

Maryland's Climate Change Pathway

In 2021, The Maryland General Assembly adopted the most ambitious greenhouse gas reduction goals in the United States. **Setting goals of a 60% reduction** in greenhouse gases (compared to 2006 levels) in ten short years and achieving net-zero greenhouse gas emissions by 2045. **Any plan for meeting these extreme goals will necessarily impact every part of Maryland's economy and, indeed, the lives of every resident of the state.** The University of Maryland School of Public has now modeled a series of measures that, if implemented, are predicted to achieve the 2031 and 2045 goals. This "Pathways" plan (The Plan) is likely to guide the Administration's climate change regulatory efforts.

The Plan is now being circulated for public review and comment but, **at 118 pages, few people are likely to review all the details**, no matter how consequential. Here I will try to summarize some of the measures that are likely to have the greatest impact and be most controversial.

Before going through the list, the scope of the challenge needs to be understood. About half of the reductions needed to meet the 2031 goals were achieved by the environmental provisions already implemented by the state. **The 60% reduction goal requires a reduction of the equivalent of 72.3 million metric tons of carbon dioxide. Thirty-six and seven tenths of that 72.3 has already been achieved leaving "only" 36.6 million metric tons of reduction left.**

However, those numbers can be misleading. Compared to the efforts needed to achieve the remaining reductions, **the first half were low-hanging fruit.** For example, the transition to **vehicles with better fuel economy** was achieved at minimal cost to vehicle owners. Similarly, **the transition from coal to natural gas** was not disruptive because newly abundant supplies of natural gas reduced the economic impact of the change. The measures to be implemented over the next few years will require changes in every sector of the economy.

There is one additional caveat. The Plan models general outlines of measures rather than detailed programs. As the saying goes, **the devil will be in the details and this report does not delve deeply into the details of program design and implementation.** Instead, The Plan is an attempt to model a set of general measures to determine the likely impact on greenhouse gas emissions and the economy. If any of the new measures are to be enacted, the details will need to be developed by the Administration, including the Department of the Environment, and the Commission on Climate Change. **Many will require the approval of the General Assembly.**

Cap-and-Invest

The measure modeled in The Plan with the most significant impact on Maryland's economy is, paradoxically, the measure that has the least detail. The Plan proposes an "economy-wide cap-and-invest" program with a cap on greenhouse gas emissions would be established. The cap would decrease each year until low enough to reach the 60% by 2031, then net-zero by 2045, reflecting the goals of the Climate Solutions Now Act.

Emission credits would be created in an amount corresponding to the number of metric tons of emissions available under the cap. No emissions of greenhouse gases would be allowed unless the emitter purchases sufficient credits at an auction of those available. The theory then calls for the proceeds of the auction to be used for greenhouse gas reduction projects and to provide benefits to low and medium-income households impacted by climate change.

To put it simply, a tax is imposed on greenhouse gas emissions and the money collected is then supposed to be spent on reducing or mitigating climate impacts. The tax rate is set by auction and likely increases over time as the cap is tightened.

The authors of the plan recognize that a cap-and-invest program would be complex and require an immense amount of development work. The program they model is simply a "high-level, theoretical" program. However, the authors reference a cap-and-invest program being developed in New York.

The New York program itself is still lacking in detail. The legislature in that state focused on a budgetary proposal with parameters for the distribution of the proceeds. The taxation portion of the program is still under development by state agencies. It is also worth noting that New York's greenhouse gas reduction targets are not as stringent as those adopted for Maryland.

What is clear is that various interest groups will likely clash over the details of a new, state-wide tax as well as the recipients of the proceeds. A tax on greenhouse gas emissions would have significant impacts on poorer communities and would impact some employers far more heavily than others. In addition, there will likely be differences of opinion about which groups or companies should be compensated in return.

In New York, there are already calls for industries in disadvantaged neighborhoods to be forbidden from purchasing credits and for the process to be used to transfer more wealth from richer communities to poorer groups who have historically been more impacted by environmental issues.

Maryland is, of course, a small state unlike New York (or California, which is also exploring cap-and-invest) and it is relatively easy for businesses to relocate across state lines. A similar problem was encountered when Maryland joined the Regional Greenhouse Gas Initiative (RGGI). RGGI is a cap-and-invest program applied solely to power plants. "Leakage" was the term used for the importation of power from outside the cap-and-trade program. For RGGI, the biggest barrier to leakage was that it was a regional program including all the states from Maine to Virginia. A Maryland-only program would encounter far more leakage as businesses would emit greenhouse gases in other states and then import products into Maryland.

The problem is that The Plan suggests that the 60% goal established in the Climate Solutions Now Act cannot be achieved without a cap-and-invest program. The report calculates that the state would fall 4.8 million metric tons short of the goal in 2031 without cap-and-invest. Basically, the state would "only" achieve a 56% reduction in greenhouse gases by 2031 instead of the 60% called for by the Climate Solutions Now Act without a cap-and-invest program. (It may be worth noting that the original recommendation from the Climate Change Commission was for a 50% reduction by 2030. Had the original recommendation been adopted by the General Assembly then a cap-and-invest program would probably not be under consideration.)

Clearly, this cap-and-invest proposal will likely be the most controversial of the measures modeled in The Plan, but there is far more in its 118 pages.

Electricity Sector

Maryland's current proposals for reducing greenhouse gases depend primarily on two programs. First, a Renewable Portfolio Standard (RPS) requires each supplier of power to provide a proscribed minimum portion of retail electricity sales from renewable energy sources. Second, Maryland is a member of RGGI, a cooperative effort of 12 Northeast and Mid-Atlantic states that operates a cap-and-trade program. Power generators in RGGI are required to bid through an auction process for the right to emit a capped quantity of greenhouse gases. Maryland's power plant emissions are also declining as the result of economic and federal regulatory efforts which are forcing the retirement of coal burning power plants.

The Plan calls for a “strengthened” RGGI cap on emissions, including zero emissions by 2040 and a mandate that all electricity generated in the state come from renewable, nuclear, or hydroelectric sources.

Whether these goals can be achieved depends on complex factors. Reducing the RGGI cap to zero will require the agreement of the other member states; many may object. Indeed, the Governor of Virginia is already trying to withdraw his state from the RGGI cooperative. A zero cap on emissions would likely require the closure of large numbers of natural gas plants across the region. Therefore, an agreement of all the RGGI states seems unlikely.

The state’s transition to 100% clean energy will also be difficult. The transition did receive a significant boost from the state’s commitment to offshore wind. However, the pace of solar development has slowed because of local opposition to utility solar farms and interconnection problems within the PJM power network.

Unless the RGGI states agree to the reduction in the emissions cap, and the pace of solar development is greatly accelerated, this Pathway will be difficult. The Plan does point out that there are opportunities to co-locate solar facilities with other uses and speaks approvingly of a New York law giving that state the ability to override local opposition to utility-scale projects.

The Plan also assumed the re-licensing of the Calvert Cliffs Nuclear Power Plant and operation of the plant until at least 2050. About 40% of the electricity generated in Maryland, and perhaps as much as 80% of the clean electricity, comes from Calvert Cliffs. If the plant does not continue to operate, then the state cannot meet the climate goals. The current licenses for the two nuclear units expire in 2034 and 2036. Constellation power, the owner of Calvert Cliffs, has not made a firm commitment to re-license the units.

An additional concern is grid stability. Maryland is a net importer of electricity, meaning the state must import electricity from other states in order to meet demand. The Plan assumes that imported electricity will make up over half of the state’s electricity demand by 2031. At the same time, The Plan assumes that demand for electricity will grow by approximately 20% by 2031 as we move to electric vehicles and replace fossil fuel heating with heat pumps. This is projected to occur simultaneously with the replacement of centralized fossil fuel plants by offshore wind and distributed solar generation.

Without substantial investments in grid improvements and transmission capacity, the grid will become unstable, especially during peak demand periods. The Plan does not model the engineering challenges but does call for significant investments in infrastructure and the deployment of new technologies, including additional energy storage and the development of microgrids.

Maryland recently enacted a pilot program to require increased energy storage facilities but, as The Plan acknowledges, there are technical and financial barriers to the kind of widespread adoption needed. Other regulatory groups are examining the issue but, for now, the difficulties are unresolved.

Transportation

Vehicles are, by far, the largest source of greenhouse gases in the state. The Plan was predictably ambitious on the transition to electric battery powered vehicles. Maryland law already phases out the sale of new gasoline powered cars, pickups and SUVs starting in 2027 and reaching a total ban by 2035. However, the law allows for exceptions in early years for plug-in hybrids as well as credits from sales of electric vehicles to disadvantaged communities or from over-achieving vehicle targets in other states.

In addition, the law does not restrict the sale of used, gasoline-powered, vehicles. The average vehicle sold today will still be on the road in 15 years. That means that in 2031, most cars will still be burning fossil fuels.

The Plan calls for addressing this issue by increasing the incentives for electric vehicles, increasing investment in public transportation, and reducing vehicle miles traveled (VMT) in the state.

On incentives, the report notes that Maryland's current excise tax credit for electric vehicles of \$3,000 is less than the rebates offered by some other states. The Plan suggests that increasing the rebates and funding may be necessary to prevent "sales leakage" to other states with less stringent targets or higher incentives. However, as The Plan points out, a rapid transition to electric vehicles could have a major impact on transportation funding as gas tax revenues plummet.

Obviously, these proposals will present difficult budgetary issues for the Administration and the General Assembly. **Can the state simultaneously provide increased financial incentives to buyers of electric cars while fashioning an alternative to the gas-tax funded transportation fund?** Will owners of electric vehicles be taxed to contribute to the fund while simultaneously offered tax incentives to own electric vehicles?

The problems are made even worse because of environmental justice concerns. Electric-powered cars, as a category, are not likely to reach cost parity with gasoline-powered equivalents until around 2030. To make the situation even more difficult, it will likely take many years before there is a thriving market in used electric vehicles. So, any incentive to purchase new electric-powered cars may primarily benefit buyers of more expensive vehicles.

One way to partially address the environmental justice issue is to invest in public transportation. However, it has proven very difficult to significantly increase ridership of those alternatives. Ridership plunged, of course, during the COVID-19 crisis but, nationally, only about 70% of riders have returned to public transportation since the epidemic ended. Remote working may account for much of this trend, but vehicle miles traveled has increased since the crisis ended – albeit at a slower pace than the pre-COVID-19 trend. Even if cost-effective, increasing investment in public transportation will add to budgetary pressures.

The Plan also addresses another thorny issue – a proposed transition to zero emission trucks. Maryland's Advanced Clean Truck Rule calls for the state to reach a target of 30-50% (depending on vehicle class) zero emission trucks by 2030. To put that into context, The Plan notes that the current market for zero emission trucks is “close to zero” and the rule will not even begin to take effect until 2027.

Once again, The Plan highlights the need for additional state investments calling for government incentive programs, especially for lower-income households and small businesses. Maryland law currently provides at least \$10 million in annual grants for this sector, but The Plan suggest that the amount is insufficient. The Plan also recognizes that transitioning large vehicles will also require significant new investments in charging infrastructure to support long-haul truck traffic. Federal sources will fund some, but not all, of these investments.

Beyond these categories, The Plan also calls for electrifying non-road engines such as lawnmowers and construction equipment. A California model has been recommended, providing incentives for the purchase of more expensive equipment including a Southern

California rebate of up to \$250 for homeowners who trade in gasoline powered mowers. Of course, it goes without saying that these incentives come with significant price tags. Similar high price tags will be attached to plans to transition the state-owned fleets of cars, trucks, and heavy-duty equipment to zero emission alternatives.

Finally, the Plan calls for reductions in vehicle miles driven by promoting “smart growth and zoning reform.” This portion of The Plan is not detailed but suggests programs identified as up zoning, transit-oriented development and parking reform.

Although the transportation programs do work well on paper, achieving anywhere near the ambitious targets identified would require truly immense investments by the state. The Plan does not calculate a specific amount, but it is likely to be measured in billions, rather than millions, of dollars, especially when the refinancing of the transportation fund is included.

Building Sector

Emissions from the building sector are another difficult issue. The use of natural gas, propane, and heating oil contributes about 12% of the greenhouse gases in the state’s 2020 inventory. The problem with transitioning this sector to lower emissions is that retrofitting older buildings can be enormously expensive. And to this, consumer resistance of giving up gas-powered stoves and transitioning to electric heat pumps. It is clear that it will be a difficult sector to address.

The Plan recognizes that the EmPOWER Maryland Energy Efficiency Act (passed in 2008) and the Climate Solutions Now Act (passed in 2021) included significant regulatory requirements which will reduce greenhouse gases from buildings. EmPOWER currently requires utilities to achieve annual energy savings of 2%, rising to 2.25% in 2025 and 2.5% in 2027. The Climate Solutions Now Act requires buildings larger than 35,000 square feet to reduce direct greenhouse gas emissions by 20% by 2030 and achieve net-zero direct emissions by 2040 (five years before the net-zero goal for the economy as a whole).

The federal Inflation Reduction Now Act also includes significant incentives for the building sector, especially for low-income consumers. These incentives include money for energy efficiency retrofits, appliance replacements, rooftop solar installations and electric heating projects.

These programs achieve 20% reductions in greenhouse gases from the building sector. However, The Plan also included a zero-emission appliance standard and a zero-emissions construction standard to the model to achieve a 35% reduction.

The zero-emission appliance standard would phase out the sale of natural gas and propane stoves, heaters and water-heaters starting in 2027 and take full effect in 2030. The zero-emission construction standard would be implemented in 2027 and restrict the construction of new buildings that rely on fossil fuels for heating. Combined, the two new requirements are projected to reduce the consumption of natural gas in residential buildings by about 31%. Once again, The Plan calls for “additional support and incentives” for zero-emission appliance adoption for low-income homeowners and renters.

One factor mentioned later in The Plan is that as consumption of natural gas falls by nearly a third, and the overhead cost of operating the natural gas distribution system remains the same, the cost to consumers of gas services may rise significantly. Mitigation of these cost impacts for low and middle-income consumers will be “essential”, but the amount of incentives required is not specified.

In addition to the need for additional incentives, the report recognizes the challenges that building electrification will present to the electric grid. Just as with the integration of renewable power sources and the electrification of vehicles, the replacement of fossil fuels for heating and cooking will place significant stress on the grid infrastructure. Other groups are studying this issue, but it appears clear that the grid cannot handle the additional load without extensive, and expensive, upgrades. Whether the engineering challenges can be overcome in time is beyond the scope of The Plan.

Industry Sector

The industrial sector produces a relatively small percentage of greenhouse gas emissions in Maryland. Of the 85.1 million metric tons (MMT) of greenhouse gases in the 2020 inventory, only about 4.5 MMT were attributable to industry. The largest portion of those emissions, by far, are the state’s two large cement plants in Union Bridge and Hagerstown.

The Plan recognizes that the Maryland EmPOWER program combined with federal incentives are having an impact on industrial emissions. It is also clear that the manufacturing sector has declined as many major industries have left the state. In addition, the report highlights expensive projects proposed by the two cement plants which will reduce emissions compared to a projected increase from rising demand for their products.

The Plan recommends the removal of a current exemption from regulations for the industrial sector and the need for a 25-mile-long natural gas pipeline to transport fuel to the Union Bridge facility (the largest emitter in the industrial sector). The use of federal grants and new technology is heavily encouraged as well.

Fossil Fuel Industry

Maryland does not have any significant mining operations for fossil fuels, so this sector consists largely of methane leaks associated with the Cove Point liquified natural gas export terminal. The Plan does not propose additional measures for this sector but does recognize the reductions from existing federal and state programs.

Waste Management

For the waste management portion, the plan primarily recites two existing programs. First, Maryland's landfill methane regulation which requires municipal solid waste landfills to either install landfill gas collection systems or evaluate their surface methane emission rate. Second, the Plan notes the Sustainable Materials Management policy established by executive order in 2017, creating a voluntary metric to target a 10% reduction in the amount of waste generated per capita.

The Plan then lists several waste diversion programs which may prove to be beneficial. For example, removing barriers to widespread adoption of composting initiatives and improved accounting for waste incineration.

Agriculture and Forestry and Land Use

Agricultural emission reductions are not included in The Plan due to a lack of data. Nevertheless, The Plan assumes a 5% reduction in greenhouse gas emission from the sector based upon Environmental Protection Agency (EPA) assumptions concerning the implementation of cost-effective reductions from livestock.

As with agriculture, The Plan does not include any modeling for this sector because of lack of data. The report , recognizes that the state has ambitious goals, including the planting of five million native trees by 2031, but the report includes no modeling on the impact of forestry programs. It does note however, the benefits of a properly managed biofuel policy and the carbon sequestration benefits of using timber to replace other materials in building construction.

Summary

The Plan outlines, in general terms, a set of policies that allow the state to achieve the ambitious goals of the Climate Solutions Now Act. However, it also illustrates the enormous challenges if those policies are implemented as described.

Almost all the proposals require immense financial resources from the state budget. Billions of dollars of new incentives and investments would be required to implement the measures outlined. Billions more would need to come from the private sector as buildings were retrofitted, vehicles replaced, appliances upgraded, and practices changed. Yet these measures must compete with proposals to increase funding for education and health care among many other legislative priorities.

Since many of the proposals focus on increased use of renewable energy in place of fossil fuel combustion, the resilience of the grid will be critical. To date, there has been no clear answer on whether the grid can reliably handle the transitions that The Plan anticipates occurring between now and 2031.

The ambitious cap-and-trade proposal that headlines The Plan will inevitably face an extremely difficult path through the General Assembly. Would voters support what amounts to a new tax on virtually every part of the economy? Can there be a consensus on where the proceeds from any new tax will flow? Can the state find a way to accelerate the construction of utility-scale solar power plants in the face of local opposition and competing land uses? Co-locating solar farms will help, but is there sufficient capacity and can interconnection issues be resolved in time?

Maryland has set an ambitious set of goals, the most ambitious, in fact, in the country. If the state wants to implement those goals, then the measures adopted will need to be equally ambitious. That will inevitably disrupt many businesses and impact the daily lives of Maryland citizens.

Michael Powell is a member of the Maryland Commission and Climate Change and co-chair the Mitigation Working Group of the Commission. The summary here is not intended to represent the views of the Working Group or the Commission.

DATE

July 07, 2023

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