

CAP-AND-INVEST FOR MARYLAND

ISSUE BRIEF 1: EMISSIONS REDUCTION TRAJECTORY

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Climate Law &
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Climate Law & Policy Project

Climate Law & Policy Project is a 501(c)(3) non-profit organization. CLPP's mission is to help formulate and advocate environmentally, socially, and scientifically sound policies to reduce emissions and protect communities around the world from the impacts of climate change.

CLPP operates like a think tank – seeking practical and politically viable strategies – while simultaneously advocating for strong responses to avert the increasingly urgent problem of climate change.

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Introduction

Maryland's Department of the Environment (MDE) has discussed the possibility of developing an economy-wide cap-and-invest program for the state. This paper explores how the ***emissions reduction trajectory*** should be determined.

Maryland has some of the most ambitious greenhouse gas (GHG) reduction targets in the country. By law, it must reduce emissions 60% from 2006 levels by 2031 and achieve net-zero emissions by 2045.

In December 2023, MDE released [Maryland's Climate Pollution Reduction Plan](#) (CPRP) laying out a strategy to achieve the state's near-term goal and place the state on a path to achieve its 2045 goal. The CPRP includes an economy-wide cap-and-invest program, both to close a 3.5 million metric ton emissions gap remaining after MDE's other policy recommendations are implemented and to raise the roughly \$1 billion per year in new revenue the CPRP estimates is needed to fund several of these policy programs. (Other mechanisms, such as a carbon fee, are also included as potential revenue-raising options.) There is little detail in the CPRP about how cap-and-invest might be designed to best serve Maryland's needs.

In December 2024, the [annual report](#) from the Maryland Commission on Climate Change (MCCC) included a recommendation that the General Assembly should authorize a study to evaluate the design of a cap-and-invest program. The MCCC's 2025 [recommendations](#) include a similar directive aimed at the Moore Administration.

Not all stakeholders may be familiar with cap-and-invest and how it works. **Put simply, a cap-and-invest approach establishes a declining cap on emissions levels, requires polluters to acquire and retire emission allowances, and invests the proceeds of**

allowance sales (which can be substantial) in achieving a rapid, effective, and equitable transition to a decarbonized economy.

CLPP previously produced a [primer](#) that offered an overview of cap-and-invest, described how it is being implemented in other jurisdictions, and identified some key design elements that must be considered to ensure cap-and-invest supports and complements other facets of Maryland's efforts to address climate change.

This issue brief begins a [series](#) of deeper dives into those design elements. Each brief will focus on one design element, review how other jurisdictions address it, and discuss the issues at play as Maryland decides on its approach.

This first brief focuses on the **emissions reduction trajectory** — the rate at which emissions levels and the number of allowances issued will decline over the course of the program to achieve the state's emissions reduction targets.

Decisions about the shape of the trajectory before, between, and beyond statutorily mandated emissions reduction targets will involve evaluation of the various tradeoffs involved. These include climate and health benefits, cost and feasibility of reductions, and revenue needs. For reasons discussed in this paper, Maryland's trajectory should begin either linearly to the 2031 target or gradually the first few years before getting steeper approaching 2031. The trajectory should remain steep after 2031 before returning to a more gradual slope approaching the 2045 target and beyond.

What Has to Be Decided Regarding the Emissions Reduction Trajectory?

Maryland law sets greenhouse gas emissions reduction goals for 2031 and 2045, but it does not specify the emissions levels in the years before, between, and beyond those target dates.

The fundamental compliance instrument of cap-and-invest is the allowance.¹ For each metric ton of covered emissions, emitters must acquire and retire one allowance. The total amount of emissions allowed in a jurisdiction's cap-and-invest system, and thus the number of allowances available through auction or allocation, is often known as the emissions cap or allowance budget. (The allowance budget generally tracks but is often lower than a jurisdiction's overall emissions reduction target, since not all emission sources and/or sectors are required to hold allowances under cap-and-invest programs.)

The Climate Solutions Now Act of 2022 sets Maryland's greenhouse gas emissions reduction goal at 60% below 2006 levels by 2031 and net-zero by 2045. A state cap-and-invest program's emissions cap would generally track those emissions reduction targets for those years.

Maryland law, however, does not specify emissions targets in the years before, between, or beyond the 2031 and 2045 targets, so the rate of decline of the emissions cap in the intervening years remains to be determined.

MDE could design Maryland's emissions reduction trajectory to simply be linear, drawing a straight line from the current emissions level to the first statutory target in 2031 and another from the first target to the second in 2045. Another option would be for MDE to make the trajectory steeper in some stretches and less steep in others.

For instance, the reduction trajectory could start ambitiously and then level off a bit in later years, spurring emitters to tackle the wide array of relatively inexpensive reduction opportunities (the "low hanging fruit") early and maximizing the climate benefits of the program, while recognizing the time it will take to address some of the more intractable or more expensive emissions reductions.

Alternatively, the trajectory could decline gradually at first and then get steeper later on, giving policies time to be implemented, technologies time to be developed and commercialized, investments of carbon price revenues time to bear fruit, and emitters time to adjust. As discussed below, different states and jurisdictions have chosen different options and approaches.

¹ Many jurisdictions allow a limited number of offset credits to be used as compliance instruments in place of allowances. Offset credits are discussed in

another [issue brief](#). In this issue brief, the term "allowance" encompasses both allowances and offset credits.

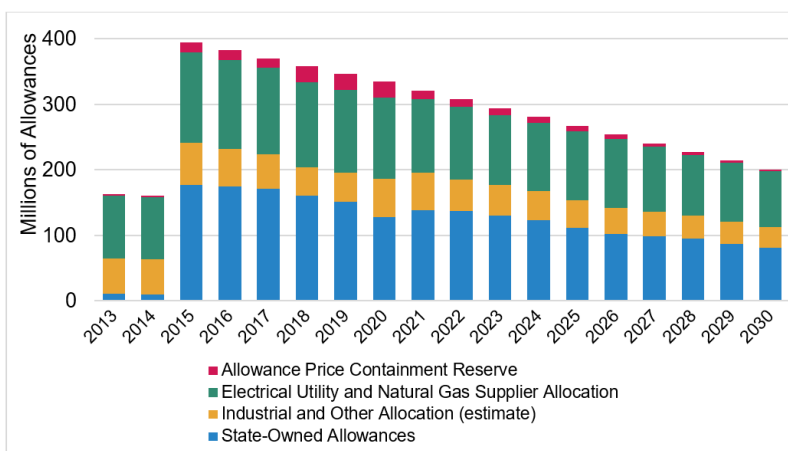
What Do Other Jurisdictions Do?

Cap-and-invest programs already exist or are under development in some other North American jurisdictions. Maryland can learn from others' experiences and approaches.

California's cap-and-invest program [covers](#) about 80% of the state's GHG emissions, and the California Air Resources Board (CARB) creates allowances to cover only those emissions. When California's program started in 2013, it only covered electricity and large industrial facilities, and the allowance budget was [set](#) about 2% below their emissions level forecast for 2012. The budget declined roughly another 2% in 2014. Starting in 2015, the program expanded to cover fuels (e.g., for transportation, natural gas), and the rate of decline was set at about 3% per year from 2015-2020 to meet the state's target of returning to 1990 levels by 2020. Following the passage of legislation in 2017 extending the cap-and-trade program through 2030, CARB established annual allowance budgets for 2021-2030 in regulatory amendments. To help California achieve its 2030 GHG target of at least 40% below 1990 levels, CARB adjusted the [program](#) to be more stringent starting in 2021, with the annual allowance budgets [set](#) to

decline 4% per year through 2030. California's allowance budgets for 2013-2030 are shown in [Figure 1](#). However, legislation passed in 2022 established a target of an 85% reduction in emissions and achievement of carbon neutrality no later than 2045, which led CARB to determine that the 2030 ambition must be increased (to 48% below 1990 levels) to be on track for the longer-term target. In September 2025, California enacted [AB1207](#), which extended the cap-and-invest program through the end of 2045 and directed that annual allowance budgets decline in line with the state's emission reduction targets. CARB will set those budgets (and otherwise respond to AB1207) through [upcoming regulatory amendments](#). (CARB staff had already been [exploring](#) the idea of adjusting annual allowance budgets downward for 2025-2030 and had been [analyzing](#) new 2031-2045 annual allowance budgets that would result in a linear trajectory from the more ambitious 2030 target to the 2045 target.)

Figure 1: California Cap-and-Trade Program Allowance Budgets



Source: CARB, [Cap-and-Trade Program: Allowance Distribution Factsheet](#)

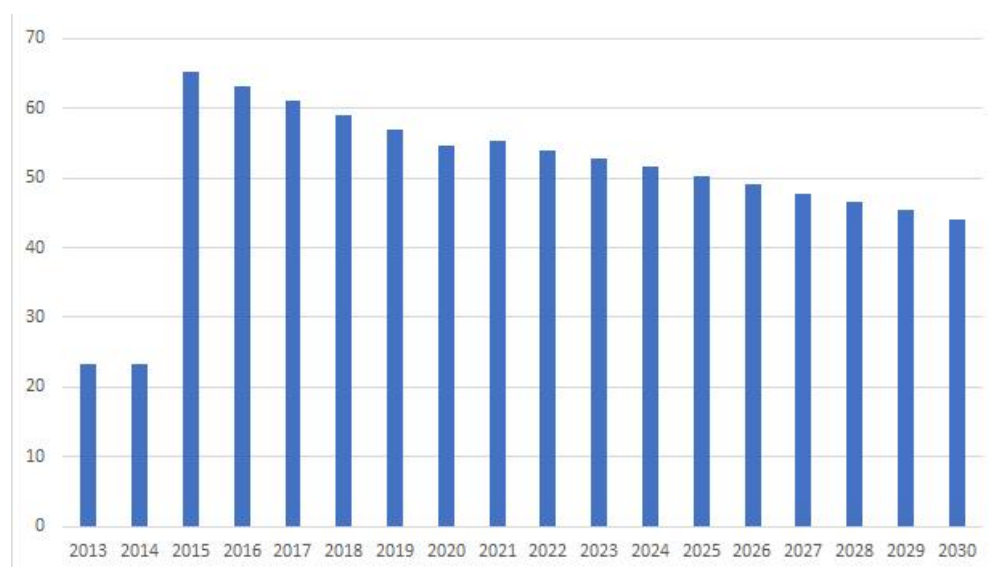
In sum: CARB started with gradual reductions but increased the rate of decline as the program went along in order to meet ever-changing statutory emissions reduction targets. The allowance budgets for 2025-2030 could change further, and budgets after 2030 are still to be determined.

Quebec established its cap-and-invest [system](#) in 2013 and linked it with California's in 2014. Like California's, it covers about 80% of the province's GHG emissions. Quebec's annual [emission unit caps](#) (i.e., allowance budgets) stayed constant 2013-14, rose in 2015 (like California's) to encompass more types of emitters, and then declined by 2.11-2.12 million emission units (between about 3.2% and 3.7%) each year from 2015-2020 in order to help meet the province's emissions reduction target of 20% below 1990 levels by 2020. To meet the

2030 target (37.5% below 1990 levels), the province in 2017 set its annual [emission unit caps](#) for 2021-2030, with the level for 2021 being a slight increase from 2020 and then declining each year through 2030 by 1.23-1.24 million emission units (between about 2.2% and 2.7%). Quebec's emission unit caps for 2013-2030 are shown in **Figure 2**. However, Quebec has an objective to achieve carbon neutrality in 2050, and its system is linked with California, so like California, it is in the process of [re-assessing](#) the cap-and-invest system's parameters, including potential downward [revisions](#) in future emission caps.

In sum: Quebec's pattern has been a steady volumetric reduction to meet the province's emissions reduction targets, with the annual reductions smaller in the cap-and-invest system's second decade than in its first.

Figure 2: Quebec's Annual Emission Unit (Allowance) Caps (in million emission units)



Source: Quebec MELCCFP, [The Carbon Market, a Green Economy Growth Tool](#)

Washington passed legislation creating its cap-and-invest [program](#) in 2021 and held its first allowance auction in 2023. The program covers

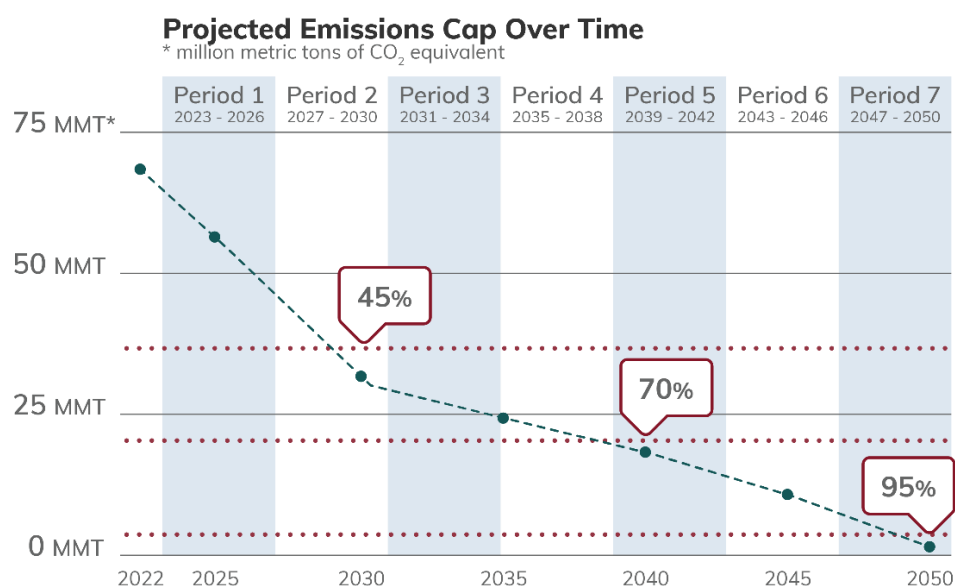
roughly 75% of the state's emissions. The state has statutory emissions targets of 45% below 1990 levels by 2030, 70% by 2040, and 95%

and net-zero by 2050. Washington [law](#) directs the Department of Ecology to set annual allowance budgets to achieve the share of reductions by covered entities necessary to achieve the state's 2030, 2040, and 2050 emissions targets, and they must provide for "progressively equivalent reductions year over year." According to [regulation](#), the allowance budgets will decline 7% each year from 2023-2030, 1.8% each year from 2031-2042, and

2.6% each year from 2043-2049, as shown in [Figure 3](#).

In sum: Washington is starting with a relatively steep reduction trajectory, then plans to level off to a more gradual decline before slightly increasing the steepness again through 2050. This more or less represents a linear trajectory from one statutory target to the next.

Figure 3: Washington's Projected Emissions Caps



Source: Washington Dept. of Ecology, [Washington's cap-and-invest program](#)

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative regional cap-and-invest [program](#) among several Northeastern and Mid-Atlantic states (including Maryland), covering only the electric power sector. The RGGI emissions cap has varied over the years, reflecting both changes in membership and member states' collective decisions to revise the program's cap levels (e.g., to increase

program stringency and account for excess banked allowances). During RGGI's first control period (2009-2011), the cap was set high at 188 million allowances.² It then dropped to 165 million during the second control period (2012-2013) to account for New Jersey's departure from the program. After the first program review in 2012, the cap for 2014 was set at 91 million allowances, 45% below 2013

² A RGGI allowance covers one short ton (2,000 lbs.) of CO₂e, unlike allowances in other cap-and-

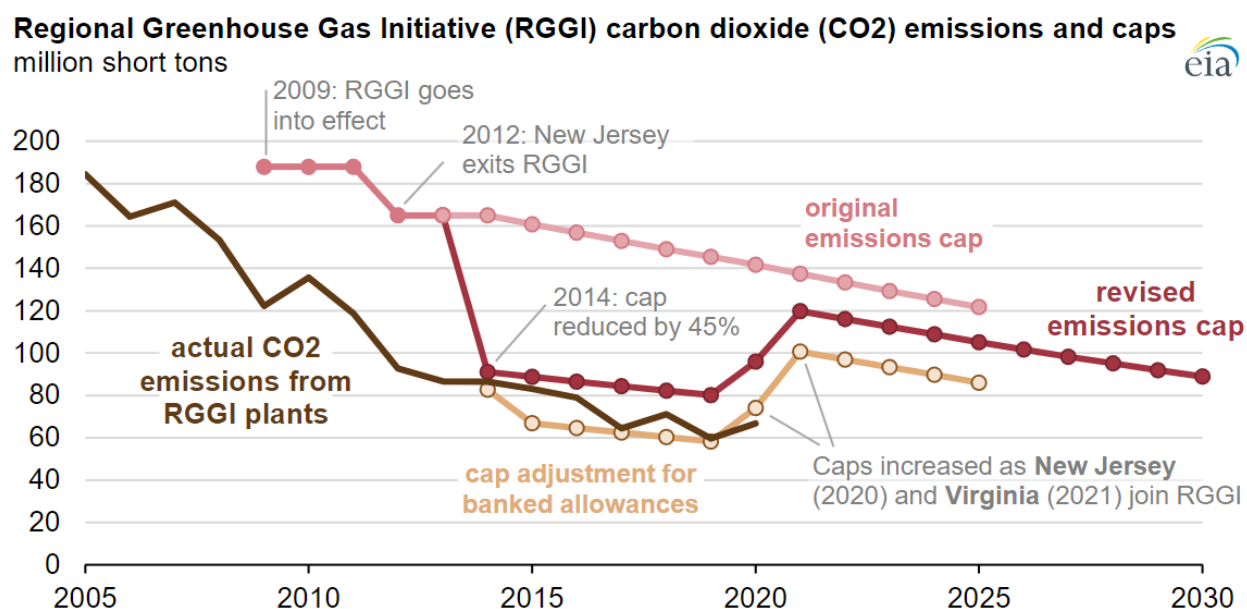
invest programs, which represent one metric ton (1,000 kg or 2,204.62 lbs.) of CO₂e.

levels, to better match projected emissions, and was then set to decline 2.5% per year through 2020. [After](#) the second program review in 2016, the RGGI states decided to reduce the cap 30% between 2020 and 2030 (so about 3% per year). When New Jersey rejoined RGGI in 2020, the overall cap was raised to reflect the addition, and the same happened when Virginia joined in 2021, though the planned rate of decline remained the same. In addition to these changes to the cap, the RGGI states have made three adjustments over the years to account for surpluses of banked allowances; the first two adjustments reduced allowances to be sold from 2014-2020 (~8.2 million per year) and from 2015-2020 (~13.7 million per year), while the third reduced allowances to be sold over the 2021-2025 period (~19.1 million allowances each year). RGGI's caps from 2009-2026, including the adjustments, are shown in [Figure 4](#).

However, RGGI's [third program review](#) concluded in July 2025, with the RGGI states deciding to reduce the cap by about 6 million tons in 2027, about 8.5 million tons (roughly 10.5% of the 2025 allowance budget) per year thereafter through 2033, and about 2.4 million tons (roughly 3% of the 2025 allowance budget) per year from 2034 through 2037. After that, the cap is currently set to stay at 2037 levels, though the actual cap beyond 2037 will be set during the next RGGI program review (which will start no later than 2028). The updated RGGI cap trajectory is shown in [Figure 5](#).

In sum: RGGI's cap trajectory generally has been one of increasing stringency over time. Unlike state programs, however, RGGI is not multi-sectoral ("economy-wide") and has no equivalent to statutorily mandated emissions reduction targets that it has to meet.

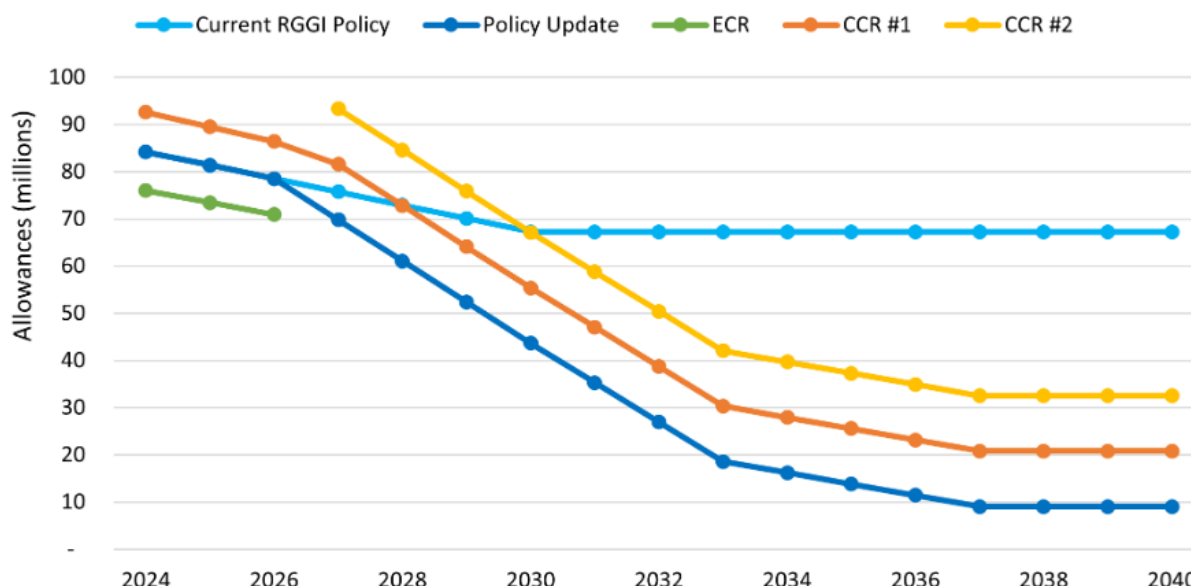
Figure 4: RGGI's Emissions and Cap Levels



Source: U.S. Energy Information Administration, based on [Regional Greenhouse Gas Initiative](#)

Source: U.S. Energy Information Administration, [Today in Energy](#)

Figure 5: Updated RGGI Cap Trajectory Following the Third Program Review



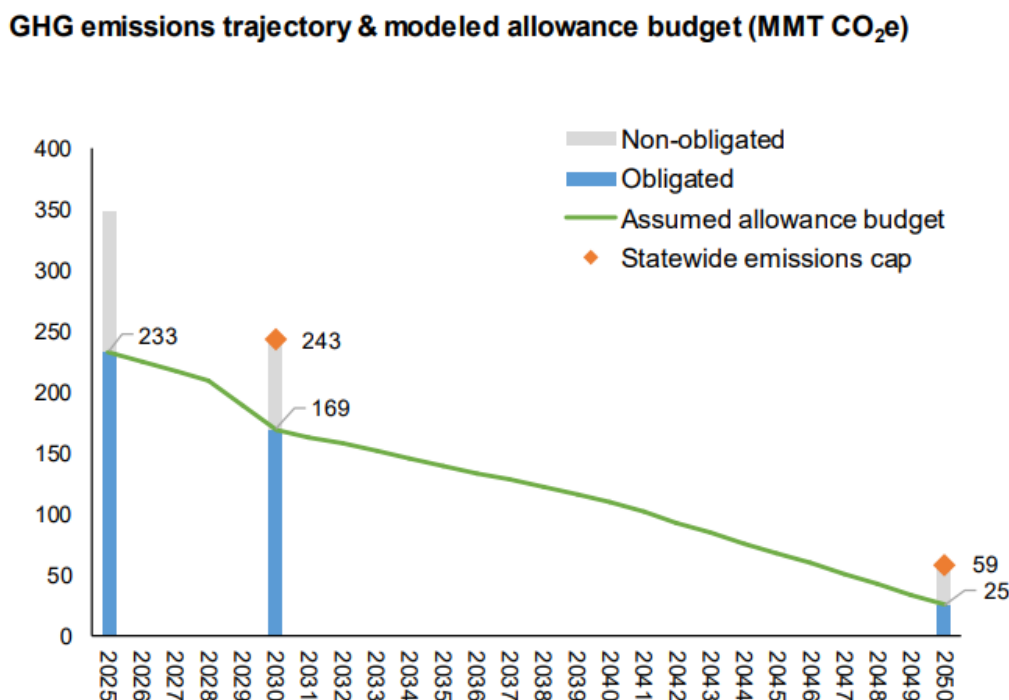
This figure compares the current regional base cap (light blue) with the updated cap trajectory (dark blue). The orange and yellow lines display the total updated regional cap if all allowances are released from the updated first and second Cost Containment Reserve tiers, respectively. (More on cost containment reserves can be found in CLPP's [issue brief](#) on automatic adjustment and price certainty mechanisms.) Source: RGGI, [Program Review](#)

New York is in the process of developing an economy-wide cap-and-invest [program](#) to ensure the state meets its climate targets (40% by 2030 and at least 85% by 2050 below 1990 levels). Based on New York's December 2023 [pre-proposal outline](#), the statewide emissions cap in 2025 (the first year of the program) would be equal to the estimated level of the state's GHG emissions in 2025. The cap would decline to the statutory and regulatory statewide targets. The trajectory, however, is not currently expected to be linear. According to the Department of Environmental Conservation, during each phase (2025-2030, 2031-2050), there will be a slower reduction period at the start (2026-2027, 2031-2040), with reductions then accelerating in the years leading up to each statewide target. As with other states'

programs, New York's allowance budget (i.e., the amount auctioned or allocated) would cover a large percentage but not all of the state's emissions, due to emissions from entities not obligated to acquire allowances and any potential adjustments needed to account for excessive banked allowances. A preliminary, illustrative graph of modeled allowance budgets for New York is shown in [Figure 6](#), but the actual allowance budgets (and all other details of the program) are still to be determined.

In sum: Preliminary trajectories for New York look to be gradual at the start of each phase and then become steeper towards the end of each phase.

Figure 6: Illustrative Modeled New York Emissions Trajectory & Allowance Budgets



Source: New York DEC & NYSERDA, [Preliminary Scenario Analyses](#)

Discussion

In discussing the pros, cons, and tradeoffs involved when setting emissions reduction trajectories, it may be useful to focus on the cap-and-invest system in Washington and the one being developed in New York, as these are the newest programs and thus have been able to learn from the experiences of the relative old-timers (California, Quebec, and RGGI).

In those states, as would be the case in Maryland, statutory emission reduction targets are the driving force guiding the cap-and-invest system's emission reduction trajectories.

Washington's trajectory is basically linear to its 2030 statutory target, then linear to the 2040 target, and then again linear to the 2050 target (with the wrinkle that the second leg of that trajectory goes from 2031-2042, not to 2040, perhaps to better align with projected compliance periods). In its [final regulatory](#)

[analyses](#), the Washington Department of Ecology explained its trajectory decisions.

Ecology noted that the trajectory had to meet the statutory targets without creating "unnecessary burden" and in a way that aligned with regulations and market structures in other jurisdictions that Washington might want to link to in the future (i.e., California and Quebec). It explained that the reduction percentages reflected its view on "likely achievable emissions reductions" (abatement options and offsets) in

the short term, the need for continued developments (e.g., technologies, efficiencies) in the medium term, and a balance between providing flexibility in achieving the hardest final reductions and recognizing the potential for breakthroughs that could make faster reduction rates possible in the long term. Ecology also noted the statutory requirement that it adopt allowance budgets that provide “progressively equivalent reductions year over year” in meeting the statutory emission reduction targets.

The only options Ecology really had, therefore, were to adopt either a linear trajectory or a trajectory that was a *bit* steeper during part of each decade and *slightly* less steep during the other part. Ecology recognized that steeper early reduction trajectories and more gradual later reduction trajectories would yield more environmental and health benefits earlier but would also “impose more burden on covered and opt-in entities by creating higher demand for emissions reductions before markets and technology have time to adapt”, which would drive up allowance prices, create inefficiencies in the market, and raise the overall cost of meeting the statutory targets. Conversely, starting off gradually in each decade before getting steeper would, in Ecology’s reasoning, delay some environmental and health benefits while only delaying (not avoiding) compliance costs and allowance price rises. Ecology thus chose not to accelerate reductions at any part of the trajectory and opted for a linear approach.

New York, in its modeling, took a different approach, starting off gradually in each of its two phases before getting steeper heading into a statutory target year. New York [officials](#) have [explained](#) that the initial gradual start is intended to provide time for markets and supply chains to adjust to the emissions transition and to ensure that investments facilitated by the program have time to yield emission reductions, while the

gradual start in the second phase can provide benefits in terms of affordability and implementation as efforts focus on achieving the state’s ambitious emissions reduction requirements post-2030. (Some commentators questioned the need for a gradual start to the second phase, and the state has welcomed additional feedback on the appropriateness of this approach.)

These decisions (and preliminary approaches) highlight some of the issues at play in determining emissions reduction trajectories:

- *Emissions reductions:* Steep early trajectories mean more early reductions and more rapid gains for the climate. They also can result in fewer cumulative emissions during the full compliance period. Climate change is driven by the accumulated concentrations of greenhouse gases in the atmosphere, so delaying reductions results in more radiative forcing of the climate. Earlier reductions will have more impact than later ones in averting catastrophic harm from climate change. Earlier emission reductions can also mean more co-pollutant reductions and health benefits.
- *Costs & revenues:* Steep early trajectories do not give emitters much time to adapt to the program, policies and investment of allowance auction revenues time to produce emission reductions, or technologies time to develop and come down in cost. That can make emission reductions more difficult and costly to achieve, leading to increased demand and prices for allowances. On the one hand, that means more revenues to support sectoral programs, but it also means placing added financial burdens on businesses and energy consumers. Particularly in the early years of a program, that could potentially put political support for the program at risk. Washington’s cap-and-

invest program, for instance, is facing [backlash](#) and a repeal ballot measure based in part on assertions that its steep reduction trajectory and thus high allowance prices led to large gasoline price increases — though it is not clear how accurate those assertions are, nor whether the repeal effort would have pushed forward regardless.

What is clear is that decisions about allowance budget trajectories, especially during the early years of cap-and-invest, can play an important role in determining the climate and financial impacts of the state's policies and the reactions by politicians, emitters, and citizens.

What Should Maryland Do?

MDE has discussed the possibility of developing an economy-wide cap-and-invest program to close an emissions gap and raise the substantial revenues needed to support the sectoral programs in its *Climate Pollution Reduction Plan*. One of the key elements to consider is the shape of the emissions reduction trajectory.

The state's statutory targets set the overarching reduction trajectory, providing limited but not insignificant leeway to MDE to make decisions about the trajectory before, between, and beyond statutory target years. As noted, these decisions could have significant implications for the program's climate impact, compliance costs, revenues, and political viability.

The backlash to Washington's cap-and-invest program was concerning, and keeping costs in check should be a priority for the early years of a Maryland program. The climate, environmental, and health benefits of early reductions are very important, but those benefits will ultimately be greater if the cap-and-invest program is durable. Either a linear approach to 2031 or New York's (preliminary) approach of starting gradually and then getting steeper makes sense for the initial compliance period. (That said, Maryland's 2031 target is set in statute, a Maryland program would not start immediately, and 2031 is not that far away — all of which is to say that there is a limited window for starting slowly before accelerating.)

For the period between the statutory targets, a steeper pathway after 2031 that eventually flattens out a bit in the approach to 2045 would be advisable. By 2031-32, emitters will have had ample time to adjust to the cap-and-invest program, invested revenues will have started bearing fruit, and more decarbonization technologies will have advanced into the marketplace and down the cost curve. Adopting an emissions reduction trajectory that achieves faster climate gains should be more workable to adopt at that point.

Beyond 2045, the emissions reduction trajectory should continue downward as much as possible, guided by scientific understanding. Combined with greater investments to boost emissions removals, the result would allow Maryland to move from net-zero in 2045 to net-negative thereafter. (The Maryland General Assembly may also adopt new statutory targets before mid-century, which would necessitate changes in the allowance budget trajectory.)

In sum, an allowance budget trajectory that generally tracks a pathway similar to what MDE

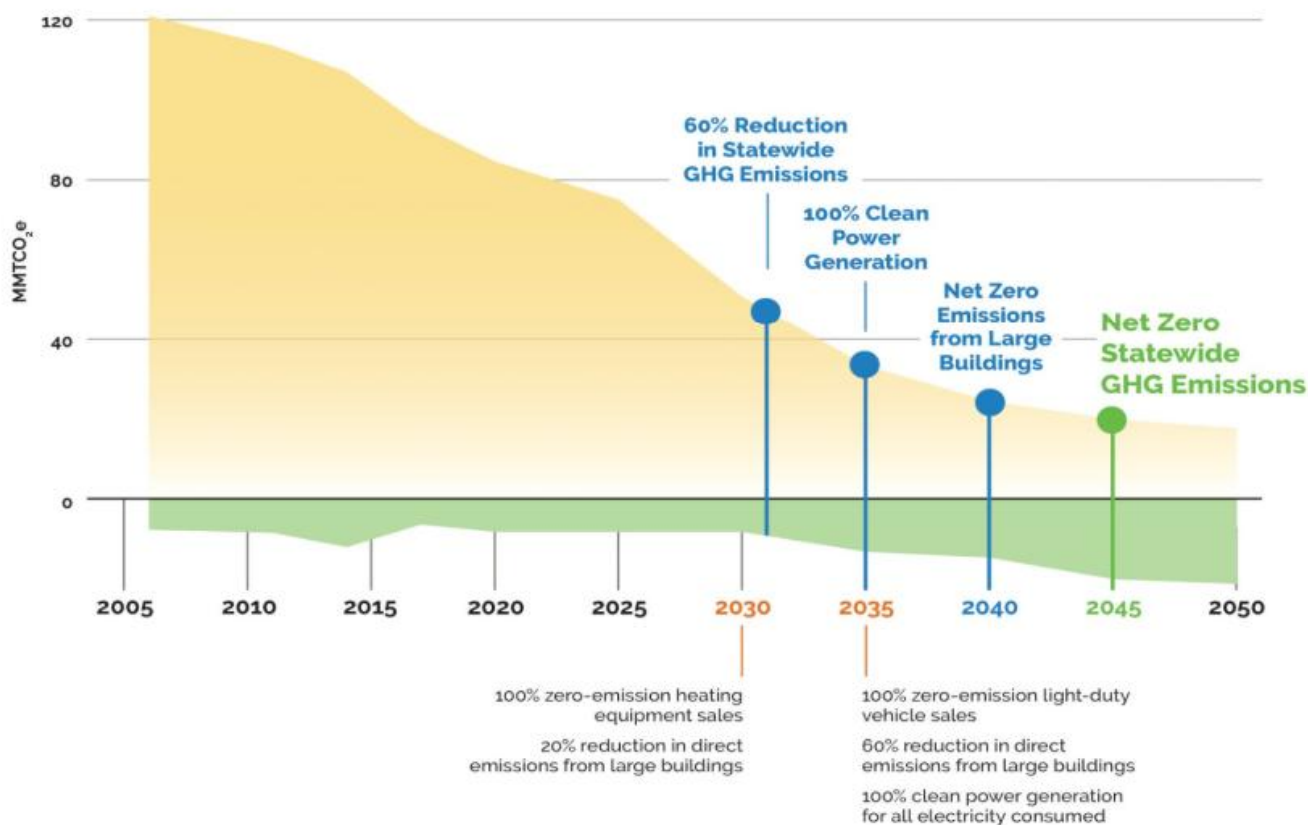
included in its [Priority Climate Action Plan](#) to the U.S. Environmental Protection Agency in March 2024, shown in **Figure 7**, would seem to be called for. (Maryland's allowance budget trajectory would, of course, be lower than the line in Figure 6, as not all statewide emissions would be covered by cap-and-invest.)

It is worth noting at least one key implication of a trajectory that does not start off steeply. As noted earlier, MDE has discussed the possibility

of developing cap-and-invest for dual purposes: both to close an [expected](#) emissions gap of 3.5 MMT and to raise about \$1 billion per year to support sectoral emission reduction programs. A gradual start to the emissions reduction trajectory may result in less early-year revenue to support those programs. Should revenues end up falling short, Maryland may have to look to other funding sources (e.g., green bonds) to fill this gap.

Figure 7: Maryland Decarbonization Timeline

Maryland Decarbonization Timeline



Source: MDE, [Priority Climate Action Plan: State of Maryland](#)