DECARBONIZATION PLAN FOR VIRGINIA

A NEAR-TERM ACTION PLAN FOR OUR LONG-TERM GOAL OF **NET ZERO EMISSIONS**



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Decarbonization Plan for Virginia:

A Near-Term Action Plan for Our Long-Term Goal of Net Zero Emissions

- 1. Factor climate mitigation and preparedness into all government decisions.
- 2. Shift electricity generation from fossil fuels to zero-carbon renewable energy.
- 3. Modernize the electric transmission and distribution grid to meet climate and energy efficiency goals.
- 4. Reform Virginia's transportation system to maximize clean, sustainable mobility.
- 5. Make buildings more energy efficient and electrified to the maximum extent possible.
- 6. Adopt programs to disincentivize GHG emissions and to encourage non-emitting technologies and energy efficiencies.
- 7. Require data centers to be leaders in energy efficiency and in using renewable energy to operate their facilities.

Introduction - Rapid Decarbonization Is Critical

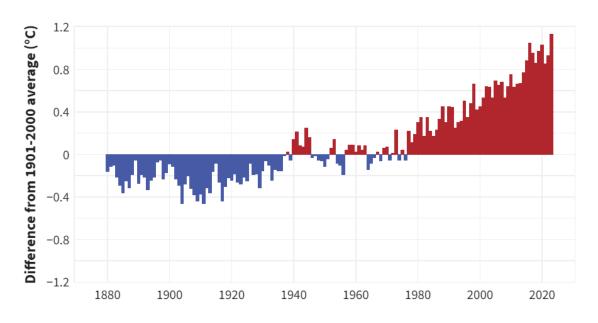
The congressionally-mandated Fifth National Climate Assessment (November 2023) finds that "[t]he effects of human-caused climate change are already far-reaching and worsening across every region of the United States...." It concisely summarizes the urgency of climate action¹:

"The more the planet warms, the greater the impacts. Without rapid and deep reductions in global greenhouse gas emissions from human activities, the risks of accelerating sea level rise, intensifying extreme weather, and other harmful climate impacts will continue to grow. Each additional increment of warming is expected to lead to more damage and greater economic losses compared to previous increments of warming, while the risk of catastrophic or unforeseen consequences also increases.

"However, this also means that each increment of warming that the world avoids—through actions that cut emissions or remove carbon dioxide (CO2) from the atmosphere—reduces the risks and harmful impacts of climate change."

Fortunately, this Assessment also reports that the tools for fighting climate change are getting better. Not only have the costs of solar, wind, and batteries dropped by 70–90% since 2012, but technological innovation has been expanding options for reducing energy demand, increasing energy efficiency, and meeting demand with carbon-free and low-carbon electricity and fuels.

GLOBAL AVERAGE SURFACE TEMPERATURE



NOAA Climate.gov graph, based on <u>data</u> from the National Centers for Environmental Information. Yearly surface temperature compared to the 20th-century average from 1880–2022. Blue bars indicate cooler-than-average years; red bars show warmer-than-average years.²

Though a worldwide problem, much of the actual work of addressing climate change must happen at the state and local level.

In 2020 and 2021, Virginia adopted a suite of laws that together put the Commonwealth on the path to a zero-carbon economy. The Virginia Clean Economy Act (VCEA), the Clean Car Standard, and the Virginia Alternative Energy and Coastal Protection Act (which required Virginia to join the Regional Greenhouse Gas Initiative or RGGI) created a framework for Virginia's energy transition that put us in the vanguard of states taking on the challenge of climate change.

REACHING NET-ZERO
EMISSIONS BY 2050 IS
TECHNICALLY AND
ECONOMICALLY
ACHIEVABLE

But our work is far from done. The Commonwealth is exposed to severe climate harms—coastal and inland, rural and urban, health and economic—and new challenges have emerged, including the soaring demand for electricity from data centers, the Governor's attempt to withdraw from RGGI, and faster-than-expected climate changes driving us closer to climate tipping points. Gaps, limitations and vagueness in Virginia's laws lower their effectiveness and reveal the need for new legislative and administrative actions to ensure the timely success of Virginia's energy transition. More rapid, sustained actions are needed to protect existing and future generations, including our most vulnerable populations.³

In this paper, we propose a suite of actions that Virginia leaders can take now. These are sound, common-sense proposals designed not just to lower carbon emissions, but to save money for consumers and taxpayers, spur economic development, create well-paying jobs, and help low-income and other vulnerable communities.

In 2021, the University of Virginia's Weldon Cooper Center for Public Policy published *Decarbonizing Virginia's Economy: Pathways to 2050* (January 2021),⁴ which demonstrates that decarbonizing Virginia's economy is both feasible and affordable, and offers multiple benefits beyond lowering greenhouse gas emissions. "In all scenarios analyzed, Virginia's expenditures on energy, as a share of Virginia's economy, will be lower than in the recent past." Moreover, the economic benefits in improved health, reduced global warming, and greater domestic energy production outweigh the costs. Importantly, the report finds that accelerating decarbonization is vital: "A quicker start means lower long-run costs; delay is costly."

A Near-Term Plan for Long-Term Action

Below are recommendations for action Virginia should take now to meet its 2050 net zero targets economy-wide.

1. Factor climate impacts, mitigation and preparedness into all government decisions.

- a. Climate mitigation, adaptation and the full "social cost of carbon" and other GHGs must be factored into all government planning and decisions. (For example, the State Corporation Commissions (SCC) must be required to consider the full impacts of GHG emissions when evaluating proposals and plans for utility facilities, efficiency and rates.) Based on the latest science and data, U.S. EPA's midpoint social-cost estimate for CO2 (inflation-adjusted) is \$190/ton emitted in 2020, \$230/ton emitted in 2030, \$270/ton emitted in 2040, and continuing upward through 2080.⁵ These impacts are too large for any agency to ignore.
- b. Virginia's Department of Energy (DOE) should be tasked and funded to provide guidance to state agencies and local governments on ways to accelerate reductions in GHG emissions. DOE should also be tasked and funded to provide independent analysis to the SCC, utilities, cooperatives, and legislators about ways energy suppliers can shift more rapidly to zero-carbon sources, more distributed energy supplies, and more energy efficient operations of utilities and customers.

2. Shift electricity generation from fossil fuels to zero-carbon renewable energy.

Utilities and the SCC must be required to prioritize and accelerate renewable energy, storage, distributed energy resources, energy efficiency, and demand-side management (DSM), as well as grid upgrades needed to support these resources.

- a. Coal-fired plants should be shut down as rapidly as possible, without utilities making new investments to extend their lives. Other carbon-emitting generation should be phased out as sufficient new solar, wind, and storage are added, and no new combustion-based generation should be constructed.
- b. Solar energy now makes up 6% of Virginia's electricity generation and is our cheapest form of generation, yet it remains hampered by policy barriers, monopoly control, and unnecessary siting constraints. Steps to bolster the supply of solar energy include:
 - i. The General Assembly should ensure that third-party development of utility solar facilities provides a minimum of 35% of solar procurement, and direst the SCC to require competitive procurement of all generation and storage resources. This is vital particularly since Dominion claimed in its Integrated

Resource Plan (IRP) that it cannot develop all the solar called for in the VCEA. Doing so will save money for ratepayers and ensure Dominion Energy and Appalachian Power meet the VCEA's solar energy targets.

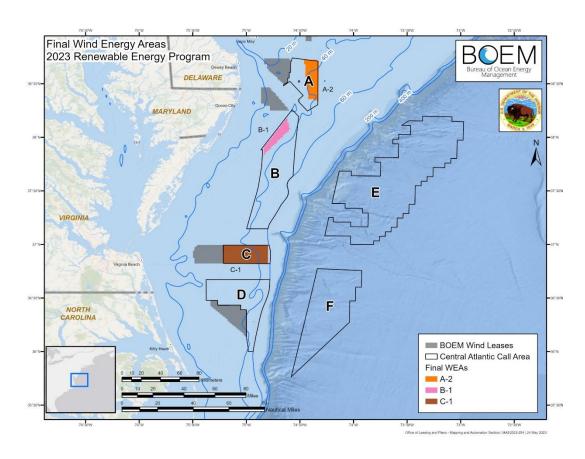


Psst, did you hear? Solar is Virginia's cheapest form of electricity generation. Photo: American Solar Grazing Association

- ii. Virginia's DOE should assist local governments by providing accurate
 - information and best practices for siting and permitting new renewable energy and storage facilities. Virginia's DOE should also educate local governments and the public about potential benefits of such sources and available incentives from government and utility sources. This will help ensure projects are not blocked or delayed based on misinformation.
- iii. All new schools and other public buildings should be built with solar-ready roofs and should be expected to have solar installed unless an energy analysis demonstrates no savings over time.
- iv. The General Assembly should reform and expand Virginia's shared solar provisions to ensure the program is viable for all customers statewide. Currently, community solar (also known as shared solar) can be offered economically only to low-and-moderate-income residents in Dominion territory.
- v. Virginia's commercial solar sector was significantly harmed in 2023 by onerous and expensive interconnection requirements imposed by Dominion unilaterally. The General Assembly should prohibit utilities from unilaterally adding interconnection burdens or requiring solar customers to pay for grid upgrades beyond the connection on the premises, while allowing utilities to seek rate-base treatment from the SCC if additional facilities are needed for safety and reliability. Allowing rate-based recovery for needed upgrades will enable the distribution grid to accommodate more customer-sited solar, storage, and EV charging.
- vi. Net metering, the program under which most residential and small commercial solar projects are installed, is currently capped at no more than 6% of an investor-owned utility's peak load. For Virginia to realize the potential of distributed solar, the cap must be lifted, and policy barriers that

hamper residents, businesses, and governments from installing distributed solar must be removed. The General Assembly should clarify that solar leasing is legal and create new programs targeted at broadening access to solar, including financing through utility bills, property assessed clean energy (PACE) programs, and green banks.

c. Offshore wind will reduce carbon emissions and build our economy. Virginia should aggressively support additional commercial offshore wind projects. The General Assembly should consider requiring competitive bidding for construction of turbines as new offshore blocks become available and increase the amount of offshore wind in the public interest from 5200 MW as it currently stands to a minimum of 8000 MW.



The Bureau of Ocean Energy Management (BOEM) is scheduled to auction offshore wind areas in mid 2024. The areas include Call Area C (in red) off the Virginia and adjacent to Dominion's Coastal Virginia Offshore Wind project.

d. Existing nuclear plants can be expected to operate as long as they are safe, but Virginia should not delay its shift to zero-carbon renewable energy in hopes that new nuclear options will prove viable a decade or more from now. Recent nuclear plants have been too expensive to complete (e.g., the abandoned VC Summer project in South Carolina and the NuScale small modular reactors (SMRs) in Utah) or to supply energy at a

reasonable price (e.g., the Vogtle plant in Georgia, which was completed 7 years late and \$17 billion over budget). It will take many years (if ever) for SMRs to be made safe and economical, and decades more to build them. They provide no justification for delaying rapid development of solar, wind and storage, all of which are viable and economical today. Moreover, nuclear plant outages can be very long, as shown by the 3-month outage following the 2011 earthquake near Mineral, VA; and, nuclear waste continues to accumulate without a safe disposal solution.

- e. Utilities' energy efficiency goals are currently too weak, and utilities are slow to implement energy efficiency programs to meet even the current standards. Improving energy efficiency is vital to reducing customers' bills and utilities' carbon emissions. Efficiency requirements must be raised, and the General Assembly should shift the task of designing and implementing rate-financed efficiency programs for all utilities to an independent entity, as has occurred in some other states.⁷
- f. Utilities should be required to rely more on demand-side management (DSM) to balance loads and costly supplies during periods of peak demands and local constraints. That could create a "virtual power plant" enhancing reliability while reducing utilities' capital and operational costs. However, any CO2 or other pollution produced by a DSM customer's back-up generation should be attributed to the utility's operations and against the utility's CO2 reduction obligations.
- g. Monopolies' incentives to serve shareholders often conflict with the public's interests, including the need to accelerate the transition to zero-carbon energy sources. Well-designed performance rates could better link a utility's profits (higher and lower) to its success in accelerating the public's carbon reduction and energy efficiency goals and to the need for transportation and building electrification, as well as traditional expectations of reasonable rates and reliable service. Lawmakers should, at a minimum, direct an agency-supervised study by experienced, public-aligned experts (such as the Regulatory Assistance Project¹⁰) on how performance-based ratemaking can be designed to achieve those goals.

3. Modernize the electric transmission and distribution grid to meet climate and energy efficiency goals.

a. The General Assembly should require utilities to prioritize the extension of transmission and distribution lines to more renewable energy sources and to areas where electrification of vehicles, businesses, and appliances will grow. The grid must support a network of roadside EV charging for trucks, as well as passenger vehicles, which will need high voltage service.

- b. Virginia should advocate with PJM to eliminate long delays for zero-carbon connections. Expanding the capacity of multistate transmission systems will enhance reliability and access to cheaper power.
- c. Redesign transmission and distribution systems to facilitate use of distributed energy systems, more demand-side management, reduced peak capacity needs, bidirectional flows, and greater resiliency. Efficiencies and reliability can be enhanced by locating energy generation and storage systems closer to markets rather than continuing to rely on long-distance transmission lines to large, remote generators.
- d. To make this work, data on electric system operations and plans must be shared more broadly with regulators, customers, and current and potential energy suppliers. Virginia's DOE, working with U.S. DOE and competent contractors who share a low-carbon vision, should be tasked and funded to help model transmission options for the future, not leave the job to monopoly utilities and their consultants.

4. Reform Virginia's transportation system to maximize clean, sustainable mobility.

Tailpipe emissions are the number one source of climate-altering pollution in Virginia. As of November 2023, the Federal Highway Administration requires state Departments of Transportation and Metropolitan Planning Organizations to establish performance measures for reducing greenhouse gas emissions in their transportation plans. Virginia

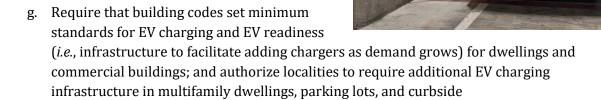
must redirect its focus from moving cars to moving people, combined with a commitment to build equitable transit and EV infrastructure across the state. This transformational shift will promote sustainability and health by reducing pollution and car dependency, and by increasing physical activity through walking, biking, and mass transit. Rapid electrification of personal, government, and fleet vehicles should also be a priority.

The General Assembly, state agencies, and localities can turn this vision into reality through legislation and policies that: Toxic tailpipe emissions represent the biggest source of climate pollution in Virginia and contributes to 3,500 premature deaths in Virginia every year.

The Advanced Clean Cars
Standards is a common sense
approach to protect our health
and preserve our climate.

- a. Maintain Advanced Clean Cars Standards (ACC)
- b. Fund the Commonwealth's EV Rebate Program, to help implement ACC
- c. Join eight other states in adopting the Advanced Clean Trucks rule

- d. Coordinate land use and transportation planning to emphasize transit and non-motorized transportation and communities that will use them
- e. Streamline permitting for charging infrastructure for passenger and commercial vehicles
- f. Establish a comprehensive and accessible EV charging network that spans urban centers, suburban areas, and rural communities



- h. Implement comprehensive outreach programs to inform local governments and the public about the advantages of sustainable transportation choices, dispel myths, and promote a culture of eco-conscious transportation choices
- i. Create a state-level office to inform and work with localities, particularly small, rural localities, to help them take advantage of federal funds while they are available

5. Make buildings more energy efficient and electrified to the maximum extent possible.

Buildings are Virginia's second largest source of carbon emissions when one considers both buildings' direct emissions and emissions from energy produced to power appliances and other building operations. Since buildings are expected to operate for 50–100 years or more (long beyond 2050 or even 2100), steady progress must begin now to mitigate economic and climate harms that lie ahead. Energy efficiency improvements in building structures, systems and appliances save occupants' money and make occupancy more affordable, since affordability is determined by occupants' overall housing costs, including utility costs.¹¹ Replacing combustion with electrification is also vital since it saves energy and reduces GHG emissions.

a. Virginia's building codes must be made at least as stringent as the International Energy Conservation Code (IECC) without weakening amendments. As repeatedly found by the U.S. DOE, savings and air pollution reductions from IECC implementation exceed incremental construction costs and reduce occupancy costs every year for decades.¹² Such savings are especially important to low-income

residents. Constructing more efficient buildings also reduces the need for more costly retrofits, and yields higher resale values. Virginia's Board of Housing and Community Development's practice of approving builder-requested weakening amendments must end.¹³

- b. Energy efficiency standards stricter than the IECC, including DOE's net-zero and net-zero-ready standards, would cut even more carbon emissions and save energy, benefitting residents and communities. Virginia should adopt these higher standards statewide or, at minimum, authorize localities to require higher standards (so-called "stretch" codes) for construction within their jurisdictions.
- c. Electric heat pumps are three times more efficient than combustion heating and can be installed in multifamily dwellings as well as single family dwellings. They should be required in new construction (at least if air conditioning would be installed anyway) and otherwise incentivized, as they will save money and energy, reduce carbon emissions and other pollution. Other high-efficiency, low-emission technologies, including heat-pump water heaters and induction stoves, should also be required or at least incentivized in new construction. These higher-efficiency technologies should, at least, be incentivized when appliances are replaced in older buildings.
- d. At a minimum, all buildings should be constructed with conduits/raceways that will permit future low-cost installations of electric HVAC, electric appliances, EV charging, and solar panels in the future. This infrastructure is inexpensive to install during construction, but far more costly if buildings need to be retrofitted after walls are closed.
- e. Builders and businesses should be incentivized to use large-scale heat pumps and other low-energy technologies in commercial and industrial buildings.
- f. Commercial buildings should be required to disclose and "benchmark" their energy usage levels. Publicizing that information would help both potential tenants and the public, and it would incentivize building owners to improve efficiencies. At a minimum, localities should be allowed to implement such requirements.
- g. Electric utilities should be encouraged to incentivize customers and builders to install electric systems and appliances, including electric heat pumps and water heating, induction stoves, and EV charging. Combustion alternatives are less efficient and more polluting. Utility promotion of electric systems and appliances should not be held back by SCC policies that restrict utility competition.

6. Adopt programs to disincentivize GHG emissions and to encourage non-emitting technologies and energy efficiencies.

- a. RGGI participation must be restored. RGGI provides proven, reasonable price incentives for utilities to lower carbon emissions in electric generation, and proceeds from emission allowances auctions provide hundreds of millions of dollars for low-income energy efficiency programs and flooding resilience. The Virginia Department of Environmental Quality (DEQ) itself acknowledged the "serious threat" posed by climate change to the health and welfare of Virginians and the "imperative" of addressing greenhouse gas pollution, even as it followed Gov. Youngkin's direction to remove Virginia from RGGI by regulation.¹⁴
- b. Virginia should adopt policies that go beyond existing law to incentivize utilities, businesses, farmers, and residents to implement greater energy efficiency, reduce GHG emissions, and sequester carbon in soils and forests. These policies could include carbon prices, regulations, and/or financial incentives.
- c. Virginia agencies should do more to help localities, businesses, and individuals to improve their energy efficiency, deploy solar installations, and qualify for federal incentives like the Inflation Reduction Act (IRA), to reduce GHG pollution or save energy in buildings and operations.

7. Require data centers to be leaders in energy efficiency and in using renewable energy to operate their facilities.

Virginia is already the data center capital of the world, and the industry is growing rapidly. Its appetite for energy is enormous, already consuming 21% of Dominion Energy Virginia's total load as of 2022, and data center load is expected to quadruple by 2038. Without action, this growth could make Virginia's transition to a zero-carbon future impossible, will drastically increase rates for residential customers, and have catastrophic impacts on nearby communities and natural resources. Accordingly, the General Assembly should:

- a. Require data centers to meet stringent criteria for energy efficiency and renewable energy procurement on a 24/7/365 basis as a condition of receiving state or local subsidies.
- b. Establish a statewide working group, with public participation and transparency, to guide the siting of future data center development. This working group should be tasked to address: grid, water, and air quality impact assessments that account for the cumulative impacts of data centers.
- c. Direct the SCC to ensure that the utility rates paid by data centers are publicly disclosed and reflect the full impacts of the industry on utility planning, costs and

service. Data centers should pay the full cost of all generation, storage, distribution and transmission to supply their operations, avoiding any cost shift to residential ratepayers and ensuring no negative impact on communities.

- d. Require the SCC to assure that utilities' race to serve data centers is coordinated with, and does not divert from, the need to reform utilities' power, transmission, and distribution to rapidly achieve net zero-carbon goals.
- e. Remove barriers to the development of solar and battery storage facilities across the Commonwealth to ensure data centers have access to carbon-free power.
- f. Require public disclosure of energy and water usage starting from the time of proposal and continuing throughout operation, and require publication of metrics to permit benchmarking.
- g. Give localities the ability to require less polluting back-up power generation, rather than leaving this to DEQ independently.

Conclusion

In sum, legislative and administrative actions are essential to protecting Virginia's residents, economy and natural resources from the accelerating dangers from climate change. Rapid expansion of zero-carbon energy production and storage, improved energy efficiency, electrification of vehicles and buildings, reasonable constraints on data center growth, and reconfiguration of utility systems and incentives are essential parts of the solutions. These will not happen in a timely manner without public and private actions. Delay is not a credible option for either existing or future generations.

- ³ Virginia's coasts, tidal rivers, wetlands, agriculture, and water supplies are highly vulnerable to sea level rise; severe storms and floods are harming Virginia communities; heat illnesses and deaths are rising; public and private infrastructure is being harmed. See e.g., https://www.washingtonpost.com/climate-environment/2022/09/08/sea-level-rise-climate-central/?%20environment 2
- https://riskfinder.climatecentral.org/state/virginia.us?comparisonType=county&forecastType=NOAA2017 int p50&leve l=5&unit=ft_In addition, for example, to coastal and other flood prone areas, low-income and other disadvantaged communities are particularly vulnerable to impacts from climate change and building inefficiencies.
- ⁴ https://energytransition.coopercenter.org/reports/decarbonizing-virginia-pathways-2050. The Energy Transition Initiative (ETI) at the University of Virginia is a center of excellence for rigorous analysis of Virginia energy systems. Organized within the Weldon Cooper Center for Public Service, the ETI works toward three primary goals: to help chart pathways and policies for net zero carbon by 2050; to identify opportunities and roadblocks on the road to zero carbon; and to promote informed, engaged, and inclusive decision making on Virginia's energy future. The ETI works with scholars across the University through the efforts of the UVA Environmental Resilience Institute, a pan-university effort to foster cross-disciplinary collaboration for solving today's environmental management challenges.
- ⁵ U.S. EPA, "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances" (November 2023) https://www.epa.gov/environmental-economics/scghg Table ES-1 shows the estimated social costs per ton of emissions (in 2020 dollars) for the three major GHGs (CO2, CH4 and N2O) for emissions each decade from 2020-2080. It shows that the social costs for CO2 emissions in 2020 had a range of \$120-340/ton with \$190/ton midpoint, depending upon the discount rate used. Inflation-adjusted costs from emitting GHGs rise significantly every decade with the midpoint CO2 cost rising approximately \$40 per decade.
- ⁶ https://www.virginiamercury.com/2023/06/26/solar-developers-ask-regulators-to-suspend-dominion-interconnection-rules/
- ⁷ The highly successful Efficiency Vermont was the first independent "efficiency utility." Over time, its funding has expanded beyond utility surcharges. https://www.efficiencyvermont.com/20-year-impact-report
- 8 https://rmi.org/clean-energy-101-virtual-power-plants/
- ⁹ The concepts and history of performance based rates are described by the National Conference of State Legislatures https://www.ncsl.org/energy/performance-based-regulation-harmonizing-electric-utility-priorities-and-state-policy NCSIL states that at least 17 states have required or authorized utility commissions to consider PBRs. Decarbonization is one objective incentivized by recent PBRs. https://rmi.org/states-move-swiftly-on-performance-based-regulation-to-achieve-policy-priorities/
- 10 https://www.raponline.org/
- 11 Virginia law (§ 15.2-2201, § 15.2-2305.1) defines housing "affordability" based upon "gross housing costs, including utilities"
- $^{12}\,\underline{\text{https://www.energycodes.gov/determinations;}}\,\underline{\text{https://www.energycodes.gov/previousdeterminations}}$
- ¹³ BHCD has repeatedly approved weakening amendments despite Virginia law's requiring the building code to be "consistent with" national codes for energy conservation, and calls for efficiency measures to be at least as stringent as the latest IECC when long-term savings and pollution reductions exceed the incremental cost of construction. §36-99A and Virginia Acts of Assembly–2021 Special Session I, Chapter 425.
- 14 https://townhall.virginia.gov/L/GetFile.cfm?File=1%5C6082%5C9879%5CAgencyStatement_DEQ_9879_v1.pdf
 DEQ's response to public comments on the Governor's proposal to withdraw from RGGI repeatedly acknowledged that climate change poses a severe threat to Virginia and that action, including funding, is imperative. For example: "DEQ agrees with the commenters that that climate change represents a serious threat to Virginia's public health and welfare." "Reducing carbon emissions in order to reduce climate change impacts is indeed imperative to protecting public health and welfare." "Energy efficiency programs and resiliency measures are indeed needed throughout the state. These programs are obviously costly and the money must be obtained one way or another..."
- 15 https://www.virginiamercurv.com/2023/11/21/a-5-point-plan-for-data-centers/

¹ Fifth National Climate Assessment by the Global Research Program (November 2023) Chapter 1. https://nca2023.globalchange.gov/ Billion-dollar (inflation-adjusted) climate disasters have increased to an average of one every three weeks now, from one every four months in the 1980s. Damages and risks disproportionately affect low-income and other disadvantaged groups. (Assessment, p. 5, 16-17, 19.) Since the start of the Industrial Revolution, human activities have caused increases in atmospheric concentrations of carbon dioxide (CO2), methane (CH4), nitrous oxide (N20), and other greenhouse gasses (GHGs) responsible for long-term warming, jumping sharply since 1970. While atmospheric surface temperatures have increased every decade since 1880, the rate of increase has doubled since 1981, and 23 of the 24 hottest years have occurred this century, with 2023 just the latest "hottest year" on record. https://www.climate.gov/climatedashboard.

² https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature





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