, and Nature-Based Solutions Incentives** - MEA, MCEC, MDE, DNR, DGS, and MDA will use and distribute funds in the form of grants and loans for different types of emissions reduction and sequestration projects.
- **Workforce Development** - The Department of Labor will expand investments in apprenticeship and workforce development programs for electricians, heat pump installers, and other jobs needed for the clean energy transition.
- **Consumer Education Campaign** - MEA will amplify its promotion of rebates and tax credits that are funded by federal and state investments.
- **Climate Transition and Clean Energy Hub** - MEA will add capacity to provide technical support to building owners on building decarbonization projects.

New Funding Sources

The investments listed above can be fully paid for by one or a combination of the funding sources listed below. The state will need to decide which one or more of these or other funding solutions are best for Maryland. New funding should provide at least $1 billion annually to ensure that the state can achieve its goals.

- **Green Revenue Bonds** - Provides near-term funding to jump-start the investments described in this plan. Revenue bonds could be repaid with revenue from any of the funding sources below and do not impact taxes or the state's capacity to use general obligation bonds to fund other state priorities.
- **Cap and Invest** - Requires polluters to reduce climate pollution and buy emission allowances for the emissions they produce. Allowance prices are determined by a market-based mechanism. Revenue from the sale of allowances would go into SEIF to fund the investments described in this plan. A portion of the funding provided by this program could offset potential fossil fuel price impacts for low-income households. This policy would expand Maryland's existing and successful cap and invest program, RGGI, by extending coverage of emissions sources beyond fossil fuel power plants.
- **Carbon Fee** - Requires polluters to pay a fee for emissions produced based on a fee rate set by the government. The government adjusts the fee rate to achieve the state's goals. Fee revenue would go into SEIF to fund the investments described in this plan. A portion of the funding provided by this program could offset potential fossil fuel price impacts for low-income households.
- **Hazardous Substance Fee** - Requires companies to pay a fee for the hazardous substances transported in the state, including fossil fuels used in or exported from the state, based on a fee rate set by the government. Fee revenue would go into SEIF to fund the investments described in this plan and help MDE pay for remediation efforts to clean up the release of hazardous substances. A portion of the funding provided by this program could offset potential fossil fuel price impacts for low-income households.
- **Clean Air Toll** - Requires interstate drivers who drive through Maryland, pollute the air in Maryland, but do not otherwise contribute to paying for pollution mitigation efforts in Maryland, to pay a toll-by-mail for the pollution they created in Maryland. This policy should be coupled with one of the other policies listed in this section to ensure that the state would be assessing a pollution fee on out-of-state drivers that is comparable to a pollution fee paid by Maryland drivers.
- **Pollution Fee on Fuel-Burning Vehicles** - Requires owners of fuel-burning vehicles to pay a pollution mitigation fee during vehicle registration. If the state decides to increase registration fees for EVs, which the state is currently considering because EV drivers do not pay motor fuel taxes that currently fund road maintenance projects, then the fee increase on fuel-burning vehicles should be at least as much as the fee increase on EVs.

This plan does not recommend any one funding solution over another. Instead, this plan informs policymakers and the public that Maryland will fall short of its goal of reducing emissions 60% by 2031 without additional policy action that reduces pollution and funds the types of investments described in this plan.

Green Bank Investments

Green banks are mission-driven financial institutions that leverage private capital to promote clean energy projects. They exist in Maryland both at the state and local levels. The state's green bank, the Maryland Clean Energy Center (MCEC), was established by statute in 2008.[88] Its mission is to encourage the transformation of the energy economy with programs that catalyze the growth of business, increase related green-collar jobs, and make clean energy technologies, products, and services affordable, accessible, and easy to implement.

MCEC supports financial partnerships among public and private organizations by promoting the deployment of technologies, serving as an incubator for development, evaluating available industry data, supporting community outreach, and providing technical assistance. Financial initiatives include the Clean Energy Advantage (CEA) Loan Program,[89] the Maryland Clean Energy Capital Program (MCAP),[90] the Maryland Energy Innovation Accelerator (MEIA),[91] and the Maryland Commercial Property Assessed Clean Energy (MDPACE) Program.[92] The Climate Solutions Now Act also created the Climate Catalytic Capital (C3) Fund, which will receive millions of dollars of state budget funding and will be combined with private donations, federal grants, financing repayments from the fund, and proceeds from sales of collateral and assets.[93]

Two other green banks are operating in Maryland: the Montgomery County Green Bank, a publicly chartered nonprofit serving Montgomery County,[94] and the Climate Access Fund, an independent nonprofit based in Baltimore and operating throughout Maryland.[95] The Montgomery County Green Bank was founded in 2016 using an estimated $18 million in funding from the merger of Pepco and Exelon corporations. It advances energy efficiency, renewable energy, and clean energy investment through residential financing opportunities as well as commercial sector opportunities. For the commercial sector, several offerings include the Affordable Multi-Family Housing Electric Vehicle Charging Infrastructure Program,[96] Property Assessed Clean Energy (C-PACE), Solar Power Purchase Agreement, Technical Assistance Program,[97] and Small Business

[88] The Maryland Clean Energy Center. https://www.mdcleanenergy.org/.
[89] Clean Energy Advantage. https://cealoan.org/maryland/.
[90] The Maryland Clean Energy Center. Maryland Clean Energy Capital Program. https://www.mdcleanenergy.org/finance/mcap/.
[91] Maryland Energy Innovation Accelerator. https://mdeia.org/.
[92] MDPACE. Property Assessed Clean Energy Loans. https://md-pace.com/.
[93] The Maryland General Assembly. Statutes Tex. Article - Economic Development. §10–855. https://mgaleg.maryland.gov/mgawebsite/Laws/StatuteText?article=gec&section=10-855&enactments=false.
[94] The Montgomery County Green Bank. https://mcgreenbank.org/.
[95] The Climate Access Fund. https://www.climateaccessfund.org/.
[96] The Montgomery County Green Bank. Electric Vehicle Charger Infrastructure Program. https://mcgreenbank.org/electric-vehicle-charger-infrastructure-program/.
[97] The Montgomery County Green Bank. Technical Assistance Program Application Form. https://mcgreenbank.org/technical-assistance-program-application-form/.

Energy Savings Solutions.[98] The Climate Access Fund was created in 2017 and focuses on delivering community solar energy access to low and moderate income residents. The Climate Access Fund provides two main financial mechanisms for developers: a solar bill guarantee, which receives funding from MEA, and low-cost financing, as well as direct economic benefits to communities served through project ownership access and paid apprenticeships and contractor opportunities.

Federal Investments

Grants

The BIL and IRA reflect the largest federal investment in infrastructure, clean energy, and climate action in U.S. history. As of November 2023, $4.9 billion in BIL and IRA funding has been announced for Maryland[99] with over 100 projects identified for funding. Approximately $3.8 billion has been announced for transportation – to invest in roads, bridges, public transit, ports, and airports – and roughly $307 million has been announced for clean water. $249 million has been announced for Maryland through grants, rebates, and other initiatives to accelerate the deployment of clean energy, clean buildings, and clean manufacturing. This does not include clean energy tax incentives from the IRA.

Maryland's state agencies collaborate through the Governor's Federal Office, which is tasked with determining the best strategies Maryland can implement to leverage federal funds for the state. FIT is responsible for tracking notices of funding opportunities, keeping the Administration updated on these funding opportunities, working collaboratively through inter-agency coordination, and mitigating any problems or concerns that arise in a timely manner. The Federal Office also supports state and local governments to identify gaps in funding to determine how federal dollars can be used to address them.

The first year of these historic federal investments has spurred the clean energy transition nationwide. Maryland is in a lead position to leverage these once-in-a-generation federal investments to further accelerate its continued response to the climate crisis and transition to a clean energy economy in a way that is robust, equitable, and inclusive. The new and expanded federal investments are available to Maryland through loans, grants, and tax incentives for consumers, private industry, and for the first time direct-pay tax incentives for tax-exempt and governmental entities—such as states, local governments, tribes, territories, and nonprofits.

Table 4 summarizes key federal grant programs that have already begun to deliver support to Maryland to achieve its climate action goals:

[98] The Montgomery County Green Bank. Solutions for commercial property owners and businesses to reach clean energy benefits. https://mcgreenbank.org/commercial-programs/.
[99] The White House. Investing In America. https://www.whitehouse.gov/invest/.

Table 4: **Notable federal grants for climate action.**

Sector	IRA / BIL Grant Programs	2023 Maryland Highlight
Environmental Justice	- EPA Emerging Contaminants in Small or Disadvantaged Communities Grant Program - EPA Fenceline Air Monitoring and Screening Air Monitoring - EPA Pollution Prevention Grants	MDE is taking a lead role to support Maryland communities with EJ concerns. In 2023, MDE was awarded three competitive grants to improve environmental quality and community resilience.
	- EPA Environmental Justice Thriving Communities Technical Assistance Centers	EPA has selected 16 Environmental Justice Thriving Communities Technical Assistance Centers (EJ TCTACs) to provide training and other assistance to build capacity for navigating federal grant application systems, writing strong grant proposals, and effectively managing grant funding.[100]
	- DOC Broadband Equity, Access, and Deployment State Grants	As of Nov 6, $768.1M in federal funding to provide affordable, reliable high-speed internet to everyone in Maryland.
Workforce Development	- DOC Good Jobs Challenge	Maryland Works for Wind (MWW) is a nearly $23 million federally-funded program that creates a pipeline of skilled talent to support the emerging offshore wind industry. In partnership with leading employers, this regional workforce training system will place and/or upskill more than 3,800 individuals into good paying careers by the end of 2025.
	- DOE State-Based Home Energy Efficiency Contractor Training Program (also known as Training for Residential Constrators)	DOE is providing $2.5 million to Maryland to provide contractor training support for the type of residential improvements that will be occurring under the HOMES and HEAR programs.

[100] EPA Region 3 EJ TCTAC Center will be led by National Wildlife Federation in partnership with the University of Maryland's (UMD) Center for Community Engagement, Environmental Justice and Health (CEEJH) and Environmental Finance Center (EFC) and multiple community-based partners. https://www.nwf.org/Our-Work/Environmental-Justice/Region-3-TCTAC.

Sector	IRA / BIL Grant Programs	2023 Maryland Highlight
Economywide	- EPA Climate Pollution Reduction Grant	MDE is leading the State of Maryland Climate Pollution Reduction Grant for Planning and coordinating with Maryland's jurisdictions in the CPRG Planning grants for the Philadelphia, Baltimore, and Washington DC metropolitan statistical areas. There will be competitive CPRG Implementation grants available for climate pollution reduction measures represented in Priority Climate Action Plans developed under the Planning Grants.
Electricity	- DOE Energy Efficiency and Conservation Block Grant Program - DOE Energy Efficiency Revolving Loan Fund Capitalization Program - DOE Preventing Outages and Enhancing the Resilience of the Electric Grid, Grants to States and Tribes - DOE State Energy Program	As the State Energy Office, the MEA leverages a number of important DOE federal grant programs to assist Maryland and its local governments in implementing strategies to reduce energy use, to reduce fossil fuel emissions, to improve energy efficiency, and enhance the electrical grid.
Transportation	- DOT Advanced Transportation Technologies and Innovative Mobility Deployment Program (ATTAIN) - DOT - FAA Airport Terminal Program - DOT - FRA Consolidated Rail Infrastructure and Safety Improvement Grants (CRISI) - Charging and Fueling Infrastructure (CFI) Grant Program	The most significant funding from the BIL has provided key investments in Maryland's roads, bridges, rail, public transit, ports, and airports.
	- DOT - FHWA National Electric Vehicle Infrastructure Formula Program	The National Electric Vehicle Infrastructure Formula Program ("NEVI Formula") provides funding to States to strategically deploy EV charging infrastructure and to establish an interconnected network to facilitate data collection, access, and reliability. Maryland's original NEVI Plan was submitted to the Federal Highway

Sector	IRA / BIL Grant Programs	2023 Maryland Highlight
		Administration (FHWA) on July 15, 2022.[101]
	- DOT - FHWA Carbon Reduction Program	The Carbon Reduction Program (CRP) provides funds for projects designed to reduce transportation emissions, defined as carbon dioxide (CO2) emissions from on-road highway sources. The CRP will send an estimated $94 million to Maryland over 5 years.[102]
	- EPA Clean School Bus Program	EPA's Clean School Bus Program provides $5 billion over five years (FY 2022-2026) to replace existing school buses with zero-emission and low-emission models. In 2022, Baltimore City Schools received $9.4 million for 25 buses.[103]
Buildings	- DOE Home Electrification and Appliance Rebates (HEAR) Program - DOE Home Efficiency Rebates Program (HOMES)	MEA will be the recipient of the HOMES and the HEAR Program being funded from the DOE through the IRA. The HOMES program is focused on whole-home energy efficiency upgrades, while the HEAR program addresses home electrification. DOE requires that both the HOMES and HEAR programs contain dedicated allocations for low-income households; additionally, the federal legislation establishing the HEAR electrification program limits electrification incentives to only households with incomes that meet the definitions of low-income or moderate-income.
	- DOE Weatherization Assistance Program	DHCD leads Maryland's WAP to assist income-eligible homeowners and renters in Maryland by reducing heating and cooling

[101] MDOT and MEA are working collaboratively with partners and stakeholders to develop annual updates of the Maryland State Plan for NEVI Formula Funding Deployment, which guide the implementation of the NEVI program. The Maryland NEVI plan and updates can be found here: https://evplan.mdot.maryland.gov/.
[102] The Maryland Department of Transportation/ Maryland Commission on Climate Change Mitigation Working Group. Carbon Reduction Program Overview. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/MWG/Carbon%20Reduction%20Program_MDoT.pdf.
[103] The U.S. Environmental Protection Agency. Clean School Bus Program. https://www.epa.gov/cleanschoolbus.

Sector	IRA / BIL Grant Programs	2023 Maryland Highlight
		costs through energy-conservation measures, while also addressing health and safety issues in their homes.
	- DOE Assistance for Latest Building Energy Code Adoption	Maryland Department of Labor will lead the state's application for the DOE Assistance for Latest Building Energy Code Adoption grants to support states and local jurisdictions in adopting, implementing, and enforcing the latest model, zero energy codes, or equivalent codes and standards, improving residential and commercial new construction and retrofits, and transitioning the building stock to more efficient, decarbonized buildings for all.
	- DOE Renew America's Schools Grant Program	DOE's Renew America's Schools grant provided funding for infrastructure upgrades at K–12 public school facilities. Baltimore County Public Schools was selected for funding in 2023.[104]
Industry	- DOE State Manufacturing Leadership	Maryland's Manufacturing Asset Deployment for Energy (MADE 4.0) Program will support Maryland small- and medium-sized manufacturers (SMMs) through a combination of smart manufacturing technology applications and community workforce training, leading to energy, production, and quality efficiency gains in their facilities.[105]
Waste	- EPA Solid Waste Infrastructure for Recycling	MDE received an EPA grant to inform the public about residential or community recycling or composting programs, provide information about the materials that are accepted as part of residential or community recycling or composting

[104] The U.S. Department of Energy. Renew America's Schools Grant. https://www.energy.gov/scep/renew-americas-schools-grant.
[105] The U.S. Department of Energy. Bipartisan Infrastructure Law: State Manufacturing Leadership Program Selected Program Fact Sheets. https://www.energy.gov/sites/default/files/2023-09/State%20Manufacturing%20Leadership%20Program%20Selections%20Factsheets_0.pdf.

Sector	IRA / BIL Grant Programs	2023 Maryland Highlight
		programs, and increase collection rates and decrease contamination in Maryland. Additionally, Baltimore City received $4 million to develop a solar-powered, scalable composting facility co-located with the new East Side Transfer Station at Bowley's Lane.[106]
Agriculture	- USDA Agricultural Conservation Easement Program - USDA Conservation Stewardship Program (CSP) - USDA Conservation Technical Assistance - USDA Environmental Quality Incentives Program (EQIP)	USDA funds numerous financial assistance programs to incentivize Maryland's farmers and forest landowners to conserve the nation's soil, water, air and other natural resources. All programs are voluntary and offer science-based solutions that benefit both the landowner and the environment.
Forestry and Land Use	- USDA Urban and Community Forestry Program - USDA Regional Conservation Partnership Program	DNR is leading federal grants to promote conservation, plant Maryland forests, implement land management practices to address water quality in the Chesapeake Bay and its tributaries, and increase resiliency.[107]

For more details, Marylanders can view the state's federal grant requests and information through the Maryland State Clearinghouse's Intergovernmental Monitor[108] or Maryland Department of Budget and Management quarterly reports[109].

[106] The U.S. Environmental Protection Agency. Investing in America through the Bipartisan Infrastructure Law Solid Waste Infrastructure for Recycling Grants Community Grant Fact Sheet. https://www.epa.gov/system/files/documents/2023-09/Mayor_and_City_Council_of_Baltimore_SWIFR.pdf.
[107] The U.S. Department of Agriculture. Regional Conservation Partnership Program 2023 Awarded Projects. https://www.nrcs.usda.gov/regional-conservation-partnership-program-2023-awarded-projects.
[108] The Maryland Department of Planning. State Clearinghouse Intergovernmental Monitor. https://planning.maryland.gov/Pages/OurWork/IntergovernmentalMonitor.aspx.
[109] The Maryland Department of Budget and Management. American Rescue Plan, Infrastructure Investment and Jobs Act, and Inflation Reduction Act Reports. https://dbm.maryland.gov/Pages/recoverynow.aspx.

Greenhouse Gas Reduction Fund

The second-largest allocation in the IRA was the creation of the $27 billion Greenhouse Gas Reduction Fund (GGRF). EPA is managing the GGRF through three concurrent, competitive grant competitions. The goal of the GGRF is a historic investment to mobilize financing and private capital to address the climate crisis, ensure our country's economic competitiveness, and promote energy independence while delivering lower energy costs and economic revitalization to communities that have historically been left behind[110].

The three competitions include the National Clean Investment Fund,[111] Clean Communities Investment Accelerator,[112] and Solar for All.[113] The $14 billion National Clean Investment Fund competition will provide grants to 2–3 national nonprofit clean financing institutions capable of partnering with the private sector to provide accessible, affordable financing for tens of thousands of clean technology projects across the country. The $6 billion Clean Communities Investment Accelerator competition will provide grants to 2–7 hub nonprofits that will, in turn, deliver funding and technical assistance to build the clean financing capacity of local community lenders working in low-income and disadvantaged communities—so that underinvested communities have the capital they need to deploy clean technology projects. The $7 billion Solar for All competition will award up to 60 grants to states, territories, Tribal governments, municipalities, and eligible nonprofit recipients to expand the number of low-income and disadvantaged communities primed for distributed solar investment—enabling millions of low-income households to access affordable, resilient, and clean solar energy. Grantees will use funds to expand existing low-income solar programs or design and deploy new Solar for All programs nationwide.

Several Maryland-based non-profits have submitted applications under the National Clean Investment Fund and Clean Communities Fund Competition. Maryland's green banks participated in all three GGRF competitions, including the state's application to the Solar for All Competition, led by the Maryland Clean Energy Center. Results from these competitions will be announced in 2024 by EPA and will result in significantly added financial resources to advance Maryland's clean energy transition.

Clean Energy Tax Incentives

The IRA introduced and expanded tax credits for clean energy technologies and provided new provisions that will enable tax-exempt and governmental entities such as states, local governments, Tribes, territories, and nonprofits to benefit from these tax credits to further

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[110] The U.S. Environmental Protection Agency. Greenhouse Gas Reduction Fund. https://www.epa.gov/greenhouse-gas-reduction-fund.
[111] The U.S. Environmental Protection Agency. National Clean Investment Fund. https://www.epa.gov/greenhouse-gas-reduction-fund/national-clean-investment-fund.
[112] The U.S. Environmental Protection Agency. Clean Communities Investment Accelerator. https://www.epa.gov/greenhouse-gas-reduction-fund/clean-communities-investment-accelerator.
[113] The U.S. Environmental Protection Agency. Solar for All. https://www.epa.gov/greenhouse-gas-reduction-fund/solar-all.

accelerate the clean energy transition. For the first time through the IRA's "elective pay" or "direct pay" provisions, tax-exempt and governmental entities will be able to receive a payment equal to the full value of tax credits for building qualifying clean energy projects.[114]

Unlike competitive grant and loan programs, in which applicants may not receive an award, elective pay allows entities to get their payment if they meet the requirements for both elective pay and the tax credit. The entities eligible for elective pay would not normally owe federal income tax. However, by filing a return and using elective pay, these entities can receive tax-free cash payments from the IRS for clean energy tax credits earned. Applicable entities can use elective pay for 12 of the Inflation Reduction Act's tax credits.[115,116] Additionally, there are bonuses to the tax credits that increase the value of the tax credit when certain criteria are met such as Prevailing Wage and Apprenticeship Requirements, Domestic Content Bonus, Energy Communities Bonus, and Low Income Communities Bonus Credit Program.[117]

The proposed guidance also includes a new rule that would enable entities to combine grants and forgivable loans with tax credits. An example provided by the Department of the Treasury is that a school district receives a tax-exempt grant in the amount of $300,000 to purchase an electric school bus, such as from the EPA Clean School Bus Program.[118] Under the IRA, clean commercial vehicles are eligible for a tax credit of up to $40,000. The school district purchases the bus for $400,000, using the grant and $100,000 of the school district's unrestricted funds. The school district's basis in the electric bus is $400,000 and the school district's section 45W credit is $40,000. Since the amount of the restricted tax-exempt grant plus the amount of the section 45W credit ($340,000) is less than the cost of the electric bus, the school district receives the full 45W credit of $40,000. Therefore, the school district can access the $400,000 bus with $60,000.

[114] The White House. Direct Pay Through The Inflation Reduction Act. https://www.nrcs.usda.gov/regional-conservation-partnership-program-2023-awarded-projects.
[115] The U.S. Internal Revenue Service. Clean Energy Tax Incentives: Elective Pay Eligible Tax Credits. https://www.irs.gov/pub/irs-pdf/p5817g.pdf.
[116] The U.S. Internal Revenue Service. Elective Pay Overview. https://www.irs.gov/pub/irs-pdf/p5817.pdf.
[117] The U.S. Internal Revenue Service. Low-Income Communities Bonus Credit. https://www.irs.gov/credits-deductions/low-income-communities-bonus-credit.
[118] The U.S. Environmental Protection Agency. Clean School Bus Program. https://www.epa.gov/cleanschoolbus.

Chapter 6: Implementation

Executive Actions

State law (Maryland Code, Environment Article, § 2-1205) requires MDE to develop plans, adopt regulations, and implement programs that reduce statewide GHG emissions to achieve the emissions reduction requirements of the state.[119] MDE has broad authority to regulate air pollution, including GHG emissions, in Maryland. MDE and other agencies mentioned in this section will use existing statutory authority to implement the following regulatory and programmatic actions:

MDE

1. **Adopt a Zero-Emission Heating Equipment Standard** - In 2024, MDE will initiate a rulemaking to propose a draft regulation by the end of 2024 and adopt a final regulation by the end of 2025.
2. **Adopt a Clean Heat Standard** - In 2024, MDE will initiate a rulemaking to propose a draft regulation by the end of 2024 and adopt a final regulation by the end of 2025.
3. **Modify the Regional Greenhouse Gas Initiative program** - In 2024, MDE will work with the other RGGI states to establish a new regional cap. Maryland is currently advocating for the cap to be strengthened to be consistent with states' 100% clean energy goals. MDE will also eliminate underutilized components of Maryland's program under RGGI including offsets and the Limited Industrial Exemption Set Aside when it updates its CO2 Budget Trading Program regulation in 2024.
4. **Evaluate a Cap and Invest program** - In 2024, MDE will explore how expanding Maryland's current cap and invest program (RGGI) to cover additional sources could work.
5. **Determine if Maryland should adopt the Advanced Clean Fleets regulation** - In 2024, MDE will work with stakeholders and consultants to determine if adopting ACF would result in emissions reductions beyond those expected by Maryland's adoption of the Advanced Clean Trucks regulation.

MEA

6. **Determine a legal framework for a Clean Power Standard** - In 2024, MEA will finalize a conceptual framework for the Clean Power Standard and determine if all or part of a CPS can be implemented through existing authority.
7. **Determine if additional state action is needed to accelerate solar power deployment** - In 2024, MEA will take the outcomes of the Task Force to Study Solar Incentives and take steps to overcome barriers to solar power deployment in Maryland.

[119] The Maryland General Assembly. Statutes Text. Article - Environment. §2–1205. https://mgaleg.maryland.gov/mgawebsite/Laws/StatuteText?article=gen&section=2-1205.

8. **Launch a consumer education campaign** - With new funding or its regular budget, MEA will launch a public information campaign to promote consumer rebates and tax credits funded by federal and state investments.
9. **Expand the Climate Transition and Clean Energy Hub** - With new funding, MEA will expand its capacity to provide technical support on building decarbonization projects to building owners.
10. **Provide new EVSE incentives** - Once new funding is secured, MEA will begin providing point-of-sale rebates for purchasing EV supply equipment (EVSE) as described in this plan.
11. **Provide new building decarbonization incentives** - Once new funding is secured, MEA will begin providing point-of-sale rebates for energy efficiency and electrification projects and distribute funding to MCEC to scale up green bank lending.
12. **Provide new industrial, public infrastructure, and nature-based solutions incentives** - Once new funding is secured, MEA will utilize and distribute funds to MDE, MCEC, DNR, MDA, and local governments for a wide range of emission reduction and sequestration projects in Maryland's industrial, waste, agricultural, and forestry & land use sectors.

MDOT

13. **Implement the ZEV Infrastructure Plan** - In 2024, MDOT in consultation with partner agencies will implement round 1 of the NEVI Program to deploy charging along Maryland's 23 EV Alternative Fuel Corridors.
14. **Implement the Maryland Transportation Plan** - In 2024, MDOT will begin implementing the updated Maryland Transportation Plan including making investments in new infrastructure projects and programs that will reduce vehicle miles traveled and enhance transportation choices in the state.
15. **Provide new EV incentives** - Once new funding is secured, MVA will begin providing point-of-sale rebates for purchasing EVs as described in this plan.

PSC

16. **Initiate a gas system planning proceeding** - In 2024, the PSC should initiate a proceeding to require natural gas utility companies to develop plans to achieve a structured transition to a net-zero emissions economy in Maryland.

Labor

17. **Expand workforce development programs** - Building on existing programs, significant federal investments, such as the $23 million Good Jobs Challenge Grant for Maryland Works for Wind[120], and with additional new funding, the Department of Labor will expand investments in apprenticeship and workforce development programs for electricians, heat pump installers, and other jobs needed for the clean energy transition.

[120] The Maryland Department of Labor. Maryland Works for Wind - Workforce Development and Adult Learning. https://www.dllr.state.md.us/employment/marylandworksforwind/.

DSCI

18. **Expand service-to-career pathways** – Growth of the Maryland Climate Corps efforts through the Department of Service and Civic Innovation will increase the number of individuals who are exposed and prepared for green jobs of the future.

All Agencies

19. **Apply for federal funding** - Under the leadership and coordination of the Governor's Federal Office, all agencies will apply for federal funding to implement actions that support the achievement of this plan. State agencies will work closely with local governments, nonprofits, and community-based organizations to ensure Maryland is competitive for federal climate action implementation funds and to build capacity for local-level implementation. State agencies will offer support to Maryland's businesses and private sector to ensure they are competitive for historic federal investments.

Legislative Actions

Fully implementing this plan will require action by the Maryland General Assembly. Maryland is fortunate to have policy experts in the legislature who are skilled at developing targeted legislation to address the complexity of the clean energy transition. Recommended legislative actions include:

1. **Develop New Funding Sources** - In consultation with MDE, pass legislation to implement one or more of the new funding sources described in Chapter 5.
2. **Modify the Renewable Portfolio Standard** - In consultation with MDE and MEA, pass legislation to modify the definitions of qualifying resources in the RPS to align with definitions of clean power resources under the forthcoming Clean Power Standard.
3. **Require new multifamily buildings to be EV-ready** - In consultation with MEA, pass legislation requiring that the state's EV-ready standards for new buildings be extended to include multifamily buildings.
4. **Modify EmPOWER** - In consultation with PSC, pass legislation establishing GHG reduction goals for electric and gas utility companies and require the utilities' programs to facilitate beneficial electrification of fossil fuel heating equipment.
5. **Modify the state's ability to regulate GHG emissions from the manufacturing sector** - In consultation with MDE, pass legislation that relaxes an existing prohibition on the state to require GHG emissions reductions from the state's manufacturing sector. A recommendation to this effect is included in the 2023 Annual Report of the Maryland Commission on Climate Change.
6. **Modify the state's EV purchasing incentives** - In consultation with MDE, MEA, and MVA, pass legislation that creates point-of-sale rebates for purchasing new and used EVs including base rebates available to most car buyers, bonus rebates for low and moderate income and high-mileage drivers, and authorize funding to provide technical assistance grants to owners of small fleets as described in this plan.

Opportunities for Stakeholder Input in Policy Development

Climate Pathway Stakeholder Input

Engaging stakeholders remains a priority throughout the development and implementation of Maryland's climate action plans. MDE actively sought robust public input to help shape Maryland's Climate Pollution Reduction Plan over an extensive six-month outreach period in 2023. Interested parties provided feedback through multiple channels, including online comment forms, letters, phone calls, and direct conversations with MDE staff at public events. The Maryland Commission on Climate Change was instrumental in providing input from its working groups, building on its long-standing engagement in previous emissions reduction efforts.

Between July and September 2023, MDE and UMD hosted a series of statewide public stakeholder meetings to present the Maryland's Climate Pathway report and gather feedback. These sessions took place at Bowie State University, Hagerstown Community College, Salisbury University, Morgan State University, and the College of Southern Maryland. The team hosted two virtual sessions as well to maximize access for busy Marylanders who could not attend an in-person session.[121]

Finally, MDE compiled all the feedback received through this extensive outreach into an outreach results webpage.[122] Thousands of Marylanders provided comments at the outreach sessions or submitted written comments. Opportunities for public and organizational input will continue as legislation is introduced to implement the plan, as well as through the regulatory hearing processes.

Executive Action Stakeholder Input

MDE's regulatory function occurs through a coordinated effort with the public and private sectors. The review process helps to ensure participation from stakeholders, other agencies, the general public, and other entities affected by regulations. Draft air regulations are also brought before the Air Quality Control Advisory Council for advice and recommendations.

Proposed regulations are published in the Maryland Register.[123] Each listing describes how and when to submit comments and provides additional information including budget impacts on agencies, industries, and small businesses. Proposed regulations are subject to a public hearing

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[121] The Maryland Department of the Environment. MDE Announces Listening Sessions on Maryland's Climate Pathway Report. https://news.maryland.gov/mde/2023/07/18/mde-announces-listening-sessions-on-marylands-climate-pathway-report/.

[122] The Maryland Department of the Environment. Outreach Results on 2031 GHG Reduction Planning. https://mde.maryland.gov/programs/air/ClimateChange/Pages/Outreach-Results-on-2031-GHG-Reduction-Planning.aspx.

[123] The Maryland Division of State Documents. Maryland Register Online. https://2019-dsd.maryland.gov/Pages/MDRegister.aspx.

after publication in the Register. Formal adoption of new regulations occurs only after a hearing is held and necessary changes are made.

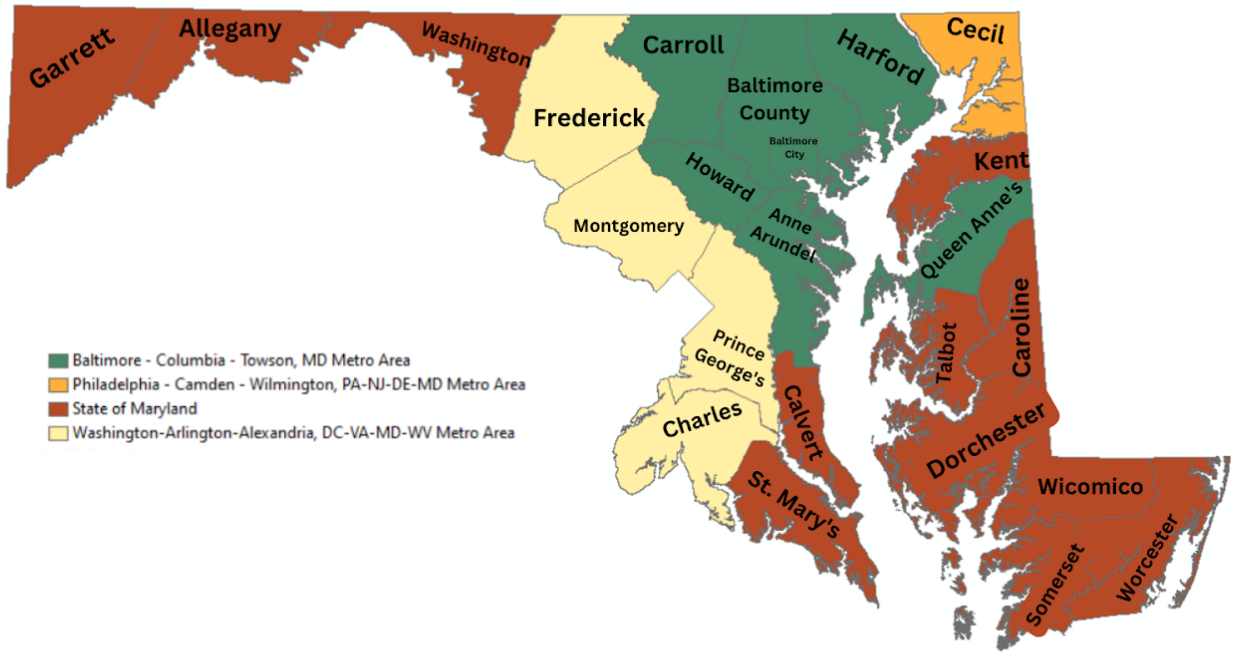
Legislative Action Stakeholder Input

As part of the legislative process, standing committees meet during the legislative session to receive testimony and take action on bills that are referred to the committee. Bill sponsors and citizens supporting or opposing the proposed legislation have an opportunity to provide input on a bill through oral and/or written testimony. Marylanders are encouraged to discuss policy matters with their elected representatives.

CPRG: From Planning to Implementation

While Maryland passed the CSNA in 2022, the federal government's passage of the BIL in 2021 and the IRA in the same year provides a once-in-a-lifetime opportunity for Maryland to leverage the federal government's funding and programs to spur state action. One such program is EPA's Climate Pollution Reduction Grant (CPRG).[124] MDE is the lead agency for Maryland's CPRG Planning Grant and is working in close coordination with the Metropolitan Statistical Areas (MSA) within the state and the counties not covered by a CPRG MSA Planning Grant (Figure 16).

Figure 16: **Maryland CPRG Planning Areas**.



[124] The U.S. Environmental Protection Agency. Climate Pollution Reduction Grants. https://www.epa.gov/inflation-reduction-act/climate-pollution-reduction-grants.

Under the CPRG for Planning, MDE will expand its GHG emission reduction planning activities and deliverables to publish the following plans and reports required by EPA.

Maryland's Priority Climate Action Plan

A Priority Climate Action Plan (PCAP), due March 1, 2024, aims to identify near-term, high-priority, and implementation-ready measures to reduce climate pollution. The PCAP will prepare Maryland's eligible entities to compete in the transformative federal funding from the BIL of 2021 and IRA of 2022, including the $4.6 billion EPA CPRG competition.

Maryland's Comprehensive Climate Action Plan

A Comprehensive Climate Action Plan (CCAP) is due two years after the award of the planning grant. This plan will focus on all significant GHG sources/sinks and sectors present in Maryland and establish near-term and long-term emission reduction goals. Measures and strategies will be identified to achieve those goals, including recent changes in technologies and market forces, potential leveraging of other funding opportunities (e.g., under the IRA of 2022, BIL of 2021, or other sources), new program areas and opportunities for regional collaboration, or inclusion of analyses to estimate benefits including those flowing to low income and disadvantaged communities. The plan as a whole is required to include:

- Maryland's GHG inventory;
- GHG emissions projections;
- GHG reduction targets;
- Quantified GHG reduction measures;
- A benefits analysis for the full geographic scope and population of Maryland;
- A low-income and disadvantaged communities benefit analysis;
- A review of authority to implement;
- A plan to leverage other federal funding; and
- A workforce planning analysis.

Maryland's Status Report

A status report is due at the end of the four-year planning grant period in the summer to fall of 2027. This report will include the implementation status of the quantified GHG reduction measures included in Maryland's CCAP, along with any relevant updated analyses or projections supporting implementation and next steps and future budget/staffing needs to continue that implementation. MDE will deliver a series of GHG emission reduction plans and inventories with an increasing emphasis on implementation planning and tracking.

CPRG Stakeholder Engagement

MDE is committed to providing inclusive, accessible, and transparent public and stakeholder engagement processes to inform the development of upcoming CPRG plans and competitive

implementation grants that may develop from these plans. MDE will lead three concurrent stakeholder engagement processes in the development of the PCAP, CCAP, and status report:

1. Ongoing public and stakeholder engagement through existing climate-action and environmental justice commissions, task forces, and working groups with over 250 cross-sectoral members, with most groups meeting either monthly or quarterly. To ensure representatives of low-income and disadvantaged communities that may be affected by or benefit from plan development are included in the process, Maryland's CPRG for Planning will align directly with best practices for engagement offered by MDE's new Office of Environmental Justice and the Maryland Commission of Environmental Justice and Sustainable Communities (CEJSC). Ongoing monthly and quarterly meetings of these advisory groups are open to the public and materials from these meetings are available on the MDE website.
2. Public outreach to compile near-term, high-priority, implementation-ready projects from covered agencies, jurisdictions, and stakeholders to include in the PCAP. This process will include leveraging existing plans, or for counties without their own plans, MDE is leading the Maryland CPRG Local Support Program to facilitate the process of identifying qualifying projects. MDE launched a webpage for this effort[125] which will include details, webinar links and recordings, and a comment submission form.
3. Environmental Justice Listening Sessions led by the MDE Secretary, MDE EJ Office Director, and MDE Secretary's EJ Advisory Council. MDE is conducting listening sessions in communities with EJ concerns. MDE has and will continue to identify top communities with EJ concerns and will use the MDE EJ Screening Tool to develop a report on the key permitted facilities in the area, identify the communities' socioeconomic demographics, and review existing community feedback and concerns about permitted facilities. MDE will schedule and conduct listening sessions with citizens in the community to identify and discuss concerns and opportunities and key actions MDE and other state agencies can undertake to address inequities and ensure direct benefits to communities. Direct citizen feedback from these sessions will help to identify priorities for Maryland's PCAP and inform methods for how to assess community benefits.

The CPRG for Planning will deliver the following benefits by driving climate pollution reduction planning into implementation and action:

- **Tackle damaging climate pollution** while supporting the creation of good jobs and lowering energy costs for families.
- **Accelerate work to address environmental injustice** and empower community-driven solutions in overburdened neighborhoods.

[125] The Maryland Department of the Environment. Climate Pollution Reduction Grant Program. https://mde.maryland.gov/programs/air/ClimateChange/Pages/Climate-Pollution-Reduction-Grant-Program.aspx.

- **Deliver cleaner air** by reducing harmful air pollution in places where people live, work, play, and go to school.
- **Ensure Maryland is competitive for federal implementation funds** from the BIL of 2021 and IRA of 2022.
- **Drive successful local-level implementation** for high-priority GHG emission reduction programs and projects.

Progress Tracking and Reporting

MDE bears an enormous responsibility to Maryland's citizens following the publication of this plan to ensure that the state's GHG reduction goals are fully achieved. Implementation and tracking of the policies and initiatives contained within will require both monitoring and annual reporting on status and success. Facilitated through such analyses, MDE will adopt a final plan that achieves net-zero statewide GHG emissions by 2045 on or before December 31, 2030. MDE will continue to analyze the success of these policies and initiatives through review and revision of the final plan on or before December 31, 2035.

Coordination among Maryland's state agencies is essential to ensure proper implementation and function of the plan. State agencies, many of which have a prominent role in the implementation of the policies and initiatives in this plan, are required to report annually on the status of programs that support the state's GHG reduction efforts or address climate change to the Maryland Commission on Climate Change. The law requires annual reports from the following Maryland state agencies:

- The Department of the Environment
- The Department of Agriculture
- The Department of General Services
- The Department of Housing and Community Development
- The Department of Natural Resources
- The Department of Planning
- The Department of Transportation
- The Maryland Energy Administration
- The Maryland Insurance Administration
- The Public Service Commission
- The University of Maryland Center for Environmental Science

These annual reports must include program descriptions and objectives; implementation milestones and whether or not they have been met; enhancement opportunities; funding; challenges; estimated GHG reductions by program for the prior calendar year; and any other information that the agency considers relevant. Additionally, when reviewing planning, regulatory, and fiscal programs, each agency is required to identify and recommend actions to more fully

integrate the consideration of Maryland's GHG reduction goal and the impacts of climate change. Such considerations include sea level rise, storm surges and flooding, increased precipitation and temperature, and extreme weather events. Specific policies, planning, regulatory, and fiscal changes to existing programs that do not currently support Maryland's GHG reduction efforts or address climate change must also be accounted for.

In conjunction with the aforementioned annual report, MDE is required to include in the Maryland Commission on Climate Change's Annual Report the status of the state's efforts to mitigate the causes of, prepare for, and adapt to the consequences of climate change, including future plans and recommendations for legislation to be considered by the General Assembly as well as an accounting of state money spent on measures to reduce GHGs and co-pollutants and the percentage of funding that benefited disproportionately affected communities.

If it becomes clear that Maryland could fall short of achieving an implementation milestone, such as the number of EVs registered, heat pumps installed, or homes weatherized, the GHG impact will be evaluated to help determine if other actions must be scaled up to make up for any shortfall to achieve an equivalent amount of GHG emissions reductions.

Appendices

This plan and its appendices are available online at https://mde.maryland.gov/programs/air/ClimateChange/Pages/Maryland's-Climate-Pollution-Reduction-Plan.aspx

Maryland
Department of
the Environment