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MODELING SHOWS VIRGINIA CLEAN ECONOMY ACT WILL CUT STATEWIDE EMISSIONS 35 PERCENT, BUT ADDITIONAL POLICIES ARE REQUIRED TO LIMIT WARMING TO 1.5°C

BY ROBBIE ORVIS, ZACK SUBIN[1] ● JANUARY 2021

This research note was updated in January 2021 to reflect feedback from experts and policymakers in Virginia to reflect the state joining the Regional Greenhouse Gas Initiative as part of the VCEA, including the requirement to have a zero-emissions power sector cap in 2050. More information on the assumptions in the scenario are available online.

INTRODUCTION

On April 20th 2020, Virginia Governor Ralph Northam signed the Virginia Clean Economy Act (VCEA), a great milestone putting the state on a path to decarbonize its power sector by 2050. The VCEA requires steep power sector emissions reductions and a significant expansion of building energy efficiency.

New research using the Virginia Energy Policy Simulator, developed by Energy Innovation and Rocky Mountain Institute, quantifies the emissions reduction impact of the VCEA: nearly 100 percent reduction in power sector emissions and 35 percent reduction in economy-wide emissions versus business-as-usual emissions by 2050.

The research also demonstrates a path forward to decarbonizing the rest of the economy. The VCEA will decarbonize the state's power sector, setting the state up to target the emissions reductions required to put Virginia on the Intergovernmental Panel on Climate Change's recommended pathway to limit warming to 1.5° Celsius for a safe climate future.[2] By implementing additional policies across the transportation, buildings, industrial, land, and agricultural sectors, the state can transition to a low-carbon economy while generating significant economic and health benefits. These policies would accelerate electricity sector emissions reductions, electrify all end uses where possible and switch to low carbon fuels where

[1] Rocky Mountain Institute https://rmi.org/

[2] See this link for more information: https://www.unenvironment.org/resources/emissions-gap-report-2019

not possible, grow emissions reduction from forests, and address non-CO_2 emissions. They include:

- Accelerated switch to 100 percent clean electricity;
- Rapid adoption of zero-emission cars and trucks;
- All-electric buildings and appliances;
- Moving away from fossil fuel use in manufacturing;
- Reducing leaks of natural gas throughout the supply system and from the waste management and coal mining sectors; and
- Better land management to capture more carbon

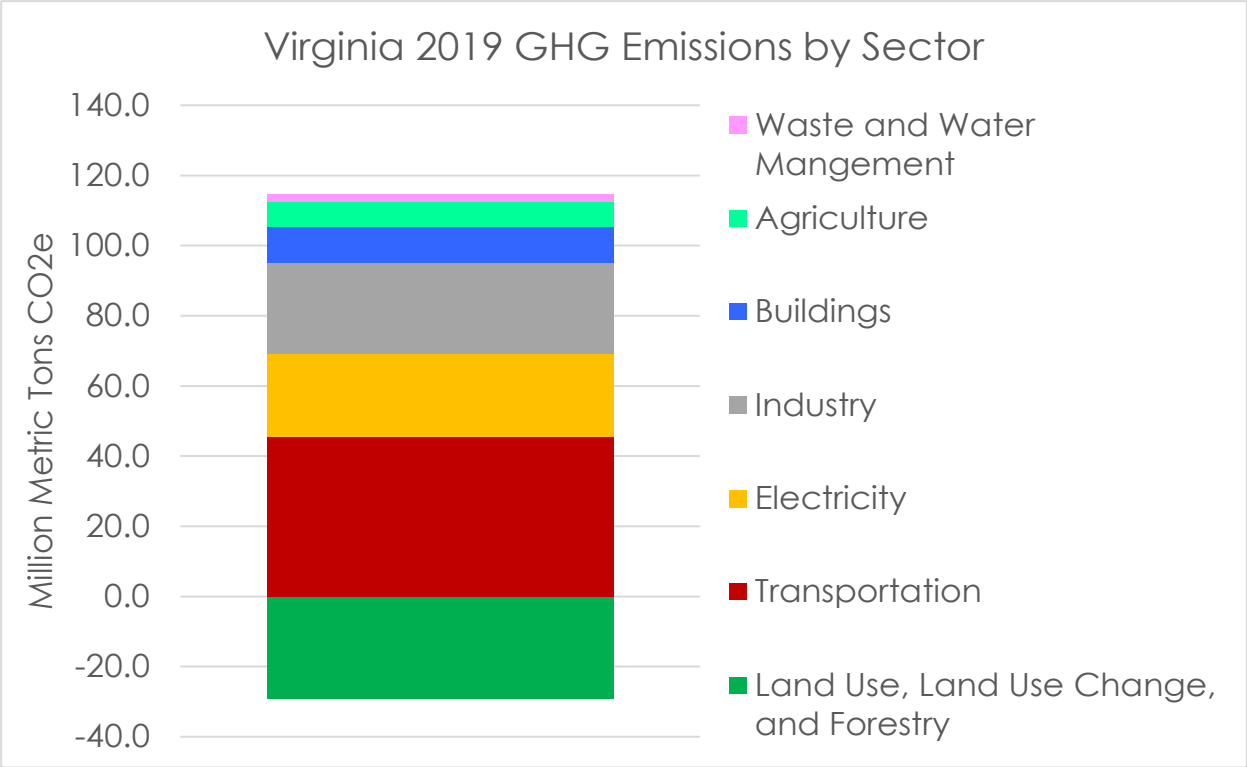
THE VIRGINIA ENERGY POLICY SIMULATOR

The Virginia Energy Policy Simulator (EPS) is a free, open-source, peer reviewed model developed by Energy Innovation and Rocky Mountain Institute that allows users to estimate impacts of climate and energy policies on emissions, the economy, and public health. The model relies on publicly available data to estimate annual emissions, infrastructure, and economic impacts of policies, accounting for ways in which policies interact with one another through 2050. EPS models have been developed for more than a dozen countries and several subnational regions, including California, and the Virginia EPS is the first of 20 planned state-level EPS models being developed by Energy Innovation and Rocky Mountain Institute.

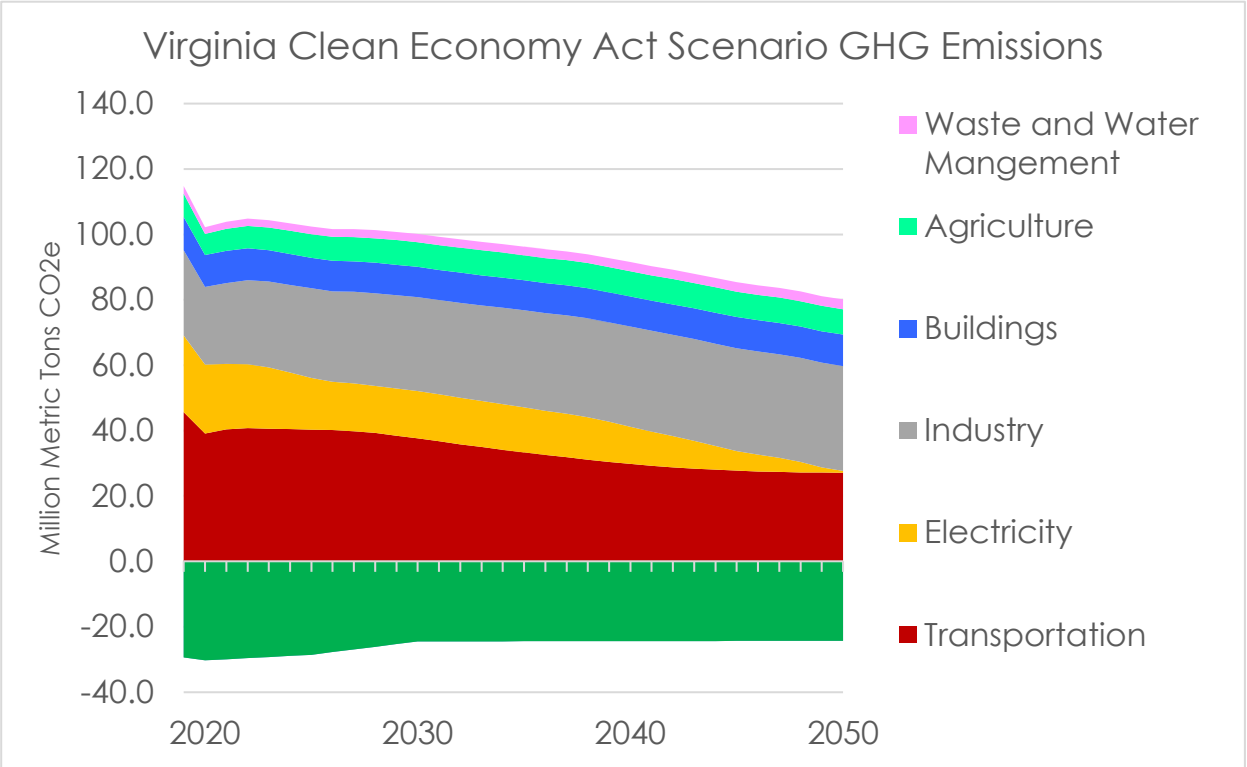
VIRGINIA'S EMISSIONS OUTLOOK WITH THE VIRGINIA CLEAN ECONOMY ACT

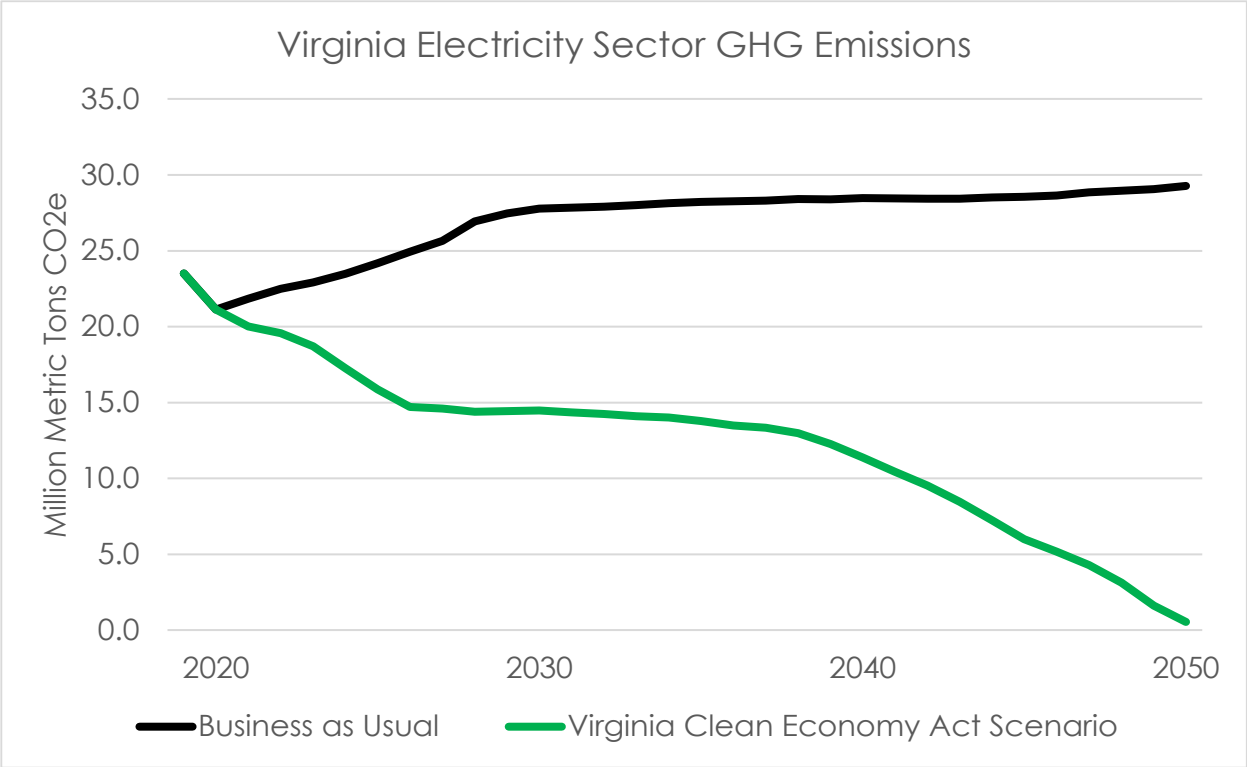
Currently, the largest source of emissions in Virginia is the transportation sector, which today makes up more half of net greenhouse gas emissions. Next is the electricity sector, followed by the industrial sector, and finally buildings, agriculture, and water and waste. Virginia's natural and working lands also remove significant carbon from the atmosphere, shown below as the negative bar.

The VCEA will decarbonize the state's electricity sector by requiring the state's investor-owned utilities to cut their emissions, including requiring Dominion to achieve 100 percent carbon-free electricity by 2045 and Appalachian Power to achieve 100 percent carbon-free electricity by 2050, joining the Regional Greenhouse Gas Initiative (RGGI), and restricting all CO_2 emissions after 2050 for nearly all power plants. It also requires closing nearly all coal-fired power plants by 2024 and most natural gas, biomass, and petroleum-fired power plants by 2045. Finally, the VCEA includes provisions for 5,200 megawatts (MW) of offshore wind by 2034, 3,100 MW of energy storage capacity by 2035, and significant growth in energy efficiency. For context, Virginia currently has 2,300 MW of installed renewable energy capacity, according to the U.S. Energy Information Administration.



Prior to the VCEA being enacted, Virginia's power sector emissions were projected to grow from roughly 30 million metric tons carbon dioxide-equivalent (MMT CO_2e) in 2019 to about 35 MMT CO_2e in 2050. The VCEA eliminates 2050 electricity-related emissions, reducing statewide 2050 emissions nearly 35 percent.





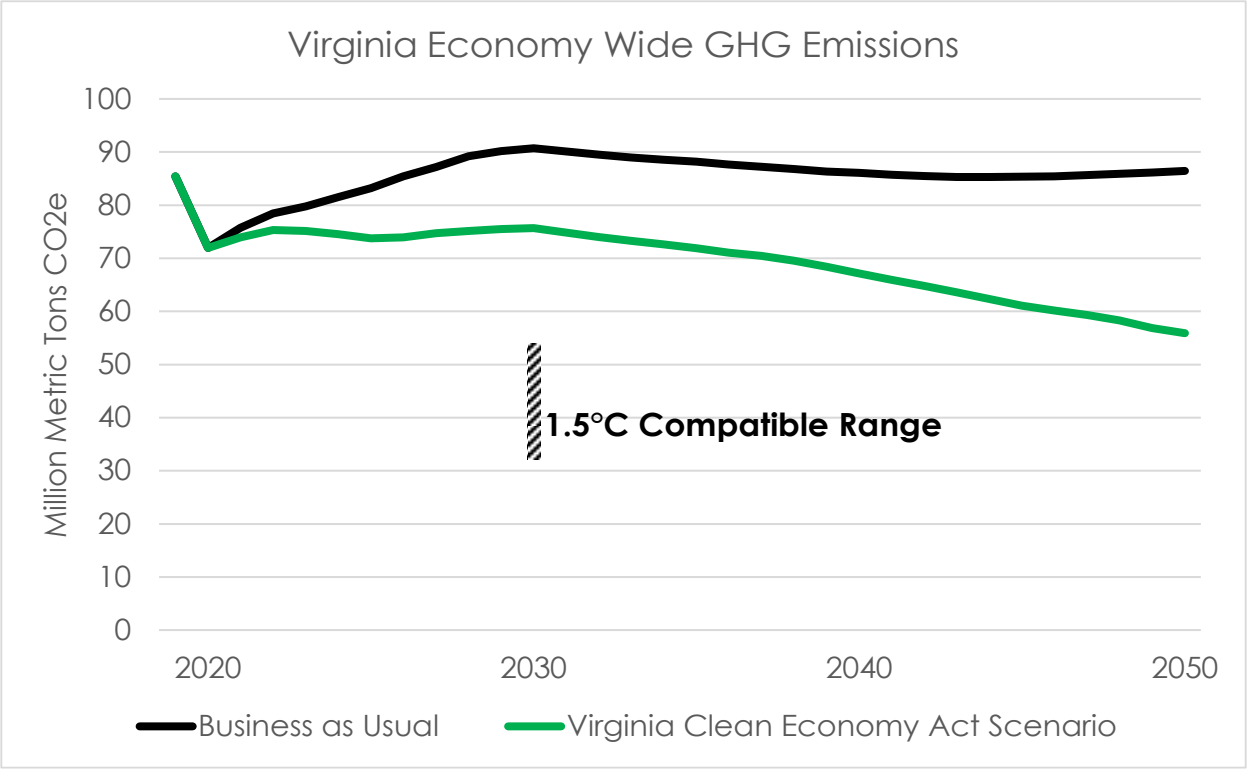
POLICY OPTIONS FOR DEEP DECARBONIZATION

Cutting power sector emissions provides a valuable foundation for economy-wide decarbonization. But to put the state on a path to deep decarbonization in line with the requirements needed to limit global warming to 1.5°C, Virginia must accelerate electricity sector emissions reductions and implement climate policy in these other economic sectors.

The illustrative 1.5°C Pathway Scenario discussed below shows one set of policies Virginia could use to achieve emissions reductions in line with this target.

In the transportation sector, this scenario uses a strong electric vehicle sales standard, requiring all new passenger cars sold to be electric by 2035, and all new trucks to be electric by 2045, aligned with California's transportation sector policies and the multi-state Memorandum of Understanding on moving to zero emissions medium and heavy duty vehicles. The scenario also includes investment in alternatives to passenger car travel, with supportive land use and transportation policies to enable people to use public transit and to walk and bike, resulting in a 20 percent reduction in passenger car travel by 2050.

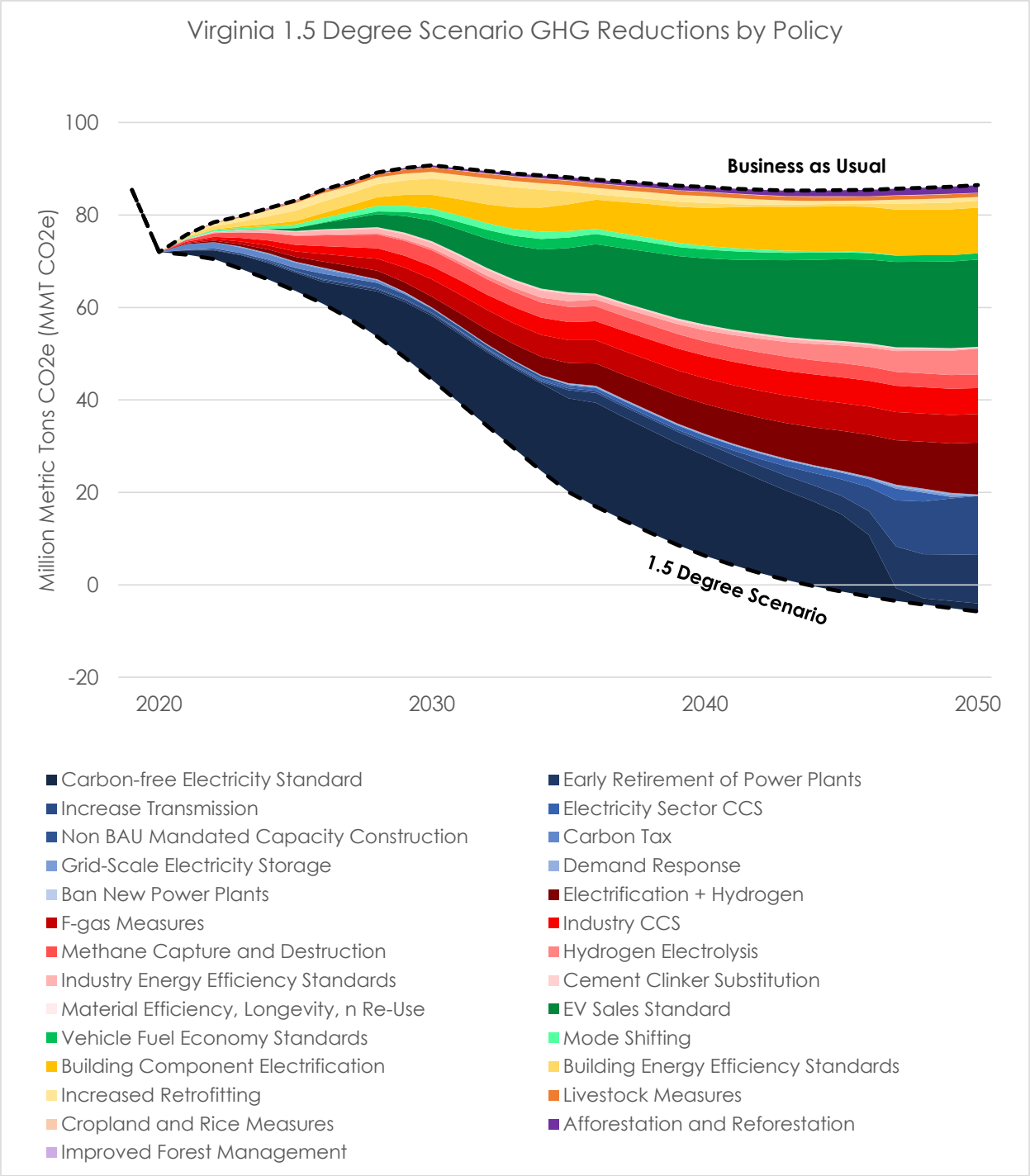
In the buildings sector, a sales standard requires all newly sold building equipment to be electric by 2030. This would shift gas space and water heating systems to all-electric heat pumps, which are already commercially available and common in many parts of the U.S. Strong efficiency standards (potentially state standards on new equipment sales, a utility rebate program, or a statewide energy efficiency resource standard) further improve the efficiency of newly sold building equipment.



In the electricity sector, the scenario builds on the VCEA, broadening the clean electricity standard to cover the entire electricity sector (including municipal and cooperative utilities) and speeding up the transition to 100 percent clean power by 2035 (instead of 2045 to 2050 for different utilities). The offshore wind and storage requirements as well as the power plant closure requirements under the VCEA are also included; along with additional policies allowing for transmission system growth, more demand response, and additional storage to add valuable grid flexibility. The existing RGGI carbon price and emissions limitations are also part of this scenario.

Industry sector emissions come from various sources including energy combustion, leaking refrigerants in heating and cooling equipment, and natural gas leakage throughout the production, transmission, and distribution system, as well as from coalmines and water and waste management. To reduce energy-related emissions, the scenario requires industrial facilities to electrify all end-uses where possible, to switch to a zero-carbon fuel (in this case hydrogen) for all others by 2050, and for the hydrogen to be produced through a zero-carbon process known as electrolysis. Policies promoting more efficient use of industrial materials and improved industrial energy efficiency achieve additional reductions in this sector.

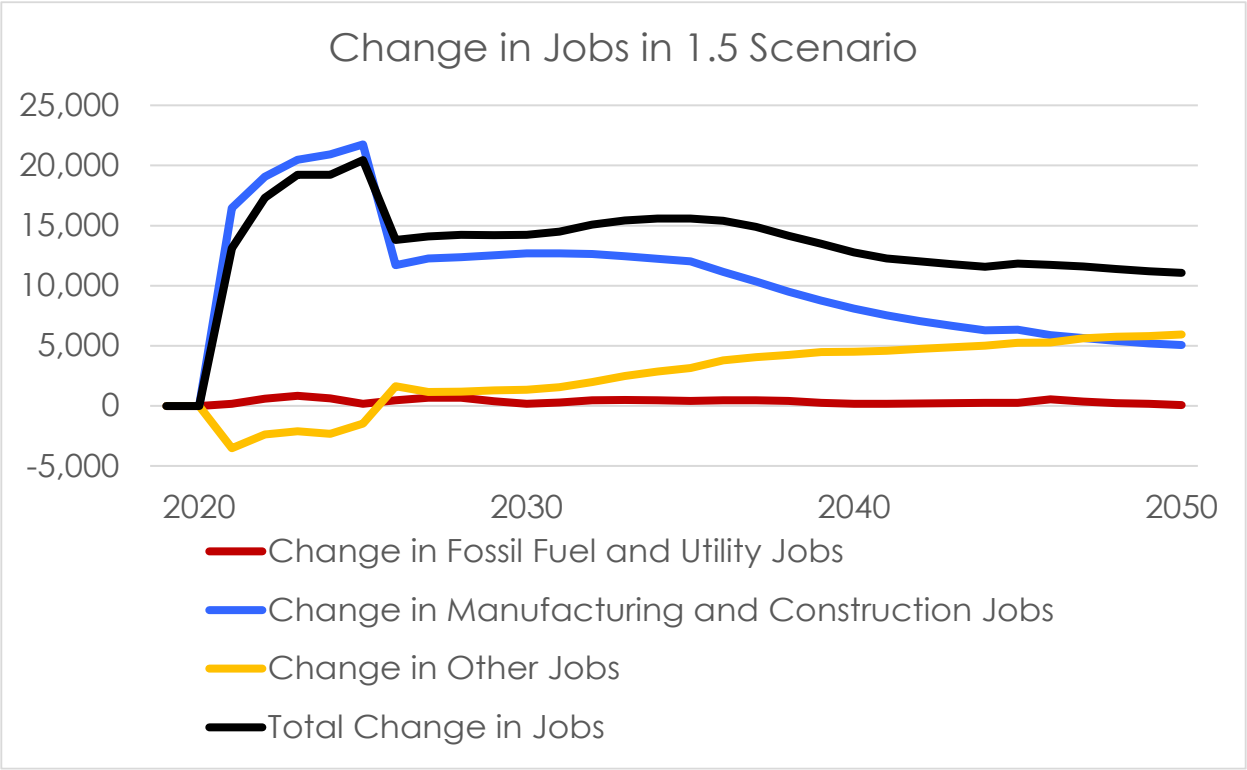
For non-energy combustion industrial emissions, this scenario includes standards requiring natural gas utilities, water and waste management facility operators, and coalmine operators to capture leaking methane. Appliance manufacturers are required to switch to low global warming potential refrigerants. The remaining industry sector emissions CO_2 emissions are required to be captured using carbon capture and sequestration.



Finally, implementing land use and agricultural policies, such as requiring use of anaerobic digesters to capture manure emissions and afforestation of land, achieves additional reductions. Altogether, this package of policies would reduce emissions by 63 percent below 2005 levels by 2030 and achieve net-zero emissions before 2050, putting Virginia on a path broadly consistent with limiting warming to 1.5°C.

JOBS, GDP, AND HEALTH BENEFITS

Transitioning to a low-carbon economy delivers tremendous economic and health benefits. The policy scenario outlined above would generate tens of thousands of jobs in Virginia as new infrastructure is built, homes are upgraded, and factories begin retooling. By 2050, this scenario is projected to generate more than 11,000 job-years, while increasing Virginia's GDP by more than $2.6 billion per year.



Moving away from fossil fuels also improves air quality by reducing emissions of particulate matter (PM) and other pollutants that can create PM, and cause adverse health impacts. For example, this scenario avoids more than 900 asthma attacks per year by 2050.

CONCLUSION

Virginia is among the vanguard of U.S. states enacting ambitious policy to transition from fossil fuels to a clean energy-based economy, but careful planning is critical for a rapid and equitable transition. While this policy pathway is challenging, it is realistic and based upon policies that have been successfully implemented in other states and nations across the world.

The economic benefits of the low-carbon transition are enormous, and continuing the momentum begun by the VCEA can position Virginia among the country's clean energy leaders, ready to capture the significant benefits of a low-carbon future.