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January 11, 2021

Via First Class U.S. Mail and Electronic Mail

Michael A. Abraczinskas, Director
Division of Air Quality
North Carolina Department of Environmental Quality
1641 Mail Service Center
Raleigh, North Carolina 27699-1641
Michael.abraczinskas@ncdenr.gov

Dear Mr. Abraczinskas:

On behalf of Clean Air Carolina and the North Carolina Coastal Federation, the Southern Environmental Law Center requests that the Division of Air Quality recommend to the Environmental Management Commission that it adopt a rule to limit carbon dioxide pollution from the electric power sector in North Carolina.

I have enclosed with this letter a Petition for Rulemaking and supporting materials. Please contact me with any questions or additional information needed to process this request. Thank you for your consideration.

Respectfully submitted,

Derb S. Carter

cc:
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BEFORE THE
NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

Clean Air Carolina and	)	PETITION FOR RULEMAKING
	)	PURSUANT TO N.C.G.S. § 150B-20 AND
North Carolina Coastal Federation,	)	15A NCAC 02I .0501
	)	TO ADOPT RULES TO LIMIT CO2
Petitioners	)	POLLUTION FROM THE ELECTRIC
	)	POWER SECTOR

The threat to North Carolina from global climate change is real, it is present, and it is getting worse.[1] Human activity is causing the Earth's temperature to rise. As a result, sea levels have risen and continue to rise. Extreme precipitation has become more common and will be even more common in the future. The intensity of hurricanes and the frequency of other severe storms will increase. Flooding will increase, but so too will droughts and wildfires. Each of these changes will hit our most vulnerable residents hardest.[2] Unabated, climate change will exact substantial costs on our environment, our economy, and the lives of all North Carolinians. Scientists urge aggressive action now to reduce carbon dioxide ("CO_2") emissions in order to have a chance at avoiding the worst impacts of climate change.

A scientific consensus exists that sustained reductions in emissions to reach net zero CO_2 are required to stabilize global warming.[3] As of the filing of this petition, 126 countries covering 51% of global greenhouse gas ("GHG") emissions have net-zero goals that are formally adopted, announced or under consideration. If the United States adopts a net-zero GHG target by 2050, as proposed in the Biden-Harris climate plan, the share would increase to 63%.[4] Many states, utilities and corporations have also adopted net-zero CO_2 or GHG goals with interim targets. This includes investor-owned utilities operating in North Carolina. Duke Energy's 2020 Climate Report states a goal "to cut our CO_2 emissions by half or more by 2030 and strive to attain net-

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[1] N.C. Inst. for Climate Studies, 2020: N.C. Climate Science Report 5-8 (2020) [hereinafter N.C. Climate Science Report], https://ncics.org/wp-content/uploads/2020/06/NC_Climate_Science_Report_FullReport_Final_revised_May2020.pdf.

[2] N.C. Climate Risk Assessment and Resilience Plan 4-1 (2020), https://files.nc.gov/ncdeq/climate-change/resilience-plan/2020-Climate-Risk-Assessment-and-Resilience-Plan.pdf.

[3] Intergovernmental Panel on Climate Change, Climate Change 2014: Synthesis Report, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014), https://www.ipcc.ch/report/ar5/syr/.

[4] United Nations Environment Programme, Emissions Gap Report 2020 (2020), https://www.unenvironment.org/emissions-gap-report-2020.

zero emissions by midcentury."[5] Last year, Dominion Energy committed to achieving net zero carbon and methane emissions from its power stations and natural gas infrastructure by 2050.[6]

In 2016, 196 countries signed the Paris Agreement, committing to reduce greenhouse gas emissions in the world's first comprehensive effort to address climate change.[7] The Agreement's long term goal is to keep the increase in global annual temperature well below 2° C (3.6°F) above pre-industrial levels, and to pursue efforts to limit the increase to 1.5°C (2.7°F) which would substantially reduce the risks caused by the impacts of climate change.

In October 2018, Governor Cooper issued Executive Order No. 80, North Carolina's Commitment to Address Climate Change and Transition to a Clean Energy Economy.[8] As directed by the executive order, the Department of Environmental Quality convened a broad stakeholder process during 2019 and prepared a comprehensive Clean Energy Plan to reduce carbon dioxide emissions from the electric power sector by 70% by 2030 (from 2005 baseline) and to become net carbon neutral by 2050.[9]

The Plan's foremost recommendation, dubbed "Recommendation A-1," entails two steps. First, it directs the Department of Environmental Quality to work with academia to deliver a report to Governor Cooper that "recommends carbon reduction policies and the specific design of those policies to best advance core values—including a significant and timely decline in greenhouse gas emissions, affordable electricity rates, expanded clean energy resources, compliance flexibility, equity, and grid reliability."[10] Specifically, the report would evaluate (1) accelerated coal retirements, (2) a market-based carbon reduction program, (3) clean energy policies such as an updated Renewable Energy and Energy Efficiency Portfolio Standard (REPS), an energy efficiency resource standard (EERS) and clean energy standard, and (4) a

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[5] Duke Energy, Achieving a Net Zero Carbon Future, Duke Energy 2020 Climate Report (2020), https://www.duke-energy.com/_/media/pdfs/our-company/climate-report-2020.pdf?la=en.

[6] Dominion Energy, 2019 Sustainability and Corporate Responsibility Report (2019). https://sustainability.dominionenergy.com/assets/pdf/Dominion-Energy_SCR-Full-Report-FY2019.pdf.

[7] The United States signed the agreement, but withdrew on November 4, 2020. On September 20, 2017, Governor Roy Cooper announced that North Carolina would join 14 other states in the U.S. Climate Alliance, a bipartisan group of states committed to reducing their share of the U.S. greenhouse gas emission reduction targets in the Paris Agreement. Press Release, Governor Roy Cooper, North Carolina Joins 14 States in Bipartisan U.S. Climate Alliance (Sept. 20, 2017), https://governor.nc.gov/news/north-carolina-joins-14-states-bipartisan-us-climate-alliance. President-elect Biden has stated the US will rejoin the accord on his first day in office.

[8] Exec. Order No. 80, (Oct. 29, 2018), https://files.nc.gov/ncdeq/climate-change/EO80--NC-s-Commitment-to-Address-Climate-Change---Transition-to-a-Clean-Energy-Economy.pdf.

[9] N.C. Dep't of Env'tl Qual., N.C. Clean Energy Plan: Transitioning to a 21st Century Electricity System 60 (2019) [hereinafter CEP], https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf.

[10] *Id.* at 60.

combination of those policy options.[11] Second, it recommends that the General Assembly and the Department "[t]ake legislative and regulatory action to implement the policy designs recommended in the above report."[12]

During 2020, stakeholders convened with academics from Duke University's Nicholas Institute for Environmental Policy Solutions and UNC's Center for Climate, Energy, Environment & Economics and government staff to assess these carbon-reduction policies.[13] The resulting report is not a "consensus" document and will not recommend a particular strategy or approach to reducing carbon emissions. However, it will contain in-depth analyses of the carbon-reduction policies identified by Clean Energy Plan stakeholders. The report will be publicly available in the near future, likely in February 2021.

One of the market-based strategies identified and assessed through the stakeholder process is for North Carolina to join the ongoing regional effort by states to our north to reduce carbon emissions from the energy sector by establishing a declining budget for carbon emissions and a regional market on carbon emissions to maximize economic efficiency of the reductions. As discussed below, analyses for the Recommendation A-1 report support this alternative as an excellent choice for North Carolina. This Petition for Rulemaking proposes regulations that establish the necessary framework for North Carolina to join the regional effort to reduce greenhouse gas emissions and achieve a 70% reduction in emissions from the energy sector by 2030.

Pursuant to North Carolina General Statute § 150B-20 and 15A North Carolina Administrative Code 02I .0501, Clean Air Carolina and the North Carolina Coastal Federation request that the Environmental Management Commission establish a rule to limit carbon dioxide pollution from the electric power sector in North Carolina. The text of the Proposed Rule is attached as Exhibit A.[14] An explanation of its effect on existing rules or orders is attached as Exhibit B.[15] A list of affected facilities is attached as Exhibit C. A summary of the ways in which climate change is harming North Carolina is attached as Exhibit D.

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[11] *Id.* at 60-61.

[12] *Id.* at 61.

[13] Stakeholders included Duke Energy, Dominion Energy, The Public Staff of the Utilities Commission, Environmental Defense Fund, North Carolina Electric Membership Corporation, Vote Solar, NC Manufacturers Alliance, Southern Environmental Law Center, Audubon Society, NC Justice Center, Sol Nation, NC Clean Energy Technology Center, NC Sustainable Energy Association, Resources for the Future, Cypress Creek Renewables, and Natural Resources Defense Council.

[14] *See* 15A N.C. Admin. Code 02I .0501(b)(1) (requiring text of proposed rule).

[15] *See* 15A NCAC 02I.0501(b)(3) (requiring statement of effect on existing rules or orders).

I. Petitions for Rulemaking

The North Carolina Administrative Procedure Act ("APA") allows any person to petition an agency to adopt a rule.[16] The statute requires a petitioner to submit the proposed text of the requested rule and a statement of effect of the requested rule change. A petitioner may submit written comments with a petition for rulemaking. An agency that is a board or commission must grant or deny a rulemaking petition within 120 days after the date the petition is submitted.[17]

The APA also directs agencies to adopt rules to establish the procedure for submitting a rulemaking petition and the procedure the agency follows in considering a rulemaking petition.[18] The EMC has adopted rules governing the "form and contents" of petitions for rulemaking.[19] EMC rules require petitioners to provide the following information: the text of the proposed rule, a statement of reasons for adoption of the proposed rule, a statement of the effect on existing rules or orders, the name(s) and address(es) of the petitioner(s), and a request to present the petition to the committee, if desired.[20] In reviewing a proposed rule, the EMC considers statutory authority to promulgate the rule, effects of the rule on programs and practices, probable costs and cost factors, and the impact of the rule on the public and regulated entities.[21] Petitioners may provide information addressing these considerations and documents and data supporting the proposed rule.[22]

II. Petitioners

There are two Petitioners: Clean Air Carolina and the North Carolina Coastal Federation.[23] Clean Air Carolina is a statewide nonprofit advocacy group based in Charlotte. Its mission is to advocate for the health of all North Carolinians by pursuing equitable and collaborative solutions that address climate change and air pollution. Using a three-pronged approach to advocacy, Clean Air Carolina partners with organizations and influencers, educates the public about the impact of air pollution, and collaborates with policymakers on issues that impact air quality. Its major initiatives include AirKeepers Citizen Science Program, Medical Advocates for Healthy Air, and Clear the Air for Kids.

Clean Air Carolina's address is:

June Blotnick, Executive Director
Clean Air Carolina
1112 Harding Place, Suite 200
Charlotte, NC 28204

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[16] N.C. Gen. Stat. § 150B-20(a).
[17] *Id.* § 150B-20(b).
[18] *Id.* § 150B-20(a).
[19] 15A NCAC 02I.0501.
[20] *Id.* 02I.0501(b).
[21] *Id.* 02I.0501(c).
[22] *Id.* 02I.0501(c).
[23] *See id.* 02I.0501(b)(4) (requiring names and addresses of petitioners).

(704) 307-9528

Mailing Address:

Clean Air Carolina
PO Box 5311
Charlotte, NC 28299

The North Carolina Coastal Federation is a non-profit organization dedicated to protecting and enhancing coastal natural resources. With 16,000 supporters, the federation represents North Carolinians who live and work in the coastal area and visit the area to enjoy the region's natural and cultural resources. For the past 38 years, the federation has taken an active role in protecting coastal water quality, natural resources, and public beach access. Since 1982, the federation has worked with coastal communities and other partners to improve and protect coastal water quality and natural resources, which are intricately tied to our coastal economy. By working to create and restore natural and productive estuarine shorelines, oyster and marsh restoration, coastal management, public access to beaches, and cleaning the estuaries of marine debris, the federation strives to support and enhance the natural environment.

North Carolina Coastal Federation's address is:

Todd Miller, Executive Director
North Carolina Coastal Federation
3609 N.C. 24 (Ocean)
Newport, NC 28570
(252) 393-8185

III. Statement of the Reasons for Adopting a Rule to Limit Carbon Pollution from the Electric Power Sector.[24]

Climate change is an urgent problem demanding immediate action. The compelling reason to adopt the Proposed Rule is the immediate need to take bold, effective, and efficient action to confront the climate crisis that threatens our state.

In December 2020, international scientists concluded we are "absolutely not" where we need to be in addressing the "emissions gap" or "where we are likely to be and where we need to be" in reducing greenhouse gas emissions to avoid the worst impacts of climate change:

> GHG concentrations in the atmosphere continue to rise, with the immediate reduction in emissions expected to have a negligible long-term impact on climate change. However, the unprecedented scale of COVID-19 economic recovery measures presents the opening for a low-carbon transition that creates the

[24] *See id.* 02I.0501(b)(2) (requiring statement of reasons for adopting proposed rule).

structural changes required for sustained emission reductions. Seizing this opening will be critical to bridging the emissions gap.[25]

Exhibit D provides an overview of how climate change is already harming human health and welfare, animal and plant life, and property in North Carolina, and how the harm and damage will increase over time. The adverse impacts of climate change to the state are also thoroughly addressed in the 2020 North Carolina Climate Risk Assessment and Resilience Plan,[26] developed by the Department of Environmental Quality. As discussed at length in Exhibit D and in the Climate Risk Assessment, rising temperatures adversely impact public health, increase heat-related illness, and increase energy burdens, with much of this impact falling on our most vulnerable citizens. Accelerating sea level rise from melting arctic ice and warmer expanding oceans increases coastal erosion and tidal flooding and inundates low-lying coastal lands. A warmer climate is projected to increase the frequency and severity of tropical storms and hurricanes and the frequency and severity of both extreme precipitation and drought. Climate change threatens both natural ecosystems and current agricultural crops and practices.

The economic impacts and costs of not addressing climate change will be staggering. The combined cost of damages from Hurricanes Floyd, Matthew, and Florence was approximately $30 billion. Hurricane Florence resulted in agricultural losses alone of $2.4 billion. Hurricane Matthew in 2016 and Florence in 2018 were so-called 1,000-year storms. With a low elevation Coastal Plain, over 300 miles of ocean shoreline, and thousands more miles of estuarine shoreline, North Carolina is particularly vulnerable to sea level rise. The frequency and severity of coastal flooding is increasing and coastal infrastructure is damaged and threatened.

Although climate change is a global problem, the solution will require a cooperative effort by governments at every level. Every state has been and increasingly will be adversely affected by climate change, and every state can and must take actions to reduce emissions of greenhouse gases that are the direct cause of global warming. It is essential that the people of North Carolina acting through our state government do our part to reduce carbon dioxide emissions and help to blunt the worst effects of climate change.

The Proposed Rule advances the most effective and efficient solution for reducing CO_2 emissions from North Carolina's electric power sector. As discussed below, the Proposed Rule establishes a declining cap on CO_2 emissions from the electric power sector in North Carolina with emissions allowances linked to the RGGI market. This section discusses this mechanism and why it is the most effective and efficient approach for reducing CO_2 emissions.

A. Carbon-reduction program

This Petition proposes joining the RGGI carbon-reduction program as the primary mechanism to reduce carbon dioxide emissions from the electric power sector in North Carolina. RGGI is a cooperative effort among eastern states extending from Maine south through Virginia

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[25] *Supra* n. 4.
[26] *Supra* n. 2.

to cap and reduce carbon dioxide emissions from the electric power sector. RGGI is composed of the individual carbon-reduction programs of its member states. To join RGGI, a state—through its governor—executes a memorandum of understanding in which it commits to set up a carbon-reduction program "substantially as reflected in the [RGGI] Model Rule that will reflect the understandings and commitments" set out in the MOU.[27] Accordingly, the state also adopts a law or regulation that is substantially similar to the RGGI Model Rule, although tailored to the state's circumstances and preferences. The Proposed Rule attached to this Petition is based closely on the RGGI Model Rule. The Commission and the Department of Environmental Quality may wish to seek input from RGGI states before finalizing the Proposed Rule.

The carbon-reduction program that the Proposed Rule establishes will work as follows. The Commission will set a statewide cap on carbon dioxide emissions from power plants. Under the Proposed Rule, the cap begins with current emissions and then declines over time to 70% below 2005 levels in 2030, consistent with the carbon-reduction goal established through the Clean Energy Plan stakeholder process.[28] The cap is also commensurate with the scope of the climate crisis because it represents doing North Carolina's share to cut emissions from the sector.

The proposed cap is lower than the RGGI states' current aggregate cap, which is set to decline to 30% below 2020 levels by 2030. There are two principal reasons for adopting a lower cap. First, it is consistent with our state's carbon-reduction goals. There is nothing in the RGGI Memorandum of Understanding that prevents a state from joining with a somewhat more stringent cap. Rather, RGGI states are primarily concerned that a state could enter with a cap that is too high, weakening the program. When a new state joins, its cap level is part of a negotiation with existing RGGI states. North Carolina should enter that negotiation advancing our state's specific carbon-reduction goal. Second, the RGGI states will enter their third "program review" in 2021, during which they will consider tightening the aggregate cap. By entering with a somewhat tighter cap North Carolina would be well-positioned for this process. Furthermore, North Carolina could seek to be grandfathered into the new aggregate cap, saving time.

To translate the cap into emissions reductions, like each state that participates in the program North Carolina will issue a declining number of CO_2 emissions allowances each year. Each allowance will represent one ton of carbon dioxide emitted. At the end of every three-year "control period," the owner or operator of a power plant must hold at least enough allowances to cover all of the plant's actual emissions during that period.[29] To ensure that emitters are on track

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[27] Reg'l Greenhouse Gas Initiative, Memorandum of Understanding (2005) [hereinafter 2005 MOU 2], https://www.rggi.org/sites/default/files/Uploads/Design-Archive/MOU/MOU_12_20_05.pdf; *see also id.* at 8 (explaining how new signatories may join). There have been two amendments to the MOU, available here: https://www.rggi.org/program-overview-and-design/design-archive/mou-model-rule.

[28] CEP 12.

[29] *See Elements of RGGI*, The Reg'l Greenhouse Gas Initiative, https://www.rggi.org/program-overview-and-design/elements (last visited Aug. 21, 2020) ("A CO2 allowance represents a limited authorization to emit one short ton of CO2 from a regulated source, as issued by a participating state."); *see* N.C. Dep't of Env'tl Qual., N.C. Clean Energy

for compliance during a control period, each emitter must hold at least half as many allowances as it would need for compliance during each of the first two calendar years in the control period. When emitters reduce emissions ahead of schedule they may "bank" their excess allowances for use in future years. This helps to create an incentive for early reductions.

To ensure that the cost of allowances does not rise too high, the state will maintain a "cost-containment reserve," which is essentially a pool of allowances that are released for auction if the market price for allowances rises above a certain threshold. Conversely, to ensure that the price of allowances does not drop too low and thereby weaken the incentive to reduce emissions, the state will maintain an "emissions containment reserve," under which the state will withhold some allowances if the market price sinks below a certain threshold.

Under the consignment auction approach, allowances must pass through the RGGI auction before an owner or operator of a carbon-emitting power plant may use them for compliance. When the Division initially issues allowances to emitters, the allowances will be "conditional," meaning emitters will "consign" them to the RGGI auction but may not use them for compliance purposes directly. At the same time, emitters must purchase all of the allowances they need for compliance through the RGGI market, either at its quarterly auctions of new allowances, known as the "primary market," or from other auction participants on the "secondary market."[30] This "consignment auction" structure prevents hoarding and ensures that the auction functions transparently and efficiently.

Under this approach, the owners or operators of carbon-emitting power plants receive the revenue from auctioning conditional allowances and incur the cost to purchase allowances needed for compliance. The North Carolina Utilities Commission will determine how the state's regulated utilities will handle revenue and recover any compliance costs. Revenue from auction of allowances will be directed to public benefit or strategic energy purposes. These utilities own and operate power plants responsible for the vast majority of carbon dioxide emissions generated in the state. Electric cooperatives and municipal utilities, as nonprofit entities, will pass revenues and any costs to their customers.

B. Advantages of the proposed carbon-reduction program.

The carbon-reduction program established in the Proposed Rule is the right policy for North Carolina to reduce its carbon dioxide emissions. First, the program will reduce emissions effectively because the declining budget guarantees emissions reductions over time. Carbon reduction was the topmost goal among stakeholders who participated in creating the Clean Energy Plan.[31] At the same time, participating in the RGGI market makes the program flexible because the owner or operator of a power plant will be able to trade allowances with a large pool

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Plan, Supporting Document Part 5: Energy & Emissions Modeling 11-12 (2019), https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/5.-Modeling-Final.pdf.

[30] *See* Potomac Economics, Annual Report on the Market for RGGI CO2 Allowances: 2019 at 7 (2020), https://www.rggi.org/sites/default/files/Uploads/Market-Monitor/Annual-Reports/MM_2019_Annual_Report.pdf.

[31] CEP 12, 49.

of other emitters. Regardless of the amount of trading that ultimately occurs, both the North Carolina budget and the RGGI aggregate cap will decline over time.

Second, the program will reduce emissions efficiently. The more participants in a market the more efficiently they will be able to reduce their cumulative emissions because among the larger number of participants there will be more whose power plants can reduce emissions cheaply. By its nature, the market creates an incentive to capture the cheapest emissions reductions available first, and when the market is larger there is more of this low-hanging fruit. As discussed below, the program will be very cost-efficient.

Finally, the carbon-reduction program is an option that is already available under North Carolina law, as discussed in the following section, and ready to set in motion now.

C. Expected results of the proposed carbon-reduction program.

Analyses prepared for the Clean Energy Plan "Recommendation A-1" carbon-policy report show that the proposed carbon-reduction program is an excellent choice for North Carolina. Technical modeling prepared for the report by the consulting firm ICF International analyzed establishment of a carbon budget for the electric power sector and joining the Regional Greenhouse Gas Initiative—a scenario almost identical to the carbon-reduction program proposed in this petition. The results show that the program will reduce carbon dioxide emissions quickly and effectively at very low cost. The results discussed below are not final but are unlikely to change significantly.

The carbon budget analyzed by ICF begins at business-as-usual emissions levels beginning at approximately 36 million metric tons in 2023 and declining to 22 million metric tons in 2030, representing the Clean Energy Plan goal of emissions 70% below 2005 levels by 2030.[32]

Modeling results show that this policy would cut carbon emissions dramatically almost immediately—by approximately 10 million tons in the first year. This is an important result because from the perspective of climate warming, the sooner a sector reduces its emission rate, the greater the reduction in its *cumulative* emissions over time, meaning earlier emissions reductions essentially are worth more. Emissions then decline more gradually through 2050. In-state emissions in 2030 appear to sit at approximately 24 million metric tons, suggesting that owners and operators in North Carolina will purchase slightly more allowances in the regional auction than the state makes available to the auction.

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[32] *See* N.C. Dep't of Envt'l Quality, N.C. Greenhouse Gas Inventory (1990-2030) 5 (2019), https://files.nc.gov/ncdeq/climate-change/ghg-inventory/GHG-Inventory-Report-FINAL.pdf (showing emissions from electric power generation of 73.27 in 2005). Under the Proposed Rule North Carolina's program will begin on January 1, 2022 rather than 2023 as modeled by ICF. The additional year will give the cap level a slightly shallower trajectory from the start of the program to the 2030 cap of 24,230,000 short tons. For consistency with other RGGI states, the Proposed Rule gives the cap in short tons rather than metric tons. A short ton is equal to 0.9072 metric tons.

The steep reduction in emissions comes almost entirely from reductions in coal-fired generation. At present, fossil fuel-burning power plants pay nothing to emit CO_2 pollution. The proposed carbon-reduction program puts a price on that pollution, determined by the market. This price increases the cost to operate a fossil fuel-burning power plant in proportion to the amount of CO_2 it emits per unit of electricity. In other words, the more carbon-intensive a generation technology less cost-competitive it will be, and burning coal is the most carbon-inefficient form of generation.

Establishing a price on CO_2 pollution also affects decisions about investments in new energy resources, making new carbon-emitting generation less appealing. As a result, modeling results show that the carbon-reduction program causes significantly less investment in new natural gas-burning generation sources by 2030. (Due to market forces, no new coal-burning generation would be anticipated even without the carbon-reduction program.)

The program would be very cost-effective, at an average cost per metric ton of CO_2 emissions reduced of $5.10. This is lower than the current allowance price and the same or lower than the escalating carbon prices used in Duke Energy's 2020 integrated resource plans.[33] In terms of price per ton of CO_2 reduced, the proposed program is likely to be the lowest cost among the major carbon-reduction policies. At the same time, it would complement other policies that the state should adopt such as a clean energy standard.

Finally, the cost-effectiveness of the program means that the cost to North Carolina utility customers would be minimal. Modeling for the Recommendation A-1 report evaluated the cost to customers under three different cases. The first is the worst case, simply passing on allowance prices to customers without taking into account the benefits of investing revenue. In this case, residential customers would see an average bill increase of less than $2 per month, declining to a *credit* of $0.87 per month in 2050. Commercial and industrial customers would see rate increases of 2.2% or less, declining to a *credit* of approximately 1% in 2050.

Moreover, the revenue from auction of allowances will likely be passed on to customers or invested in ways that benefit North Carolinians. The modeling evaluated spending all revenue on energy-efficiency measures, or spending all revenue on direct bill assistance for residential customers. Investing in energy efficiency decreases costs all around, largely because energy-efficiency measures reduce total system costs. Investing in direct bill assistance resulted in a bill *credit* to residential customers on the order of a dollar per month. The North Carolina Utilities Commission will determine how the utilities it regulates will cover costs and invest revenues associated with the proposed program.

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[33] Duke Energy Carolinas, LLC, 2020 Integrated Resource Plan 153, https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=9752b166-f870-4b0c-8469-8f791405d95c; Duke Energy Progress, LLC, 2020 Integrated Resource Plan 153, https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=425097c5-fe15-4925-b1b9-8712b8c5261b.

IV. The Commission's Authority to Limit CO_2 Pollution from the Electric Power Sector.[34]

The Air Pollution Control Act ("Act") entrusts the Commission with the authority and the duty to limit CO_2 air pollution from the electric power sector by adopting the Proposed Rule. The Commission has the duty to control air pollution.[35] As detailed in Section IV.B. below and Exhibit D, there is overwhelming evidence that CO_2 in excessive amounts is an air contaminant that causes air pollution, harming the people of North Carolina.[36] The Act authorizes the Commission to develop air quality standards[37] and emission control standards.[38] These provisions give the Commission ample authority to establish a carbon cap as an air quality standard to limit CO_2 pollution from the electric power sector. Furthermore, the Act explicitly authorizes the Commission to use emissions allowance trading.[39] The subsections that follow set out the Commission's authority to adopt the Proposed Rule in greater detail.

A. The Commission has a duty to control air pollution.

The Commission's duty to control air pollution begins with state policy. Under the North Carolina Constitution, it is the policy of the state of North Carolina "to control and limit the pollution of our air and water . . . and in every other appropriate way to preserve as a part of the common heritage of this State its forests, wetlands, estuaries, beaches, historical sites, openlands, and places of beauty."[40] The policy underlying the Air Pollution Control Act is threefold: to conserve our state's air resources, to "achieve and to maintain for the citizens of the State a total environment of superior quality," and to use our air resources in a way that is "in the best interest of all its citizens."[41]

This policy explicitly guides the Department of Environmental Quality and the Commission, which promulgates rules for the Department. The Department is charged with creating a "*complete* program of water and air conservation, pollution abatement and control and achieving a coordinated effort of pollution abatement and control with other jurisdictions."[42] Further:

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[34] *See* 15A NCAC 02I .0501(c)(1) (requiring statement of authority).

[35] N.C. Gen. Stat. § 143-215.107(a); *see* N.C. Gen. Stat. § 143B-282(a)(2) (directing EMC to adopt rules pursuant to N.C.G.S. § 143-215.107).

[36] N.C. Gen. Stat. § 143-213(2) (defining "air contaminants"); N.C. Gen. Stat. § 143-213(5) (defining "air pollution"); N.C. Gen. Stat. § 143-215.105 (incorporating definitions from § 143-213).

[37] N.C.G.S. § 143-215.107(a)(3).

[38] *Id.* § 143-215.107(a)(5).

[39] *Id.* § 143-215.107(12).

[40] N.C. Const. art. XIV, § 5.

[41] N.C. Gen. Stat. § 143-211(a); N.C.G.S. § 143-215.105 (incorporating declaration of public policy set forth in N.C. Gen. Stat. § 143-211 as applicable to Air Pollution Control Act).

[42] N.C.G.S. § 143-211(c) (emphasis added).

> Standards of water and air purity shall be designed to protect human health, to prevent injury to plant and animal life, to prevent damage to public and private property, to insure the continued enjoyment of the natural attractions of the State, to encourage the expansion of employment opportunities, to provide a permanent foundation for healthy industrial development and to secure for the people of North Carolina, now and in the future, the beneficial uses of these great natural resources.[43]

These requirements apply to the Department's efforts to control air pollution.

Under the Act, the Commission has a duty to adopt air pollution control plans and standards, and is "directed and empowered, as rapidly as possible" to control air pollution according to specifically enumerated duties.[44] The following three duties are most relevant to controlling CO_2 emissions from the electric power sector:

> (3) To develop and adopt, after proper study, air quality standards applicable to the State as a whole or to any designated area of the State as the Commission deems proper in order to promote the policies and purposes of this Article and Article 21 most effectively.[45]
>
> (5) To develop and adopt emission control standards as in the judgment of the Commission may be necessary to prohibit, abate, or control air pollution commensurate with established air quality standards. . . .[46]
>
> (12) To develop and adopt a program of incentives to promote voluntary reductions of emissions of air contaminants, including, but not limited to, emissions banking and trading and credit for voluntary early reduction of emissions.[47]

To implement these enumerated duties, the Commission has the additional "power and duty" to adopt rules for air quality standards, emission control standards, and classifications for air contaminant sources,[48] and the even broader rulemaking authority to make rules implementing any of its duties and authorities in Article 21B, Air Pollution Control.[49]

As explained below, these specific and general duties establish the Commission's authority and obligation to regulate CO_2 by establishing a cap on CO_2 emissions from the electric power sector as an air quality standard and by limiting CO_2 pollution from sources within the

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[43] *Id.*

[44] N.C.G.S. § 143-215.107(a).

[45] *Id.* §§ 143-215.107(a)(3), 143B-282(a)(2)(a.).

[46] N.C.G.S. § 143-215.107(a)(5). This requirement includes some exceptions related to toxic air pollution.

[47] *Id.*. § 143-215.107(a)(12).

[48] N.C.G.S. § 143B-282(a)(2) (directing EMC to adopt rules pursuant to N.C.G.S. § 143-215.107).

[49] N.C. Gen. Stat. § 143-215.3(a)(1).

electric power sector by emission control standards implementing the cap consisting of a regional emission allowance auction through participation in the RGGI.

B. CO_2 in excessive amounts in the atmosphere is an air contaminant, and the climate impacts caused by its long-term accumulation is air pollution.

CO_2 in excessive amounts in the atmosphere meets the statutory definition of an air contaminant that causes air pollution, triggering the Commission's duty to regulate it under North Carolina law. As defined in the Air Pollution Control Act, "air contaminants" include "gas," CO_2 is a gas.[50] Air pollution is "the presence in the outdoor atmosphere of one or more air contaminants in such quantities and duration as is or tends to be injurious to human health or welfare, to animal or plant life or to property or that interferes with the enjoyment of life or property."[51] As discussed at length in Exhibit D, there is ample evidence that, by causing climate change, CO_2 at its current levels has these negative effects. The Air Pollution Control Act directs that the Commission assure "standards of . . . air purity" that do not result in these effects.[52] Thus, CO_2 at excessive levels in the atmosphere is an air contaminant that causes air pollution and the Commission has a duty to abate the pollution.

The Commission has a duty to determine through data and studies "the degree of air contamination and air pollution in the State" and to develop plans and air quality standards to control the pollution.[53] These duties necessarily entail the authority to determine what air contaminants cause air pollution.[54] The Commission has a compelling basis on which to make the determination that CO_2 in excessive amounts in the atmosphere is a contaminant causing air pollution based on the information included with and cited in this petition, much of which was originally developed by our state government under the auspices of Executive Order No. 80.

C. The Commission has a duty to set a cap on CO_2 as an air quality standard.

Upon determining that CO_2 in excessive amounts in the atmosphere causes air pollution, the Commission has a duty to establish an air quality standard for it. The Commission must

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[50] N.C.G.S. § 143-213(2). Regulations further explain that "air pollutant" means "an air pollution agent or combination of such agents, including any physical, chemical, biological, or radioactive substance or matter emitted into or otherwise entering the ambient air." 15A N.C. Admin. Code 2D.0101(3). Carbon dioxide is an agent that enters the ambient air.

[51] N.C.G.S. § 143-213(5); N.C.G.S. § 143-215.105 (incorporating definitions from § 143-213).

[52] N.C.G.S. §143-211(c).

[53] N.C.G.S. § 143-215.107(a)(1)-(3).

[54] For example, in adopting its recent rule on methyl bromide the Commission relied on its "additional" or general power to make rules, in N.C.G.S. § 143-215.3(a)(1); on its duty and power to develop and adopt air quality standards, collect reporting, and develop and adopt emissions control standards, in N.C.G.S. § 143-215.107(a)(3)-(5); and on its organic statute, N.C.G.S. § 143B-282. Proposed Rule: 15A NCAC 02D .0546 Control Of Emissions from Log Fumigation Operations, https://files.nc.gov/ncdeq/Air%20Quality/rules/hearing/log-fumigation/2020-02-03-comment-peroid/Combined-Rules-Log-Fumigation.pdf.

"develop and adopt, after proper study, air quality standards applicable to the State as a whole . . . in order to promote the policies and purposes of this Article and Article 21 most effectively."[55] A "standard" is defined as a "measure or measures of the quality of . . . air."[56] As used in the Act, "air quality standard" is an overall goal for the quality of air while "emission control standard" is a means of achieving the goal. The Commission has the authority to establish an overall state emission tonnage limit for CO_2 (rather than an ambient concentration) as an air quality standard. This limit would mitigate harmful air pollution and reflect the unique nature of greenhouse gas concentrations which are not solely within the state's control.

An air quality standard for carbon dioxide will promote the policies and purposes of the Articles cited in subsection (3). Subsection (3) is part of Article 21B, which adopts the public policy set forth in N.C. Gen. Stat. § 143-211,[57] the declaration of public policy for Article 21. Article 21 sets forth the threefold policy underlying the Air Pollution Control Act: to conserve our state's air resources, to "achieve and to maintain for the citizens of the State a total environment of superior quality," and to use our air resources in a way that is "in the best interest of all its citizens."[58] Setting an air quality standard for carbon dioxide will serve each of these interests by improving air quality and beginning to do our state's part to confront the ongoing climate crisis.

Air quality standards also must comply with certain statutory criteria. The Commission must "consider varying local conditions and requirements and may prescribe uniform standards and plans throughout the State . . . as may be necessary and appropriate to improve ambient air quality . . . or achieve the purposes of this Article and Article 21."[59] Because carbon dioxide is a global pollutant, the standard applies at the state-wide level.

Accordingly, the Commission has the authority under subsection (3) to establish an air quality standard in the form of a cap for CO_2 emissions from the electric power sector, the major stationary source of CO_2 pollution.

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[55] N.C.G.S. § 143-215.107(a)(3). The requirement to conduct "proper study" before establishing an air quality standard simply refers to making a factual finding that the proposed air quality standard serves the purposes of the cited articles. While the Commission must make its own determination, this petition cites and includes ample evidence on which to make that determination.

[56] N.C.G.S. §143-213(16). The water quality statutes referenced in this definition of "standard" (N.C. Gen. Stat. § 143-214.1 (water quality standards) and 143-215 (effluent guidelines)) indicate that "standard" encompasses both an overall goal and the means of achieving it. *See* N.C.G.S. § 143-214.1(a), (c). "Standard" as used in the Act must thus be interpreted to include both the pollution reduction target and the means of achieving it.

[57] N.C.G.S. § 143-215.105.

[58] N.C.G.S. § 143-211(a); N.C.G.S. § 143-215.105 (incorporating declaration of public policy set forth in N.C.G.S. § 143-211 as applicable to Air Pollution Control Act).

[59] N.C.G.S. § 143-215.107(b).

D. The Commission's duty to establish a cap on CO_2 emissions from the electric power sector as an air quality standard requires emission control standards "commensurate with" the cap to abate and control the pollution.

Once it sets an air quality standard in the form of a cap for CO_2, the Commission has a duty and broad authority to establish an emission control standard that "in the judgment of the Commission may be necessary to prohibit, abate, or control" air pollution caused by carbon dioxide, "commensurate with established air quality standards."[60] The statute explicitly leaves it to the Commission's judgment to determine what form of emission control standard is necessary, extending all the way to outright prohibition. The emission control standard simply must be "commensurate" with the relevant air quality standard that the Commission has set. "Commensurate" means "equal in measure or extent."[61]

The carbon-reduction program established in the Proposed Rule, consisting of a declining statewide cap for CO_2 emissions from the electric power sector and permitting trading among emitters in the RGGI region, is commensurate with the air quality standard or CO_2 cap discussed above. Carbon dioxide is a global pollutant emitted by every sector of the economy and the proposed program on its own will not ensure that the global concentration of carbon dioxide will remain at safe levels. However, subsection (5) does not require that an emission control standard on its own achieve an air quality standard; it must be commensurate. The proposed carbon budget and auction program is commensurate with the air quality standard because it represents North Carolina doing its share to reduce CO_2 emissions from electric power use as part of a coordinated regional effort and global commitment.

The program is also commensurate with a statewide budget for CO_2 emissions from the electric power sector. The program serves as an emission control standard, making the budget enforceable through the requirement to hold allowances to emit. The program also establishes a compliance mechanism in the form of a regional allowance auction and secondary allowance trading.

The Act explicitly recognizes this approach to air pollution abatement. In authorizing the Commission to adopt a program of incentives to promote voluntary reductions of emissions of air contaminants, the Act includes emissions banking and trading and credit for voluntary early reduction of emissions."[62] The Commission used this authority when it established North Carolina's emissions banking program.[63]

The Commission has abundant authority to adopt the Proposed Rule to set a statewide cap for CO_2 emissions from the electric power sector and establish the carbon-reduction program as the emission control standard. CO_2 is an air contaminant causing air pollution when, in excessive amounts, it results in climate change. The Commission has a duty to adopt an air

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[60] N.C.G.S. § 143-215.107(a)(5).

[61] *See Amarr Co. v. J. M. Dixon, Inc.*, 5 N.C. App. 479, 481, 168 S.E.2d 475, 476 (1969) (citing Webster's Third New International Dictionary (1968)).

[62] N.C.G.S. § 143-215.107(12).

[63] 15A N.C. Admin. Code 02D .2301, .2302(10).

quality standard to address CO_2 pollution, and a cap on CO_2 emissions from the electric power sector is an authorized and appropriate standard. The Commission is required to adopt emission control standards commensurate with this air quality standard, and participation in the regional allowance auction in the RGGI region is both commensurate with achieving the declining cap of CO_2 emissions from the electric power sector and the most efficient means of reducing CO_2 emissions.

E. The Commission has authority to adopt the Proposed Rule under the North Carolina Administrative Procedure Act.

The Commission has the authority to adopt rules implementing Articles 21 (Water and Air Resources) and 21B (Air Pollution Control).[64] Articles 21 and 21B include the authorities and duties to control air pollution addressed in Section IV above.

The APA governs the rulemaking process.[65] N.C. Gen. Stat. § 150B-19.3 of the APA prohibits the Commission from adopting an environmental rule "that imposes a more restrictive standard, limitation, or requirement than those imposed by federal law or rule if a federal law or rule pertaining to the same subject matter has been adopted."[66] This limitation on rulemaking has other exceptions, including "[a] serious and unforeseen threat to the public health, safety, or welfare." Because the Proposed Rule addresses a subject matter that is not the subject of a federal law or rule, and because the Proposed Rule addresses a serious and unforeseen threat to public health and welfare, this limitation on environmental rulemaking does not apply.

1. N.C. Gen. Stat. § 150B-19.3 does not prohibit the State from adopting a cap and plan to limit CO_2 pollution from the electric power sector when there is no federal rule pertaining to the same subject matter.

Although section 150B-19.3 is part of the APA, it is the spiritual successor to three state statutes from the 1970s known as the "Hardison Amendments." Those laws required North Carolina's standards for water pollution, air pollution, and hazardous waste to be no more restrictive than the applicable federal standard. The State's contemporary understanding was that if there *was* no federal standard for an air pollutant, it could adopt its own, provided it conducted an economic assessment of the proposed rule.[67]

The legislature repealed the Hardison Amendments in 1995, but in 2011 it enacted section 150B-19.3. While some still refer to section 150B-19.3 as the "Hardison Amendment," it

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[64] N.C.G.S. §143-215.3(a)(1).
[65] N.C. Gen. Stat. §§ 150B Article 2A.
[66] N.C. Gen. Stat. § 150B-19.3.
[67] Jack Betts, "The Hardison Amendments: Time For a Reappraisal?" *North Carolina Insight* (March 1988) at 110 n.9, *available at* https://nccppr.org/wp-content/uploads/2017/02/The_Hardison_Amendments-Time_for_a_Reappraisal.pdf. *See also* Deanna Schmitt, *North Carolina Air Toxics Regulations*, 69 N.C. L. Rev. 1579, 1583 n.44 (1991) ("[W]here the federal government has not regulated, the EMC must conduct an economic impact assessment before the standards are adopted.").

differs from the former statutes in important respects. The new statute clarifies that it applies only "*if* a federal law or rule pertaining to *the same subject matter* has been adopted."[68] Because its scope is expressly limited to where a federal law or rule already applies, the statute does not prohibit the State from regulating a subject matter that lacks a federal standard.[69] Section 150B-19.3 does not prohibit the Commission from adopting as an air quality standard a cap on CO_2 emissions from the electric power sector, because there is no federal law or rule on this subject matter. Indeed, the lack of comprehensive federal greenhouse gas regulation is a reason for the State to lead. The Proposed Rule is not "more restrictive" than federal law because there *is* no comparable federal law capping carbon emissions from the power sector.[70]

Since the 1980s, there have been periodic efforts in Congress to regulate greenhouse gas emissions. All have failed. The most recent legislative attempt was a 2009 cap and trade bill, the American Clean Energy and Security Act. It passed the House of Representatives but failed in the Senate without a vote.[71] In the face of Congressional inaction, the Obama administration in 2014 introduced the Clean Power Plan, which was intended to reduce carbon emissions from electric generation roughly 32% from 2005 levels by 2030, using existing statutory authority in the Clean Air Act.[72] The Plan would have cut electric sector CO_2 emissions between 484 and 625 million tons, primarily by curtailing coal usage and increasing adoption of renewable energy.[73]

In March 2017, President Trump ordered a review of the Clean Power Plan.[74] In 2019, the Environmental Protection Agency ("EPA") repealed the Clean Power Plan and replaced it with the Affordable Clean Energy ("ACE") Rule, which proposed a standard of performance based entirely on improving heat rate efficiency within existing coal-fired power plants.[75] Heat rate improvement is an engineering approach that boosts efficiency of steam generators converting coal into electricity. The ACE Rule would reduce emissions in one way—by making existing coal plants slightly more efficient. It would not achieve or even attempt the much larger

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[68] N.C.G.S. § 150B-19.3(a) (emphasis added).

[69] Unlike the Hardison Amendments, section 150B-19.3 does not require an economic assessment if the State acts to fill a federal vacuum.

[70] As noted above, the General Assembly in enacting the Air Pollution Control Act has directed the Commission to adopt air quality standards that achieve the purpose of the Act to maintain a "complete program" of air pollution abatement and to "maintain for the citizens of the State a total environment of superior quality." N.C Gen Stat. §§ 143-211, 215.107(a)(3). These legislated declarations of public policy and the duty imposed on the Commission to enact air quality standards would also inform and guide any attempt to reconcile section 150B-19.3 in determining whether there is a comparable federal law that is more restrictive. This is unnecessary, because there is no comparable federal law.

[71] H.R. 2454, 111th Congress (2009–2010), *available at* https://www.congress.gov/bill/111th-congress/house-bill/2454.

[72] 80 Fed. Reg. 64661, 65665 (Oct. 23, 2015).

[73] Energy Information Agency, "Analysis of the Impacts of the Clean Power Plan" (May 22, 2015), *available at* https://www.eia.gov/analysis/requests/powerplants/cleanplan.

[74] Exec. Order 13783 (Mar. 28, 2017).

[75] 84 Fed. Reg. 32520 (July 9, 2019).

reductions that could be achieved by switching to cleaner energy sources and improving demand-side energy efficiency. Accordingly, the ACE Rule is expected to reduce greenhouse gas emissions by just 11 million tons by 2030.[76]

A cap on CO_2 emissions from the electric power sector as described in the Petition and implemented by the Proposed Rule is different from the ACE Rule in fundamental ways. First, it sets an upper limit on emissions, whereas the ACE Rule does not regulate CO_2 emissions, but rather plant efficiency. Second, it applies to the entire electric power sector, not just coal-powered generators. Perhaps most critically, the Proposed Rule does what the ACE Rule explicitly professes *not* to do: facilitate "generation shifting" away from coal and toward zero-emitting renewables by capping the total allowable amount of carbon emissions.[77] Underscoring these points, a senior EPA official stated that the ACE Rule "does not cap emissions, does not set a state-wide cap or a facility cap—we don't cap emissions, we limit emissions rate."[78] The Proposed Rule, by contrast, would embrace a market-based emission regulation program. It does not pertain to "the same subject matter" as any existing federal rule to curtail greenhouse gas emissions.[79]

EPA also recently proposed New Source Performance Standards for greenhouse gas emissions from power plants. These standards would set specific limits for stationary sources and would not allow any trading.[80] EPA never finalized the proposed rule, meaning the prior New Source Performance Standards from 2015 still control. As with the ACE Rule, the 2015 Standards are not the "same subject matter" as the Petition. For one thing, they cover only new sources, not the entire electric sector. And like the ACE Rule, they are performance standards based on heat rate improvements, which has long been a basis for New Source Performance Standards.[81] Similar to the ACE Rule, the 2015 Standards are aimed at improving power plant efficiency. Current federal efforts to address CO_2 emissions, including the ACE Rule and the 2015 New Source Performance Standards, touch on the same general topic, but they invoke entirely different methods to fulfill different purposes, and consequently address a different subject matter. Section 150B-19.3 does not prevent the Commission from adopting this Petition.

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[76] *Id.* at 32561.

[77] *Id.* at 32527 and 32522 (concluding that Clean Air Act section 111 does not authorize "generation shifting" as a "best system of emission reduction," and that the new rule would *not* include "[s]ubstituting increased generation from new zero-emitting renewable energy generating capacity for decreased generation from affected fossil fuel-fired generating units").

[78] Miranda Green, "Trump admin submits final rule to kill Obama Clean Power Plan," *The Hill* (June 19, 2019), *available at* https://thehill.com/policy/energy-environment/449303-trump-admin-submits-final-rule-to-kill-obama-clean-power-plan.

[79] *See* N.C.G.S. § 150B-19.3.

[80] *See* 83 Fed. Reg. 65424 (Dec. 20, 2018) (Proposed Rule).

[81] 40 C.F.R. § 60.5520(a); 40 C.F.R. Pt. 60, Subpt. TTTT, Tbls. 1, 2; 40 C.F.R. § 60.5525(a)(1); *see also Sierra Club v. Costle*, 657 F.2d 298, 384 (D.C. Cir. 1981).

2. The Commission is not bound by a prior order interpreting section 150B-19.3.

In 2018, the Commission received a petition from Hallie Turner and two other young people requesting that it adopt by rule a CO_2 emissions reduction plan with a series of benchmarks and goals to be enforced by the Department of Environmental Quality. The Commission denied the petition ("2018 Denial"). Because of the required public participation period in the APA, the Commission determined it could not adopt the proposed plan and the rules necessary to effectuate it by the July 1, 2018 deadline requested in the petition. The Commission also relied on section 150B-19.3, finding that "air emissions are already the subject of federal regulations," and "regulation of carbon dioxide and Green House Gas [sic] emissions were further regulated through the Clean Power Plan."[82] On that basis, the Commission concluded it "could not impose more restrictive standards than those imposed through federal regulations."[83]

For several reasons, the Commission should depart from this prior interpretation announced in its 2018 Denial. First, it erroneously reads "same subject matter" so broadly as to preclude *any* state regulation of air emissions. *See* 2018 Denial at 3 ("Given the existence of federal regulations related to air emissions, the Commission determined that its authority to adopt the proposed carbon dioxide plan would be subject to the limitations contained in [section] 150B-19.3."). There is some federal regulation on every conceivable environmental topic. Taking "same subject matter" to its illogical extreme, as the Commission's order did, would preclude state regulation not just in the case of a specific federal standard, but also if any federal regulation related to the same general topic—e.g. air, water, hazardous waste.[84] This would be an absurd result.

In prohibiting the Commission from creating a "more restrictive standard," section 150B-19.3 presupposes the existence of a federal standard as a basis for comparison. Here, although there are undoubtedly federal rules related to air emissions, none imposes a collective cap on greenhouse gas emissions from the entire electric sector. The Petition cannot be "more restrictive" than a nullity. The 2018 Denial was overbroad.

Second, the Commission is not bound by its prior order. Although a panel of the North Carolina Court of Appeals is bound by a prior decision of another panel addressing the same question,[85] that is not the case for administrative agencies, which can change their interpretations over time.[86] Although new interpretations that conflict with prior ones are entitled to less

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[82] Environmental Management Commission, Order Denying Petition for Rulemaking (May 7, 2018).

[83] *Id.*

[84] *See State v. Jones*, 358 N.C. 473, 484 (2004) (Refusing to take an argument to its logical end when doing so would lead to an absurd result).

[85] *In re Civil Penalty*, 324 N.C. 373, 384 (1989).

[86] *See Long Island Care at Home, Ltd. v. Coke*, 551 U.S. 158, 171 (2007) ("[A]s long as interpretive changes create no unfair surprise . . . the change in interpretation alone presents no separate ground for disregarding the Department's present interpretation."). Once a court

deference by the courts, deference only extends to statutes the agency "is charged with administering."[87] Here, the Commission is not charged with administering the APA, and no court has published a decision interpreting section 150B-19.3. The Commission can and should abandon the reasoning used in the 2018 Denial.

Third, the subject matter of the Petition diverges from federal law more so than in 2018. Unlike the Hallie Turner petition, which did not propose rules to enforce emissions reduction targets, this Petition proposes discrete collective emissions limitations and a plan with specific benchmarks. Additionally, while a state-based emissions reduction plan responding to the 2018 petition could have approximated the provisions of the federal Clean Power Plan, that Plan has been jettisoned and its replacement ACE rule only addresses heat rate performance standards. For these reasons, the Proposed Rule is even further removed from any federal provision, making the application of section 150B-19.3 even less of a concern than it was in 2018.

3. Climate change invokes the exception in section 150B-19.3 for a serious and unforeseen threat.

The Proposed Rule does not apply to the "same subject matter" as existing federal rules, but even if the Commission determines that it does, it may still adopt the Petition. Section 150B-19.3 contains an exception allowing the Commission to adopt a more restrictive standard if "adoption of the rule is required by . . . (1) A serious and unforeseen threat to the public health, safety, or welfare."[88]

Global warming is a serious threat to North Carolinians' health, safety, and welfare. In 1959, when humans began measuring the CO_2 concentration in the atmosphere, it was 315 parts per million ("ppm"), up from 280 ppm before the Industrial Revolution. In 1988, when NASA scientist James Hansen testified before Congress about the climate crisis, the concentration had grown to 350 ppm.[89] A year later, President George H.W. Bush declared that the United States would "play a leadership role in global warming," and the Intergovernmental Panel on Climate Change made its first attempt to adopt a global climate treaty at Noordwijk, the Netherlands.[90] The Noordwijk Conference failed to secure binding commitments, and the United States failed to ratify emissions targets established by the subsequent 1997 Kyoto Protocol.[91] There has never

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interprets a statute, that interpretation binds subsequent agency decisions. *Nat'l Cable & Telecomms. Ass'n v. Brand X Internet Servs.*, 545 U.S. 967, 982 (2005).

[87] *N.C. Acupuncture Licensing Bd. v. N.C. Bd. of Physical Therapy Exam'rs*, 371 N.C. 697, 700 (2018).

[88] N.C.G.S. § 150B-19.3(a)(1).

[89] Bill McKibben, "On Climate Change, We're Entirely Out of Margin," *The New Yorker* (Oct. 28, 2020), *available at* https://www.newyorker.com/news/annals-of-a-warming-planet/on-climate-change-were-entirely-out-of-margin.

[90] Nathaniel Rich, "Losing Earth: The Decade We Almost Stopped Climate Change," *The New York Times Magazine* (Aug. 1, 2018), *available at* https://www.nytimes.com/interactive/2018/08/01/magazine/climate-change-losing-earth.html.

[91] *Id.*

been another serious effort to negotiate a binding global climate treaty.[92] Meanwhile, the atmospheric CO_2 level recently topped 415 ppm and continues to rise, as does global temperature.[93] Humanity has emitted more CO_2 since 1988 than in all the years before, and Earth is now as warm as it was before the last ice age 115,000 years ago.[94] Effects of global warming are no longer distant; they appear in the news nearly every day.[95] Humanity has been running out of time to address global warming since the 1980s. Time is no longer running out—it *is* out. Against this backdrop, global warming presents an inarguably "serious" threat to the public health, safety, and welfare, within the meaning of the statute.[96]

The rapidity of the onset of impacts of climate change are serious and unforeseen. Although the effects of global warming were once perceived to be decades away, they have arrived, perhaps sooner than expected. In December 2019, the New York Times reported that those effects are accelerating, with climate-related disasters "piling up, season after season."[97] The full scope of global warming's future impacts is still uncertain, in part because it depends on "tipping points," including major loss of ice sheets and changes in ocean circulation.[98] The lead author of a study of global sea level rise stated that there is uncertainty what will happen by 2100: "If the ice sheets really start to go, things could change dramatically."[99]

Also unforeseen was the recent retreat by the federal government from international commitments and federal actions to address climate change. The Trump Administration has been antagonistic to climate science and regulation to address climate change. Among other actions, it has withdrawn from the Paris Climate Agreement,[100] has withdrawn prior Executive Orders focused on climate change,[101] has silenced or removed climate scientists at federal agencies,[102] and repealed the Clean Power Plan, the former centerpiece of federal action. With

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[92] *Id.*

[93] McKibben, *supra* n.89.

[94] *Id.*; Rich, *supra* n. 90.

[95] *See, e.g.*, Environmental Defense Fund, "The Impacts of Climate Change: A primer on the latest science" (Oct. 26, 2020), *available at* https://www.edf.org/content/impacts-climate-change.

[96] *See* N.C.G.S. § 150B-19.3(a)(1).

[97] Henry Fountain, "Climate Change Is Accelerating, Bringing World 'Dangerously Close' to Irreversible Change," *The New York Times* (Dec. 4, 2019), *available at* https://www.nytimes.com/2019/12/04/climate/climate-change-acceleration.html.

[98] Fred Pearce, "As Climate Change Worsens, A Cascade of Tipping Points Looms," Yale Environment 360 (Dec. 5, 2019), *available at* https://e360.yale.edu/features/as-climate-changes-worsens-a-cascade-of-tipping-points-looms.

[99] *Id.*

[100] Department of State, "On the U.S. Withdrawal from the Paris Agreement (Nov. 4, 2019), *available at* https://www.state.gov/on-the-u-s-withdrawal-from-the-paris-agreement/.

[101] Exec. Order 13783 § 3 (withdrawing Exec. Order 13653 and Presidential Memoranda on carbon pollution and climate change).

[102] Brad Plumer & Coral Davenport, "Science Under Attack: How Trump Is Sidelining Researchers and Their Work," *The New York Times* (Dec. 28, 2019), *available at* https://www.nytimes.com/2019/12/28/climate/trump-administration-war-on-science.html.

the scientific consensus immediate action is necessary and the growing public support for meaningful action, abandoning international commitments and federal proposals to address climate change was unfortunate and unforeseen. Global warming presents a threat to life of such magnitude that it satisfies the exception in section 150B-19.3 for serious and unforeseen threats to public health, safety, or welfare.

Adopting this Petition and enacting the Proposed Rule is well within the Commission's statutory authority. A cap and plan to limit CO_2 from the electric power sector would not run afoul of section 150B-19.3 because there is no federal law or regulation pertaining to the same subject matter. Additionally, taking action to regulate CO_2 emissions would satisfy the statute's exception for a serious and unforeseen threat to public health, safety, or welfare.

V. Request to Present Petition to the Committee.

Pursuant to 15A N.C. Admin Code 02I .0501(5) and 15A N.C. Admin. Code 2I.0502(3), and based on the information contained in this petition and the attached materials, Petitioners request the opportunity to present their viewpoint to the Air Quality Committee or other appropriate committee of the Environmental Management Commission.

Conclusion

In light of the urgent threat that climate change poses to North Carolinians, now is the time to take action to reduce CO_2 emissions in our state. The Cooper Administration has recognized this urgent need to take action through the Governor's Executive Order 80 and carbon-reduction goals in DEQ's Clean Energy Plan. The Proposed Rule represents an efficient and effective emissions-reduction strategy to achieve those goals, and one that the Commission is empowered to adopt. Accordingly, Petitioners respectfully request that the Commission grant this petition and adopt the Proposed Rule.

Respectfully submitted this the 11th day of January, 2021.

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Exhibit A

15A N.C.A.C. 2D .2800
North Carolina Carbon Dioxide (CO_2) Budget Trading Program

Table of Contents

Tables

CO2 BUDGET TRADING PROGRAM GENERAL PROVISIONS

.2801 PURPOSE.

This Section establishes the North Carolina component of the CO_2 Budget Trading Program, which is designed to reduce anthropogenic emissions of carbon dioxide (CO_2), a greenhouse gas, from CO_2 budget sources in an economically efficient manner.

.2802 DEFINITIONS.

As used in this Section, unless the context clearly requires otherwise, the following words or phrases have the following meanings:

"Account number" means the identification number given by the Division or its agent to each COATS account.

"Acid rain emissions limitation" means, as defined in 40 CFR 72.2, a limitation on emissions of sulfur dioxide (SO_2) or nitrogen oxides (NO_x) under the Acid Rain Program under Title IV of the Clean Air Act (CAA).

"Acid Rain Program" means a multi-state SO_2 and NO_x air pollution control and emission reduction program established by the Administrator under Title IV of the CAA and 40 CFR Parts 72 through 78.

"Administrator" means the Administrator of the United States Environmental Protection Agency or the Administrator's authorized representative.

"Allocate or allocation" means the determination by the Division of the number of CO_2 conditional allowances to be allocated to a CO_2 budget unit.

"Allocation year" means a calendar year for which the Division allocates or awards conditional CO_2 allowances pursuant to Rules .2819 through .2821. The allocation year of each conditional allowance is reflected in the unique identification number given to the allowance pursuant to Rule .2825(c).

"Allowance auction" or "auction" means an auction in which conditional allowances are offered for sale.

"Attribute" means a characteristic associated with electricity generated using a particular renewable fuel, such as its generation date, facility geographic location, unit vintage, emissions output, fuel, state program eligibility, or other characteristic that can be identified, accounted for, and tracked.

"Attribute credit" means a credit that represents the attributes related to one megawatt-hour of electricity generation.

"Automated Data Acquisition and Handling System" or "DAHS" means that component of the continuous emissions monitoring system (CEMS), or other emissions monitoring system approved for use under Rules .2833 through .2838, designed to interpret and convert individual output signals from pollutant concentration monitors, flow monitors, diluent gas monitors, and other component parts of the monitoring system to produce a continuous record of the measured parameters in the measurement units required by Rules .2833 through .2838.

"Billing meter" means a measurement device used to measure electric or thermal output for commercial billing under a contract. The facility selling the electric or thermal output must have different owners from the owners of the party purchasing the electric or thermal output.

"Boiler" means an enclosed fossil or other fuel-fired combustion device used to produce heat and to transfer heat to recirculating water, steam, or other medium.

"CO_2 allowance" means a limited authorization by the Division or a participating state under the CO_2 Budget Trading Program to emit up to one ton of CO_2, which is purchased from the consignment auction in accordance with Section .2841 of this Part, and which may be deposited in the compliance account of a CO_2 budget source, subject to all applicable limitations contained in this Section.

"CO_2 allowance deduction" or "deduct CO_2 allowances" means the permanent withdrawal of CO_2 allowances by the Division from a COATS compliance account to account for the number of tons of CO_2 emitted from a CO_2 budget source for a control period or an interim control period, determined in accordance with Rules .2833 to .2838, or for the forfeit or retirement of CO_2 allowances as provided by this Section.

"CO_2 Allowance Tracking System" or "COATS" means a system by which the Division or its agent records allocations, deductions, and transfers of CO_2 allowances under the CO_2 Budget Trading Program. The tracking system may also be used to track CO_2 emissions offset projects, CO_2 allowance prices, and emissions from affected sources.

"CO_2 Allowance Tracking System account" or "COATS account" means an account in the CO_2 Allowance Tracking System established by the Division or its agent for purposes of recording the allocation, holding, transferring, or deducting of CO_2 allowances.

"CO_2 allowance transfer deadline" means midnight of the March 1 occurring after the end of the relevant control period and each relevant interim control period or, if that March 1 is not a business day, midnight of the first business day thereafter, and is the deadline by which CO_2 allowances must be submitted for recordation in a CO_2 budget source's compliance account in order for the source to meet the CO_2 requirements of Rule .2805(c) for the control period and each interim control period immediately preceding such deadline.

"CO_2 allowances held" or "hold CO_2 allowances" means the CO_2 allowances recorded by the Division or its agent, or submitted to the Division or its agent for recordation, in accordance with Rules .2822 through .2832, in a COATS account.

"CO_2 authorized account representative" means, for a CO_2 budget source and each CO_2 budget unit at the source, the natural person who is authorized by the owners and operators of the source and all CO_2 budget units at the source, in accordance with Rules .2808 through .2813, to represent and legally bind each owner and operator in matters pertaining to the CO_2 Budget Trading Program or, for a general account, the natural person who is authorized, under Rules .2822 through .2829, to transfer or otherwise dispose of CO_2 allowances held in the general account.

"CO_2 authorized alternate account representative" means, for a CO_2 budget source and each CO_2 budget unit at the source, the alternate natural person who is authorized by the owners and operators of the source and all CO_2 budget units at the source, in accordance with Rules .2808 through .2813, to represent and legally bind each owner and operator in matters pertaining to the CO_2 Budget Trading Program or, for a general account, the alternate natural person who is authorized, under Rules .2822 through .2829, to transfer or otherwise dispose of CO_2 allowances held in the general account. If the CO_2 budget source is also subject to the Acid Rain Program, CSAPR NOx Annual Trading Program or CSAPR SO2 Group 1 Trading Program, then, for a CO_2 Budget Trading Program compliance account, this alternate natural person shall be the same person as the alternate designated representative as defined in the respective program.

"CO_2 budget emissions limitation" means, for a CO_2 budget source, the tonnage equivalent, in CO_2 emissions in a control period or an interim control period, of the CO_2 allowances available for compliance deduction for the source for a control period or an interim control period.

"CO_2 budget permit" means the portion of the legally binding permit issued by the Division pursuant to Subchapter 2Q (Air Quality Permits Procedures) to a CO_2 budget source or CO_2 budget unit which specifies the CO_2 Budget Trading Program requirements applicable to the CO_2 budget source, to each CO_2 budget unit at the CO_2 budget source, and to the owners and operators and the CO_2 authorized account representative of the CO_2 budget source and each CO_2 budget unit.

"CO_2 budget source" means a source that includes one or more CO_2 budget units.

"CO_2 Budget Trading Program" means the Regional Greenhouse Gas Initiative (RGGI), a multi-state CO_2 air pollution control and emissions reduction program established pursuant to this Section and corresponding regulations in other states as a means of reducing emissions of CO_2 from CO_2 budget sources.

"CO_2 budget unit" means a unit that is subject to the CO_2 Budget Trading Program requirements under Rule .2804.

"CO_2 cost containment reserve allowance" or "CO_2 CCR allowance" or "CO_2 conditional CCR allowance" means a conditional CO_2 allowance that is offered for sale at an auction for the purpose of containing the cost of CO_2 allowances. CO_2 CCR allowances offered for sale at an auction are separate from and additional to conditional CO_2 allowances allocated from the North Carolina CO_2 Budget Trading Program base and adjusted budgets. CO_2 CCR allowances are subject to all applicable limitations contained in this Rule.

"CO_2 cost containment reserve trigger price" or "CCR trigger price" means the minimum price at which CO_2 CCR allowances are offered for sale at an auction. The CCR trigger price in calendar year 2022 shall be $13.91. Each calendar year thereafter, the CCR trigger price shall be 1.07 multiplied by the CCR trigger price from the previous calendar year, rounded to the nearest whole cent, as shown in Table 1.

Table 1. CO_2 CCR Trigger Price

2022	2023	2024	2025	2026	2027	2028	2029	2030
$13.91	$14.88	$15.92	$17.03	$18.22	$19.50	$20.87	$22.33	$23.89

"CO_2 emissions containment reserve allowance" or "CO_2 ECR allowance" means a conditional allowance that is withheld by the Division or its agent for the purpose of additional emission reduction in the event of lower than anticipated emission reduction costs.

"CO_2 emissions containment reserve trigger price" or "ECR trigger price" means the price below which conditional CO_2 allowances will be withheld by the Division or its agent. The ECR trigger price in calendar year 2022 shall be $6.42. Each calendar year thereafter, the ECR trigger price shall be 1.07 multiplied by the ECR trigger price from the previous calendar year, rounded to the nearest whole cent, as shown in Table 2.

Table 2. CO_2 ECR Trigger Price

2022	2023	2024	2025	2026	2027	2028	2029	2030
$ 6.42	$ 6.87	$ 7.35	$ 7.86	$ 8.41	$ 9.00	$ 9.63	$10.30	$11.02

"CO_2 offset allowance" means a CO_2 allowance that is awarded to the sponsor of a CO_2 emissions offset project by a participating state and is subject to the relevant compliance deduction limitations of the participating state's corresponding offset regulations as a means of reducing CO_2 from CO_2 budget sources.

"Combined cycle system" means a system comprised of one or more combustion turbines, heat recovery steam generators, and steam turbines configured to improve overall efficiency of electricity generation or steam production.

"Combustion turbine" means an enclosed fossil or other fuel-fired device that is comprised of a compressor (if applicable), a combustor, and a turbine, and in which the flue gas resulting from the combustion of fuel in the combustor passes through the turbine, rotating the turbine.

"Commence commercial operation" means, with regard to a unit that serves a generator, to have begun to produce steam, gas, or other heated medium used to generate electricity for sale or use, including test generation. For a unit that is a CO_2 budget unit under Rule .2804 on the date the unit commences commercial operation, such date shall remain the unit's date of commencement of commercial operation even if the unit is subsequently modified, reconstructed, or repowered. For a unit that is not a CO_2 budget unit under Rule .2804 on the date the unit commences commercial operation, the date the unit becomes a CO_2 budget unit under Rule .2804 shall be the unit's date of commencement of commercial operation, and such date shall remain the unit's date of commencement of commercial operation even if the unit is subsequently modified, reconstructed, or repowered.

"Commence operation" means to begin any mechanical, chemical, or electronic process, including, with regard to a unit, start-up of a unit's combustion chamber. For a unit that is a CO_2 budget unit under Rule .2804 on the date of commencement of operation, such date shall remain the unit's date of commencement of operation even if the unit is subsequently modified, reconstructed, or repowered. For a unit that is not a CO_2 budget unit under Rule .2804 on the date of commencement of operation, the date the unit becomes a CO_2 budget unit under Rule .2804 shall be the unit's date of commencement of operation, and such date shall remain the unit's date of commencement of commercial operation even if the unit is subsequently modified, reconstructed, or repowered.

"Compliance account" means a COATS account, established by the Division or its agent for a CO_2 budget source under Rules .2822 through .2829, in which are held CO_2 allowances available for use by the source for a control period and each interim control period for the purpose of meeting the CO_2 requirements of Rule .2805(c).

"Conditional allowance" means an allowance allocated by the department to CO_2 budget sources. A conditional allowance shall be consigned by the entity to whom it is allocated to the consignment auction as specified under Rules .2839 through .2841, only after which the conditional allowance becomes a CO_2 allowance that may be used for compliance purposes.

"Conditional allowance account" means a general COATS account established by the department for CO_2 budget sources where conditional allowances allocated to CO_2 budget sources are held until auction.

"Conditional CCR allowance" means a CCR allowance that may be offered for sale when the CCR is triggered. If any CCR allowances are unsold, they shall be returned to the CCR account and may be offered for sale in future auctions during the same year.

"Consignment auction" or "auction" means the CO_2 auction conducted on a quarterly basis by the Division or its agent, in which CO_2 budget sources are allocated a share of conditional allowances by the Division that CO_2 budget sources consign into the auction, and auction revenue is returned to CO_2 budget sources in accordance with procedures established by the Division.

"Continuous Emissions Monitoring System" or "CEMS" means the equipment required under Rules .2833 through .2838 to sample, analyze, measure, and provide, by means of readings recorded at least once every 15 minutes (using an automated data acquisition and handling system (DAHS)), a permanent record of stack gas volumetric flow rate, stack gas moisture content, and O_2 or CO_2 concentration (as applicable), in a manner consistent with 40 CFR Part 75 and Rules .2833 through .2838. The following systems are types of CEMS required under Rules .2833 through .2838.

(1) A flow monitoring system, consisting of a stack flow rate monitor and an automated DAHS and providing a permanent, continuous record of stack gas volumetric flow rate, in standard cubic feet per hour;

(2) A NOx emissions rate (or NO_X-diluent) monitoring system, consisting of a NO_X pollutant concentration monitor, a diluent gas (CO_2 or O_2) monitor, and an automated DAHS and providing a permanent, continuous record of NO_X concentration, in parts per million; diluent gas concentration, in percent CO_2 or O_2; and NO_X emissions rate, in pounds per million British thermal units (lb/MMBtu);

(3) A moisture monitoring system, asdefined in 40 CFR 75.11(b)(2) and providing a permanent, continuous record of the stack gas moisture content, in percent H_2O;

(4) A CO_2 monitoring system, consisting of a CO_2 pollutant concentration monitor (or an O_2 monitor plus suitable mathematical equations from which the CO_2 concentration is derived) and anautomated DAHS and providing a permanent, continuous record of CO_2 emissions, in percent CO_2; and

(5) An O_2 monitoring system, consisting of an O_2 concentration monitor and an automated DAHS and providing a permanent, continuous record of O_2, in percent O_2.

"Control period" means a three-calendar-year time period. The fifth control period is from January 1, 2021, to December 31, 2023, inclusive. North Carolina's participation in the CO_2 Budget Trading Program begins on January 1, 2022, during the fifth control period. Each of the first two calendar years of each control period is an interim control period, as defined below.

"Cross State Air Pollution Rule (CSAPR) NO_X Annual Trading Program" means a multi-state NOX air pollution control and emission reduction program established in accordance with subpart AAAAA of 40 CFR Part 97 and 40 CFR 52.38(a) (including such a program that is revised in a SIP revision approved by the Administrator under 40 CFR 52.38(a)(3) or (4) or that is established in a SIP revision approved by the Administrator under 40 CFR 52.38(a)(5)), as a means of mitigating interstate transport of fine particulates and NO_X.

"Cross State Air Pollution Rule (CSAPR) SO_2 Group 1 Trading Program" means a multi-state SO_2 air pollution control and emission reduction program established in accordance with subpart

CCCCC of 40 CFR Part 97 and 40 CFR 52.39(a), (b), (d) through (f), (j), and (k) (including such a program that is revised in a SIP revision approved by the Administrator under 40 CFR 52.39(d) or (e) or that is established in a SIP revision approved by the Administrator under 40 CFR 52.39(f)), as a means of mitigating interstate transport of fine particulates and SO_2.

"Department" means the North Carolina Department of Environmental Quality.

"Division" means the Department's Division of Air Quality.

"Excess emissions" means any tonnage of CO_2 emitted by a CO_2 budget source during a control period or an interim control period that exceeds the CO_2 budget emissions limitation for the source.

"Excess interim emissions" means any tonnage of CO_2 emitted by a CO_2 budget source during an interim control period multiplied by 0.50 that exceeds the CO_2 budget emissions limitation for the source.

"Fossil fuel" means natural gas, petroleum, coal, or any form of solid, liquid, or gaseous fuel derived from such material.

"Fossil fuel-fired" means the combustion of fossil fuel, alone or in combination with any other fuel, where the fossil fuel combusted comprises, or is projected to comprise, more than 5% of the annual heat input on a Btu basis during any year.

"General account" means a COATS account, established under Rules .2822 through .2829, that is not a compliance account.

"Gross generation" means the electrical output (in megawatt equivalents, or MWe) at the terminals of the generator.

"Interim control period" means the one-calendar-year time period, during each of the first and second calendar years of each three-year control period. Each successive three-year control period will have two interim control periods, comprised of each of the first two calendar years of that control period.

"Life-of-the-unit contractual arrangement" means a unit participation power sales agreement under which a customer reserves, or is entitled to receive, a specified amount or percentage of nameplate capacity and/or associated energy from any specified unit pursuant to a contract:

(1) For the life of the unit;

(2) For a cumulative term of no less than 30 years, including a contract that permit an election for early termination; or

(3) For a period equal to or greater than 25 years or 70% of the economic useful life of the unit determined as of the time the unit is built, with option rights to

purchase or release some portion of the nameplate capacity and associated energy generated by the unit at the end of the period.

"Maximum potential hourly heat input" means an hourly heat input used for reporting purposes when a unit lacks certified monitors to report heat input. If the unit intends to use appendix D of 40 CFR Part 75 to report heat input, this value shall be calculated, in accordance with 40 CFR Part 75, using the maximum fuel flow rate and the maximum gross calorific value. If the unit intends to use a flow monitor and a diluent gas monitor, this value shall be reported, in accordance with 40 CFR Part 75, using the maximum potential flow rate and either the maximum CO_2 concentration (in percent CO_2) or the minimum O_2 concentration (in percent O_2).

"Minimum reserve price" means, in calendar year 2021, $2.38. Each calendar year thereafter, the minimum reserve price shall be 1.025 multiplied by the minimum reserve price from the previous calendar year, rounded to the nearest whole cent.

"Monitoring system" means any monitoring system that meets the requirements of Rules .2833 through .2838, including a CEMS, an excepted monitoring system, or an alternative monitoring system.

"Nameplate capacity" means the maximum electrical output (in MWe) that a generator can sustain over a specified period of time when not restricted by seasonal or other de-ratings as measured in accordance with the United States Department of Energy standards.

"Net-electric output" means the amount of gross generation in megawatt-hours (MWh) the generator(s) produce (including, but not limited to, output from steam turbine(s), combustion turbine(s), and gas expander(s)), as measured at the generator terminals, less the electricity used to operate the plant (i.e., auxiliary loads); such uses include fuel handling equipment, pumps, fans, pollution control equipment, other electricity needs, and transformer losses as measured at the transmission side of the step up transformer (e.g., the point of sale).

"Non-CO_2 budget unit" means a unit that does not meet the applicability criteria of Rule .2804.

"North Carolina CO_2 Budget Trading Program adjusted budget" means an adjusted budget determined in accordance with Rule .2821 and is the annual amount of CO_2 tons available in North Carolina for allocation in a given allocation year, in accordance with the CO_2 Budget Trading Program. Conditional CCR allowances offered for sale at an auction are separate from and additional to conditional allowances allocated from the North Carolina CO_2 Budget Trading Program adjusted budget.

"North Carolina CO_2 Budget Trading Program base budget" means the budget specified in Rule .2819. Conditional CCR allowances offered for sale at an auction are separate from and additional to conditional allowances allocated from the North Carolina CO_2 Budget Trading Program base budget.

"Operator" means any person who operates, controls, or supervises a CO_2 budget unit or a CO_2 budget source and includes, but is not limited to, any holding company, utility system, or plant manager of such a unit or source.

"Owner" means any of the following persons:

(1) Any holder of any portion of the legal or equitable title in a CO_2 budget unit;

(2) Any holder of a leasehold interest in a CO_2 budget unit, other than a passive lessor, or a person who has an equitable interest through such lessor, whose rental payments are not based, either directly or indirectly, upon the revenues or income from the CO_2 budget unit;

(3) Any purchaser of power from a CO_2 budget unit under a life-of-the-unit contractual arrangement in which the purchaser controls the dispatch of the unit; or

(4) With respect to any general account, any person who has an ownership interest with respect to the CO_2 allowances held in the general account and who is subject to the binding agreement for the CO_2 authorized account representative to represent that person's ownership interest with respect to the CO_2 allowances.

"Participating state" means a state that participates in the CO_2 Budget Trading Program.

"Public benefit or strategic energy purpose" means to encourage and foster the following: promotion of energy efficiency measures, direct mitigation of electricity ratepayer impacts attributable to the implementation of the CO2 Budget Trading Program, projects to improve community resilience from the effects of climate change, reduction of energy burdens faced by low-income communities, reduction of environmental injustices, and promotion of zero-carbon-emitting renewable energy technologies.

"Receive" or "receipt of" means, when referring to the Division or its agent, to come into possession of a document, information, or correspondence (whether sent in writing or by authorized electronic transmission), as indicated in an official correspondence log, or by a notation made on the document, information, or correspondence, by the Division or its agent in the regular course of business.

"Recordation," "record," or "recorded" means, with regard to conditional allowances or CO_2 allowances, the movement of conditional allowances or CO_2 allowances by the Division or its agent from one COATS account to another, for purposes of allocation, transfer, or deduction.

"Reserve price" means the minimum acceptable price for each CO_2 allowance in a specific auction. The reserve price at an auction is either the minimum reserve price or the CCR trigger price, as specified in Rules .2839 through .2841.

"Serial number" means, when referring to CO_2 allowances, the unique identification number assigned to each CO_2 allowance by the Division or its agent under Rule .2825(c).

"Source" means any governmental, institutional, commercial, or industrial structure, installation, plant, building, or facility that emits or has the potential to emit any air pollutant. A source, including a source with multiple units, shall be considered a single facility.

"State" means a state of the United States of America, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, and American Samoa and includes the Commonwealth of the Northern Mariana Islands.

"Submit" or "serve" means to send or transmit a document, information, or correspondence to the person specified in accordance with the applicable regulation:

(1) In person;

(2) By United States Postal Service; or

(3) By other means of dispatch or transmission and delivery.

Compliance with any "submission," "service," or "mailing" deadline shall be determined by the date of dispatch, transmission, or mailing and not the date of receipt.

"Ton" or "tonnage" means any short ton, or 2,000 pounds. For the purpose of determining compliance with the CO_2 requirements of Rule .2805(c), total tons for a control period and each interim control period shall be calculated as the sum of all recorded hourly emissions (or the tonnage equivalent of the recorded hourly emissions rates) in accordance with Rules .2833 through .2838, with any remaining fraction of a ton equal to or greater than 0.50 ton deemed to equal one ton and any fraction of a ton less than 0.50 ton deemed to equal zero tons. A short ton is equal to 0.9072 metric tons.

"Unit" means any stationary boiler, combustion turbine, or combined cycle system that emits CO_2 directly as a condition of its operation.

"Unit operating day" means a calendar day in which a unit combusts any fuel.

"Unsold CO_2 allowance" means a CO_2 allowance that has been made available for sale in an auction conducted by the Division or its agent, but not sold.

.2803 MEASUREMENTS, ABBREVIATIONS AND ACRONYMS.

Measurements, abbreviations, and acronyms used in this Section are defined as follows:

(1) Btu: British thermal unit.

(2) CAA: federal Clean Air Act.

(3) CCR: cost containment reserve.

(4) CEMS: Continuous Emissions Monitoring System.

(5) COATS: CO_2 Allowance Tracking System.

(6) CO_2: carbon dioxide.

(7) DAHS: Data Acquisition and Handling System.

(8) H2O: water.

(9) hr: hour.

(10) lb: pound.

(11) LME: low mass emissions.

(12) MMBtu: one million British thermal units.

(13) MW: megawatt.

(14) MWe: megawatt electrical.

(15) MWh: megawatt hour.

(16) NOx: nitrogen oxides.

(17) O2: oxygen.

(18) ORIS: Office of Regulatory Information Systems.

(19) QA/QC: quality assurance/quality control.

(20) ppm: parts per million.

(21) SO2: sulfur dioxide.

.2804 APPLICABILITY.

Units. Any unit that, at any time on or after January 1, 2005, serves an electricity generator with a nameplate capacity equal to or greater than 25 MWe shall be a CO_2 budget unit, and any source that includes one or more such units shall be a CO_2 budget source, subject to the requirements of this Rule.

.2805 STANDARD REQUIREMENTS.

(a) *Permit requirements.*

(1) The CO_2 authorized account representative of each CO_2 budget source required to have an operating permit pursuant to 15A N.C.A.C.

Subchapter 2Q and each CO_2 budget unit required to have an operating permit pursuant to 15A N.C.A.C. Subchapter 2Q shall:

(A) Submit to the Division a complete CO_2 budget permit application under Rule .2816 in accordance with the deadlines specified in Rule .2815; and

(B) Submit in a timely manner any supplemental information that the Division determines is necessary in order to review the CO_2 budget permit application and issue or deny a CO_2 budget permit.

(2) The owner and operator of each CO_2 budget source required to have an operating permit pursuant to 15A N.C.A.C. Subchapter 2Q, and each CO_2 budget unit required to have an operating permit pursuant to 15A N.C.A.C. Subchapter 2Q for the source, shall have a CO_2 budget permit and operate the CO_2 budget source and the CO_2 budget unit at the source in compliance with such CO_2 budget permit.

(b) *Monitoring requirements.*

(1) The owner and operator and, to the extent applicable, the CO_2 authorized account representative of each CO_2 budget source and each CO_2 budget unit at the source shall comply with the monitoring requirements of Rules .2833 through .2838.

(2) The emissions measurements recorded and reported in accordance with Rules .2833 through .2838 shall be used to determine compliance by the unit with the CO_2 requirements under Paragraph (c) of this section.

(c) *CO_2 requirements.*

(1) The owners and operators of each CO_2 budget source and each CO_2 budget unit at the source shall hold CO_2 allowances available for compliance deductions under Rule .2826, as of the CO_2 allowance transfer deadline, in the source's compliance account in an amount not less than the total CO_2 emissions for the control period from all CO_2 budget units at the source, less the CO_2 allowances deducted to meet the requirements of Subparagraph (c)(2), with respect to the previous two interim control periods, as determined in accordance with Rules .2822 through .2829 and Rules.2833 through .2838.

(2) The owners and operators of each CO_2 budget source and each CO_2 budget unit at the source shall hold CO_2 allowances available for compliance deductions under Rule .2826, as of the CO_2 allowance transfer deadline, in the source's compliance account in an amount not less than the total CO_2 emissions for the interim control period from all CO_2 budget

units at the source multiplied by 0.50, as determined in accordance with Rules .2822 through .2829 and Rules .2833 through .2838.

(3) Each ton of CO_2 emitted in excess of the CO_2 budget emissions limitation for a control period shall constitute a separate violation of this Section and applicable state law.

(4) Each ton of excess interim emissions shall constitute a separate violation of this Section and applicable state law.

(5) A CO_2 budget unit shall be subject to the requirements under Subparagraph (c)(1) of this Rule starting on the later of January 1, 2022 or the date on which the unit commences operation.

(6) CO_2 allowances shall be held in, deducted from, or transferred among COATS accounts in accordance with Rules .2819 through .2821, Rules .2822 through .2829, and Rules .2830 through .2832.

(7) A CO_2 allowance shall not be deducted, in order to comply with the requirements under Subparagraph (c)(1) or (2) of this Rule, for a control period or interim control period that ends prior to the year for which the CO_2 allowance was allocated (as a conditional allowance). A CO_2 offset allowance shall not be deducted, in order to comply with the requirements under Subparagraph (c)(1) or (2) of this Rule, beyond the applicable percent limitations set out in 15A N.C.A.C. 2D .2826(a)(3).

(8) A CO_2 allowance under the CO_2 Budget Trading Program is a limited authorization by the Division or a participating state to emit one ton of CO_2 in accordance with the CO_2 Budget Trading Program. No provision of the CO_2 Budget Trading Program, the CO_2 budget permit application, or the CO_2 budget permit or any provision of law shall be construed to limit the authority of the Division or a participating state to terminate or limit such authorization.

(9) A CO_2 allowance under the CO_2 Budget Trading Program does not constitute a property right.

(d) *Excess emissions requirements.*

The owners and operators of a CO_2 budget source that has excess emissions in any control period, or excess interim emissions in any interim control period, shall:

(1) Forfeit the CO_2 allowances required for deduction under 15 N.C.A.C. 2D .2826(d)(1), provided CO_2 offset allowances may not be used to cover any part of such excess emissions; and

(2) Pay any fine, penalty, or assessment or comply with any other remedy imposed under 15 N.C.A.C. 2D .2826(d)(2).

(e) *Recordkeeping and reporting requirements.*

(1) Unless otherwise provided, the owners and operators of the CO_2 budget source and each CO_2 budget unit at the source shall keep on site at the source each of the following documents for a period of 10 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 10 years, in writing by the Division.

(A) The account certificate of representation for the CO_2 authorized account representative for the CO_2 budget source and each CO_2 budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with Rule .2811, provided that the certificate and documents shall be retained on site at the source beyond such 10-year period until such documents are superseded because of the submission of a new account certificate of representation changing the CO_2 authorized account representative.

(B) All emissions monitoring information, in accordance with Rules .2833 through .2838 and 40 CFR 75.57.

(C) Copies of all reports, compliance certifications, and other submissions and all records made or required under the CO_2 Budget Trading Program.

(D) Copies of all documents used to complete a CO_2 budget permit application and any other submission under the CO_2 Budget Trading Program or to demonstrate compliance with the requirements of the CO_2 Budget Trading Program.

(2) The CO_2 authorized account representative of a CO_2 budget source and each CO_2 budget unit at the source shall submit the reports and compliance certifications required under this Section or the CO_2 Budget Trading Program, including those under Rules .2817 through .2818.

(f) *Liability.*

(1) No permit revision shall excuse any violation of the requirements of the CO_2 Budget Trading Program that occurs prior to the date that the revision takes effect.

(2) Any provision of this Section or the CO_2 Budget Trading Program that applies to a CO_2 budget source (including a provision applicable to the

CO_2 authorized account representative of a CO_2 budget source) shall also apply to the owners and operators of such source and of each CO_2 budget unit at the source.

(3) Any provision of this Section or the CO_2 Budget Trading Program that applies to a CO_2 budget unit (including a provision applicable to the CO_2 authorized account representative of a CO_2 budget unit) shall also apply to the owners and operators of such unit.

(g) *Effect on other authorities.*

No provision of this Section, the CO_2 Budget Trading Program, a CO_2 budget permit application, or a CO_2 budget permit shall be construed as exempting or excluding the owners or operators and, to the extent applicable, the CO_2 authorized account representative of the CO_2 budget source or CO_2 budget unit, from compliance with any other provisions of applicable State or federal law, rules, regulations, or orders. The permit requirements of Rules .2814 through .2816 are additional to all related requirements in Section .300 of Subchapter 2Q of Title 15A of the North Carolina Administrative Code, and are not limited by those requirements in any way.

.2806 COMPUTATION OF TIME.

(a) Unless otherwise stated, any time period scheduled, under this Section or the CO_2 Budget Trading Program, to begin on the occurrence of an act or event shall begin on the day the act or event occurs.

(b) Unless otherwise stated, any time period scheduled, under this Section or the CO_2 Budget Trading Program, to begin before the occurrence of an act or event shall be computed so that the period ends the day before the act or event occurs.

(c) Unless otherwise stated, if the final day of any time period, under this Section or the CO_2 Budget Trading Program, falls on a weekend or a participating state or federal holiday, the time period shall be extended to the next business day.

.2807 SEVERABILITY.

If any provision of this Section, or its application to any particular person or circumstances, is held invalid or unenforceable to any extent, the remainder of this Section, and the application thereof to other persons or circumstances, shall not be affected thereby.

CO2 AUTHORIZED ACCOUNT REPRESENTATIVE FOR A CO2 BUDGET SOURCE

.2808 AUTHORIZATION AND RESPONSIBILITIES OF THE CO2 AUTHORIZED ACCOUNT REPRESENTATIVE FOR A CO_2 BUDGET SOURCE.

(a) Except as provided under Rule .2809, each CO_2 budget source, including all CO_2 budget units at the source, shall have one and only one CO_2 authorized account representative, with regard to all matters under this Section and the CO_2 Budget Trading Program concerning the source or any CO_2 budget unit at the source.

(b) The CO_2 authorized account representative of the CO_2 budget source shall be selected by an agreement binding on the owners and operators of the source and all CO_2 budget units at the source and shall act in accordance with the certificate of representation under Rule .2811.

(c) Upon receipt by the Division or its agent of a complete account certificate of representation under Rule .2811, the CO_2 authorized account representative of the source shall represent and, by his or her representations, actions, inactions, or submissions, legally bind each owner and operator of the CO_2 budget source represented and each CO_2 budget unit at the source in all matters pertaining to this Section or the CO_2 Budget Trading Program, notwithstanding any agreement between the CO_2 authorized account representative and such owner and operator. The owners and operators shall be bound by any decision or order issued to the CO_2 authorized account representative by the Division or a court regarding the source or unit.

(d) No CO_2 budget permit shall be issued, and no COATS account shall be established for a CO_2 budget source, until the Division or its agent has received a complete account certificate of representation under Rule .2811 for a CO_2 authorized account representative of the source and the CO_2 budget units at the source.

(e) Each submission under this Section or the CO_2 Budget Trading Program shall be submitted, signed, and certified by the CO_2 authorized account representative for each CO_2 budget source on behalf of which the submission is made. Each such submission shall include the following certification statement by the CO_2 authorized account representative:

"I am authorized to make this submission on behalf of the owners and operators of the CO2 budget sources or CO2 budget units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment."

(f) The Division or its agent will accept or act on a submission made on behalf of an owner or operator of a CO_2 budget source or a CO_2 budget unit only if the submission has been made, signed, and certified in accordance with Paragraph (e) of this Rule.

.2809 CO_2 AUTHORIZED ALTERNATE ACCOUNT REPRESENTATIVE.

(a) An account certificate of representation may designate one and only one CO_2 authorized alternate account representative who may act on behalf of the CO_2 authorized account representative. The agreement by which the CO_2 authorized alternate account representative is selected shall include a procedure for authorizing the CO_2 authorized

alternate account representative to act in lieu of the CO_2 authorized account representative.

(b) Upon receipt by the Division or its agent of a complete account certificate of representation under Rule .2811, any representation, action, inaction, or submission by the CO_2 authorized alternate account representative shall be deemed to be a representation, action, inaction, or submission by the CO_2 authorized account representative.

(c) Except in this section and 15 N.C.A.C. 2D .2808(a), Rule .2810, Rule .2811, and Rule .2823, whenever the term "CO_2 authorized account representative" is used in this Section, the term shall be construed to include the CO_2 authorized alternate account representative.

.2810 CHANGING THE CO_2 AUTHORIZED ACCOUNT REPRESENTATIVES AND THE CO_2 AUTHORIZED ALTERNATE ACCOUNT REPRESENTATIVE; CHANGES IN THE OWNER AND OPERATORS.

(a) *Changing the CO_2 authorized account representative.*

The CO_2 authorized account representative may be changed at any time upon receipt by the Division or its agent of a superseding complete account certificate of representation under Rule .2811. Notwithstanding any such change, all representations, actions, inactions, and submissions by the previous CO_2 authorized account representative or CO_2 authorized alternate account representative prior to the time and date when the Division or its agent receives the superseding account certificate of representation shall be binding on the new CO_2 authorized account representative and the owners and operators of the CO_2 budget source and the CO_2 budget units at the source.

(b) *Changing the CO_2 authorized alternate account representative.*

The CO_2 authorized alternate account representative may be changed at any time upon receipt by the Division or its agent of a superseding complete account certificate of representation under Rule .2811. Notwithstanding any such change, all representations, actions, inactions, and submissions by the previous or CO_2 authorized alternate account representative or CO_2 authorized alternate account representative prior to the time and date when the Division or its agent receives the superseding account certificate of representation shall be binding on the new CO_2 authorized alternate account representative and the owners and operators of the CO_2 budget source and the CO_2 budget units at the source.

(c) *Changes in the owners and operators.*

(1) In the event a new owner or operator of a CO_2 budget source or a CO_2 budget unit is not included in the list of owners and operators submitted in the account certificate of representation, such new owner or operator shall be deemed to be subject to and bound by the account certificate of representation, the representations, actions, inactions, and submissions of

the CO_2 authorized account representative and any CO_2 authorized alternate account representative of the source or unit, and the decisions, orders, actions, and inactions of the Division, as if the new owner or operator were included in such list.

(2) Within 30 days following any change in the owners and operators of a CO_2 budget source or a CO_2 budget unit, including the addition of a new owner or operator, the CO_2 authorized account representative or CO_2 authorized alternate account representative shall submit a revision to the account certificate of representation amending the list of owners and operators to include the change.

.2811 ACCOUNT CERTIFICATE OF REPRESENTATION.

(a) A complete account certificate of representation for a CO_2 authorized account representative or a CO_2 authorized alternate account representative shall include the following elements in a format prescribed by the Division or its agent:

(1) Identification of the CO_2 budget source and each CO_2 budget unit at the source for which the account certificate of representation is submitted;

(2) The name, address, email address, and telephone number of the CO_2 authorized account representative and any CO_2 authorized alternate account representative;

(3) A list of the owners and operators of the CO_2 budget source and of the owners and operators of each CO_2 budget unit at the source;

(4) The following certification statement by the CO_2 authorized account representative and any CO_2 authorized alternate account representative:

"I certify that I was selected as the CO_2 authorized account representative or CO_2 authorized alternate account representative, as applicable, by an agreement binding on the owners and operators of the CO_2 budget source and the owners and operators of each CO_2 budget unit at the source. I certify that I have all the necessary authority to carry out my duties and responsibilities under the CO_2 Budget Trading Program on behalf of the owners and operatorsof the CO_2 budget source and the owners and operators of each CO_2 budget unit at the source and that each such owner and operator shall be fully bound by my representations, actions, inactions, or submissions and by any decision or order issued to me by the Division or a court regarding the source or unit."; and

(5) The signature of the CO_2 authorized account representative and any CO_2 authorized alternate account representative and the dates signed.

(b) Unless otherwise required by the Division or its agent, documents of agreement referred to in the account certificate of representation shall not be submitted to the Division or its agent. Neither the Division nor its agent shall be under any obligation to review or evaluate the sufficiency of such documents, if submitted.

.2812 OBJECTIONS CONCERNING THE CO_2 AUTHORIZED ACCOUNT REPRESENTATIVE.

(a) Once a complete account certificate of representation under Rule .2811 has been submitted and received, the Division and, if applicable, its agent will rely on the account certificate of representation unless and until the Division or its agent receives a superseding complete account certificate of representation under Rule .2811.

(b) Except as provided in 15A N.C.A.C. 2D .2810(a) or (b), no objection or other communication submitted to the Division or its agent concerning the authorization of, or any representation, action, inaction, or submission of, the CO_2 authorized account representative shall affect any representation, action, inaction, or submission of the CO_2 authorized account representative or the finality of any decision or order by the Division or its agent under this Section or the CO_2 Budget Trading Program.

(c) Neither the Division nor its agent will adjudicate any private legal dispute concerning the authorization of, or any representation, action, inaction, or submission of, any CO_2 authorized account representative, including private legal disputes concerning the proceeds of CO_2 allowance transfers.

.2813 DELEGATION BY CO_2 AUTHORIZED ACCOUNT REPRESENTATIVE AND CO_2 AUTHORIZED ALTERNATE ACCOUNT REPRESENTATIVE.

(a) A CO_2 authorized account representative may delegate, to one or more natural persons, his or her authority to make an electronic submission to the Division or its agent under this Section.

(b) A CO_2 authorized alternate account representative may delegate, to one or more natural persons, his or her authority to make an electronic submission to the Division or its agent under this Section.

(c) To delegate authority to make an electronic submission to the Division or its agent in accordance with Paragraphs (a) and (b) of this Rule, the CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, must submit to the Division or its agent a notice of delegation, in a format prescribed by the Division that includes the following elements:

(1) The name, address, email address, and telephone number of such CO_2 authorized account representative or CO_2 authorized alternate account representative;

(2) The name, address, email address, and telephone number of each such natural person, herein referred to as the "electronic submission agent";

(3) For each such natural person, a list of the type of electronic submissions under Paragraph (a) or (b) of this Rule for which authority is delegated to him or her; and

(4) The following certification statements by such CO_2 authorized account representative or CO_2 authorized alternate account representative:

(A) *"I agree that any electronic submission to the Division or its agent that is by a natural person identified in this notice of delegation and that is of a type listed for such electronic submission agent in this notice of delegation and that is made when I am a CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, and before this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2813(d) shall be deemed to be an electronic submission by me."*

(B) *"Until this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2813(d), I agree to maintain an email account and to notify the Division or its agent immediately of any change in my email address unless all delegation authority by me under Rule .2813 isterminated."*

(d) A notice of delegation submitted under Paragraph (c) of this Rule shall be effective, with regard to the CO_2 authorized account representative or CO_2 authorized alternate account representative identified in such notice, upon receipt of such notice by the Division or its agent and until receipt by the Division or its agent of a superseding notice of delegation by such CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate. The superseding notice of delegation may replace any previously identified electronic submission agent, add a new electronic submission agent, or eliminate entirely any delegation of authority.

(e) Any electronic submission covered by the certification in Part (c)(4)(A) of this Rule and made in accordance with a notice of delegation effective under Paragraph (d) of this Rule shall be deemed to be an electronic submission by the CO_2 authorized account representative or CO_2 authorized alternate account representative submitting such notice of delegation.

(f) A CO_2 authorized account representative may delegate, to one or more natural persons, his or her authority to review information in COATS under this Section.

(g) A CO_2 authorized alternate account representative may delegate, to one or more natural persons, his or her authority to review information in COATS under this Section.

(h) To delegate authority to review information in COATS in accordance with Paragraphs (f) and (g) of this Rule, the CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, must submit to the Division or its agent a notice of delegation, in a format prescribed by the Division that includes the following elements:

(1) The name, address, email address, and telephone number of such CO_2 authorized account representative or CO_2 authorized alternate account representative;

(2) The name, address, email address, and telephone number of each such natural person, herein referred to as the "reviewer";

(3) For each such natural person, a list of the type of information under Paragraph (f) or (g) of this Rule for which authority is delegated to him or her; and

(4) The following certification statements by such CO_2 authorized account representative or CO_2 authorized alternate account representative:

(A) *"I agree that any information that is reviewed by a natural person identified in this notice of delegation and that is of a type listed for such information accessible by the reviewer in this notice of delegation and that is made when I am a CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, and before this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2813(i), shall be deemed to be reviewed by me."*

(B) *"Until this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2813(i), I agree to maintain an email account and to notify the Division or its agent immediately of any change in my email address unless all delegation authority by me under Rule .2813 is terminated."*

(i) A notice of delegation submitted under Paragraph (h) of this Rule shall be effective, with regard to the CO_2 authorized account representative or CO_2 authorized alternate account representative identified in such notice, upon receipt of such notice by the Division or its agent and until receipt by the Division or its agent of a superseding notice of delegation by such CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate. The superseding notice of delegation may replace any previously identified reviewer, add a new reviewer, or eliminate entirely any delegation of authority.

PERMITS

.2814 CO_2 BUDGET PERMIT REQUIREMENTS.

(a) Each CO2 budget source must have a permit issued by the Division pursuant to Subchapter 2Q (Air Quality Permits Procedures).

(b) Each CO_2 budget permit shall contain all applicable CO_2 Budget Trading Program requirements and shall be a complete and distinguishable portion of the permit under Paragraph (a) of this Rule.

.2815 SUBMISSION OF CO_2 BUDGET PERMIT APPLICATIONS.

For any CO_2 budget source, the CO_2 authorized account representative shall submit a complete CO_2 budget permit application under Rule .2816 covering such CO_2 budget source to the Division by the later of January 1, 2022 or 12 months before the date on which the CO_2 budget source, or a new unit at the source, commences operation.

.2816 INFORMATION REQUIREMENTS FOR CO_2 BUDGET PERMIT APPLICATIONS.

(a) A complete CO_2 budget permit application shall include thefollowing elements concerning the CO_2 budget source for which the application is submitted, in a format prescribed by the Division:

(1) Identification of the CO_2 budget source, including plant name and the ORIS (Office of Regulatory Information Systems) or facility code assigned to the source by the Energy Information Administration of the United States Department of Energy, if applicable;

(2) Identification of each CO_2 budget unit at the CO_2 budget source; and

(3) The standard requirements under Rule .2805.

COMPLIANCE CERTIFICATION

.2817 COMPLIANCE CERTIFICATION REPORT.

(a) *Applicability and deadline.* For each control period in which a CO_2 budget source is subject to the CO_2 requirements of 15A N.C.A.C. 2D .2805(c), the CO_2 authorized account representative of the source shall submit to the Division by the March 1 following the relevant control period, a compliance certification report. A compliance certification report is not required as part of the compliance obligation during an interim control period.

(b) *Contents of report.* The CO_2 authorized account representative shall include in the compliance certification report under Paragraph (a) of this Rule the following elements, in a format prescribed by the Division:

(1) Identification of the source and each CO_2 budget unit at the source;

(2) At the CO_2 authorized account representative's option, the serial numbers of the CO_2 allowances that are to be deducted from the source's compliance account under Rule .2826 for the control period or an interim control period, including the serial numbers of any CO_2 offset allowances that are to be deducted subject to the limitations of 15A N.C.A.C. 2D .2826(a)(3); and

(3) The compliance certification under Paragraph (c) of this Rule.

(c) *Compliance certification.* In the compliance certification report under Paragraph (a) of this Rule, the CO_2 authorized account representative shall certify, based on reasonable inquiry of those persons with primary responsibility for operating the source and the CO_2 budget units at the source in compliance with the CO_2 Budget Trading Program, whether the source and each CO_2 budget unit at the source for which the compliance certification is submitted was operated during the calendar years covered by the report in compliance with the requirements of the CO_2 Budget Trading Program, including:

(1) Whether the source was operated in compliance with the CO_2 requirements of 15A N.C.A.C. 2D .2805(c);

(2) Whether the monitoring plan applicable to each unit at the source has been maintained to reflect the actual operation and monitoring of the unit and contains all information necessary to attribute CO_2 emissions to the unit, in accordance with Rules .2833 through .2838;

(3) Whether all the CO_2 emissions from the units at the source were monitored or accounted for through the missing data procedures and reported in the quarterly monitoring reports, including whether conditional data were reported in the quarterly reports in accordance with Rules .2833 through .2838. If conditional data were reported, the owner or operator shall indicate whether the status of all conditional data has been resolved and all necessary quarterly report resubmissions have been made;

(4) Whether the facts that form the basis for certification under Rules .2833 through .2838 of each monitor at each unit at the source, or for using an excepted monitoring method or alternative monitoring method approved under Rules .2833 through .2838, if any, have changed; and

(5) If a change is required to be reported under Subparagraph (c)(4) of this Rule, specify the nature of the change, the reason for the change, when the change occurred, and how the unit's compliance status was determined subsequent to the change, including what method was used to determine emissions when a change mandated the need for monitor recertification.

.2818 DIVISION'S ACTION ON COMPLIANCE CERTIFICATIONS.

(a) The Division or its agent may review and conduct independent audits concerning any compliance certification or any other submission under this Section or the CO_2 Budget Trading Program and make appropriate adjustments of the information in the compliance certifications or other submissions.

(b) The Division or its agent may deduct CO_2 allowances from or transfer CO_2 allowances to a source's compliance account based on the information in the compliance certifications or other submissions, as adjusted under Paragraph (a) of this Rule.

CO2 ALLOWANCE ALLOCATIONS

.2819 NORTH CAROLINA CO_2 TRADING PROGRAM BASE BUDGET.

(a) The North Carolina CO2 Budget Trading Program base budget shall be as follows:

(1) For 2022, the North Carolina CO_2 Budget Trading Program base budget is 38,654,000 tons.

(2) For 2023, the North Carolina CO_2 Budget Trading Program base budget is 36,851,000 tons.

(3) For 2024, the North Carolina CO_2 Budget Trading Program base budget is 35,048,000 tons.

(4) For 2025, the North Carolina CO_2 Budget Trading Program base budget is 33,245,000 tons.

(5) For 2026, the North Carolina CO_2 Budget Trading Program base budget is 31,442,000 tons.

(6) For 2027, the North Carolina CO_2 Budget Trading Program base budget is 29,639,000 tons.

(7) For 2028, the North Carolina CO_2 Budget Trading Program base budget is 27,836,000 tons.

(8) For 2029, the North Carolina CO_2 Budget Trading Program base budget is 26,033,000 tons.

(9) For 2030 and each succeeding calendar year, the North Carolina CO_2 Budget Trading Program base budget is 24,230,000 tons, or as established in a future program adjustment.

(b) The Division will allocate conditional allowances to CO_2 budget units. After a conditional allowance has been consigned in an auction by a CO_2 budget unit as specified

under Rules .2839 through .2841, the conditional allowance becomes a CO2 allowance once it is sold to an auction participant.

.2820 UNDISTRIBUTED AND UNSOLD CONDITIONAL ALLOWANCES.

(a) The Division may retire undistributed conditional allowances at the end of each control period.

(b) The Division may retire unsold conditional allowances at the end of each control period.

.2821 CONDITIONAL ALLOWANCE ALLOCATIONS.

(a) *General allocation.* The Division will allocate the North Carolina CO_2 Budget Trading Program base budget set forth in Rule .2819 to CO_2 budget sources to be consigned to the North Carolina Consignment Auction Account.

(b) Conditional allowances allocated for a calendar year will be automatically transferred to the North Carolina Consignment Auction Account to be consigned to auction. Following each auction, all conditional allowances sold at the auction will be transferred from the North Carolina Consignment Auction Account to winning bidders' accounts as CO_2 allowances.

(c) *Cost Containment Reserve (CCR) allocation.* The Division shall allocate conditional CCR allowances, separate from and additional to the North Carolina CO_2 Budget Trading Program base budget set forth in Rule .2819, to the North Carolina Consignment Auction Account. The CCR allocation is for the purpose of containing the cost of CO_2 allowances. The Division shall allocate conditional CCR allowances in the following manner:

(1) On or before January 1 of 2022 and each year thereafter, the Division shall allocate, on a pro rata basis to CO_2 budget sources, current vintage year conditional CCR allowances equal to the quantity in Table 3, and withdraw the number of conditional CCR allowances that remain in the North Carolina Consignment Auction Account at the end of the prior calendar year.

Table 3. Conditional CCR allowances from 2022 forward

2022	2023	2024	2025	2026	2027	2028	2029	2030 and each year thereafter
3,865,400	3,685,100	3,504,800	3,324,500	3,144,200	2,963,900	2,783,600	2,603,300	2,423,000

(2) The pro rata calculation to be used for the distribution of conditional CCR allowances is as follows:

*SAA/TAA * CCR = SCCR*

Where:

SAA = source adjusted allocation
TAA = total adjusted allocation
SCCR = source CCR

(3) Conditional CCR allowances allocated for a calendar year will be automatically transferred to the North Carolina Consignment Auction Account to be consigned to auction. Following each auction, all conditional CCR allowances sold at auction will be transferred to winning bidders' accounts as CO_2 CCR allowances.

(4) Unsold conditional CCR allowances will remain in the North Carolina Consignment Auction Account to be re-offered for sale at auction within the same calendar year. Conditional CCR allowances remaining unsold at the end of the calendar year in which they were originated will be made unavailable for sale at future auctions.

(d) *Emissions Containment Reserve (ECR) Withholding.* In the event that the ECR is triggered during an auction, the Division or its agent will withhold conditional allowances as needed. The Division or its agent shall convert and transfer any conditional allowances that have been withheld from any auction(s) into the North Carolina ECR Account. The ECR withholding is for the purpose of additional emissions reductions in the event of lower than anticipated emissions reduction costs. The Division or its agent shall withhold CO_2 ECR allowances in the following manner.

(1) If the condition in 15A N.C.A.C. 2D .2840(d)(1) is met at an auction, then the maximum number of CO2 ECR allowances that will be withheld from that auction will be equal to the quantity shown in Table 4 minus the total quantity of CO2 ECR allowances that have been withheld from any prior auction(s) in that calendar year. Any CO_2 ECR allowances withheld from an auction will be transferred into the North Carolina ECR Account.

Table 4. ECR allowances from 2022 forward

2022	2023	2024	2025	2026	2027	2028	2029	2030 and each year thereafter
3,865,400	3,685,100	3,504,800	3,324,500	3,144,200	2,963,900	2,783,600	2,603,300	2,423,000

(2) Allowances that have been transferred into the North Carolina ECR Account shall not be withdrawn.

(e) *Timing requirements for conditional allowance allocations shall be as follow*s:

(1) Within 30 days of January 1, 2022, the Division will submit to RGGI, Inc., the conditional allowance allocations, in a format prescribed by RGGI, Inc., and in accordance with this Rule, for the then-current control period.

(2) By May 1 of 2022 and of every year thereafter, the Division will submit to RGGI, Inc., the conditional allowance allocations, in a format prescribed by RGGI, Inc., for the applicable control period or interim control period, and in accordance with this Rule.

(f) *CO_2 allocation methodology*.

(1) The net electric output in MWh used with respect to conditional allowance allocations under subsection (2) of this section for each CO_2 budget unit shall be:

(A) For units operating on or before January 1, 2022, the average of the three amounts of the unit's net electric output during the prior three calendar years to determine allocations for the then-current control period.

(B) For all units operating in each control period after January 1, 2022, the average of the three amounts of the unit's total net electric output during the three most recent years for which data are available prior to the start of the control period.

(2) Allocations

(A) For each control period, beginning in 2022 and thereafter, the Division will allocate to all CO2 budget units that have a net electric output, as determined under subsection (1) of this section, a total amount of conditional allowances equal to the CO2 base budget.

(B) The Division will allocate conditional allowances to each CO_2 budget unit under subdivision (A) of this subsection in an amount determined by multiplying the total amount of conditional allowances allocated under subdivision (A) of this subsection by the ratio of the baseline electrical output of such CO_2 budget unit to the total amount of baseline electrical output of all such CO_2 budget units and rounding to the nearest whole allowance as appropriate.

(C) New CO_2 budget units will be allocated conditional allowances once they have established electrical output data to be used in the conditional allowance allocation process.

(3) For the purpose of the allocation process as described in subsections (1) and (2) of this section, CO_2 budget units shall report the unit's net electric output to the Division on a yearly basis as follows:

(A) Within 30 days of January 1, 2022, each CO_2 budget unit shall report yearly net electric output data during the preceding three calendar years.

(B) By March 1 of each year thereafter, each CO_2 budget unit shall report yearly net electric output data for the previous year.

(g) *Auction revenues.* Each electric public utility with CO_2 budget units shall file with the North Carolina Utilities Commission a plan for how it will spend auction revenues for public benefit, strategic energy, or other purposes approved by the Commission.

CO2 ALLOWANCE TRACKING SYSTEM

.2822 CO_2 ALLOWANCE TRACKING SYSTEM ACCOUNTS.

(a) *Nature and function of compliance accounts.* Consistent with 15A N.C.A.C. 2D .2823(a), the Division or its agent will establish one compliance account for each CO_2 budget source. Allocations of conditional allowances pursuant to .2819 through .2821 and deductions or transfers of CO_2 allowances pursuant to Rules .2818, .2826, .2828, or Rules .2830 through .2832 will be recorded in the compliance accounts in accordance with Rules .2822 through .2829.

(b) *Nature and function of general accounts.* Consistent with subdivision 15A N.C.A.C. 2D .2823 (b), the Division or its agent will establish, upon request, a general account for any person. Transfers of CO_2 allowances pursuant to Rules .2830 through .2832 will be recorded in the general account in accordance with Rules .2822 through .2829.

.2823 ESTABLISHMENT OF ACCOUNTS.

(a) *Compliance accounts.* Upon receipt of a complete account certificate of representation under Rule .2811, the Division or its agent will establish a conditional allowance account and a compliance account for each CO_2 budget source for which the account certificate of representation was submitted.

(b) *General accounts.*

(1) *Application for general account.* Any person may apply to open a general account for the purpose of holding and transferring CO_2 allowances. An application for a general account may designate one and only one CO_2 authorized account representative and one and only one CO_2 authorized

alternate account representative who may act on behalf of the CO_2 authorized account representative. The agreement by which the CO_2 authorized alternate account representative is selected shall include a procedure for authorizing the CO_2 authorized alternate account representative to act in lieu of the CO_2 authorized account representative. A complete application for a general account shall be submitted to the Division or its agent and shall include the following elements in a format prescribed by the Division or its agent:

(A) Name, address, email address, and telephone number of the CO_2 authorized account representative and any CO_2 authorized alternate account representative;

(B) At the option of the CO_2 authorized account representative, organization name and type of organization;

(C) A list of all persons subject to a binding agreement for the CO_2 authorized account representative or any CO_2 authorized alternate account representative to represent their ownership interest with respect to the CO_2 allowances held in the general account;

(D) The following certification statement by the CO_2 authorized account representative and any CO_2 authorized alternate account representative:

"*I certify that I was selected as the CO_2 authorized account representative or the CO_2 authorized alternate account representative, as applicable, by an agreement that is binding on all persons who have an ownership interest with respect to CO_2 allowances held in the general account. I certify that I have all the necessary authority to carry out my duties and responsibilities under 15A N.C.A.C. 2D, Section 2700, and the CO_2 Budget Trading Program on behalf of such persons and that each such person shall be fully bound by my representations, actions, inactions, or submissions and by any order or decision issued to me by the Division or its agent or a court regarding the general account.";*

(E) The signature of the CO_2 authorized account representative and any CO_2 authorized alternate account representative and the dates signed; and

(F) Unless otherwise required by the Division or its agent, documents of agreement referred to in the application for a general account shall not be submitted to the Division or its agent. Neither the Division nor its agent shall be under any obligation to review or evaluate the sufficiency of such documents, if submitted.

(2) *Authorization of CO_2 authorized account representative.*

(A) Upon receipt by the Division or its agent of a complete application for a general account under Subparagraph (b)(1) of this section:

(i) The Division or its agent will establish a general account for the person or persons for whom the application is submitted.

(ii) The CO_2 authorized account representative and any CO_2 authorized alternate account representative for the general account shall represent and, by his or her representations, actions, inactions, or submissions, legally bind each person who has an ownership interest with respect to CO_2 allowances held in the general account in all matters pertaining to this Section or the CO_2 Budget Trading Program, notwithstanding any agreement between the CO_2 authorized account representative or any CO_2 authorized alternate account representative and such person. Any such person shall be bound by any order or decision issued to the CO_2 authorized account representative or any CO_2 authorized alternate account representative by the Division or its agent or a court regarding the general account.

(iii) Any representation, action, inaction, or submission by any CO_2 authorized alternate account representative shall be deemed to be a representation, action, inaction, or submission by the CO_2 authorized account representative.

(B) Each submission concerning the general account shall be submitted, signed, and certified by the CO_2 authorized account representative or any CO_2 authorized alternate account representative for the persons having an ownership interest with respect to CO_2 allowances held in the general account. Each such submission shall include the following certification statement by the CO_2 authorized account representative or any CO_2 authorized alternate account representative:

"I am authorized to make this submission on behalf of the persons having an ownership interest with respect to the CO_2 allowances held in the general account. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true,

accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment."

(C) The Division or its agent will accept or act on a submission concerning the general account only if the submission has been made, signed, and certified in accordance with Part (b)(2)(B) of this Rule.

(3) *Changing CO_2 authorized account representative and CO_2 authorized alternate account representative; changes in persons with ownership interest.*

(A) The CO_2 authorized account representative for a general account may be changed at any time upon receipt by the Division or its agent of a superseding complete application for a general account under Subparagraph (b)(1) of this section. Notwithstanding any such change, all representations, actions, inactions, and submissions by the previous CO_2 authorized account representative, or the previous CO_2 authorized alternate account representative, prior to the time and date when the Division or its agent receives the superseding application for a general account shall be binding on the new CO_2 authorized account representative and the persons with an ownership interest with respect to the CO_2 allowances in the general account.

(B) The CO_2 authorized alternate account representative for a general account may be changed at any time upon receipt by the Division or its agent of a superseding complete application for a general account under Subparagraph (b)(1) of this section. Notwithstanding any such change, all representations, actions, inactions, and submissions by the previous CO_2 authorized account representative, or the previous CO_2 authorized alternate account representative, prior to the time and date when the Division or its agent receives the superseding application for a general account shall be binding on the new CO_2 authorized alternate account representative and the persons with an ownership interest with respect to the CO_2 allowances in the general account.

(C) In the event a new person having an ownership interest with respect to CO_2 allowances in the general account is not included in the list of such persons in the application for a general account, such new person shall be deemed to be subject to and bound by the application for a general account, the representations, actions, inactions, and submissions of the CO_2 authorized account representative and any CO_2 authorized alternate account representative, and the decisions,

orders, actions, and inactions of the Division or its agent, as if the new person were included in such list.

(D) Within 30 days following any change in the persons having an ownership interest with respect to CO_2 allowances in the general account, including the addition or deletion of persons, the CO_2 authorized account representative or any CO_2 authorized alternate account representative shall submit a revision to the application for a general account amending the list of persons having an ownership interest with respect to the CO_2 allowances in the general account to include the change.

(4) *Objections concerning CO_2 authorized account representative.*

(A) Once a complete application for a general account under Subparagraph (b)(1) of this section has been submitted and received, the Division or its agent will rely on the application unless and until a superseding complete application for a general account under Subparagraph (b)(1) of this Rule is received by the Division or its agent.

(B) Except as provided in Parts (b)(3)(A) and (B) of this section, no objection or other communication submitted to the Division or its agent concerning the authorization, or any representation, action, inaction, or submission of the CO_2 authorized account representative or any CO_2 authorized alternate account representative for a general account shall affect any representation, action, inaction, or submission of the CO_2 authorized account representative or any CO_2 authorized alternate account representative or the finality of any decision or order by the Division or its agent under this Section or the CO_2 Budget Trading Program.

(C) Neither the Division nor its agent will adjudicate any private legal dispute concerning the authorization or any representation, action, inaction, or submission of the CO_2 authorized account representative or any CO_2 authorized alternate account representative for a general account, including private legal disputes concerning the proceeds of CO_2 allowance transfers.

(5) *Delegation by CO_2 authorized account representative and CO_2 authorized alternate account representative.*

(A) A CO_2 authorized account representative may delegate, to one or more natural persons, his or her authority to make an electronic submission to the Division or its agent provided for under Rules .2822 through .2829 and Rules .2830 through .2832.

(B) A CO_2 authorized alternate account representative may delegate, to one or more natural persons, his or her authority to make an electronic submission to the Division or its agent provided for under Rules .2822 through .2829 and Rules .2830 through .2832.

(C) In order to delegate authority to make an electronic submission to the Division or its agent in accordance with Subparts (i) and (ii) of this Part, the CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, must submit to the Division or its agent a notice of delegation, in a format prescribed by the Division that includes the following elements:

(i) The name, address, email address, andtelephone number of such CO_2 authorized account representative or CO_2 authorized alternate account representative;

(ii) The name, address, email address, and telephone number of each such natural person, herein referred to as "electronic submission agent";

(iii) For each such natural person, a list of the type of electronic submissions under Paragraph (a) or (b) of this Rule for which authority is delegated to him or her; and

(iv) The following certification statements by such CO_2 authorized account representative or CO_2 authorized alternate account representative:

(I) *"I agree that any electronic submission to the Division or its agent that is by a natural person identified in this notice of delegation and that is of a type listed for such electronic submission agent in this notice of delegation and that is made when I am a CO_2 authorized account representative or CO_2 authorized alternate account representative, as appropriate, and before this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2823(b)(5)(C) shall be deemed to be an electronic submission by me."*

(II) "*Until this notice of delegation is superseded by another notice of delegation under 15A N.C.A.C. 2D .2823(b)(5)(C), I agree to maintain an email account and to notify the Division or its agent immediately of any change in my email address unless all delegation authority by me under 15A N.C.A.C. 2D .2823(b)(5) is terminated."*

(D) A notice of delegation submitted under Part (C) of this Subparagraph shall be effective, with regard to the CO_2 authorized account representative or CO_2 authorized alternate account representative identified in such notice, upon receipt of such notice by the Division or its agent and until receipt by the Division or its agent of a superseding notice of delegation by such CO_2 authorized account representative or CO_2 authorized alternate account representative as appropriate. The superseding notice of delegation may replace any previously identified electronic submission agent, add a new electronic submission agent, or eliminate entirely any delegation of authority.

(E) Any electronic submission covered by the certification in Subsubpart (C)(iv)(I) of this Subparagraph and made in accordance with a notice of delegation effective under Part (D) of this paragraph shall be deemed to be an electronic submission by the CO_2 authorized account representative or CO_2 authorized alternate account representative submitting such notice of delegation.

(c) *Account identification.* The Division or its agent will assign a unique identifying number to each account established under Paragraphs (a) or (b) of this Rule.

.2824 CO_2 ALLOWANCE TRACKING SYSTEM RESPONSIBILITIES OF CO_2 AUTHORIZED ACCOUNT REPRESENTATIVE.

Following the establishment of a COATS account, all submissions to the Division or its agent pertaining to the account, including, but not limited to, submissions concerning the deduction or transfer of CO_2 allowances in the account, shall be made only by the CO_2 authorized account representative for the account.

.2825 RECORDATION OF CONDITIONAL ALLOWANCE ALLOCATIONS.

(a) By January 1 of each calendar year, the Division or its agent will record in the following accounts:

(1) In each CO_2 budget source's conditional allowance account, the conditional allowances allocated for CO_2 budget units at the source (if any) under Rule .2821(a) prior to being consigned to auction; and

(2) In each CO_2 budget source's compliance account, the CO_2 allowances purchased at auction by CO_2 budget units at that source under Rules .2821(a) and .2839 to .2841.

(b) Each year, the Division or its agent will also record conditional CO_2 allowances, as allocated under Rule .2821, in the conditional allowance account for the year after the last year for which conditional CO_2 allowances were previously allocated to the compliance account.

(c) *Serial numbers for allocated conditional allowances.* When allocating conditional allowances to and recording them in an account, the Division or its agent will assign each conditional allowance a unique identification number that will include digits identifying the year for which the conditional allowance is allocated.

.2826 COMPLIANCE.

(a) *Allowances available for compliance deduction.* CO_2 allowances that meet the following criteria are available to be deducted in order for a CO_2 budget source to comply with the CO_2 requirements of 15A N.C.A.C. 2D .2805(c) for a control period or an interim control period.

(1) The CO_2 allowances, other than CO_2 offset allowances, are of allocation years that fall within a prior control period, the same control period, or the same interim control period for which the allowances will be deducted.

(2) The CO_2 allowances are held in the CO_2 budget source's compliance account as of the CO_2 allowance transfer deadline for that control period or interim control period or are transferred into the compliance account by a CO_2 allowance transfer correctly submitted for recordation under section Rule .2830 by the CO_2 allowance transfer deadline for that control period or interim control period.

(3) For CO_2 offset allowances generated by other participating states, the number of CO_2 offset allowances that are available to be deducted in order for a CO_2 budget source to comply with the CO_2 requirements of 15A N.C.A.C. 2D .2805(c) for a control period or an interim control period shall not exceed 3.3% of the CO_2 budget source's CO_2 emissions for that control period, or may not exceed 3.3% of 0.5 times the CO_2 budget source's CO_2 emissions for an interim control period, as determined in accordance with this Rule and Rules .2822 through .2829 and .2833 through .2838 of this Part.

(4) The CO_2 allowances are not necessary for deductions for excess emissions for a prior control period under Paragraph (d) of this Rule.

(b) *Deductions for compliance.* Following the recordation, in accordance with Rule .2831, of CO_2 allowance transfers submitted for recordation in the CO_2 budget source's compliance account by the CO_2 allowance transfer deadline for a control period or interim control period, the Division or its agent will deduct CO_2 allowances available under Paragraph (a) of this Rule to cover the source's CO_2 emissions (as determined in accordance with Rules .2833 through .2841) for the control period or interim control period, as follows:

(1) Until the amount of CO_2 allowances deducted equals the number of tons of total CO_2 emissions (or 0.50 times the number of tons of total CO_2 emissions for an interim control period) from all CO_2 budget units at the CO_2 budget source for the control period or interim control period; or

(2) If there are insufficient CO_2 allowances to complete the deductions in Subparagraph (b)(1) of this Rule, until no more CO_2 allowances available under Paragraph (a) of this section remain in the compliance account.

(c) *Identification of available CO_2 allowances by serial number; default compliance deductions.*

(1) The CO_2 authorized account representative for a source's compliance account may request that specific CO_2 allowances, identified by serial number, in the compliance account be deducted for emissions or excess emissions for a control period or interim control period in accordance with Paragraph (b) or (d) of this Rule. Such identification shall be made in the compliance certification report submitted in accordance with Rule .2817.

(2) The Division or its agent will deduct CO_2 allowances for a control period or interim control period from the CO_2 budget source's compliance account, in the absence of an identification or in the case of a partial identification of available CO_2 allowances by serial numberunder Subparagraph (c)(1) of this section, in the following order:

(A) First, subject to the relevant compliance deduction limitations under 15A N.C.A.C. 2D .2826(a)(3) and (d)(1), CO_2 offset allowances. CO_2 offset allowances shall be deducted in chronological order (i.e., CO_2 offset allowances from earlier allocation years shall be deducted before CO_2 offset allowances from later allocation years). In the event that some, but not all, CO_2 offset allowances from a particular allocation year are to be deducted, CO_2 offset allowances shall be deducted by serial number, with lower serial number allowances deducted before higher serial number allowances.

(B) Second, any CO_2 allowances, other than CO_2 offset allowances, that are available for deduction under Paragraph (a) of this Rule. CO_2 allowances shall be deducted in chronological order (i.e., CO_2 allowances from earlier allocation years shall be deducted before CO_2 allowances from later allocation years). In the event thatsome, but not all, CO_2 allowances from a particular allocation year are to be deducted, CO_2 allowances shall be deducted by serial number, with lower serial number allowances deducted before higher serial number allowances.

(d) *Deductions for excess emissions.*

(1) After making the deductions for compliance under Paragraph (b) of this Rule, the Division or its agent will deduct from the CO_2 budget source's compliance account a number of CO_2 allowances, equal to three times the number of the source's excess emissions. In the event that a source has

insufficient CO_2 allowances to cover three times the number of the source's excess emissions, the source shall be required to immediately transfer sufficient allowances into its compliance account.

(2) Any CO_2 allowance deduction required under Subparagraph (d)(1) of this Rule shall not affect the liability of the owners and operators of the CO_2 budget source or the CO_2 units at the source for any fine, penalty, or assessment, or their obligation to comply with any other remedy, for the same violation, as ordered under applicable state law. The following guidelines will be followed in assessing fines, penalties or other obligations.

(A) For purposes of determining the number of days of violation, if a CO_2 budget source has excess emissions for a control period each day in the control period constitutes a day in violation unless the owners and operators of the unit demonstrate that a lesser number of days should be considered.

(B) Each ton of excess emissions is a separate violation.

(C) For purposes of determining the number of days of violation, if a CO_2 budget source has excess interim emissions for an interim control period, each day in the interim control period constitutes a day in violation unless the owners and operators of the unit demonstrate that a lesser number of days should be considered.

(D) Each ton of excess interim emissions is a separate violation.

(3) The propriety of the Division's determination that a CO_2 budget source had excess emissions and the concomitant deduction of CO_2 allowances from that CO_2 budget source's account may be later challenged in the context of the initial administrative enforcement, or any civil or criminal judicial action arising from or encompassing that excess emissions violation. The commencement or pendency of any administrative enforcement or civil or criminal judicial action arising from or encompassing that excess emissions violation will not act to prevent the Division or its agent from initially deducting the CO_2 allowances resulting from the Division's original determination that the relevant CO_2 budget source has had excess emissions. Should the Division's determination of the existence or extent of the CO_2 budget source's excess emissions be revised either by a settlement or final conclusion of any administrative or judicial action, the Division will act as follows.

(A) In any instance where the Division's determination of the extent of excess emissions was too low, the Division will take further action

under Subparagraphs (d)(1) and (2) of this section to address the expanded violation.

(B) In any instance where the Division's determination of the extent of excess emissions was too high, the Division will distribute to the relevant CO_2 budget source a number of CO_2 allowances equaling the number of CO_2 allowances deducted which are attributable to the difference between the original and final quantity of excess emissions. Should such CO_2 budget source's compliance account no longer exist, the CO_2 allowances will be provided to a general account selected by the owner or operator of the CO_2 budget source from which they were originally deducted.

(e) The Division or its agent will record in the appropriate compliance account all deductions from such an account pursuant to Paragraphs (b) and (d) of this Rule.

(f) *Action by the Division on submissions.*

(1) The Division may review and conduct independent audits concerning any submission under this Section or the CO_2 Budget TradingProgram and make appropriate adjustments of the information in the submissions.

(2) The Division may deduct CO_2 allowances from or transfer CO_2 allowances to a source's compliance account based on information in the submissions, as adjusted under Subparagraph (f)(1) of this Rule.

.2827 BANKING.

Each CO_2 allowance that is held in a compliance account or a general account will remain in such account unless and until the CO_2 allowance is deducted or transferred under Rule .2818, Rule .2826, Rule .2828, or Rules .2830 through .2832.

.2828 ACCOUNT ERROR.

The Division or its agent may, at its sole discretion and on its own motion, correct any error in any COATS account. Within 10 business days of making such correction, the Division or its agent will notify the CO_2 authorized account representative for the account.

.2829 CLOSING OF GENERAL ACCOUNTS.

(a) A CO_2 authorized account representative of a general account may instruct the Division or its agent to close the account by submitting a statement requesting deletion of the account from COATS and by correctly submitting for recordation under Rule .2830 a CO_2 allowance transfer of all CO_2 allowances in the account to one or more other COATS accounts.

(b) If a general account shows no activity for a period of one year or more and does not contain any CO_2 allowances, the Division or its agent may notify the CO_2 authorized

account representative for the account that the account will be closed in COATS 30 business days after the notice is sent. The account will be closed after the 30-day period unless before the end of the 30-day period the Division or its agent receives a correctly submitted transfer of CO_2 allowances into the account under Rule .2830 or a statement submitted by the CO_2 authorized account representative demonstrating to the satisfaction of the Division or its agent good cause as to why the account should not be closed. The Division or its agent will have sole discretion to determine if the owner or operator of the unit demonstrated that the account should not be closed.

CO2 ALLOWANCE TRANSFERS

.2830 SUBMISSION OF CO_2 ALLOWANCE TRANSFERS.

The CO_2 authorized account representatives seeking recordation of a CO_2 allowance transfer shall submit the transfer to the Division or its agent. To be considered correctly submitted, the CO_2 allowance transfer shall include the following elements in a format specified by the Division or its agent:

(a) The numbers identifying both the transferor and transferee accounts;

(b) A specification by serial number of each CO_2 allowance to be transferred;

(c) The printed name and signature of the CO_2 authorized account representative of the transferor account and the date signed;

(d) The date of the completion of the last sale or purchase transaction for the allowance, if any; and

(e) The purchase or sale price of the allowance that is the subject of a sale or purchase transaction under Paragraph (d) of this Rule.

.2831 RECORDATION OF CO_2 ALLOWANCE TRANSFERS.

(a) Within 5 business days of receiving a CO_2 allowance transfer, except as provided in Paragraph (b) of this Rule, the Division or its agent will record a CO_2 allowance transfer by moving each CO_2 allowance from the transferor account to the transferee account as specified by the request, provided that:

(1) the transfer is correctly submitted under Rule .2830; and

(2) The transferor account includes each CO_2 allowance identified by serial number in the transfer.

(b) A CO_2 allowance transfer into or out of a compliance account that is submitted for recordation following the CO_2 allowance transfer deadline and that includes any CO_2 allowances that are of allocation years that fall within a control period or interim control period prior to or the same as the control period or interim control period to which the

CO_2 allowance transfer deadline applies will not be recorded until after completion of the process pursuant to 15A N.C.A.C. 2D .2826(b).

(c) Where a CO_2 allowance transfer submitted for recordation fails to meet the requirements of Paragraph (a) of this Rule, the Division or its agent will not record such transfer.

.2832 NOTIFICATION OF CO_2 ALLOWANCE TRANSFERS.

(a) *Notification of recordation.* Within 5 business days of recordation of a CO_2 allowance transfer under Rule .2831, the Division or its agent will notify each party to the transfer. Notice will be given to the CO_2 authorized account representatives of both the transferor and transferee accounts.

(b) *Notification of non-recordation.* Within 10 business days of receipt of a CO_2 allowance transfer that fails to meet the requirements of 15A N.C.A.C. 2D .2831(a), the Division or its agent will notify the CO_2 authorized account representatives of both accounts subject to the transfer of:

(1) A decision not to record the transfer, and

(2) The reasons for such non-recordation.

(c) Nothing in this Rule shall preclude the submission of a CO_2 allowancetransfer for recordation following notification of non-recordation.

MONITORING, REPORTING & RECORDKEEPING

.2833 MONITORING, REPORTING & RECORDKEEPING.

(a) *Interaction with other provisions.* The requirements of Rules .2833 through .2838 are additional to all related requirements in Subchapter 2D of Title 15A of the North Carolina Administrative Code, and are not limited by those requirements in any way. For purposes of the North Carolina CO_2 Budget Trading Program, the applicable provisions of Rules .2833 through .2838 displace the procedure for petitioning for alternative monitoring, reporting, and recordkeeping set forth in 15A N.C.A.C. 2D .0612 and the testing requirements set forth in Section .2600 of Subchapter 2D of Title 15A of the North Carolina Administrative Code.

(b) *General requirements.* The owners and operators, and to the extent applicable, the CO_2 authorized account representative of a CO_2 budget unit, shall comply with the monitoring, recordkeeping and reporting requirements as provided in Rules .2833 through .2838 and all applicable sections of 40 CFR part 75. Where referenced in Rules .2833 through .2838, the monitoring requirements of 40 CFR Part 75 shall be adhered to in a manner consistent with the purpose of monitoring and reporting CO_2 mass emissions pursuant to this Section. For purposes of complying with such requirements, the definitions in Rule .2802 and in 40 CFR 72.2 shall apply, and the terms “affected unit,” “designated representative,” and “continuous emissions monitoring system” (or

"CEMS") in 40 CFR part 75 shall be replaced by the terms "CO_2 budget unit," "CO_2 authorized account representative," and "continuous emissions monitoring system" (or "CEMS"), respectively, as defined in Rule .2802. For units not subject to an acid rain emissions limitation, the term "Administrator" in 40 CFR Part 75 shall be replaced with "the Administrator, Division or its agent." Owners or operators of a CO_2 budget unit who monitor a non-CO_2 budget unit pursuant to the common, multiple, or bypass stack procedures in 40 CFR 75.72(b)(2)(ii), or 40 CFR 75.16 (b)(2)(ii)(B) as pursuant to 40 CFR 75.13, for purposes of complying with this Section, shall monitor and report CO_2 mass emissions from such non-CO_2 budget units according to the procedures for CO_2 budget units established in Rules .2833 through .2838.

(c) *Requirements for installation, certification, and data accounting.* The owner or operator of each CO2 budget unit must meet the following requirements.

(1) Install all monitoring systems necessary to monitor CO_2 mass emissions in accordance with 40 CFR Part 75, except for equation G-1. Equation G-1 in Appendix G shall not be used to determine CO_2 emissions under this Part. This may require systems to monitor CO_2 concentration, stack gas flow rate, O_2 concentration, heat input, and fuel flow rate.

(2) Successfully complete all certification tests required under Rule .2834 and meet all other requirements of Rules .2833 through .2838 and 40 CFR part 75 applicable to the monitoring systems under Subparagraph (a)(1) of this Rule.

(3) Record, report, and quality-assure the data from the monitoring systems under Subparagraph (a)(1) of this Rule.

(d) *Compliance dates.* The owner or operator shall meet the monitoring system certification and other requirements of Subparagraphs (a)(1) through (a)(3) of this Rule on or before the following dates. The owner or operator shall record, report and quality-assure the data from the monitoring systems under Subparagraph (a)(1) of this Rule on and after the following dates.

(1) The owner or operator of a CO_2 budget unit, except for a CO_2 budget unit under Subparagraph (b)(2) or (b)(3) of this section, that commences commercial operation before July 1, 2021, shall comply with the requirements of Rules .2833 through .2838 by January 1 of 2022.

(2) The owner or operator of a CO_2 budget unit that commences commercial operation on or after July 1 of 2021 must comply with the requirements of Rules .2833 through .2838 by the later of the following dates:

(A) January 1 of 2022; or

(B) The earlier of:

(i) 90 unit operating days after the date on which theunit commences commercial operation; or

(ii) 180 calendar days after the date on which the unit commences commercial operation.

(3) For the owner or operator of a CO_2 budget unit for which construction of a new stack or flue installation is completed after the applicable deadline under Subparagraph (b)(1) or (b)(2) of this section by the earlier of:

(A) 90 unit operating days after the date on which emissions first exit to the atmosphere through the new stack or flue; or

(B) 180 calendar days after the date on which emissions first exit to the atmosphere through the new stack or flue.

(e) *Reporting data.*

(1) Except as provided in Subparagraph (e)(2) of this section, the owner or operator of a CO_2 budget unit that does not meet the applicable compliance date set forth in Subparagraph (d)(1), (d)(2), or (d)(3) of this Rule for any monitoring system under Subparagraph (c)(1) of this Rule shall, for each such monitoring system, determine, record, and report maximum potential (or, as appropriate, minimum potential) values for CO_2 concentration, CO_2 emissions rate, stack gas moisture content, fuel flow rate, heat input, and any other parameter required to determine CO_2 mass emissions in accordance with 40 CFR 75.31(b)(2) or (c)(3), or section 2.4 of appendix D of 40 CFR part 75 as applicable.

(2) The owner or operator of a CO_2 budget unit that does not meet the applicable compliance date set forth in Subparagraph (d)(3) of this Rule for any monitoring system under Subparagraph (c)(1) of this Rule shall, for each such monitoring system, determine, record, and report substitute data using the applicable missing data procedures in Subpart D, or appendix D of 40 CFR part 75, in lieu of the maximum potential (or as appropriate minimum potential) values for a parameter if the owner or operator demonstrates that there is continuity between the data streams for that parameter before and after the construction or installation under Subparagraph (d)(3) of this Rule.

(A) CO_2 budget units subject to an acid rain emissions limitation or the requirements of the CSAPR NOx Annual Trading Program that qualify for the optional SO_2, NO_X, and CO_2 (for acid rain) emissions calculations for low mass emissions (LME) units under 40 CFR

75.19 and report emissions for such programs using the calculations under 40 CFR 75.19, shall also use the CO_2 emissions calculations for LME units under 40 CFR 75.19 for purposes of compliance with these regulations.

(B) CO_2 budget units subject to an acid rain emissions limitation or the requirements of the CSAPR NOx Annual Trading Program that do not qualify for the optional SO_2, NO_X, and CO_2 (for acid rain) emissions calculations for LME units under 40 CFR 75.19, shall not use the CO_2 emissions calculations for LME units under 40 CFR 75.19 for purposes of compliance with these regulations.

(C) CO_2 budget units not subject to an acid rain emissions limitation or the requirements of the CSAPR NOx Annual Trading Program shall qualify for the optional CO_2 emissions calculation for LME units under 40 CFR 75.19, provided that they emit less than 100 tons of NO_X annually and no more than 25 tons of SO_2 annually.

(f) *Prohibitions.*

(1) No owner or operator of a CO_2 budget unit shall use any alternative monitoring system, alternative reference method, or any other alternative for the required CEMS without having obtained prior written approval in accordance with Rule .2838.

(2) No owner or operator of a CO_2 budget unit shall operate the unit so as to discharge, or allow to be discharged, CO_2 emissions to the atmosphere without accounting for all such emissions in accordance with the applicable provisions of Rules .2833 through .2838 and 40 CFR part 75.

(3) No owner or operator of a CO_2 budget unit shall disrupt the CEMS, any portion thereof, or any other approved emissions monitoring method, and thereby avoid monitoring and recording CO_2 mass emissions discharged into the atmosphere, except for periods of recertification or periods when calibration, quality assurance testing, or maintenance is performed in accordance with the applicable provisions of Rules .2833 through .2838 and 40 CFR part 75.

(4) No owner or operator of a CO_2 budget unit shall retire or permanently discontinue use of the CEMS, any component thereof, or any other approved emissions monitoring system under Rules .2833 through .2838, except under any one of the following circumstances:

(A) The owner or operator is monitoring emissions from the unit with another certified monitoring system approved, in accordance with the applicable provisions of Rules .2833 through .2838 and 40 CFR part

75, by the Division for use at that unit that provides emissions data for the same pollutant or parameter as the retired or discontinued monitoring system; or

(B) The CO_2 authorized account representative submits notification of the date of certification testing of a replacement monitoring system in accordance with 15A N.C.A.C. 2D .2834(d)(3).

.2834 INITIAL CERTIFICATION AND RECERTIFICATION PROCEDURES FOR MONITORING, REPORTING AND RECORDKEEPING.

(a) The owner or operator of a CO_2 budget unit shall be exempt from the initial certification requirements of this section for a monitoring system under 15A N.C.A.C. 2D .2833(c)(1) if the following conditions are met:

(1) The monitoring system has been previously certified in accordance with 40 CFR part 75; and

(2) The applicable quality-assurance and quality-control requirements of 40 CFR 75.21 and appendix B and appendix D of 40 CFR part 75 are fully met for the certified monitoring system described in Subparagraph (a)(1) of this Rule.

(b) The recertification provisions of this section shall apply to a monitoring system under 15A N.C.A.C. 2D .2833(c)(1) exempt from initial certification requirements under Paragraph (a) of this Rule.

(c) Notwithstanding Paragraph (a) of this Rule, if the Administrator has previously approved a petition under 40 CFR 75.72(b)(2)(ii), or 40 CFR 75.16(b)(2)(ii)(B) pursuant to 40 CFR 75.13 for apportioning the CO_2 emissions rate measured in a common stack or a petition under 40 CFR 75.66 for an alternative requirement in 40 CFR part 75, the CO_2 authorized account representative shall submit the petition to the Division under 15A N.C.A.C. 2D .2838(a) to determine whether the approval applies under this program.

(d) Except as provided in Paragraph (a) of this Rule, the owner or operator of a CO_2 budget unit shall comply with the following initial certification and recertification procedures for a CEMS and an excepted monitoring system under appendix D of 40 CFR part 75 and under 15A N.C.A.C. 2D .2833(a)(1). The owner or operator of a unit that qualifies to use the low mass emissions excepted monitoring methodology in 40 CFR 75.19 or that qualifies to use an alternative monitoring system under Subpart E of 40 CFR part 75 shall comply with the procedures in Paragraph (e) or (f) of this Rule, respectively.

(1) *Requirements for initial certification.* The owner or operator shall ensure that each CEMS required under 15A N.C.A.C. 2D .2833(c)(1) (which includes the automated DAHS) successfully completes all of the initial certification testing required under 40 CFR 75.20 by the applicable deadlines specified in 15A N.C.A.C. 2D .2833(d). In addition, whenever

the owner or operator installs a monitoring system in order to meet the requirements of Rules .2833 through .2838 in a location where no such monitoring system was previously installed, initial certification in accordance with 40 CFR 75.20 is required.

(2) *Requirements for recertification.*

(A) Whenever the owner or operator makes a replacement, modification, or change in a certified CEMS under 15A N.C.A.C. 2D .2833(c)(1) that the Administrator or the Division determines significantly affects the ability of the system to accurately measure or record CO_2 mass emissions or to meetthe quality-assurance and quality-control requirements of 40 CFR 75.21 or appendix B to 40 CFR part 75, the owner or operator shall recertify the monitoring system according to 40 CFR 75.20(b).

(B) For systems using stack measurements such as stack flow, stack moisture content, CO_2 or O_2 monitors, whenever the owner or operator makes a replacement, modification, or change to the flue gas handling system or the unit's operation that the Administrator or the Division determines to significantly change the flow or concentration profile, the owner or operator shall recertify the CEMS according to 40 CFR 75.20(b). Examples of changes which require recertification include: replacement of the analyzer, change in location or orientation of the sampling probe or site, or changing of flow rate monitor polynomial coefficients.

(3) *Approval process for initial certifications and recertification*. Parts (d)(3)(A) through (D) of this Rule apply to both initial certification and recertification of a monitoring system under 15A N.C.A.C. 2D .2833(c)(1). For re-certifications, replace the words "certification" and "initial certification" with the word "recertification," replace the word "certified" with "recertified," and proceed in the manner prescribed in 40 CFR 75.20(b)(5) and (g)(7) in lieu of 15A N.C.A.C. 2D .2834(d)(3).

(A) *Notification of certification.* The CO_2 authorized account representative shall submit to the Division or its agent, the appropriate EPA Regional Office, and the Administrator a written notice of the dates of certification in accordance with Rule .2836.

(B) *Certification application.* The CO_2 authorized account representative shall submit to the Division or its agent a certification application for each monitoring system. A complete certification application shall include the information specified in 40 CFR 75.63.

(C) *Provisional certification data.* The provisional certification date for a monitor shall be determined in accordance with 40 CFR 75.20(a)(3). A provisionally certified monitor may be used under this Section and the CO_2 budget Trading Program for a period not to exceed 120 days after receipt by the Division of the complete certification application for the monitoring system or component thereof under Part (d)(3)(B) of this Rule. Data measured and recorded by the provisionally certified monitoring system or component thereof, in accordance with the requirements of 40 CFR part 75, will be considered valid quality-assured data (retroactive to the date and time of provisional certification), provided that the Division does not invalidate the provisional certification by issuing a notice of disapproval within 120 days of receipt of the complete certification application by the Division.

(D) *Certification application approval process.* The Division will issue a written notice of approval or disapproval of the certification application to the owner or operator within 120 days of receipt of the complete certification application under Part (d)(3)(B) of this Rule. In the event the Division does not issue such a notice within such 120-day period, each monitoring system which meets the applicable performance requirements of 40 CFR part 75 and is included in the certification application will be deemed certified for use under the CO_2 Budget Trading Program.

(i) *Approval notice.* If the certification application is complete and shows that each monitoring system meets the applicable performance requirements of 40 CFR part 75, then the Division will issue a written notice of approval of the certification application within 120 days of receipt.

(ii) *Incomplete application notice.* If the certification application is not complete, then the Division will issue a written notice of incompleteness that sets a reasonable date by which the CO_2 authorized account representative must submit the additional information required to complete the certification application. If the CO_2 authorized account representative does not comply with the notice of incompleteness by the specified date, then the Division may issue a notice of disapproval under Subpart (d)(3)(D)(iv) of this Rule. The 120 day review period shall not begin before receipt of a complete certification application.

(iii) *Disapproval notice.* If the certification application shows that any monitoring system or component thereof does not meet the performance requirements of 40 CFR part 75, or if

the certification application is incomplete and the requirement for disapproval under Subpart (d)(3)(D)(ii) of this Rule is met, then the Division will issue a written notice of disapproval of the certification application. Upon issuance of such notice of disapproval, the provisional certification is invalidated by the Division and the data measured and recorded by each uncertified monitoring system or component thereof shall not be considered valid quality assured data beginning with the date and hour of provisional certification. The owner or operator shall follow the procedures for loss of certification in Part (d)(3)(E) of this Rule for each monitoring system or component thereof, which is disapproved for initial certification.

(iv) *Audit decertification.* The Division may issue a notice of disapproval of the certification status of a monitor in accordance with 15A N.C.A.C. 2D .2835(b).

(E) *Procedures for loss of certification.* If the Division issues a notice of disapproval of a certification application under Subpart (d)(3)(D)(iii) of this Rule or a notice of disapproval of certification status under Subpart (d)(3)(D)(iv) of this Rule, then:

(i) The owner or operator shall substitute the following values for each disapproved monitoring system, for each hour of unit operation during the period of invalid data beginning with the date and hour of provisional certification and continuing until the time, date, and hour specified under 40 CFR 75.20(a)(5)(i) or 40 CFR 75.20(g)(7):

(I) For units using or intending to monitor for CO_2 mass emissions using heat input or for units using the low mass emissions excepted methodology under 40 CFR 75.19, the maximum potential hourly heat input of the unit; or

(II) For units intending to monitor for CO_2 mass emissions using a CO_2 pollutant concentration monitor and a flow monitor, the maximum potential concentration of CO_2 and the maximum potential flow rate of the unit under section 2.1 of appendix A of 40 CFR part 75.

(ii) The CO_2 authorized account representative shall submit a notification of certification retest dates and a new

certification application in accordance with Parts (d)(3)(A) and (B) of this Rule; and

(iii) The owner or operator shall repeat all certification tests or other requirements that were failed by the monitoring system, as indicated in the Division's notice of disapproval, no later than 30 unit operating days after the date of issuance of the notice of disapproval.

(e) *Initial certification and recertification procedures for low mass emissions units using the excepted methodologies under 15A N.C.A.C. 2D .2833(e)(2).* The owner or operator of a unit qualified to use the low mass emissions excepted methodology under 15A N.C.A.C. 2D .2833(e)(2) shall meet the applicable certification and recertification requirements of 40 CFR 75.19(a)(2), 40 CFR 75.20(h) and Rule .2834. If the owner or operator of such a unit elects to certify a fuel flow meter system for heat input determinations, the owner or operator shall also meet the certification and recertification requirements in 40 CFR 75.20(g).

(f) *Certification/recertification procedures for alternative monitoring systems.* The CO_2 authorized account of each unit for which the owner or operator intends to use an alternative monitoring system approved by the Administrator and, if applicable, the Division under Subpart E of 40 CFR part 75 shall comply with the applicable notification and application procedures of 40 CFR 75.20(f).

.2835 OUT-OF-CONTROL PERIODS.

(a) Whenever any monitoring system fails to meet the quality assurance and quality control requirements or data validation requirements of 40 CFR part 75, data shall be substituted using the applicable procedures in Subpart D or appendix D of 40 CFR part 75.

(b) *Audit decertification.* Whenever both an audit of a monitoring system and a review of the initial certification or recertification application reveal that any monitoring system should not have been certified or recertified because it did not meet a particular performance specification or other requirement under Rule .2834 or the applicable provisions of 40 CFR part 75 , both at the time of the initial certification or recertification application submission and at the time of the audit, the Division or Administrator will issue a notice of disapproval of the certification status of such monitoring system. For the purposes of this paragraph, an audit shall be either a field audit or an audit of any information submitted to the Division or the Administrator. By issuing the notice of disapproval, the Division or Administrator revokes prospectively the certification status of the monitoring system. The data measured and recorded by the monitoring system shall not be considered valid quality-assured data from the date of issuance of the notification of the revoked certification status until the date and time that the owner or operator completes subsequently approved initial certification or recertification tests for the monitoring system. The owner or operator shall follow the initial certification or recertification procedures in Rule .2834 for each disapproved monitoring system.

.2836 NOTIFICATIONS OF MONITORING, REPORTING & RECORDKEEPING.

The CO_2 authorized account representative for a CO_2 budget unit shall submit written notice to the Division and the Administrator in accordance with 40 CFR 75.61.

.2837 RECORDKEEPING AND REPORTING.

(a) *General provisions.* The CO_2 authorized account representative shall comply with all recordkeeping and reporting requirements in this Rule, the applicable recordkeeping and reporting requirements under 40 CFR 75.73 and with the requirements of 15A N.C.A.C. 2D .2808(e).

(b) *Monitoring plans.* The owner or operator of a CO_2 budget unit shall submit a monitoring plan in the manner prescribed in 40 CFR 75.62.

(c) *Certification applications.* The CO_2 authorized account representative shall submit an application to the Division within 45 days after completing all CO_2 monitoring system initial certification or recertification tests required under Rule .2834 including the information required under 40 CFR 75.63 and 40 CFR 75.53(g) and (h).

(d) *Quarterly reports.* The CO_2 authorized account representative shall submit quarterly reports, as follows:

(1) The CO_2 authorized account representative shall report the CO_2 mass emissions data for the CO_2 budget unit, in an electronic format prescribed by the Administrator unless otherwise prescribed by the Division for each calendar quarter.

(2) The CO_2 authorized account representative shall submit each quarterly report to the Division or its agent within 30 days following the end of the calendar quarter covered by the report. Quarterly reports shall be submitted in the manner specified in Subpart H of 40 CFR part 75 and 40 CFR 75.64. Quarterly reports shall be submitted for each CO_2 budget unit (or group of units using a common stack), and shall include all of the data and information required in Subpart G of 40 CFR part 75, except for opacity, heat input, NOx, and SO_2 provisions.

(3) *Compliance certification.* The CO_2 authorized account representative shall submit to the Division or its agent a compliance certification in support of each quarterly report based on reasonable inquiry of those persons with primary responsibility for ensuring that all of the unit's emissions are correctly and fully monitored. The certification shall state that:

(A) The monitoring data submitted were recorded in accordance with the applicable requirements of this Subpart and 40 CFR part 75, including the quality assurance procedures and specifications;

(B) For a unit with add-on CO_2 emissions controls and forall hours where data are substituted in accordance with 40 CFR 75.34(a)(1), the add-on emissions controls were operating within the range of parameters listed in the quality assurance/quality control program under appendix B of 40 CFR part 75 and the substitute values do not systematically underestimate CO_2 emissions; and

(C) The CO_2 concentration values substituted for missing dataunder Subpart D of 40 CFR part 75 do not systematically underestimate CO_2 emissions.

.2838 PETITIONS FOR ALTERNATIVE MONITORING, REPORTING & RECORDKEEPING REQUIREMENTS.

(a) Except as provided in Paragraph (c) of this Rule, the CO_2 authorized account representative of a CO_2 budget unit that is subject to an acid rain emissions limitation may submit a petition to the Administrator under 40 CFR 75.66 and to the Division requesting approval to apply an alternative to any requirement of 40 CFR Part 75. Application of an alternative to any requirement of 40 CFR Part 75 is in accordance with Rules .2833 through .2838 only to the extent that the petition is approved in writing by the Administrator, and subsequently approved in writing by the Division.

(b) Petitions for a CO_2 budget unit that is not subject to an acid rain emissions limitation.

(1) The CO_2 authorized account representative of a CO_2 budget unit that is not subject to an acid rain emissions limitation may submit a petition to the Administrator under 40 CFR 75.66 and to the Division requesting approval to apply an alternative to any requirement of 40 CFR Part 75. Application of an alternative to any requirement of 40 CFR Part 75 is in accordance with Rules .2833 through .2838 only to the extent that the petition is approved in writing by the Administrator and subsequently approved in writing by the Division.

(2) In the event that the Administrator declines to review a petition under Subparagraph(b)(1) of this Rule, the CO_2 authorized account representative of a CO_2 budget unit that is not subject to an acid rain emissions limitation may submit a petition to the Division requesting approval to apply an alternative to any requirement of Rules .2833 through .2838. That petition shall contain all of the relevant information specified in 40 CFR 75.66. Application of an alternative to any requirement of Rules .2833 through .2838 is in accordance with Rules .2833 through .2838 only to the extent that the petition is approved in writing by the Division.

(c) The CO_2 authorized account representative of a CO_2 budget unit that is subject to an acid rain emissions limitation may submit a petition to the Administrator under 40 CFR 75.66 and to the Division requesting approval to apply an alternative to a requirement

concerning any additional CEMS required under the common stack provisions of 40 CFR 75.72 or a CO_2 concentration CEMS used under 40 CFR 75.71(a)(2). Application of an alternative to any such requirement is in accordance with Rules .2833 through .2838 only to the extent the petition is approved in writing by the Administrator and subsequently approved in writing by the Division.

AUCTION OF ALLOWANCES

.2839 PURPOSE OF AUCTION OF CONDITIONAL ALLOWANCES, CONDITIONAL CCR ALLOWANCES AND WITHHOLDING OF CO2 ECR ALLOWANCES.

The following Rules .2840 and .2841 shall apply to each allowance auction. The Division or its agent may specify additional information in the auction notice for each auction. Such additional information may include the time and location of the auction, auction rules, registration deadlines, and any additional information deemed necessary or useful.

.2840 GENERAL REQUIREMENTS FOR AUCTION OF CONDITIONAL ALLOWANCES, CONDITIONAL CCR ALLOWANCES, AND WITHHOLDING OF CO2 ECR ALLOWANCES.

(a) The Division or its agent shall include the following information in the auction notice for each auction:

(1) The number of conditional allowances offered for sale at the auction, not including any conditional CCR allowances;

(2) The number of conditional CCR allowances that will be offered for sale at the auction if the condition of Subparagraph (b)(1) of this Rule is met;

(3) The minimum reserve price for the auction; and

(4) The CCR trigger price for the auction.

(5) The maximum number of conditional allowances that may be withheld from sale at the auction if the condition of Subparagraph (d)(1) of this section is met;

(6) The ECR trigger price for the auction.

(b) The Division or its agent shall follow these rules for the sale of conditional CCR allowances:

(1) Conditional CCR allowances shall only be sold at an auction in which total demand for allowances, above the CCR trigger price, exceeds the number of conditional allowances available for purchase at the auction, not including any conditional CCR allowances.

(2) If the condition of Subparagraph (b)(1) of this Rule is met at an auction, then the number of conditional CCR allowances offered for sale by the Division or its agent at the auction shall be equal to the number of conditional CCR allowances in the North Carolina Consignment Auction Account at the time of the auction.

(3) After all of the conditional CCR allowances in the North Carolina Consignment Auction Account have been sold in a given calendar year, no additional conditional CCR allowances will be sold at any auction for the remainder of that calendar year, even if the condition of Subparagraph (b)(1) of this Rule is met at an auction; and

(4) At an auction in which conditional CCR allowances are sold, the reserve price for the auction shall be the CCR trigger price.

(5) If the condition of Subparagraph (b)(1) of this Rule is not satisfied, no conditional CCR allowances shall be offered for sale at the auction, and the reserve price for the auction shall be equal to the minimum reserve price.

(c) The Division or its agent shall implement the reserve price in the following manner:

(1) No allowances shall be sold at any auction for a price below the reserve price for that auction; and

(2) If the total demand for allowances at an auction is less than or equal to the total number of allowances made available for sale in that auction, then the auction clearing price for the auction shall be the reserve price.

(d) The Division or its agent shall follow these rules for the withholding of CO_2 ECR allowances from an auction:

(1) CO_2 ECR allowances shall be withheld from an auction only if the demand for allowances would result in an auction clearing price that is less than the ECR trigger price, prior to the withholding from the auction of any ECR allowances.

(2) If the condition in Subparagraph (d)(1) of this Rule is met at an auction, then the maximum number of CO_2 ECR allowances that may be withheld from that auction will be equal to the quantity shown in 15A N.C.A.C. 2D .2821, Table 4 minus the total quantity of CO_2 ECR allowances that have been withheld from any prior auction in that calendar year. Any CO_2 ECR allowances withheld from an auction will be transferred into the North Carolina ECR Account.

(3) The Division will withhold allowances from each CO_2 budget source proportionally to the number of allowances that the CO_2 budget source has consigned to the auction.

.2841 CONSIGNMENT AUCTION OF CONDITIONAL ALLOWANCES

(a) *Delegation.* The Division may delegate the implementation and administrative support functions for any CO_2 allowance consignment auction conducted pursuant to Rules .2839 through .2841 to an agent qualified to conduct auctions, including a regional entity, provided that such agent shall perform all such functions under the direction and oversight of the Division.

(b) *Consignment Auction.* In accordance with Rule .2821, conditional allowances shall be consigned by the CO_2 budget source to whom they are allocated to each auction in accordance with procedures specified by the Division. At the completion of the consignment auction, a conditional allowance sold at auction shall become an allowance eligible to be used for compliance purposes.

REVIEW AND IMPLEMENTATION

.2842 PROGRAM MONITORING AND REVIEW

In conjunction with the CO_2 Budget Trading Program monitoring and review process, the Division will evaluate impacts of the program specific to North Carolina, including economic, energy, public health, and environmental impacts across the state, and impacts on low-wealth communities and communities of color that have historically borne a disproportionate air-pollution burden. In evaluating the impacts on these communities, the Division will develop and implement a plan to ensure their increased participation in the review.

.2843 EFFECTIVE DATE

This Section shall go into effect January 1, 2022, following publication of the final rule in the North Carolina Register. If the final rule is not published in the North Carolina Register before January 1, 2022 then it will go into effect on January 1 of the year following the year in which it is published. If the effective date of this Section is delayed in this manner then prior to publication the Department will update the dates and deadlines contained in the rule accordingly, and will also update the North Carolina CO_2 trading program base budget to decline from projected emissions levels in the starting year to no higher than 24,230,000 tons in 2030, representing a 70 percent reduction from 2005 levels, or a lower amount if established in a program adjustment.

Exhibit B

EXHIBIT B – STATEMENT OF THE PROPOSED RULES' EFFECT ON EXISTING RULES OR ORDERS

The "North Carolina Carbon Dioxide (CO_2) Budget Trading Program" ("Program") establishes a new section, Section .2800, comprised of Proposed Rules .2801 through .2843, within Subchapter 2D of Title 15A of the North Carolina Administrative Code. This exhibit explains the interaction between the Proposed Rules and existing rules or orders, pursuant to 15A N.C.A.C. 2I .0501(b). It follows the organization of existing rules within Chapter 2 of Title 15A.

The Program does not alter the requirements of any rule adopted by or order previously issued by the Environmental Management Commission ("EMC") or the Division of Air Quality ("Division"). This is partly by virtue of the fact that the Proposed Rule establishes an entirely new section of the Administrative Code. Further, the proposed rules expressly deny any effect on existing rules, regulations, or orders, stating as follows:

> Effect on other authorities. No provision of this Section, the CO_2 Budget Trading Program, a CO_2 budget permit application, or a CO_2 budget permit, shall be construed as exempting or excluding the owners and or operators and, to the extent applicable, the CO_2 authorized account representative of the CO_2 budget source or CO_2 budget unit, from compliance with any other provisions of applicable State or federal law, rules, regulations, or orders.

Proposed Rule .2805(g).[1]

Subchapter 2D – Air Pollution Control Requirements

The Proposed Rule has no effect on the existing rules in Subchapter 2D. The absence of any effect on existing rules or orders that restrict air pollution is inherent in the Program's design. Proposed Rule .2802 defines "CO_2 allowance" as a "limited authorization . . . to emit up to one ton of CO_2." A CO_2 allowance does not authorize an air contaminant source to emit an air contaminant other than CO_2 at any level. Furthermore, under proposed Rule .2805(c)(8), the Division has authority to terminate or limit the authorization represented by a CO_2 allowance. The Division would do so if necessary to comply with existing rules or orders.

Section .0500 of Subchapter 2D contains rules governing emission control standards. Although the Proposed Rule establishes an emission control standard for CO_2, it has no effect on the existing rules in Section .0500 of Subchapter 2D.

Subchapter 2D – Monitoring, Reporting, Recordkeeping, and Testing Requirements

Section .0600 of Subchapter 2D contains rules governing monitoring, recordkeeping and reporting. Proposed Rules .2833 through .2838 impose monitoring, reporting, recordkeeping, and

[1] This proposed provision also preserves existing rules, regulations, and orders of the North Carolina Utilities Commission, which at any rate are not amendable by the EMC.

testing requirements on CO_2 budget sources. These provisions incorporate and build upon similar federal requirements for CO_2 set forth in 40 C.F.R. Part 75.

Existing state rules incorporate 40 C.F.R. Part 75 only as it pertains to the federal Acid Rain Program. *See* 15A N.C.A.C. 2D .0610(a)(4), (b). Sources that emit pollutants that are *not* regulated by the Acid Rain Program still must comply with monitoring requirements set forth in 15A N.C.A.C. 2D .0611. *See* 15A N.C.A.C. 2D .0610(b). In addition, the owner or operator of a source may petition to use alternative procedures for non-federal monitoring and reporting. *See* 15A N.C.A.C. 2D .0612(a), (b). Similarly, specific federal testing requirements (not including those of 40 C.F.R. Part 75) and state testing requirements apply to all air pollution sources, and owners or operators may request approval for alternative test methods. *See* 15A N.C.A.C. 2D .2601; 15A N.C.A.C. 2D .2602(h). Quality assurance programs for monitoring devices are required in certain circumstances. *See* 15A N.C.A.C. 2D .0613(b).

Finally, an existing state rule specifies that fossil fuel-fired steam generators "shall be monitored as described in 40 CFR Part 51, Appendix P," 15A N.C.A.C. 2D .0606(a)(1), which requires monitoring of CO_2 emissions from fossil fuel-fired steam generators "where measurements of oxygen or carbon dioxide in the flue gas are required to convert either sulfur dioxide or nitrogen oxides continuous emission monitoring data, or both, to units of the emission standard within the applicable [state implementation] plan." 40 C.F.R. Part 51, App. P, paragraph 2.1.4.

The monitoring, reporting, and recordkeeping requirements of proposed Rules .2833 through .2838 would be additional to all related requirements in existing rules and would not be limited by existing rules. For the purposes of the Program only, the requirements would displace the petition procedure for alternative monitoring, reporting, and recordkeeping described in 15A N.C.A.C. 2D .0612 with a separate procedure. They also would displace the testing regime set forth in Section .2600 for purposes of the Program.

Subchapter 2J – Civil Penalties

These proposed penalty provisions are consistent with, and do not alter, the rules governing civil penalties in Subchapter 2J of Title 15A of the North Carolina Administrative Code. Proposed Rule .2826(d)(2) states that allowance deductions for excess emissions "shall not affect the liability of the owners and operators of the CO_2 budget source or the CO_2 units at the source for any fine, penalty, or assessment, or their obligation to comply with any other remedy, for the same violation, as ordered under applicable State law." Further, it sets forth guidelines for assessing penalties specifying that each day that a budget source has excess emissions is a separate day in violation and each ton of excess emissions is a separate violation.

Subchapter 2Q – Air Quality Permits Procedures

Proposed Rules .2814 through .2816 supplement existing permitting requirements for CO_2 budget sources subject to the Program. Existing rules require an air quality construction and operation permit for any source on the basis of its emissions of non-CO_2 air pollutants. *See* 15A N.C.A.C. 2Q .0101(a)(1); 15A N.C.A.C. 2Q.0103(30) (defining "[r]egulated air pollutant"); 15A N.C.A.C. 2Q .0301(a).

Under existing state rules, new or modified sources must file air permit applications at least 90 days before the projected date of construction or modification. 15A N.C.A.C. 2Q .0304(c). The application must include certain information. *See* 15A N.C.A.C. 2Q .0305. The Division may modify a permit if "[t]he conditions under which the permit or permit renewal was granted have changed." 15A N.C.A.C. 2Q .0309(a)(2). Further, "[a]ll emissions limitations, controls, and other requirements imposed by a permit issued pursuant to this Section [.300] shall be at least as stringent as any other applicable requirement as defined pursuant to 15A NCAC 02Q .0103." 15A N.C.A.C. 2Q .0314(a); *see also* 15A N.C.A.C. 2Q .0103(5) (defining "[a]pplicable requirements"). Finally, "[e]missions limitations, controls, and requirements contained in permits issued pursuant to this Section shall be permanent, quantifiable, and otherwise enforceable as a practical matter" under 15A N.C.A.C. 2Q .0314(b).

Proposed Rule .2815 requires a CO_2 budget source to submit a CO_2 budget permit application by January 1, 2022 or 12 months before the unit commences operation, whichever is later. Under Proposed Rule .2816, the permit application must include certain information, including the monitoring, recordkeeping and reporting, allowance-holding, and compliance requirements specified under proposed Rule .2805. These proposed permit application requirements complement those of Section .0300 of Subchapter 2Q and are not limited by existing deadlines, specifically required application requirements, or the definitions of "regulated air pollutant" and "applicable requirements" under Section .0300.

Existing state rules implementing the federal Title V program require certain sources to hold a Title V permit. 15A N.C.A.C. 02Q .0502. Such a permit "shall specify emission limitations and standards, including operational requirements and limitations, that assure compliance with all applicable requirements at the time of permit issuance." 15A N.C.A.C. 02Q .0508(b). The requirements of a CO_2 budget permit will be "applicable requirements" that will need to be included in a CO_2 budget source's Title V permit; however, the Proposed Rule does not alter the Title V procedures in existing Section .0500 in any way.

Environmental Management Commission Orders

The Commission has previously issued an order denying a citizen petition for rulemaking concerning climate change.[2] The Commission is not bound by its prior decisions. Furthermore, granting this Petition would not conflict with the Commission's prior decisions to deny different petitions.

[2] Environmental Management Commission, Order Denying Petition for Rulemaking (May 7, 2018).

Exhibit C

Power Plant	Operating Capacity (MW)	Plant Operator	EIA Site Code
Anson County Project	366.6	North Carolina Electric Membership Corporation	56249
Asheville CC	586.4	Duke Energy Progress, LLC	02706
Asheville CT	370.0	Duke Energy Progress, LLC	02706
Belews Creek	2,220.0	Duke Energy Carolinas, LLC	08042
Blewett CT	68.0	Duke Energy Progress, LLC	02707
Buck CC	724.0	Duke Energy Carolinas, LLC	02720
Butler Warner	215.0	Fayetteville Public Works Commission	01016
Butler Warner CT	50.0	Fayetteville Public Works Commission	01016
Canton	52.5	Blue Ridge Paper Products, Inc.	50244
Carolina Food Processors 1	28.5	Smithfield Packing Co	54823
Cleveland CT	780.0	Southern Power Company	57029
Craven County Wood Energy	47.0	CMS Generation Operating Co II	10525
Dan River CC	718.0	Duke Energy Carolinas, LLC	02723
G.G. Allen	1,130.0	Duke Energy Carolinas, LLC	02718
H.F. Lee Energy Complex (Wayne County CC Plant)	1,059.0	Duke Energy Progress, LLC	58215
Hamlet	366.6	North Carolina Electric Membership Corporation	56292
James E. Rogers Energy Complex (Cliffside)	1,395.0	Duke Energy Carolinas, LLC	02721
Kings Mountain Energy Center	532.0	NAES Corporation	59325
L V Sutton CC	719.0	Duke Energy Progress, LLC	58697
L V Sutton GT	91.0	Duke Energy Progress, LLC	58697
Lincoln Combustion	1,565.0	Duke Energy Carolinas, LLC	07277
Lumberton ST	25.0	Veolia Energy Operating Services LLC	10382
Marshall	2,078.0	Duke Energy Carolinas, LLC	02727
Mayo	746.0	Duke Energy Progress, LLC	06250
Monroe CT	30.0	North Carolina Municipal Power Agency Number 1	57505
Plymouth	114.8	Domtar Paper Company, LLC	50189
Riegelwood Mill	52.8	International Paper Co-Riegel	54656
Roanoke Rapids, North Carolina	30.0	KapStone Kraft Paper Corporation	50254
Rockingham Power Project	895.0	Duke Energy Carolinas, LLC	55116
Rosemary	186.0	NAES Corporation	50555
Rowan	534.0	Southern Power Company	07826
Rowan CC	565.0	Southern Power Company	07826
Roxboro	2,462.0	Duke Energy Progress, LLC	02712
Roxboro ST	47.0	Capital Power Corporation	10379
Sherwood H. Smith Jr. Energy Complex (Richmond County)	934.0	Duke Energy Progress, LLC	07805
Sherwood H. Smith Jr. Energy Complex CC	1,250.0	Duke Energy Progress, LLC	07805
Southport	52.5	Archer-Daniels-Midland Company	54316
Southport ST	96.0	Capital Power Corporation	10378
UNC - Chapel Hill Cogen Facility	28.7	University of North Carolina	54276
W.H. Weatherspoon CT	164.0	Duke Energy Progress, LLC	02716
Wayne County	963.0	Duke Energy Progress, LLC	07538
Weyerhaeuser New Bern Cellulose Fiber Cogen	33.0	International Paper Company	50188

* Prepared by NRDC using publicly available data provided by S&P Global Market Intelligence.*

Exhibit D

An Overview of the Ways that the Climate Crisis Harms North Carolina

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An Overview of the Ways That the Climate Crisis Harms North Carolina

Climate change due to human-produced greenhouse gases is already harming the economy, natural resources, and people of North Carolina, and threatens our state with worse harm in the future.[1] Increased carbon dioxide emissions and associated warming are already harming the State's forests, wetlands, beaches and other special places, and these impacts will get worse over time. Hurricane intensity and sea level rise[2] will almost certainly increase, and total annual precipitation—along with extreme rainfall events—is likely to increase across the State. This will lead to increases in flooding and storm surge. Additionally, it is very likely that extreme heat values will increase. Finally, wildfires and drought are likely to become more common and intense.

The effects of climate change will not be felt equally by all North Carolinians.[3] Instead, climate change will exacerbate existing vulnerabilities and inequities among the State's

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[1] Kenneth E. Kunkel et al., *North Carolina Climate Science Report*, N.C. INST. FOR CLIMATE STUDIES (2020), https://ncics.org/programs/nccsr/ [hereinafter "N.C. Climate Science Report"]. In response to Governor Cooper's Executive Order 80, the North Carolina state government released the North Carolina Climate Science Report in March 2020 as a component of the subsequent North Carolina Risk Assessment and Resilience Plan, released in June 2020. This report is the most thorough assessment of North Carolina specific climate change impacts and trends created to date. The bulk of the report scales down national and regional findings from the 4th National Climate Assessment released in 2018 and adds detail specific to North Carolina. The results of this report greatly informed the findings presented in this section.

[2] William V. Sweet et al., *Global and Regional Sea Level Rise Scenarios for the United States*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. (NOAA) (2017), https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf. In 2017 NOAA released new scenarios of sea level rise to inform the 4th National Climate Assessment. This effort incorporated and improved upon previous work from NOAA, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Geological Survey, and academia. Localized projections for each tide gauge are provided in the report. These projections are more fine-tuned than coarse global estimations because they account for factors such as subsidence and ocean currents, which significantly increase the rate of sea level rise along the North Carolina coast relative to the global average.

[3] NORTH CAROLINA CLIMATE RISK ASSESSMENT AND RESILIENCE PLAN (2020), https://files.nc.gov/ncdeq/climate-change/resilience-plan/2020-Climate-Risk-Assessment-and-Resilience-Plan.pdf [hereinafter "N.C. Resilience Plan"]. The North Carolina Climate Risk Assessment and Resilience Plan was released in June 2020 as a deliverable of Governor Cooper's Executive Order 80. Building from the research presented in the Climate Science Report, the Resilience Plan outlines the threats North Carolina is facing from climate change and first steps for state agencies to address these challenges. In particular, the Resilience Plan devotes an entire chapter to climate and environmental justice considerations. The chapter identifies the inequities in adaptation in North Carolina and lays out recommendations for sharing climate solutions equitably.

communities.[4] Each of the climate change impacts discussed below disproportionately affects socially vulnerable, low-income, marginalized, and underserved communities. Poor areas in North Carolina are expected to incur greater losses than elsewhere in the State.

1. Rising temperature

North Carolina's climate is getting hotter. Average surface temperature in the State has warmed by an average of about 1°F since 1895.[5] Surface temperatures in the State have steadily increased since the 1970s, and average temperatures have been consistently above the long-term average since the 1990s (Figure 1).[6] The number of heat-stressed days has increased dramatically from the Piedmont to the Outer Banks.[7] Summer average surface temperature changes have trended higher than winter changes. Alarmingly, the highest three summer average temperatures on record have occurred in the last ten years, including the first in 2010, the second in 2011, and the third in 2016 (Figure 2).[8] Meanwhile, winter average temperatures over the last decade have also been warmer than normal.[9]

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[4] *See, e.g.*, Solomon Hsiang et al., *Estimating economic damage from climate change in the United States*, 365 SCI. 1,362 (2017), https://doi.org/10.1126/science.aal4369.

[5] John Walsh et al., *Our Changing Climate*, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THIRD NATIONAL CLIMATE ASSESSMENT 19 (2014), https://doi.org/10.7930/J0KW5CXT.

[6] Rebekah Frankson et al., *North Carolina State Climate Summary*, NOAA (revised May 2019), https://statesummaries.ncics.org/chapter/nc/.

[7] PHYSICIANS FOR SOC. RESPONSIBILITY (PSR), *Death by Degrees: The Health Threats of Climate Change in North Carolina* (2001), https://p2infohouse.org/ref/16/15294.pdf.

[8] N.C. Climate Science Report at 44.

[9] *Id.*

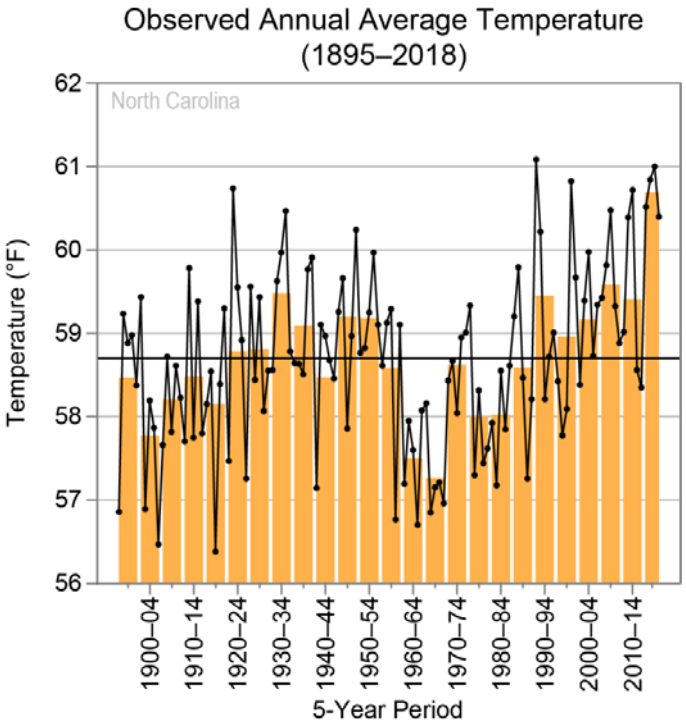

Figure 1. Observed Annual Temperature in North Carolina (1895-2018). Bars show observed annual average temperature, as averaged over 5-year periods, with the last bar representing a 4-year period (2015–2018). Dots show annual values. The horizontal black line shows the long-term average (58.7°F) for 1895–2018. N.C. Climate Science Report at 45.

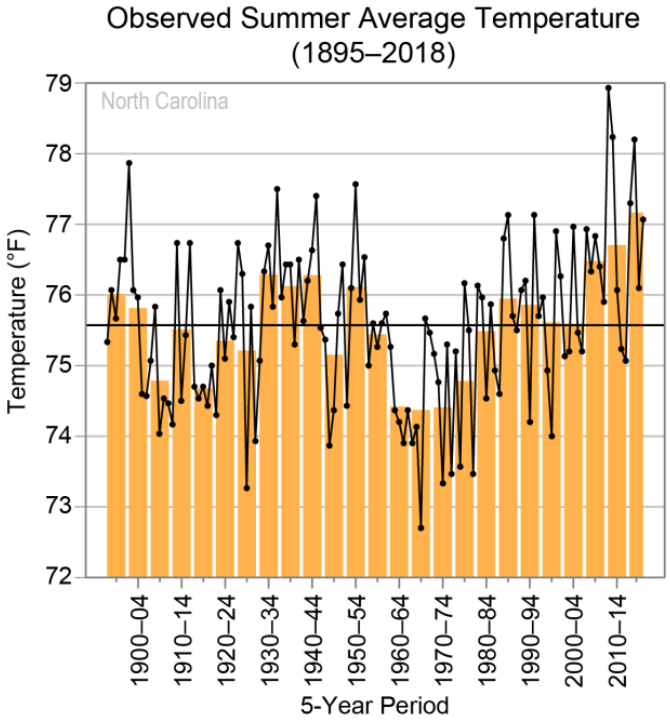

Figure 2. Observed Summer Average Temperature in North Carolina (1895-2018).

Bars show observed summer average temperatures, as averaged over 5-year periods, with the last bar representing a 4-year period (2015–2018). Dots show annual values. The horizontal black lines show the long-term summer average (75.6°F) for 1895–2018. N.C. Climate Science Report at 46.

Climate models indicate that these trends will continue, and that we should expect significant temperature increases by the middle and end of the century. By 2050, models project that the annual average temperature in North Carolina will increase by 2–4°F under a lower scenario and by as much as 5°F under a higher scenario.[10] By 2100, the average temperature is projected to increase by 2–6°F under a lower scenario and by as much as 10°F under a higher scenario.[11] Thus far, observed temperature increases in North Carolina have tended towards the lower end of historical predictions,[12] suggesting that higher confidence could be placed in the lower-warming scenarios. However, warming trends in the Southeast are still not well understood, so the higher warming scenarios cannot be ruled out.

The overall increase in average temperature across the State encompasses some highly variable effects. First, there has been a dramatic increase in the annual number of very warm nights (i.e., minimum daily temperature of 75°F or higher). This figure has been well above the long-term average for the past 15 years; a record-setting 14 very warm nights occurred in 2010 (Figure 3).[13]

[10] *Id.*
[11] *Id.*
[12] Frankson et al., *supra* note 6.
[13] N.C. Climate Science Report at 47.

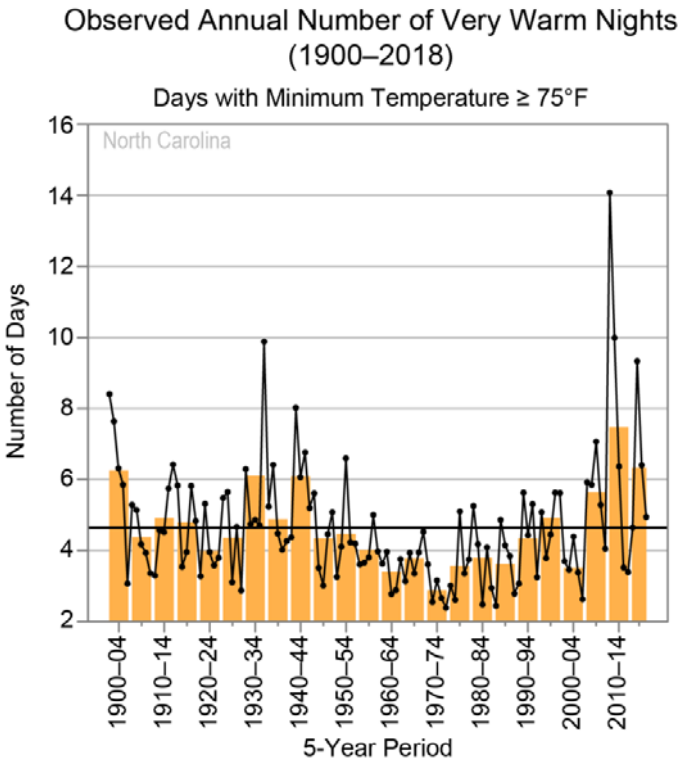

Figure 3. Observed Annual Number of Very Warm Nights in North Carolina (1900-2018).

Bars show observed annual number of very warm nights (i.e., minimum daily temperature of 75°F or higher), as averaged over 5-year periods, with the last bar representing a 4-year period (2015–2018). Dots show annual values. The horizontal black line shows the long-term average (4.6 nights per year) for 1900–2018. N.C. Climate Science Report at 49.

As discussed below, very warm nights increase overall heat vulnerability by making it more difficult to recover from warm days.

Second, not surprisingly, the Piedmont and Coastal Plain have been and will continue to be more susceptible to temperature increases than the Mountains. Although there has been no clear trend in the annual occurrence of very hot days (i.e., maximum daily temperature 95°F or higher) statewide,[14] very hot days and very warm nights have been far more common in the Piedmont and Coastal Plain regions than in the Western Mountains.[15] By mid-century (i.e., 2041-2060), much of the Piedmont and Coastal Plain is expected to see 15-25 more very hot days per year under a lower scenario (Figure 4b), and more than 25 very hot days per year under a higher scenario (Figure 4c), compared with current averages.[16] These areas are likely to see 6-25 more very warm nights per year under a lower scenario (Figure 5b), and 18-35 more very

[14] *Id.*
[15] *Id.* at 49.
[16] *Id.* at 49-50.

warm nights per year under a higher scenario (Figure 5c), compared with current averages.[17] By this time period, the Western Mountains are expected to see up to 15 more very hot days per year under both a lower and higher scenario (Figure 4), with little to no increases in the number of very warm nights per year (Figure 5).[18] These projections are more confident for very warm nights than they are for very hot days.

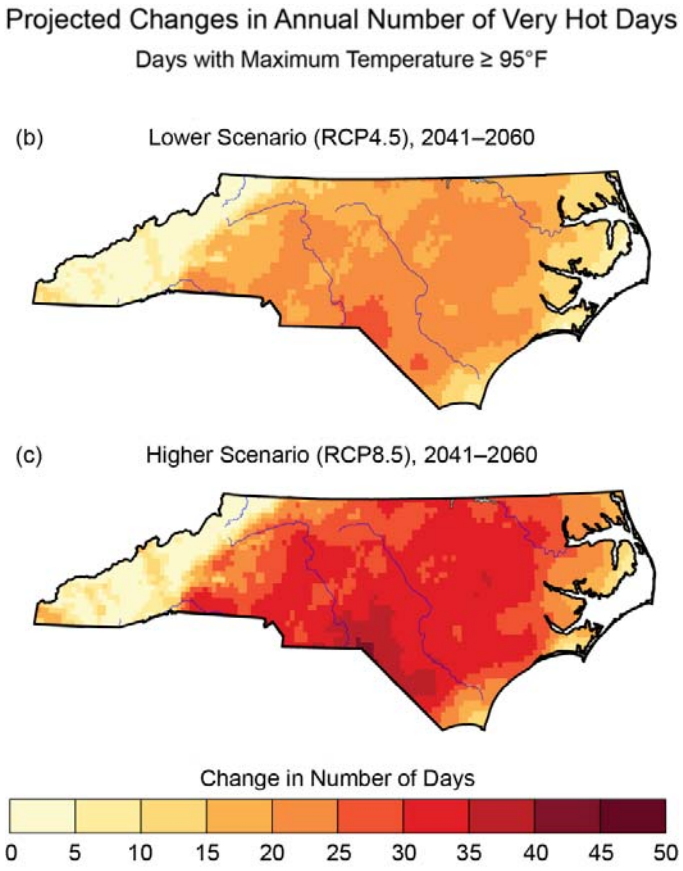

Figure 4. Projected Changes in Annual Number of Very Hot Days in North Carolina by Mid-Century.

Maps show projected increases in the annual number of very hot days (i.e., maximum temperature of 95°F or higher) in North Carolina by mid-century (i.e., 2041-2060) under two climate scenarios. All projected values are shown as changes compared to the long-term (i.e., 1996–2015) average. Panel B depicts projected changes under a lower scenario, and Panel C shows projected changes under a higher scenario. N.C. Climate Science Report at 51.

[17] *Id.* at 50.
[18] *Id.*

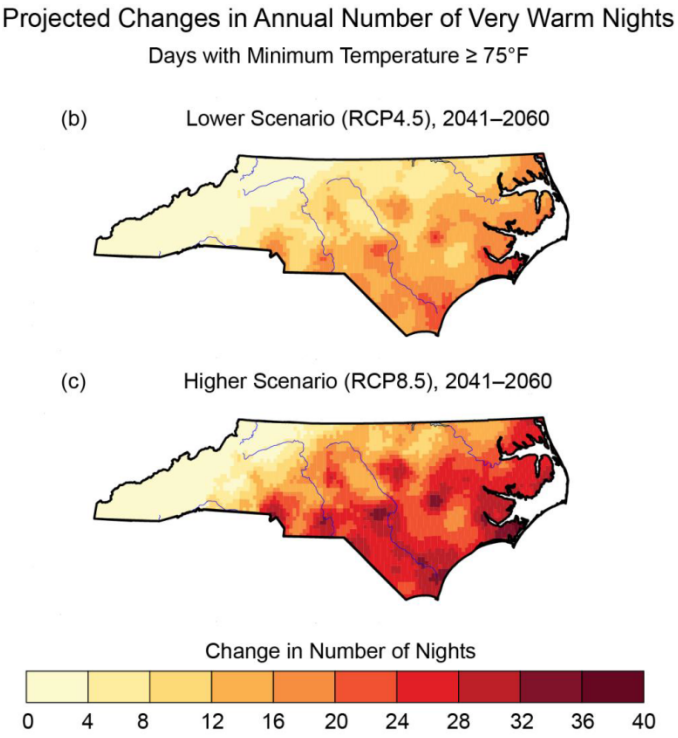

Figure 5. Projected Changes in Annual Number of Very Warm Nights in North Carolina by Mid-Century.

Maps show projected increases in the annual number of very warm nights (i.e., minimum daily temperature of 75°F or higher) in North Carolina by mid-century (i.e., 2041-2060) under two climate scenarios. All projected values are shown as changes compared to the long-term (i.e., 1996-2015) average. Panel B depicts projected changes under a lower scenario, and Panel C shows projected changes under a higher scenario. N.C. Climate Science Report at 52.

a. Urban heat-island effect

With its large and growing metro areas, North Carolina is vulnerable to a compounding impact on temperatures from climate change: the urban heat-island effect. This is the tendency for densely populated areas to be warmer than surrounding rural areas—particularly at night—due to the absorption and emission of heat by buildings and other impervious surfaces.[19] A warming climate will exacerbate the urban heat-island effect due to changes in the structure, spatial extent, and population density of urban areas.[20]

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[19] Keely Maxwell et al., *Built Environment, Urban Systems, and Cities*, 2 IMPACTS, RISKS, & ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT 438 (2018), https://doi.org/10.7930/NCA4.2018.CH11.

[20] Kathy A. Hibbard et al., *Changes in Land Cover and Terrestrial Biogeochemistry*, 1CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT 277 (2017), https://doi.org/10.7930/J0416V6X.

North Carolina cities are already experiencing this effect. A recent analysis of 50 large U.S. cities identified Raleigh as seeing increasing trends in all facets of summer heat waves: frequency, duration, intensity, and timing.[21] Between 1950 and 2000 the number of four-day heat waves experienced in Charlotte more than doubled.[22] These trends are expected to intensify in cities across the State, and will likely lead to concentrated heat-related illnesses in densely populated areas.[23] Charlotte is already one of only a few Southeastern cities with definitive mortality increases associated with heat events compared to non-heat event days.[24] These projected impacts will likely disproportionately affect more vulnerable communities (e.g., low-wealth communities, communities of color, and elderly populations) who are often located in urban centers and may not have access to sufficient cooling.[25]

b. Energy burden

A household bears an energy burden when its members spend a disproportionate amount of household annual income on home energy bills.[26] Household energy burden becomes unaffordable when it exceeds six percent of a household's income.[27] However, the poor often spend more than 10 percent of their income on energy, and in North Carolina that number has been documented to be as much as 20 percent.[28] Counties with high energy burdens are

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[21] Dana Habeeb et al., *Rising heat wave trends in large US cities*, 76 NATURAL HAZARDS 1,651 (2015), https://doi.org/10.1007/s11069-014-1563-z.

[22] PSR, *supra* note 7.

[23] Jeremy E. Diem et al., *Heat in the southeastern United States: Characteristics, trends, and potential health impact*, PLOS ONE (May 16, 2017), https://doi.org/10.1371/journal.pone.0177937.

[24] G. Brooke Anderson & Michelle L. Bell, *Heat waves in the United States: Mortality risk during heat waves and effect modification by heat wave characteristics in 43 U.S. communities*, 119 ENVTL. HEALTH PERSPECTIVES 210 (2011), https://doi.org/10.1289/ehp.1002313.

[25] Lynne Carter et al., *Southeast*, 2 IMPACTS, RISKS, & ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT 743 (2018), https://doi.org/10.7930/NCA4.2018.CH19.

[26] N.C. Clean Energy Plan, Part 3: Electricity Rates and Energy Burden 10 (2019), https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/3.-Electricity-Rates-and-Energy-Burden-FINAL.pdf [hereinafter "CEP Part 3"]; *see also* Joseph Daniel, *The Energy Burden: How Bad is it and How to Make it Less Bad*, UNION OF CONCERNED SCIS. (Feb. 26, 2019), https://blog.ucsusa.org/joseph-daniel/how-to-make-energy-burden-less-bad.

[27] CEP Part 3 at 10; Adam Chandler, *Where the Poor Spend More Than 10 Percent of Their Income on Energy. Hint: Almost Everywhere in the United States*, THE ATLANTIC (June 8, 2016), https://www.theatlantic.com/business/archive/2016/06/energy-poverty-low-incomehouseholds/486197/; *see also* David Tucker, *Charging into the Question of Affordability: Residential Electric Rates in North Carolina from 2011 to 2013*, UNC ENVTL. FIN. CTR. (Feb. 19, 2014), http://efc.web.unc.edu/2014/02/19/charging-into-the-question-of-affordability-residential-electric-rates-in-north-carolina-from-2011-to-2013/.

[28] Chandler, *supra* note 27.

clustered in eastern North Carolina.[29] Energy-burdened households disproportionately earn fewer than $20,000 per year and their members disproportionately are of African-American or Latino descent.[30]

Record heat worsens energy burdens, which are already a serious problem in the State.[31] Energy burden in North Carolina is driven mostly by electric bills.[32] These proportionally high bills are driven by increasing cooling and heating demands as extreme weather becomes more frequent, as well as other causes such as inefficient appliances.[33] The Southeast is expected to suffer higher costs associated with meeting increased energy demands more than anywhere else in the United States, as the number of days in which people need to use air-conditioning increases.[34] In North Carolina, since the 1970s, cooling-degree days have increased steadily to the highest 10-year averages on record (Figure 6).[35]

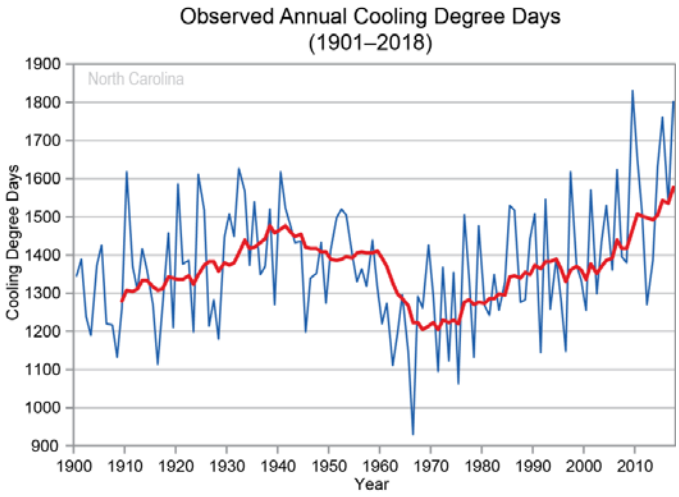

Figure 6. Observed Annual Cooling-Degree Days in North Carolina (1901-2018).

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[29] *Housing Matters: Mapping Energy Burden*, N.C. HOUSING COAL. (Dec. 20, 2018), https://nchousing.org/housing-matters-mapping-energy-burden/.

[30] CEP Part 3 at 10.

[31] *Supra* note 27.

[32] Daniel, *supra* note 26.

[33] *See* Lauren Ross et al., *The High Cost of Energy in Rural America: Household Energy Burdens and Opportunities for Energy Efficiency*, ACEEE 9 (2018), https://aceee.org/research-report/u1806; Adam Wagner, *As temps and utility bills rise, burden grows for Southeast NC's poor*, STARNEWS ONLINE (July 13, 2018), https://www.starnewsonline.com/news/20180713/as-temps-and-utility-bills-rise-burden-grows-for-southeast-ncs-poor; Lou Murrey, *The Energy Burden: Inefficient housing and financial difficulties can lead to insurmountable energy bills for rural residents*, APPVOICES (Feb. 10, 2017), http://appvoices.org/2017/02/10/the-energy-burden/.

[34] Carter et al., *supra* note 25.

[35] N.C. Climate Science Report at 73. Note: "Cooling-degree day" is a temperature indicator related to air conditioning demand, and is expressed as the number of degrees that the average temperature is above 65°F. *Id.*

Blue line shows the statewide annual average cooling-degree days for 1901–2018; red line shows the 10-year moving average. N.C. Climate Science Report at 74.

These trends are expected to continue: by mid-century (i.e., 2041-2060) under a higher scenario, cooling-degree days are projected to increase by 400 to 800 per year, depending on the region (Figure 7).[36]

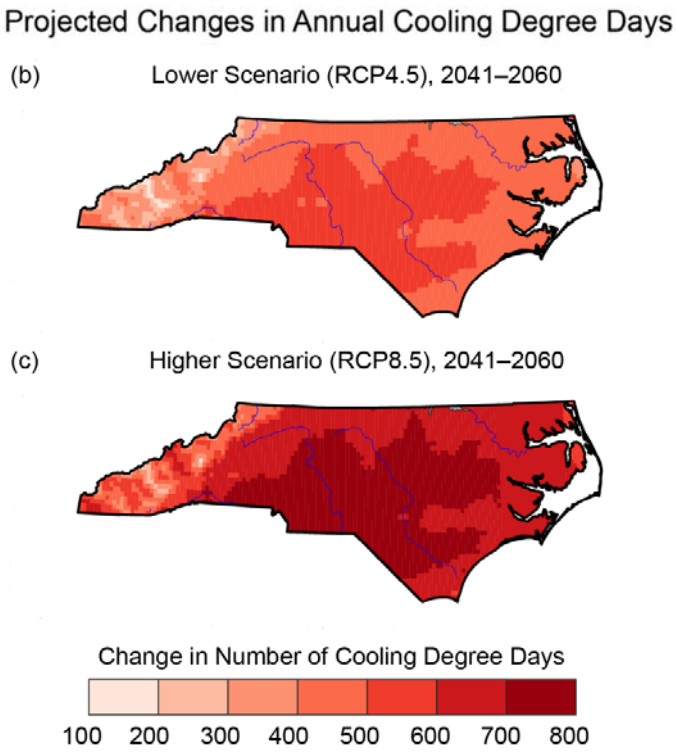

Figure 7. Projected Changes in Annual Cooling-Degree Days in North Carolina by Mid-Century.

Maps show projected increases in the annual number of cooling-degree days (i.e., the number of degrees that the average temperature is above 65°F) in North Carolina by mid-century (i.e., 2041-2060) under two climate scenarios. All projected values are shown as changes compared to the long-term (i.e., 1996-2015) average. Panel B depicts projected changes under a lower scenario, and Panel C shows projected changes under a higher scenario. Darker shades of red indicate increases in cooling-degree days, indicative of overall warmer conditions. N.C. Climate Science Report at 77.

Rising energy burdens will increase preexisting inequality in the United States[37] in general and in North Carolina. The costs, however, are not just financial. When residents are unable to afford to operate their air conditioners due to energy costs, there can be a heightened

[36] *Id.* at 75.
[37] Carter et al., *supra* note 25.

risk of heat-related illnesses.[38] In addition, low-wealth residents may not have adequate access to transportation to find relief at an air-conditioned shopping mall, public library, or swimming pool.[39] Furthermore, these facilities may not always be available at all, such as during a pandemic. The landscape is even starker for homeless populations, who when cooling centers are not available to them, remain in the heat during the scorching summer days.

2. Sea level rise

With 301 miles of ocean shoreline and 3,375 miles of tidal shoreline,[40] North Carolina is particularly vulnerable to sea level rise. In addition, a significant area of North Carolina's Coastal Plain lies within a few feet of sea level, making it highly susceptible to inundation from rising seas (Figure 8).[41] Sea levels have already risen and it is virtually certain that sea level rise will continue.[42]

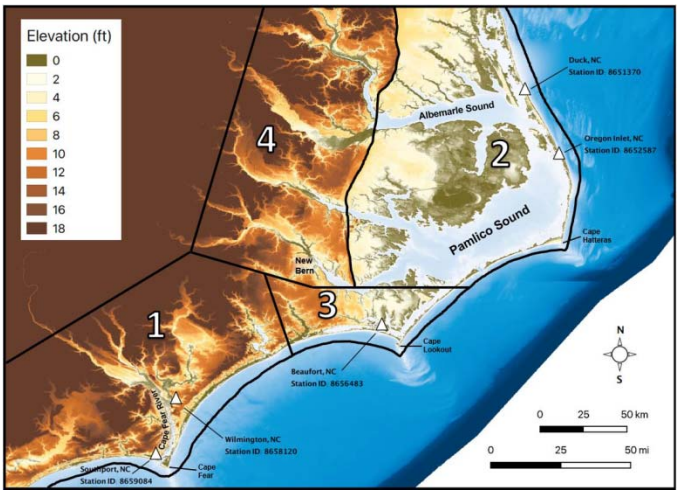

Figure 8. Elevation Across Coastal North Carolina.
N.C. Climate Science Report at 169.

Sea level rises at different rates along the coast due to a combination of large scale and local processes. Global sea level rise is determined by greenhouse gas emission pathways, ice sheet dynamics, and the thermal expansion of the ocean as it warms due to climate change. Relative, or local, sea level is determined by all these global factors combined with local

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[38] Margaret Kovach Sugg, *Heat Exposure and Health Impacts in North Carolina*, 79 N.C. MED. J. 320 (2018), https://doi.org/10.18043/ncm.79.5.320.

[39] Thomas Goldsmith, *Rising NC Heat Blasts Everyone, but Hits Those Over 65 Harder*, N.C. HEALTH NEWS (July 10, 2018), https://www.northcarolinahealthnews.org/2018/07/10/rising-nc-heat-blasts-everyone-but-hits-those-over-65-harder/.

[40] U.S. CENSUS BUREAU, *Statistical Abstract of the U.S.: 2011*, Table 360: Coastline and Shoreline of the United States by State, https://www2.census.gov/library/publications/2010/compendia/statab/130ed/tables/geo.pdf.

[41] N.C. Climate Science Report at 168.

[42] *Id.* at 37.

conditions, including subsidence or vertical land movement, ocean and wind circulation patterns, shoreline change, land-water storage exchange, and geomorphology.

Sea level along the entire North Carolina coast is rising faster than the global average. Furthermore, sea level is rising twice as fast along North Carolina's northeastern coast as its southeastern coast, due partly to the rate of sinking land in the northeast. In the past century, sea levels along the North Carolina shoreline have risen around 0.8 feet near Wilmington and around 1.5 feet along the Outer Banks. Compared to sea levels in the year 2000, the National Oceanic and Atmospheric Administration ("NOAA") projects that sea levels along the North Carolina coast will rise between 1-3 feet by the middle of the century, and between 2-9 feet by the end of the century. [43]

Observed rates of global sea level rise are tracking with the projections above, and these scenarios are consistent with observations of sea level rise along the North Carolina coast.[44] In order to have a good chance of keeping sea level rise to less than one foot by mid-century, we will need to achieve net zero global greenhouse gas emissions before mid-century.[45] The full range of sea level rise projections for the North Carolina coast, as outlined in the NOAA 2017 report,[46] is shown in Figure 9 below. Regardless of the scenario, any amount of sea level rise will have a drastic effect on the North Carolina shoreline.

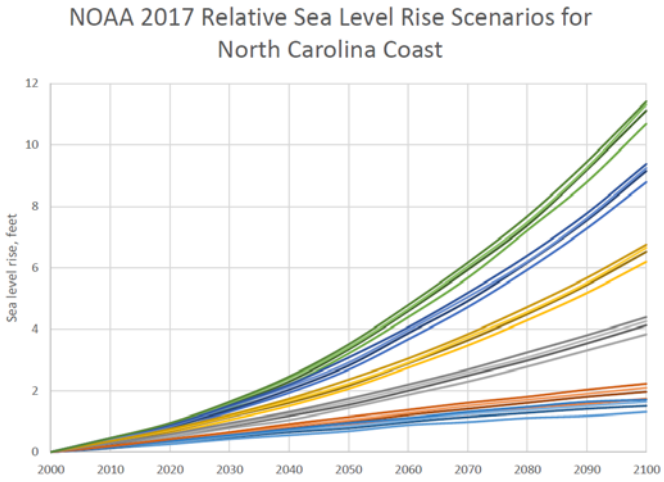

Figure 9. NOAA 2017 Relative Sea Level Rise Scenarios for North Carolina Coast.

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[43] Sweet et al. (2017), *supra* note 2.

[44] In a comparison of the observed local sea level rise trends and local projections in several US locations, NOAA found that "in most circumstances, *the range of interannual relative sea level change/variability since 2000 has been bounded (to date) by the trajectory of the Intermediate-High scenario*." *Id.* at 35 (emphasis added).

[45] Intergovernmental Panel on Climate Change, *Summary for Policymakers*, *in* CLIMATE CHANGE 2014: SYNTHESIS REPORT, 2-34 (Rajendra K. Pachauri & Leo Meyer eds., 2015), https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_SPM.pdf.

[46] Sweet et al. (2017), *supra* note **Error! Bookmark not defined.**.

Sea level rise values are relative to the year 2000, at four gauges along the North Carolina shoreline: Wilmington, Beaufort, Cape Hatteras, and Duck Pier. From top to bottom, the scenarios are Extreme (green), High (dark blue), Intermediate-high (yellow), Intermediate (grey), Intermediate-Low (orange), and Low (light blue). Sweet et al. (2017), *supra* note 2.

New findings on ice sheet instability show that the higher sea level rise scenarios are even more likely than previously thought. Research predicts that ice sheet melt has a tipping point or trigger, and any melting past that point could initiate a chain reaction of rapid melt that most climate models have not considered.[47] Though researchers can only estimate the amount of warming it would take to trigger this avalanche of melt, crossing that tipping point will significantly contribute to and accelerate sea level rise. Observations from NASA and the European Space Agency in 2018 revealed that Antarctic ice melt is tracking close to the Intergovernmental Panel on Climate Change's worst case climate scenario.[48] Research shows that both Greenland's[49] and Antarctica's[50] ice sheets are melting faster and in greater volume than expected and that the ocean is also warming more rapidly than predicted.[51] In fact, NASA scientists recently discovered that the Thwaites glacier in Antarctica is more unstable than previously thought, and the collapse of this ice mass alone could increase global sea levels by 2 feet.[52] For these reasons, the lower scenarios of sea level rise are less representative and the moderate and high scenarios are more reliable.

Changes in sea level affect the landscape of the North Carolina coast very differently depending on the sub-region. The northeastern coast along the Albemarle-Pamlico Sound has an average land slope of 0.2 feet per mile,[53] while the southern Coastal Plain surrounding

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[47] Robert M. DeConto & David Pollard, *Contribution of Antarctica to past and future sea level rise*, 531 NATURE 591 (2016), https://doi.org/10.1038/nature17145.

[48] Andrew Shepherd et al., *Mass balance of the Antarctic Ice Sheet from 1992 to 2017*, 558 NATURE 219 (2018), https://doi.org/10.1038/s41586-018-0179-y.

[49] Jason E. Box et al., *Global sea level contribution from Arctic land ice: 1971-2017*, 13 ENVTL. RES. LETTERS 124,012 (2018), https://doi.org/10.1088/1748-9326/aaf2ed. *See also* John Schwartz, *Greenland's Melting Ice Nears a 'Tipping Point,' Scientists Say*, N.Y. TIMES (Jan. 21, 2019), https://nyti.ms/2RV6GCE.

[50] Eric Rignot et al., *Four decades of Antarctic Ice Sheet mass balance from 1979–2017*, 116 PROCEEDINGS NAT'L ACAD. SCI. 1,095 (2019), https://doi.org/10.1073/pnas.1812883116.

[51] Lijing Cheng et al., *How fast are the oceans warming?*, 363 SCI. 128 (2019), https://doi.org/10.1126/science.aav7619.

[52] Pietro Milillo et al., *Heterogeneous retreat and ice melt of Thwaites Glacier, West Antarctica*, 5 SCI. ADVANCES 3,433 (2019), https://doi.org/10.1126/sciadv.aau3433. *See also* Denise Chow, *A Hole Opens up under Antarctic Glacier—Big Enough to Fit Two-Thirds of Manhattan*, NBC NEWS (Feb. 4, 2019), https://www.nbcnews.com/mach/science/hole-opens-under-antarctic-glacier-big-enough-fit-two-thirds-ncna965696.

[53] Stanley R. Riggs et al., *Influence of inherited geologic framework on barrier shoreface morphology and dynamics*, 126 MARINE GEOLOGY 213 (1995), https://doi.org/10.1016/0025-3227(95)00079-E; STANLEY R. RIGGS ET AL., THE BATTLE FOR NORTH CAROLINA'S COASTS: EVOLUTIONARY HISTORY, PRESENT CRISIS, AND VISION FOR THE FUTURE (2011); Margery

Wilmington has an average land slope of 3 feet per mile.[54] The northern Coastal Plain is already very low lying and close to sea level, and the land is sinking,[55] while the land along the southern Coastal Plain is rising at a small rate.[56] Due to these differences, more land on the northern coast will be inundated as sea levels rise compared to the southern coast.

Sea level rise increases the damage that storms can bring to the North Carolina coast. Higher sea levels create a higher launch point for storm surge, which makes storm surges and flooding more likely.[57] In addition, stronger storms bring higher storm surges and more rainfall that combine to exacerbate high water levels and increase flood risk.[58] With continued high emission rates and associated sea level rise, severe storm-driven flooding along the coast that currently presents a one percent chance of occurring in a given year will be 30-100 percent more likely to occur by the end of the century.[59] Higher sea levels along the southeastern coast will significantly increase water levels during an extreme storm. One study found that after 2050, flood levels that currently have a 10 percent chance of occurring in Wilmington will occur every year after 2050.[60]

Overton et al., *North Carolina Sea Level Rise Assessment Report: 2015 Update to the 2010 Report and 2012 Addendum*, N.C. COASTAL RES. COMM'N SCI. PANEL (Mar. 31, 2015), https://files.nc.gov/ncdeq/Coastal%20Management/documents/PDF/Science%20Panel/2015%20NC%20SLR%20Assessment-FINAL%20REPORT%20Jan%2028%202016.pdf.

[54] Stanley R. Riggs, *Life at the Edge of North Carolina's Coastal System: The Geologic Controls*, LIFE AT THE EDGE OF THE SEA: ESSAYS ON NORTH CAROLINA'S COAST AND COASTAL CULTURE 63 (2002); *supra* note 53

[55] Simon E. Engelhart et al., *Holocene relative sea-level changes and glacial isostatic adjustment of the U.S. Atlantic coast*, 39 GEOLOGY 751 (2011), https://doi.org/10.1130/G31857.1; Andrew C. Kemp et al., *Timing and magnitude of recent accelerated sea-level rise (North Carolina, United States)*, 39 GEOLOGY 751 (2009), https://doi.org/10.1130/G30352A.1; Andrew C. Kemp et al., *Climate related sea-level variations over the past two millennia*, 108 PROC. NAT'L ACAD. SCI. 11,017 (2011), https://doi.org/10.1073/pnas.1015619108.

[56] Orson van de Plassche et al., *Estimating tectonic uplift of the Cape Fear Arch (south-eastern United States) using reconstructions of Holocene relative sea level*, 29 J. QUATERNARY SCI. 749 (2014), https://doi.org/10.1002/jqs.2746.

[57] SeaLevelRise.Org, *Overview: North Carolina's Sea Level Is Rising, and It's Costing Over $2 Billion* (last visited June 30, 2020), https://sealevelrise.org/states/north-carolina/.

[58] N.C. Climate Science Report at 179.

[59] Reza Marsooli et al., *Climate change exacerbates hurricane flood hazards along US Atlantic and Gulf Coasts in spatially varying patterns*, 10 NATURE COMMC'NS 3,785 (2019), https://doi.org/10.1038/s41467-019-11755-z.

[60] Robert E. Kopp et al., *Past and future sea-level rise along the coast of North Carolina, USA*, 132 CLIMATIC CHANGE 693 (2015), https://doi.org/10.1007/s10584-015-1451-x.

a. Coastal erosion

Accelerating sea level rise will continue to increase erosion rates along the coast, which is dominated by fragile barrier islands and dynamic inlets.[61] In response to rising sea levels, barrier islands migrate landward by "rolling over," as sand is eroded from the oceanfront beach and deposited behind the island.[62] In a natural system, this process occurs without any actual reduction of sand from the island.[63]

Human changes to the shoreline also exacerbate erosion. When the "rolling over" process is interrupted by coastal development, sand that would otherwise be deposited onto higher ground is instead left on the shoreface, exposed to continued erosional forces.[64] At the same time, sea level rise and its associated impacts on barrier island migration are also intensified by natural and human-driven coastal subsidence, or sinking of the land.[65]

Sea level rise works with other climate change-driven impacts to exacerbate erosion further. Changes in wave action along the coast, connected to intensifying storms fueled by climate change, have led to dramatic shifts in sediment movement along the shoreline.[66] Even a single hurricane or major storm can remove considerable amounts of sand from a beach, particularly if that beach has been artificially filled, a characteristic of almost every developed beach in North Carolina.[67] Under the worst case climate scenario, the United States could lose 3,436 miles of sandy beach to climate change-related factors, ranking it 6th in the world in

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[61] *See* Stephen P. Leatherman et al., *Sea level rise shown to drive coastal erosion*, 81 EOS 55 (2000), https://doi.org/10.1029/00EO00034; Roshanka Ranasinghe et al., *Climate change impact assessment for inlet-interrupted coastlines*, 3 NATURE CLIMATE CHANGE 83 (2012), https://doi.org/10.1038/NCLIMATE1664.

[62] Craig E. Landry, *Optimal erosion management on developed barrier island beaches* (Working Paper, E. Carolina Univ., Apr. 2008), https://tamug-ir.tdl.org/bitstream/handle/1969.3/28981/ecu0809[1].pdf?sequence=1.

[63] N.C. DIV. OF COASTAL MGMT. (DCM), *Coastal Erosion Study* (Feb. 12, 2016), https://files.nc.gov/ncdeq/Coastal%20Management/documents/PDF/North%20Carolina%20Beach%20Erosion%20Study%20DRAFTvMASTER%2020150211.pdf.

[64] *Id.*

[65] John Upton, *Sinking Atlantic Coastline Meets Rapidly Rising Seas*, CLIMATE CENTRAL (Apr. 14, 2016), http://www.climatecentral.org/news/sinking-atlantic-coastline-meets-rapidly-rising-seas-20247.

[66] Jennifer M. Johnson et al., *Recent shifts in coastline change and shoreline stabilization linked to storm climate change*, 40 EARTH SURFACE PROCESSES & LANDFORMS 569 (2014), https://doi.org/10.1002/esp.3650.

[67] *See, e.g.*, Cornelia Dean, *A North Carolina Lifeline Built on Shifting Sands*, N.Y. TIMES (Mar. 5, 2012), https://www.nytimes.com/2012/03/06/science/highway-12-outer-banks-lifeline-is-under-siege-by-nature.html.

percentage of lost beach, with sea level rise accounting for roughly 70-85 percent of this shoreline retreat.[68]

b. Tidal flooding

As sea levels rise, daily high-tide flooding will become increasingly common along our coast. High-tide flooding is defined as any time water levels are 1.6-2.1 feet higher than normal high tide.[69] Most communities along the North Carolina coast saw no more than 3 days of high-tide flooding before the 1990s.[70] But as sea level increases, the tideline rises closer to the threshold at which water moves into the streets and cities begin to flood more often. Since 2000, flooding has increased 800 percent in North Carolina.[71] Today, Duck, N.C. sees an average of eight days per year when a high tide will block roads and inundate infrastructure. Under Intermediate-Low and Intermediate projections, tidal flooding could occur on half the days of the year in the middle of the century and will likely become a daily occurrence in the latter half of the century.[72] High-tide flooding affects not only residents living in low lying areas, but also anyone trying to drive to work through flooded roads, or ambulances trying to navigate to a flooded hospital district.

3. Hurricanes and other severe storms

North Carolina is especially vulnerable to hurricanes. Eastern North Carolina is particularly exposed and prone to tropical storm and hurricane strikes as a result of Atlantic coast geography and currents,[73] and as a result, the State experiences a hurricane once every two to three years on average.[74] At least one tropical storm or hurricane has passed through or close to North Carolina nearly every year since 1900.[75] During the 20th century, North Carolina experienced an average of six tropical storms or hurricanes in a given five-year period.[76] Florida is the only state in the U.S. through which more hurricanes have passed than North Carolina.[77]

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[68] This translates to 2,451 miles of sandy beach loss under the most conservative climate scenario. Michalis I. Vousdoukas et al., *Sandy coastlines under threat of erosion*, 10 NATURE CLIMATE CHANGE 260 (2020), https://doi.org/10.1038/s41558-020-0697-0.

[69] William V. Sweet et al., *Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold*, NOAA (Feb. 2018), https://tidesandcurrents.noaa.gov/publications/techrpt86_PaP_of_HTFlooding.pdf.

[70] **Error! Hyperlink reference not valid.** *Id.*

[71] First St. Found., *Flood iQ: NC / GA Launch* (July 26, 2018), https://medium.com/firststreet/flood-iq-nc-ga-launch-fe34ef18246c.

[72] N.C. Climate Science Report at 176.

[73] Barry D. Keim et al., *Spatial and temporal variability of coastal storms in the North Atlantic Basin*, 210 MARINE GEOLOGY 7 (2004),https://doi.org/10.1016/j.margeo.2003.12.006.

[74] Frankson et al., *supra* note 6.

[75] N.C. Climate Science Report at 83.

[76] *Id.*

[77] Brian Donegan, *North Carolina Second only to Florida for U.S. Tropical Storms and Hurricanes*, THE WEATHER CHANNEL (Sept. 11, 2018),

Climate change is making tropical storms and hurricanes worse. Since 1985, tropical storm and hurricane activity has been higher than average, with North Carolina experiencing approximately eight events over five years.[78] While future changes in the frequency of Atlantic hurricanes are still being studied,[79] there is a consensus that climate change will strengthen tropical systems and bring about larger hurricanes with heavier rainfall and more destructive wind and storm surges.[80] Warmer air and sea temperatures, along with altered ocean current and atmospheric circulation patterns, will provide more energy to these storm systems,[81] increasing the destructive potential of August storms, for example, by 40 to 50 percent.[82]

As discussed above, sea level rise is making the storm surge caused by tropical storms and hurricanes worse. Observations of recent hurricane storm surge records along the North Carolina coast show the damaging storm surge these more intense hurricanes bring. During Hurricane Florence, even as the storm made landfall as a Category 1 on the Saffir-Simpson scale, the storm surge of 3.6 feet over Mean High-High Water ("MHHW") broke the Wilmington storm surge and tide level record. This exceeded the record going back to the 1930s that Hurricane Matthew's 3.48 foot MHHW storm surge set in Wilmington just two years before in 2016.[83] Hurricane Florence brought a storm surge over 10 feet to New Bern in 2018, and a year later in 2019 Hurricane Dorian brought a storm surge over 6 feet to Ocracoke.[84]

As a result of climate change, tropical storms and hurricanes increasingly bring extreme rainfall. Hurricanes have dropped more rain in recent years compared to the historic average, even accounting for changes in storm frequency over time.[85] Recent research shows that climate change has already increased the average and extreme rainfall of some hurricanes compared to

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https://weather.com/storms/hurricane/news/2018-06-05-map-shows-how-many-tropical-storms-hurricanes-struck-each-state.

[78] N.C. Climate Science Report at 83.

[79] *See, e.g.*, Thomas Knutson et al., *Tropical cyclones and climate change assessment: Part II: Projected response to anthropogenic warming*, 101 BULL. AM. METEOROLOGICAL SOC'Y 303 (2020), https://doi.org/10.1175/BAMS-D-18-0194.1; Kieren Bhatia et al., *Projected response of tropical cyclone intensity and intensification in a global climate model*, 31 J. CLIMATE 8,281 (2018), https://doi.org/10.1175/JCLI-D-17-0898.1.

[80] James P. Kossin et al., *Extreme Storms*, 1 CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT 257 (2017), https://doi.org/10.7930/J07S7KXX.

[81] *See generally* Knutson et al., *supra* note 79.

[82] Keim et al., *supra* note 73.

[83] Jeff Masters, *Florence's 1-in-100-Year Storm Surge Breaks All-Time Records*, WEATHER UNDERGROUND (Sept. 14, 2018), https://www.wunderground.com/cat6/Florences-1-100-Year-Storm-Surge-Breaks-All-Time-Records.

[84] N.C. Climate Science Report at 171.

[85] Kenneth E. Kunkel et al., *Recent increases in U.S. heavy precipitation associated with tropical cyclones*, 37 GEOPHYSICAL RES. LETTERS 24,706 (2010), https://doi.org/10.1029/2010GL045164.

pre-industrial conditions.[86] As climate change alters wind circulation patterns, storms and other extreme weather events are more commonly stalling and unleashing more damage as a result.[87]

Extreme precipitation will increasingly cause extensive flooding throughout the Coastal Plain, as occurred during recent hurricanes such as Matthew and Florence.[88] Between 1898 and 2018, six of the seven highest-precipitation storms occurred within the last 20 years.[89] With Hurricane Matthew in 2016 and Florence in 2018, the Coastal Plain was dealt two so-called 1,000-year storms in only two years.[90] In total, Hurricane Florence dumped about 8 trillion gallons of rain on North Carolina, according to National Weather Service radar estimates,[91] and Hurricane Florence was the wettest hurricane on record in North Carolina.[92] It is very likely that higher-than-average sea surface temperatures contributed to the excessive rainfall brought by Hurricane Florence.[93]

Flooding from tropical storms and hurricanes is not limited to the coast. Remnants of tropical systems have caused devastating flooding in the Western Mountains.[94] In 2016 Hurricane Matthew brought over six inches of rain to the Raleigh-Durham area.[95] In 2018 Hurricane Michael's remnants brought flooding, mudslides, and road closures to parts of Western North Carolina.[96] This trend is increasing as well.

Climate change is also making extra-tropical storms—sometimes referred to as Nor'easters—worse as well. Nor'easters are powerful storm systems that occur primarily

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[86] Christina M. Patricola & Michael F. Wehner, *Anthropogenic influences on major tropical cyclone events*, 563 NATURE 339 (2018), https://doi.org/10.1038/s41586-018-0673-2.

[87] Michael E. Mann et al., In*fluence of anthropogenic climate change on planetary wave resonance and extreme weather*, 7 NATURE SCI. REPORTS 45,242 (2017), https://doi.org/10.1038/srep45242.

[88] Hans W. Paerl et al., *Recent increase in catastrophic tropical cyclone flooding in coastal North Carolina, USA: Long-term observations suggest a regime shift*, 9 SCI. REPORTS 10,620 (2019), https://doi.org/10.1038/s41598-019-46928-9.

[89] *Id.*

[90] Hydrometeorological Design Studies Ctr., *Exceedance Probability Analysis for Selected Storm Events*, NAT'L WEATHER SERV. (last visited June 30, 2020), https://www.nws.noaa.gov/oh/hdsc/aep_storm_analysis/.

[91] Nat'l Weather Serv. Raleigh (Sept. 18, 2018), https://twitter.com/NWSRaleigh/status/1042003250881482752.

[92] Nat'l Weather Serv., *Historic Hurricane Florence, September 12-15, 2018*, NOAA (last visited January 7, 2021), https://www.weather.gov/mhx/Florence2018.

[93] N.C. Climate Science Report at 87.

[94] *Id.* at 187.

[95] Richard Stradling & T. Keung Hui, *4 Dead in NC as Hurricane Matthew Soaks the State*, NEWS & OBSERVER (Oct. 8, 2016), https://www.newsobserver.com/article106905852.html.

[96] Mark Barrett, *WNC Roads, Including NC 9, Back to Normal After Tropical Storm Michael*, CITIZEN TIMES (Oct. 15, 2018), https://www.citizen-times.com/story/news/local/2018/10/15/hurricane-michael-north-carolina-roads-flooding-landslide/1647466002/.

between October and April, and take their name from the strong, sustained winds that blow from the northeast. These storms present significant risks to the State similar to tropical storms and hurricanes, often being accompanied by heavy precipitation and causing significant coastal inundation and erosion from storm surge. For example, Duck, N.C. experiences an average of 14.5 non-tropical storms per year that cause a storm surge over 1 foot.[97] Due to the geography of North Carolina's coast, storm surge from these extra-tropical systems brings powerful wave action and is capable of significantly damaging dunes and oceanfront structures.[98] Early studies have suggested that warmer Arctic temperatures could be creating conditions for more extra-tropical storms to form in the winter, making these storms more powerful and more frequent in times when the temperature balance between the Arctic and North America is thrown off due to climate change.[99]

The combination of increased rainfall, stronger storm surges, and sea level rise will expand the area at risk from flooding. Areas that are already vulnerable, such as low-lying communities along the sounds of the North Carolina coast, will become increasingly exposed to hazards from these storms.

4. Extreme precipitation

Climate change is increasing the frequency and intensity of extreme precipitation. As the atmosphere warms, the amount of water vapor the air can hold increases, creating conditions for storms to release more rainfall. As a result, extreme precipitation events are increasing globally.[100] Extreme rainstorms that drop more than six inches of rain in one area over two days are around 50 percent more likely in the Southeast U.S. than they were in the middle of the 20th century.[101] North Carolina has experienced an increase in the number of extreme rain events (i.e., a day with rainfall totaling 3 inches or more) seen each year across all of its regions.[102] The

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[97] Robert Munroe & Scott Curtis, *Storm surge evolution and its relationship to climate oscillations at Duck, NC*, 129 THEORETICAL & APPLIED CLIMATOLOGY 185 (2016), https://doi.org/10.1007/s00704-016-1770-5.

[98] N.C. Climate Science Report at 171.

[99] Judah Cohen et al., *Warm Arctic episodes linked with increased frequency of extreme winter weather in the United States*, 10 NATURE COMMC'NS 20 (2018), https://doi.org//10.1038/s41558-019-0662-y.

[100] Sonia I. Seneviratne et al., *Changes in Climate Extremes and their Impacts on the Natural Physical Environment*, MANAGING THE RISKS OF EXTREME EVENTS AND DISASTERS TO ADVANCE CLIMATE CHANGE ADAPTATION 109 (2012), https://doi.org/10.7916/d8-6nbt-s431.

[101] Specifically, the number of storms dropping rainfall more extreme than is expected in a five-year return interval storm over two days (the storm system that would drop six inches of rain over 48 hours) have increased by 49 percent in the Southeast since the mid-20th century, and by 58 percent since the beginning of the 20th century. The National Climate Assessment defines extreme events as anything larger than the five-year return interval, two-day storm, which is about six inches of rain in 48 hours in our region.

[102] N.C. Climate Science Report at 6.

period between 2015 and 2018 was one of the wettest on record (since 1895) across North Carolina (Figure 10).[103]

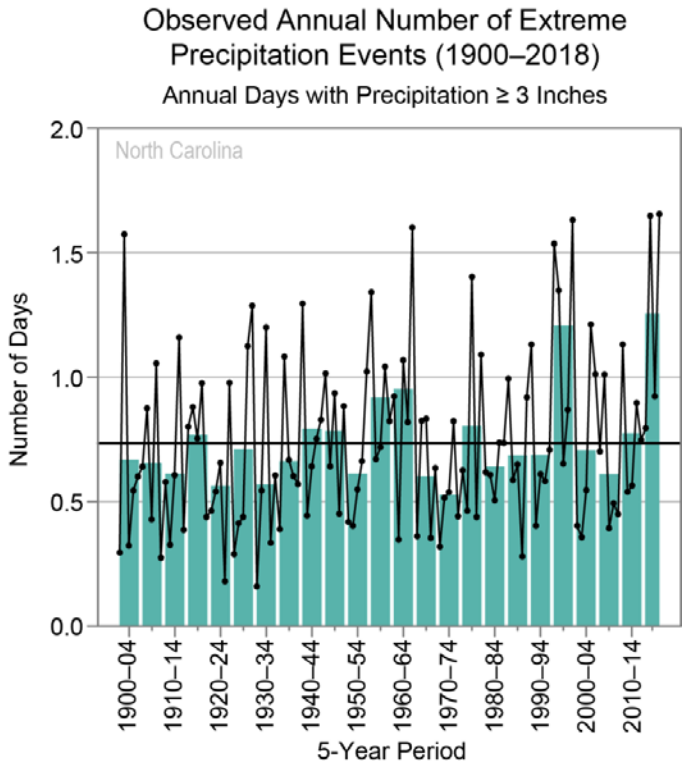

Figure 10. Observed Annual Number of Extreme Precipitation Events in North Carolina (1900-2018).

Bars show observed annual number of extreme rain events (i.e., days with precipitation accumulation of 3 inches or more), as averaged over 5-year periods, with the last bar representing a 4-year period (2015–2018). Dots show annual values. The horizontal black line shows the long-term average (0.7 events per year) for 1900–2018. N.C. Climate Science Report at 66.

This trend will continue. Without a reduction in greenhouse gas emissions, the number of extreme rain storms across the Southeast will increase by two to three times the historic average by the end of the 21st century.[104] Extreme rainfall totals in the Southeast have increased by 27 percent since the middle of the 20th century. Even under a climate scenario with slightly reduced emissions, it is very likely (90-100 percent chance) that the number of extreme rain events will increase across the State.[105]

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[103] N.C. Climate Science Report at 66.

[104] David R. Easterling et al., *Precipitation Change in the United* States, 1 CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, 207 (2017), https://doi.org/10.7930/J0H993CC.

[105] N.C. Climate Science Report at 67.

Annual rainfall amounts may increase in North Carolina's Western Mountains and Piedmont regions as the climate changes. Climate models show that with continued high greenhouse gas emissions, the Piedmont and Western Mountain regions would see higher annual rainfall by mid-century (Figure 11).[106] Future changes in annual rainfall for the Coastal Plain are more uncertain.

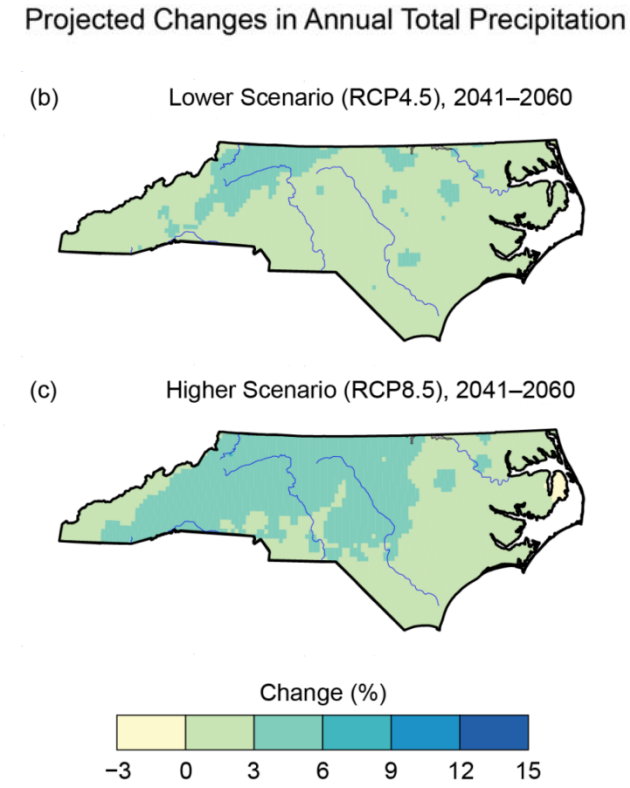

Figure 11. Projected Changes in Annual Total Precipitation in North Carolina by Mid-Century.

Maps show projected increases in the annual total precipitation in North Carolina by mid-century (i.e., 2041-2060) under two climate scenarios. All projected values are shown as changes compared to the long-term (i.e., 1996-2015) average. Panel B depicts projected changes under a lower scenario, and Panel C shows projected changes under a higher scenario. N.C. Climate Science Report at 65.

This change in precipitation patterns will harm North Carolina. First and foremost, extreme rainfall events increasingly cause hazardous flooding across the State,[107] as discussed

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[106] *Id.* at 64.

[107] *See* Bruce Henderson et al., *Storm 'Proving Deadly': NC Declares State of Emergency as Rivers Hit Record-High Levels*, CHARLOTTE OBSERVER (May 30, 2018), https://www.charlotteobserver.com/article212169229.html; WECT, *Hurricane-Level Flooding Seen in NC Town as Rainy Week Continues*, CBS 17 (June 16, 2020), https://www.cbs17.com/news/north-carolina-news/hurricane-level-flooding-seen-in-nc-town-as-rainy-week-continues/.

further below. In addition, across the State, it is likely that the timing of rainfall will become more random and a higher portion of a given year's rainfall will come in short periods of time. This means it will become more common to experience dry spells bookended by extreme rain events, or for multiple extreme rain events to occur back to back. This variation will increase the frequency and severity of droughts, and it in turn drives other disasters, such as landslides[108] and wildfires, as discussed further below.

a. Inland flooding

Climate-change driven extreme precipitation will increase inland flooding. Periods of extreme dryness or wetness cause soil moisture deficits or excesses that can persist for months or years. This can affect the likelihood and severity of flooding in that watershed over periods (e.g., years) longer than the periods of precipitation deficit or excess.[109] Most inland flooding events in North Carolina result from tropical cyclones, such as Hurricanes Floyd (1999), Matthew (2016), and Florence (2018), or nor'easters, such as the April 2017 storm that brought damaging floods to the central part of the State.[110] As a result of these effects, throughout the Southeast, extreme summer thunderstorms that typically result in 100-year flooding events are expected to drop between 40 and 80 percent more rain than today before the end of the century.[111]

Inland flooding risk exacerbates several social inequities. As discussed in the Resilience Plan, land values are typically lower in the floodplain and homes are more affordable to build, sell, and rent. Particularly in inland locations and cities with a legacy of redlining, low-income communities and communities of color are likely to experience higher flood risk due to lower-lying elevations and/or underinvestment in flood mitigation infrastructure.[112] As a result, low-income residents often reside in vulnerable floodplains. In the event of a flood, these residents have less ability to pay for a hotel or replace food lost due to a power outage compared to wealthier residents. Socially vulnerable populations also typically have less access to public transportation, resulting in limited mobility to evacuate or reach safety before or during a flood. Differences in housing quality, housing ownership, and access to insurance typically mean that wealthier communities are able to recover from a flood faster than low-income communities.

b. Drought

Climate change-driven variation in precipitation will increase the frequency and severity of droughts. Much of the State has broken drought records in recent years, particularly in the Western Mountains. The fall of 2016 was one of the driest seasons ever recorded for this region,

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[108] *See* Alexander L. Handwerger et al., *A shift from drought to extreme rainfall drives a stable landslide to catastrophic failure*, 9 NATURE SCI. REPORTS 1,569 (2019), https://doi.org/10.1038/s41598-018-38300-0.

[109] N.C. Climate Science Report at 187.

[110] *Id.*

[111] Andreas F. Prein et al., *Increased rainfall volume from future convective storms in the US*, 7 NATURE CLIMATE CHANGE 880 (2017), https://doi.org/10.1038/s41558-017-0007-7.

[112] Marilyn C. Montgomery & Jayajit Chakraborty, *Assessing the environmental justice consequences of flood risk: A case study in Miami, Florida*, 10 ENVTL. RES. LETTERS 95,010 (2015), https://doi.org/10.1088/1748-9326/10/9/095010.

during which extreme drought conditions were present for the first time since 2011.[113] Cherokee and Clay counties were placed into the most severe drought category for the first time since 2008.[114] While other counties in the region were placed into less severe categories, several of them recorded the driest conditions in more than a century.[115] From 2007 to 2009, the Coastal Plain experienced its most severe drought since the 1930s.[116]

There is a high level of confidence that future droughts across the State will both be more frequent and more extreme with climate change.[117] Warmer drought conditions will lead to increases in potential evapotranspiration of vegetation and in turn more rapid drying, a vicious cycle.[118] The severity of drought in the State is expected to increase 42 percent by 2050.[119] Thus drought will continue to be a recurrent issue for the State's agriculture, forestry, and water resources, discussed below.

c. Wildfires

Development patterns such as suburban sprawl have left North Carolina particularly vulnerable to wildfire damage. About half the State's population—4.8 million people, more than any other state in the country—live at the interface between undeveloped land and urban areas, putting them at increased risk from wildfire damage and health impacts.[120] As urban growth continues and development extends further into undeveloped areas, the occurrence of wildfire and associated economic and public health impacts will increase.[121]

Climate change will make wildfires more likely. As drought conditions increase across the State, wildfires have become more common. Droughts result in the death of vegetation and drying of surface litter, increasing the combustibility of plant matter. Further, as discussed above, warmer temperatures cause more rapid drying of vegetation and depletion of soil moisture. Both factors increase wildfire risk and likely helped cause and exacerbate wildfires in

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[113] Rebecca Ward & Corey Davis, *Rapid Reaction: Drought Intensifies in Western NC*, N.C. CLIMATE OFFICE (Oct. 20, 2016), http://152.14.35.147/climateblog?id=217.

[114] Bruce Henderson, *Drought Deepens, Feeds Wildfires in North Carolina Mountains*, CHARLOTTE OBSERVER (Nov. 10, 2016), https://www.charlotteobserver.com/news/local/article113887983.html.

[115] *Id.*

[116] N.C. Climate Science Report at 113.

[117] Laifang Li et al., *Summer rainfall variability over the Southeastern United States and its intensification in the 21st century as assessed by CMIP5 models*, 118 J. GEOPHYSICAL RES.: ATMOSPHERES 340 (2013), https://doi.org/10.1002/jgrd.50136; Yongqiang Liu et al., *Trends in global wildfire potential in a changing climate*, 259 FOREST ECOLOGY & MGMT. 685 (2010), https://doi.org/10.1016/j.foreco.2009.09.002.

[118] N.C. Climate Science Report at 69.

[119] CLIMATE CENTRAL, *States at Risk: America's Preparedness Report Card: North Carolina* (Nov. 18, 2015), http://assets.statesatrisk.org/summaries/NorthCarolina_report.pdf.

[120] *Id.*

[121] Jeffrey P. Prestemon et al., *Projecting wildfire area burned in the south-eastern United States, 2011-60*, 25 INT'L J. WILDLAND FIRE 715 (2016), https://doi.org/10.1071/WF15124.

recent years. In 2008, 2011, and 2016, North Carolina suffered large wildfires that coincided with relatively severe droughts.[122] The wildfires in the fall of 2016 were particularly severe, burning 62,000 acres of land in the Western Mountains—causing a state of emergency—and more than 77,000 acres across the State. It was the worst fire season on record, in terms of area burned, since the mid-1980s.[123] The event was attributed to an unprecedented combination of record-high fall temperatures and near-record-low fall precipitation.[124]

Given the projected increase in the frequency of droughts and corresponding drying rates with higher temperatures, it is likely that wildfires will become even more common in North Carolina in the coming years.[125] By 2050, the number of annual days with a high potential for wildfire may more than double, from less than five to more than 10.[126] Large fires may be 50-100 percent more likely across the Western Mountains and 300 percent more likely across the Coastal Plain by mid-century.[127]

5. Public health impacts

Climate change will worsen public health in North Carolina. The rising average surface temperature, increases in very hot days and very warm nights, urban heat-island effect, and energy burden—as it translates into a lack of access to cooling—all will increase heat-related illness among North Carolinians. High temperatures also exacerbate poor air quality and its effects on public health. Finally, a warmer climate will bring new vector-borne diseases such as those carried by mosquitoes. At the same time, confronting climate change by transitioning to clean energy will help to mitigate many of these impacts.[128]

a. Heat-related illness

As discussed above, average temperatures in North Carolina have already increased significantly; we have seen a dramatic increase in the annual number of very warm nights, and these trends will continue. North Carolina is likely to experience a significant increase in the number of very hot days and very warm nights each year by mid-century.

As a result of these changes, North Carolinians will increasingly be exposed to life-threatening heat. Between 2010 and 2019, there were approximately 26,500 emergency

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[122] N.C. Climate Science Report at 189.

[123] N.C. FOREST SERV., *2017 - Biennial Report*, https://ncforestservice.gov/publications/2017BiennialReport.pdf.

[124] N.C. Climate Science Report at 192.

[125] Keith T. Ingram et al., *Forests and Climate Change in the Southeast USA*, CLIMATE OF THE SOUTHEAST UNITED STATES: VARIABILITY, CHANGE, IMPACTS, AND VULNERABILITY 165 (2013), https://doi.org/10.5822/978-1-61091-509-0_8.

[126] CLIMATE CENTRAL (2015), *supra* note 119.

[127] Renaud Barbero et al., *Climate change presents increased potential for very large fires in the contiguous United States*, 24 INT'L J. WILDLAND FIRE 892 (2015), https://doi.org/10.1071/WF15083.

[128] Virginia T. Guidry et al., *Sidebar: Health Benefits of North Carolina's Transition to Clean Energy*, 81 N.C. MED. J. 334 (2020), https://doi.org/10.18043/ncm.81.5.334.

department visits for heat-related illnesses, with almost 75% of those visits occurring over the past five years—indicating an increasing trend.[129] Extreme heat can lead to ailments such as heat exhaustion, heat stroke, cardiovascular distress, and diabetes complications.[130] North Carolina likely will experience more cardiovascular-related deaths as a result of rising temperatures.[131] Emergency room visits for heat-related illness increase substantially with temperatures between 98 and 100°F.[132] Annual heat-related death rates are correlated with higher average summer temperatures and with the number of days per year at 90°F or higher.[133]

The increase in extremely warm nights will seriously exacerbate the public health effects of extreme daytime temperatures. When nighttime temperatures are very warm it is more difficult for people to recover physically from high daytime temperatures, resulting in more heat-related illness and death.[134] Yet again, energy burden will exacerbate this problem. Whereas typically people may open their windows to let in cooler nighttime air, this will be less effective on very warm nights, either forcing people to spend more to run the air conditioning or to endure the very warm nighttime temperatures, thus risking their recovery from daytime exposure.

The burden of high temperatures, energy burden, and heat-related illness will not fall on all North Carolinians equally. Rural areas of the Coastal Plain and Sandhills region are particularly vulnerable to these impacts due to socioeconomic status, holding jobs that must be done outdoors, and inadequate access to indoor cooling.[135] Historically marginalized North Carolinians are at greater risk of illness and injury from heat due to decreased access to healthcare and air conditioning, and living in hotter urban areas.[136] Race can also be a contributing factor; non-Hispanic Blacks in the United States may be 2.5 times more likely to

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[129] N.C. Dep't of Health & Human Servs. (DHHS), *2020 Summer Heat Emergency Data and Prevention Tips*, N.C. DIV. PUB. HEALTH (DPH) (last visited Aug. 4, 2020), https://publichealth.nc.gov/chronicdiseaseandinjury/heat.htm.

[130] Lauren Thie & Kimberly Thigpen Tart, *On the front lines of climate health effects in North Carolina*, N.C. MED. J. (Sept. 2018), https://doi.org/10.18043/ncm.79.5.318.

[131] *See* PSR, *supra* note 7. *See also* Douglas A. Becker, The human health impacts of future changes in air quality and temperature in the United States (Master's Thesis, Univ. of N.C., Mar. 19, 2019), https://cdr.lib.unc.edu/concern/dissertations/5m60qs45r.

[132] Sarah Rhea et al., *Using near real-time morbidity data to identify heat-related illness prevention strategies in North Carolina*, 37 J. CMTY. HEALTH 495 (2011), https://doi.org/10.1007/s10900-011-9469-0.

[133] Maria C. Mirabelli & David B. Richardson, *Heat-related fatalities in North Carolina*, 95 AM. J. PUB. HEALTH 635 (2005), https://doi.org/10.2105/AJPH.2004.042630.

[134] Marcus C. Sarofim et al., *Temperature-Related Death and Illness*, THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT 44 (2016), https://doi.org/10.7930/J0MG7MDX.

[135] *See* Margaret M. Kovach et al., *Area-level risk factors for heat-related illness in rural and urban locations across North Carolina, USA*, 60 APPLIED GEOGRAPHY 175 (2015), https://doi.org/10.1016/j.apgeog.2015.03.012. *See also* Thie & Tart, *supra* note 130.

[136] Fact Sheet, *Heat Waves and Climate Change: The Effects of Worsening Heat on People, Communities, and Infrastructure*, UNION OF CONCERNED SCIENTISTS (Aug. 2018), https://www.ucsusa.org/sites/default/files/attach/2018/08/extreme-heat-impacts-fact-sheet.pdf.

experience heat-related mortality compared to non-Hispanic whites.[137] Workers in the agriculture, forestry, construction, and waste industries will be the most vulnerable to heat-related deaths.[138] The agriculture industry is exempt from federal age and wage minimums and overtime limits for child labor, and North Carolina has exempted the industry from most of its child-labor laws.[139] In 2017, nearly half of the child workers in the agriculture industry reported symptoms of heat-related illness such as vomiting, confusion, and fainting.[140] Other populations of concern are older adults, children, and people living in densely populated cities.[141]

b. Impacts of air quality on health

The primary cause of climate change—burning fossil fuels—is also responsible for the majority of deadly air pollution in the United States. [142] And although we have made progress since the mid-20th century, air pollution remains a serious problem. Recent Congressional testimony given by climate scientists at Duke University revealed that across the country, the impacts of air quality on health are roughly twice as bad as previously thought.[143] Presently, air pollution leads to almost 250,000 premature deaths per year.[144] Aggressive decarbonization over the next decade could reduce that death toll by 40 percent; over 20 years, it could save approximately 1.4 million lives.[145] Furthermore, the economic value of these avoided deaths would be enormous, from healthcare savings to the preservation of labor.

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[137] Jeffrey Berko et al., *Deaths attributed to heat, cold, and other weather events in the United States, 2005-2010*, NAT'L CTR. HEALTH STATISTICS (July 30, 2014), https://www.cdc.gov/nchs/data/nhsr/nhsr076.pdf.

[138] Carter et al., *supra* note 25.

[139] Marsha Mercer, *Children as Young as 10 Can Do Farm Work in Some States*, PEW STATELINE (Aug. 30, 2013), https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2013/08/30/children-as-young-as-10-can-do-farm-work-in-some-states.

[140] Juanita Constible et al., *On the front lines: Climate change threatens the health of America's workers*, NRDC (June 2020), https://www.nrdc.org/sites/default/files/front-lines-climate-change-threatens-workers-report.pdf.

[141] Sarofim et al., *supra* note 134.

[142] *See, e.g.*, Richard Burnett et al., *Global estimates of mortality associated with long-term exposure to outdoor fine particulate matter*, 115 PROC. NAT'L ACAD. SCI. 9,592 (2018), https://doi.org/10.1073/pnas.1803222115.

[143] *Health and Economic Benefits of a 2ºC Climate Policy, Hearing on "The Devastating Impacts of Climate Change on Health" Before the H. Comm. on Oversight & Reform*, 116th Cong. (Aug. 5, 2020) (statement of Drew Shindell, Professor, Duke Univ. Nicholas Sch. Env't), https://oversight.house.gov/sites/democrats.oversight.house.gov/files/Testimony%20Shindell.pdf Note: Though the model and techniques have been peer-reviewed, these latest findings are currently undergoing peer review. See testimony appendix for documentation of methodology.

[144] *Id.* While this testimony only presents national findings, the forthcoming published study contains state-by-state data, including for North Carolina.

[145] *Id.*; *see also* AM. LUNG ASSOC., THE ROAD TO CLEAN AIR 7 (2020), https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf (estimating transportation electrification could avoid 6,300 premature deaths by 2050).

Climate change is itself making air quality worse. First, it may make ozone—or smog—worse. Because ozone levels are influenced by temperature and sunlight, a warming climate can cause indirect increases in this pollutant, especially if hot and sunny days become more frequent.[146] Exposure to increased ozone levels can trigger multiple respiratory illnesses, including asthma, bronchitis, emphysema, and lung infections.[147]

Similarly, the increasing wildfires negatively affect air quality. Wildfire smoke contains a number of toxic particulates, including carbon monoxide, and winds can disperse smoke over long distances.[148] Health impacts are especially pronounced in vulnerable populations such as children and the elderly, as well as people with asthma, heart disease, or diabetes.[149] In 2008, wildfires in Dare County caused emergency department visits to increase between 42 and 66 percent.[150] In 2016, wildfires near Charlotte prompted the City to adopt a "Code Red" air quality warning, indicating that the air was unsafe for all groups of people.[151]

Finally, air stagnation, a phenomenon which occurs when an air mass remains over an area for an extended period of time due to light winds and lack of precipitation, leads to poor air quality because pollutants cannot be cleared from the air. Charlotte has seen one of the largest increases in average annual number of summer stagnant air days in the United States, with 19 more days since 1973.[152] Scientists expect air stagnation events to become more frequent as a result of climate change.[153] Recent research has also noted that in areas with poor air quality, such as in urban cities with stagnant air, people are more likely to die from respiratory illnesses like COVID-19.[154]

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[146] Christopher G. Nolte et al., *Air Quality*, 2 IMPACTS, RISKS, & ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT 512 (2018), https://doi.org/10.7930/NCA4.2018.CH13.

[147] *Health Effects of Ozone Pollution*, U.S. EPA (last visited January 7, 2021), https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution.

[148] *E.g.*, Maria Stefanidou et al., *Health impacts of fire smoke inhalation*, 20 INHALATION TOXICOLOGY 761 (Oct. 6, 2008), https://doi.org/10.1080/08958370801975311.

[149] *See, e.g., id.*

[150] N.C. DHHS, *North Carolina Climate and Health Profile*, N.C. DPH (2015), http://epi.publichealth.nc.gov/oee/climate/ClimateAndHealthProfile.pdf.

[151] Karen Garloch, *Smoke Over Charlotte is Talk of the Town—and a Danger to Some*, CHARLOTTE OBSERVER (Nov. 16, 2016), https://www.charlotteobserver.com/news/local/article115225503.html.

[152] CLIMATE CENTRAL, *Report: Stagnant Air on the Rise, Upping Ozone Risk* (Aug. 17, 2016), https://www.climatecentral.org/news/stagnation-air-conditions-on-the-rise-20600.

[153] *See, e.g.*, Hannah Hoag, *Air Quality to Suffer with Global Warming*, SCI. AM. (June 23, 2014), https://www.scientificamerican.com/article/air-quality-to-suffer-with-global-warming/; Daniel E. Horton et al., *Response of air stagnation frequency to anthropogenically enhanced radiative forcing*, 7 ENVTL. RES. LETTERS 44,034 (2012), https://doi.org/10.1088/1748-9326/7/4/044034.

[154] Lisa Friedman, *New Research Links Air Pollution to Higher Coronavirus Death Rates*, N.Y. TIMES (Apr. 7, 2020), https://nyti.ms/2UROU3Y.

c. Vector-borne diseases

Climate change likely will increase the prevalence of vector-borne diseases. Currently, North Carolina's mosquito season--during which climatic conditions are most suitable for mosquitoes carrying viruses such as dengue, chikungunya, and Zika--lasts from July through September. Increasing temperature and humidity has lengthened this season here and throughout much of the country. Raleigh has seen some of the largest growth in the country in the length of its mosquito season since 1970, with an average annual increase of 26 days.[155] In 2016, Raleigh and Charlotte were identified among thirty U.S. cities most at risk of Zika virus spread.[156] The incidence of Lyme disease, which is spread by ticks, has also been increasing.[157]

Climate change is likely to continue to modify the seasonality, distribution, and prevalence of disease-carrying mosquitos and ticks across the entire Southeast.[158] The Southeast already has the most favorable conditions in the country for mosquito presence.[159] Mosquito populations increase in response to increasing temperature and humidity, particularly following heavy rainfalls and hurricanes, which produce breeding habitat.[160] Summer increases in dengue cases are expected across every state in the Southeast, including North Carolina.[161] This risk is greater in urban than in rural areas, due to higher population densities and the presence of man-made breeding grounds such as road-side ditches.[162]

6. Economic Impacts

This section describes the way in which the impacts of climate change described above will affect major sectors of the State's economy, including infrastructure and public safety, agriculture, tourism and cultural sites, and commercial fishing. However, the discussion in this

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[155] Julia Langer et al., *U.S. Faces a Rise in Mosquito 'Disease Danger Days'*, CLIMATE CENTRAL (Aug. 8, 2018), http://assets.climatecentral.org/pdfs/August2018_CMN_Mosquitoes.pdf?pdf=Mosquitoes-Report.

[156] Tribune Media Wire, *2 NC Cities Make List of 30 American Cities Most at Risk of Zika Virus*, FOX 8 (Apr. 11, 2016), https://myfox8.com/news/30-american-cities-most-at-risk-of-zika-virus/.

[157] John S. Brownstein et al., *Effect of climate change on Lyme disease risk in North America*, 2 ECOHEALTH 38 (2005), https://doi.org/10.1007/s10393-004-0139-x.

[158] Charles B. Beard et al., *Vector-Borne Diseases*, THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT 130 (2016), https://doi.org/10.7930/J0765C7V.

[159] Andrew J. Monaghan et al., *On the seasonal occurrence and abundance of the Zika virus vector mosquito* Aedes aegypti *in the contiguous United States*, PLOS CURRENTS, OUTBREAKS (Mar. 16, 2016), https://doi.org/10.1371/currents.outbreaks.50dfc7f46798675fc63e7d7da563da76.

[160] N.C. DHHS (2015), *supra* note 150.

[161] Carter et al., *supra* note 25.

[162] *Id.*

section is not comprehensive, as "[a]ll North Carolina businesses are affected by weather and climate, no matter where they are located or what economic sector they represent."[163]

a. Infrastructure and public safety impacts

Climate change increasingly damages essential infrastructure in the State and correspondingly threatens public safety. This damage will come primarily from severe storms, extreme precipitation, and corresponding flooding, along with the other disasters discussed above including inland flooding, drought, and wildfires. As these events become more frequent and intense, they will inflict more damage on the State, threatening housing, public infrastructure and safety.

Flooding and sea level rise in coastal North Carolina likely will degrade infrastructure such as wastewater treatment plants, resulting in impaired water quality.[164] In addition, the increased frequency of extreme rainfall events presents potentially serious implications for the reliability of existing stormwater infrastructure. According to a 2019 study, even well-designed, modern municipal stormwater systems can no longer keep up with the changes in extreme rainfall.[165] Depending on its location, stormwater runoff can be loaded with toxic pollutants such as fertilizers, heavy metals, pesticides, and fecal bacteria. In many North Carolina communities, stormwater runoff discharges unfiltered directly into rivers, sounds, or the ocean.

In addition, the State's transportation network will continue to be significantly impacted by the changes to our climate that we are already witnessing. Under current sea level rise projections, by 2050, a number of local roadways, particularly in low-lying areas, will be inundated. Highway 12 on the Outer Banks is a prime example as it already washes out and is closed with increased frequency. In addition, higher-intensity hurricanes will increasingly cause road damage with huge economic impacts. Going forward, these effects will only become more severe. According to the Resilience Plan, "[a]ny disruption caused by a climate-related hazard of either a person's workplace or the transportation route connecting his home to his workplace has a direct impact on that person's ability to collect a paycheck."[166] Therefore any vulnerability in the transportation sector affects the economy. Furthermore, the burden of damage to transportation infrastructure will fall most heavily on socially disadvantaged groups, particularly among rural North Carolinians who typically must travel farther on our roadways.

b. Property damage

The cost of recovery from recent hurricanes has already been staggering. The combined cost of damages from Hurricanes Floyd, Matthew, and Florence totaled between $28.5 and 30.9

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[163] N.C. Resilience Plan at 5D-1.

[164] Lawrence B. Cahoon & Marc H. Hanke, *Rainfall effects on inflow and infiltration in wastewater treatment systems in a coastal plain region*, 75 WATER SCI. & TECH. 1,909 (2017), https://doi.org/10.2166/wst.2017.072.

[165] Daniel B. Wright et al., *U.S. hydrologic design standards insufficient due to large increases in frequency of rainfall extremes*, 46 GEOPHYSICAL RES. LETTERS 8,144 (2019), https://doi.org/10.1029/2019GL083235.

[166] N.C. Resilience Plan at 5D-2.

billion.[167] In total, 291,080 FEMA Individual Assistance applications were filed, and 119 fatalities were recorded.[168] Damage from flooding will worsen with climate change. There are already more than 680,000 properties at risk from flooding in North Carolina.[169] Between 2005 and 2017, 81,900 homes lost value in coastal North Carolina, amounting to a loss in home value appreciation of $582 million.[170] These costs will grow as storms become more frequent and intense.

The economic damages from storms and flooding will burden socially vulnerable populations, such as communities of color and immigrants, disproportionately. For instance, African American property owners are often ineligible for federal disaster relief funds due to a lack of clear property titles, and become subject to predatory offers by coastal land developers.[171] In Beaufort County, legal loopholes and ownership disputes stemming from historically inequitable property laws have led to land loss by Black families.[172] Due to distrust of state officials and language barriers, immigrants may be less willing to seek out disaster aid or resilience resources. Coastal storms also present disproportionate challenges for adopting preventative adaptation measures like home repair, in a positive feedback loop exposing the shortcoming of federal disaster aid.[173]

c. Agriculture impacts

Climate change creates multiple potential risks for North Carolina agriculture, including rising temperatures, flooding, more frequent and intense drought, and increased wildfire risk, as well as the movement of invasive species and diseases.[174] Higher temperatures, including a

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[167] Governor Roy Cooper, *Hurricane Florence Recovery Recommendations*, N.C. OFFICE OF THE GOVERNOR (Oct. 26, 2018), https://files.nc.gov/ncosbm/documents/files/Florence_Report_Full_rev20181016v10.pdf.

[168] *Id.*

[169] Online Database, FLOOD FACTOR (last visited Aug. 20, 2020), https://floodfactor.com/state/northcarolina/37_fsid#historic_flooding.

[170] Press Release, *State by State Analysis: Property Value Loss from Sea Level Rise*, FIRST ST. FOUND. (Aug. 8, 2019), https://firststreet.org/press/property-value-loss-from-sea-level-rise-state-by-state-analysis/.

[171] Rory Fleming et al., *Splitting Heirs: The Challenges Posed by Heirs' Property Ownership to Coastal Resilience Planning*, N.C. SEA GRANT (Aug. 2016), https://ncseagrant.ncsu.edu/ncseagrant_docs/coastallaw/pubs/heirs_property.pdf.

[172] Lizzie Presser, *Their Family Bought Land One Generation After Slavery: The Reels Brothers Spent Eight Years in Jail for Refusing to Leave It*, PROPUBLICA (July 15, 2019), https://features.propublica.org/black-land-loss/heirs-property-rights-why-black-families-lose-land-south/.

[173] Danny Vinik, *'People just give up': Low-income hurricane victims slam federal relief programs*, POLITICO (May 29, 2018), https://www.politico.com/story/2018/05/29/houston-hurricane-harvey-fema-597912.

[174] U.S. ENVTL. PROT. AGENCY (EPA), *Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment* (May 2017), https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095.

longer freeze-free season and a lack of nighttime cooling, can result in decreased productivity of some of the State's important cultivated crops, including cotton, corn, and soybeans.[175] Agriculture workers are among the most highly vulnerable to heat-related deaths in a warming climate, putting this sector's workforce at risk.[176] Rural communities are likely to be more vulnerable to these changes due to socioeconomic factors such as demography, income, literacy, and poverty incidence.[177]

Drought and flooding both harm agriculture, and as they become more severe and frequent across North Carolina, the cost will rise.[178] In 2002, the State's agricultural industry incurred $398 million in drought-related losses.[179] The 2007 drought caused an estimated $500 million in damages to North Carolina agriculture.[180] Droughts in 2016 severely curbed production of hay and Christmas trees.[181] In addition, flooding in eastern North Carolina from Hurricane Matthew in 2016 resulted in an estimated $544 million in agricultural losses, and flooding from Hurricane Florence in 2018 resulted in an estimated $2.4 billion in agricultural losses across the State.[182] Flooding from Matthew and Florence, respectively, caused $1.4 million and $5.7 million in damages to facilities owned or leased by the North Carolina Department of Agriculture.

Climate change will affect our livestock as well. Excessive heat, which disrupts metabolic processes in animals, could potentially lead to significant reductions in livestock

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[175] Steven McNulty et al., *Southeast regional climate hub assessment of climate change vulnerability and adaptation and mitigation strategies*, AGRIC. RES. SERV. (Oct. 6, 2015), https://www.fs.usda.gov/treesearch/pubs/50521.

[176] Diane M. Gubernot et al., *Characterizing occupational heat-related mortality in the United States, 2000–2010: An analysis using the census of fatal occupational injuries database*, 58 AM. J. INDUS. MED. 203 (2015), https://doi.org/10.1002/ajim.22381.

[177] *See, e.g.*, Pankaj Lal et al., *Socio-economic impacts of climate change on rural United States*, 16 MITIGATION & ADAPTATION STRATEGIES FOR GLOB. CHANGE 819 (2011), https://doi.org/10.1007/s11027-011-9295-9; Matthew Jurjonas & Erin Seekamp, *Rural coastal community resilience: Assessing a framework in eastern North Carolina*, 162 OCEAN & COASTAL MGMT. 137 (2017), https://doi.org/10.1016/j.ocecoaman.2017.10.010.

[178] N.C. Resilience Plan at 5B-7.

[179] Daria Karetinkov et al., *Economic Impacts of Climate Change on North Carolina*, UNIV. OF MD. CTR. FOR INTEGRATIVE ENVTL. RES. (Sept. 2008), http://cier.umd.edu/climateadaptation/North%20Carolina%20Economic%20Impacts%20of%20Climate%20Change%20Full%20Report.pdf**Error! Bookmark not defined.**.

[180] N.C. Resilience Plan at 5B-9.

[181] Abigail Margulis, *Severe Drought Creeps into Some WNC Counties*, CITIZEN-TIMES (June 24, 2016), https://www.citizen-times.com/story/news/local/2016/06/24/severe-drought-creeps-into-some-wnc-counties/86328144/; Heather Waliga, *What the Drought and Wildfires Mean for North Carolina Christmas Trees*, ABC 11 (Nov. 16, 2016), https://abc11.com/weather/what-does-the-drought-mean-for-nc-christmas-trees/1610518/.

[182] N.C. Resilience Plan at 5B-5.

yields and put North Carolina's hog, dairy, and poultry production at risk.[183] Livestock are sensitive to heat stress; an estimated 1 in 200 dairy cows and 1 in 500 hogs die annually due to heat stress in North Carolina, causing an economic loss of $80 million per year.[184] In addition, storms and resulting flooding have exacted heavy tolls on livestock.

d. Tourism and cultural impacts

Tourism across the State will suffer from climate change impacts. Visits to the coast will decrease with increasing sea level rise, beach erosion, hurricanes, and associated coastal infrastructure and property damage. Sea level rise is expected to cost the State $3.9 billion in lost recreational value over the next 75 years.[185] Beach visitation by out-of-town residents is expected to decrease by almost 50 percent by 2080,[186] and erosion may make recreation at some of the State's most popular beaches impossible by that time.[187] Beach nourishment as a means to protect coastal infrastructure has already cost the State upwards of $929 million.[188] The Office of State Archaeology estimates nearly 5,800 prehistoric and historic archaeological sites in the Coastal Plain are subject to severe damage from shoreline erosion and land loss from flooding and erosion.[189] In addition, cultural resources like the site of the famous Lost Colony on Roanoke Island may be completely inundated.[190]

Tourism impacts are not limited to the coast, as droughts, wildfires, and warmer winters affect visitation to the Western Mountains. For example, droughts and wildfires in 2016 resulted in fewer visits to golf courses in the western part of the State.[191] Additionally, over the past two decades, North Carolina ski resorts saw at least 40,000 fewer visitors on average during low

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[183] Fact Sheet, *What Climate Change Means for North Carolina*, U.S. EPA (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-nc.pdf.

[184] Normand R. St-Pierre et al., *Economic losses from heat stress by US livestock industries*, 86 J. DAIRY SCI. 52 (2003), https://doi.org/10.3168/jds.S0022-0302(03)74040-5.

[185] Okmyung Bin et al., Impacts of Global Warming on North Carolina Coastal Economy (White Paper, E. Carolina Univ., N.d.), https://bipartisanpolicy.org/wp-content/uploads/2019/03/NC-Climate_0.pdf.

[186] *Id.*

[187] Okmyung Bin et al., *Measuring the Impacts of Climate Change on North Carolina Coastal Resources*, NAT'L COMM'N ON ENERGY POLICY (Mar. 15, 2007), https://econ.appstate.edu/climate/NC-NCEP%20final%20report.031507.pdf.

[188] Online Database, *Beach Nourishment Viewer*, PROGRAM FOR THE STUDY OF DEVELOPED SHORELINES (last visited Aug. 20, 2020), http://beachnourishment.wcu.edu/.

[189] N.C. Resilience Plan at 5E-4.

[190] *Id.* at 5E-5.

[191] Davin Eldridge, *The Impacts of Drought on Western North Carolina*, BLUE RIDGE PUB. RADIO (July 26, 2016), https://www.bpr.org/post/impact-drought-western-north-carolina.

snowfall years compared to high snowfall years.[192] This accounted for an average annual revenue loss of $3.5 million to the industry.[193]

e. Commercial fishing impacts

Climate change is likely to reduce the availability of many species critical to North Carolina's recreational and commercial fishing industries. As discussed below, many freshwater and marine fish species are already shifting their ranges within or outside of the State. These shifts will likely continue to affect the ability of North Carolina's commercial fishermen to fill their quotas, and recreational fishermen to find target species in the future. Ocean acidification is expected to reduce U.S. harvests of shellfish, such as Atlantic sea scallops, which are caught in commercial fisheries north of Cape Hatteras.[194] In addition, harmful algal blooms, which are expected to increase with a warming climate, can cause fishery closures.[195]

f. Economic benefits of a clean energy transition

In addition to reducing greenhouse gas emissions and associated economic costs, a transition to clean energy has the potential to add great *benefit* to North Carolina's regional and local economies. According to a recent analysis, from 2007 to 2018, clean energy programs in the State contributed $16.9 billion in gross state product and added, on average, 14,000 jobs to the workforce each year.[196] This expansion of zero-emissions alternatives has been vital to reducing their costs; in many cases, the price of clean energy infrastructure has become more competitive than that of their fossil-fuel counterparts.[197] In addition, the health benefits of improving air quality and reducing fossil fuel pollution can amount to significant economic

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[192] Elizabeth Burakowski & Matthew Magnusson, *Climate Impacts on the Winter Tourism Economy in the United States*, NATURAL RES. DEF. COUNCIL (NRDC) (Dec. 2012), https://www.nrdc.org/sites/default/files/climate-impacts-winter-tourism-report.pdf.

[193] *Id.*

[194] Sarah R. Cooley et al., *An integrated assessment model for helping the United States sea scallop (*Placopecten magellanicus*) fishery plan ahead for ocean acidification and warming*, PLOS ONE (May 6, 2015), https://doi.org/10.1371/journal.pone.0124145.

[195] Anna M. Michalak, *Study role of climate change in extreme threats to water quality*, NATURE (July 19, 2016), https://doi.org/10.1038/535349a.

[196] Jeffrey Petrusa et al., *Economic impact analysis of clean energy development in North Carolina–2019 update*, N.C. SUSTAINABLE ENERGY ASS'N (May 2019), https://energync.org/wp-content/uploads/2019/05/v3NCSEA_Economic_Impact_Analysis_of_Clean_Energy_Development_in_North_Carolina_2019.pdf.

[197] Harold Anuta et al., *Renewable Power Generation Costs in 2018*, INT'L RENEWABLE ENERGY AGENCY (May 2019), https://www.irena.org/publications/2019/May/Renewable-power-generation-costs-in-2018.

benefits.[198] These trends are all expected to continue, as climate mitigation actions are often contagious across communities.[199]

7. Natural ecosystem and wildlife changes

Climate change greatly influences the structure and functioning of all natural systems. North Carolina's diverse ecosystems and wildlife are being transformed. Changing temperatures, storm and precipitation patterns, and sea levels, and all of the associated impacts discussed above, will redistribute species and greatly modify the State's ecosystems. As a result, the ecological resources that provide many benefits to society are increasingly at risk, and future generations will experience natural systems that are much different than those that we see today.

a. Forest ecosystem changes

Climate change is causing the composition, diversity, and abundance of North Carolina's forests to change, as tree species vary in their ability to tolerate changes in temperature, moisture, and disturbances.[200] Warmer year-round temperatures cause species-specific habitats to shift to higher altitude regions[201] such as the Western Mountains of North Carolina, which include some of the highest elevations and coolest climates in the entire Southeast.[202] Species found at the uppermost altitudes have nowhere to go and as the environmental conditions to which these high-elevation forests have adapted disappear, the viability of these ecosystems will face severe risk.[203] Accordingly, forests in western North Carolina are expected to undergo profound changes as a direct result of climate change, and these changes will affect the availability of forest resources important to North Carolinians.[204]

Threats to forest ecosystems are not limited to species range shifts. Pests that thrive in warmer climates will also pose new risks to the forestry industry.[205] For example, pine beetle outbreaks are more common as summers become warmer and winters turn milder.[206] Such

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[198] *See, e.g.*, Gregory F. Nemet et al., Implications of incorporating air-quality co-benefits into climate change policymaking, 5 ENVTL. RES. LETTERS 14,007 (2010), https://doi.org/10.1088/1748-9326/5/1/014007.

[199] Bryan Bollinger & Kenneth Gillingham, *Peer effects in the diffusion of solar photovoltaic panels*, 31 MKTG. SCI. 873 (2012), https://doi.org/10.1287/mksc.1120.0727.

[200] Virginia H. Dale et al., *Climate change and forest disturbances*, 51 BIOSCIENCE 723 (2001), https://doi.org/10.1641/0006-3568(2001)051[0723:CCAFD]2.0.CO;2.

[201] Nat'l Envtl. Modeling and Analysis Center (NEMAC), *Climate Change*, UNIV. OF N.C. ASHEVILLE (last visited June 11, 2020), http://www.wncvitalityindex.org/weather-and-climate/climate-change.

[202] N.C. Climate Science Report at 196.

[203] McNulty et al. (2013), *supra* note 125.

[204] NEMAC, *supra* note 201.

[205] Craig Hanson et al., *Southern Forests for the Future*, WORLD RES. INST. (Mar. 2010), https://files.wri.org/s3fs-public/pdf/southern_forests_for_the_future.pdf.

[206] Aaron S. Weed et al., *Consequences of climate change for biotic disturbances in North American forests*, 83 ECOLOGICAL MONOGRAPHS 441 (2013), https://doi.org/10.1890/13-0160.1.

outbreaks can cause the forestry industry to suffer economically; a pine beetle outbreak in 2001 resulted in $1 billion lost from the southern timber industry.[207] Furthermore, forests can become more susceptible to insects and pathogens when prolonged drought occurs over multiple growing seasons.[208] Finally, increased potential evapotranspiration from higher air temperatures under a warming climate likely will lead to decreased forest water yield, thus increasing drought and wildfire occurrence, as discussed above.

b. Coastal ecosystem changes

Just as it reshapes our forests, climate change is altering the State's coastal ecosystems, including our coastal wetlands, barrier islands, and marine ecosystems. Coastal wetlands and tidal marshes are essential to surrounding communities for floodwater storage, storm and wave buffering, flow control, carbon sequestration, and water purification, among other benefits/services.[209] These ecosystems also provide wildlife habitat, fish nurseries, and food supply.[210] Coastal wetlands are at risk from sea level rise, as the plants making up this habitat have adapted to live at very specific water levels and can drown in higher water.[211] Furthermore, areas that are not directly inundated by rising water levels will be compromised by saltwater intrusion, through saltwater toxicity and reduction in availability of fresh water.[212] As these changes take effect, ecosystems may need to migrate inland. However, it is likely that wetland loss due to sea level rise will outpace the rate of inland wetland migration in many areas because developed shorelines block migration. Finally, drought can also affect wetland ecosystems, for example by contributing to mortality of vegetation in salt marshes and tidal freshwater forests.[213]

As discussed above, climate change will exacerbate coastal erosion and threaten our barrier islands. North Carolina's sensitive barrier island ecosystems are already losing habitat

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[207] Karetinkov et al., *supra* note 179.

[208] NEMAC, *supra* note 201.

[209] William J. Mitsch et al., *Ecosystem services of wetlands*, 11 INT'L J. BIODIVERSITY SCI., ECOSYSTEM SERV. & MGMT. 1 (2015), https://doi.org/10.1080/21513732.2015.1006250; Katie K. Arkema et al., *Coastal habitats shield people and property from sea-level rise and storms*, 3 NATURE CLIMATE CHANGE 913 (2013), https://doi.org/10.1038/NCLIMATE1944; Christine C. Shepard et al., *The protective role of coastal marshes: A systematic review and meta-analysis*, PLOS ONE (Nov. 23, 2011), https://doi.org/10.1371/journal.pone.0027374.

[210] Denise Sanger & Catharine Parker, *Guide to the salt marshes and tidal creeks of the Southeastern United States*, S.C. DEP'T OF NAT. RES. (2016), https://www.saltmarshguide.org/.

[211] N.C. Resilience Plan at 5C-15.

[212] Amielle DeWan et al., *Understanding the Impacts of Climate Change on Fish and Wildlife in North Carolina*, DEFENDERS OF WILDLIFE (Jan. 22, 2010), https://www.ncwildlife.org/Portals/0/Conserving/documents/ActionPlan/Revisions/Executive_Summary_Understanding_Climate_Change_Impacts_2009.pdf.

[213] *See, e.g.*, Brian R. Silliman et al., *Drought, snails, and large-scale die-off of southern U.S. salt marshes*, 310 SCI. 1,803 (2005), https://doi.org/10.1126/science.1118229; Larisa R.G. DeSantis et al., *Sea-level rise and drought interactions accelerate forest decline on the Gulf Coast of Florida, USA*, 13 GLOB. CHANGE BIOLOGY 2,349 (2007), https://doi.org/10.1111/j.1365-2486.2007.01440.x.

due to erosion.[214] Sea level rise will accelerate coastal erosion, particularly on developed shorelines. This erosion will likely be exacerbated by other climate-induced changes such as increased storm intensity and changes in prevailing currents, both of which are projected to lead to increased beach loss. For reasons noted above, these ecosystems may not always move inland, and many simply will be lost.

Offshore marine ecosystems will undergo massive changes in water temperature, pH, and related chemical variables because of climate change, which will have a profound effect on the marine ecosystem of the region. Ocean acidification, the progressive change in ocean pH caused by uptake of atmospheric carbon dioxide, will become an increasingly important driver of ocean ecosystem change.[215] Ocean warming will also lead to deoxygenation through the direct influence of temperature on oxygen solubility (i.e., warm water holds less oxygen).[216] Ocean temperature changes will further influence oceanographic conditions by altering stratification, photosynthesis, and productivity.[217] Warming ocean temperatures will also continue to exacerbate the presence of oxygen-depleting algal blooms, posing significant threats to ocean ecosystems.[218] Such alteration of these communities puts at risk the ecosystem services provided by marine ecosystems in ways that will harm North Carolina's economy, fisheries harvest, and cultural heritage.

c. Biodiversity changes

Climate change is already causing North Carolina to lose some of our impressive biodiversity and losses will accelerate with climate change. Reptiles, amphibians, cold-water aquatic species, and ecological communities at high elevations will be most vulnerable to temperature increases.[219] At least 83 fish species, 43 mussel species, 21 crayfish species, and 10 snail species are at risk of dramatic habitat loss and degradation as a result of climate change and may disappear from the State.[220] Cold-water fish like trout, which are stocked in cold-water hatcheries in the State, are at great risk from warmer temperatures.[221] Many of these species have important commercial and recreational value.

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[214] *See supra* note 61.

[215] Andrew J. Pershing et al., *Oceans and Marine Resources*, 2 IMPACTS, RISKS, & ADAPTATION IN THE UNITED STATES: FOURTH NATIONAL CLIMATE ASSESSMENT 353 (2018), https://doi.org/10.7930/NCA4.2018.CH9.

[216] *Id.*

[217] *Id.*

[218] Gustaaf M. Hallegraeff, *Ocean climate change, phytoplankton community responses, and harmful algal blooms: A formidable predictive challenge*, 46 J. PHYCOLOGY 220 (2010), https://doi.org/10.1111/j.1529-8817.2010.00815.x; Stephanie K. Moore et al., *Impacts of climate variability and future climate change on harmful algal blooms and human health*, 7 ENVTL. HEALTH 4 (2008), https://doi.org/10.1186/1476-069X-7-S2-S4.

[219] DeWan et al., *supra* note 212.

[220] *Id.*

[221] *Id.*

Birds are also at risk. More than 200 bird species that breed, winter, or migrate through North Carolina are at risk from climate change.[222] Of these, about 130 are moderately or highly vulnerable to climate change, and close to 100 will lose more than half of their range under a worst-case warming scenario.[223] Across the Southeast, milder winters likely will cause many bird species to stop migrating as far south, which could affect birding and hunting recreational opportunities.[224]

Numerous marine species may suffer habitat loss and range shifts and may disappear from the State, as many marine species are sensitive to even small changes in ocean temperature. Scientists have also already documented shifts in the distribution of many fish species along the eastern seaboard, including off the coast of North Carolina. In the region north of Cape Hatteras, many recreationally and commercially important fishery species likely will continue to shift their habitat ranges to the northeast.[225] These include 10 species of skates and sharks, eight species of flatfish, both long- and short-fin squid, surf clams, and scallops.[226] Suitable habitat for summer flounder has also been shifting northward, at a rate of roughly 19 miles per decade over the last 40 years.[227] Furthermore, populations that thrive in warm water year-round are also flourishing and expanding their ranges, potentially crowding out migratory species.[228]

Climate change poses other threats to marine species besides habitat shifts. Ocean acidification and related changes in ocean chemistry from climate change will lead to alterations in species distribution, the decline of some species' calcification, and mismatched timing of prey–predator abundance.[229] A decrease in the growth of sea turtles in the West Atlantic, for

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[222] Chad B. Wilsey et al., *Survival by Degrees: 389 Bird Species on the Brink*, AUDUBON (2019), https://www.audubon.org/sites/default/files/climatereport-2019-english-lowres.pdf.

[223] *Id.*

[224] Michael Notaro et al., *Projected influences of changes in weather severity on autumn-winter distributions of dabbling ducks in the Mississippi and Atlantic Flyways during the twenty-first century*, PLOS ONE (Dec. 13, 2016), https://doi.org/10.1371/journal.pone.0167506.

[225] James W. Morley et al., *Projecting shifts in thermal habitat for 686 species on the North American continental shelf*, PLOS ONE (May 16, 2018), https://doi.org/10.1371/journal.pone.0196127.

[226] *Id.*

[227] Marianne Lavelle, *Uncivil War Breaks Out Over Fluke as Habitat Shifts North*, SCI. AM. (June 3, 2014), https://web.archive.org/web/20170717182658/https://www.scientificamerican.com/article/uncivil-war-breaks-out-over-fluke-as-habitat-shifts-north/.

[228] Morley et al., *supra* note 225.

[229] Pershing et al., *supra* note 215.

example, has been linked to higher ocean temperatures.[230] Laboratory studies have shown that ocean acidification can impact fish and their prey.[231]

Finally, sea level rise puts the biodiversity in low-lying habitats such as salt marshes and barrier islands at risk. By 2030, between 16 and 60 percent of all nesting beach habitat for sea turtles and shorebirds is projected to be more vulnerable to erosion due to sea level rise.[232] Furthermore, the loss of wetland plant species, like salt marsh grasses, will have considerable ecological consequences.[233] In these ways and more, climate change will further reduce the availability of suitable habitat in these sensitive coastal ecosystems and may even lead to invasion by foreign species.[234]

8. Climate Justice

Climate impacts will disproportionally affect socially vulnerable, low-income, marginalized, and underserved communities in North Carolina.[235] Communities that are already struggling with other challenges will be more likely to be exposed to climate hazards and have less ability to adapt to the shocks and stressors of climate change on their own. As defined in the Resilience Plan, climate justice refers to social and political action acknowledging the deep inequities posed by climate change impacts and identifying opportunities to focus greenhouse gas mitigation and climate change resilience efforts on the needs of those who are most vulnerable.[236]

Communities across North Carolina currently face widely varying levels of vulnerability to stressors. This variation is exacerbated by structural racism.[237] For example, Black

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[230] Karen A. Bjorndal et al., *Ecological regime shift drives declining growth rates of sea turtles throughout the West Atlantic*, 23 GLOB. CHANGE BIOLOGY 4,556 (2017), https://doi.org/10.1111/gcb.13712.

[231] D. Shallin Busch & Paul McElhany, *Estimates of the direct effect of seawater pH on the survival rate of species groups in the California Current ecosystem*, PLOS ONE (Aug. 11, 2016), https://doi.org/10.1371/journal.pone.0160669.

[232] Betsy von Holle et al, *Effects of future sea level rise on coastal habitat*, 83 J. WILDLIFE MGMT. 694 (2019), https://doi.org/10.1002/jwmg.21633.

[233] Aaron M. Ellison et al., *Loss of foundation species: consequences for the structure and dynamics of forested ecosystems*, 3 FRONTIERS ECOLOGY & ENV'T 479 (2005), https://doi.org/10.1890/1540-9295(2005)003[0479:LOFSCF]2.0.CO;2.

[234] DeWan et al., *supra* note 212.

[235] *See generally*, N.C. Resilience Plan; RITA CLIFFTON & CATHLEEN KELLY, CTR. FOR AM. PROGRESS, BUILDING A JUST CLIMATE FUTURE FOR NORTH CAROLINA (2020), https://www.americanprogress.org/issues/green/reports/2020/09/09/490114/building-just-climate-future-north-carolina/.

[236] N.C. Resilience Plan at 4-1.

[237] Structural racism "involves interconnected institutions, whose linkages are historically rooted and culturally reinforced. It refers to the totality of ways in which societies foster racial discrimination, through mutually reinforcing inequitable systems (in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice, and so on) that in

individuals are less likely than white individuals to own their homes, making them more susceptible to the issues mentioned above. Historical redlining and other racist, exclusionary policies mean that communities of color are more likely to live in floodplains, neighborhoods lacking green space, and regions with high concentrations of hazardous facilities, thereby subject to greater environmental harms.[238] Also, immigrants may face cultural and language barriers to communication that can prevent them from receiving emergency messages about natural disasters.

Race, ethnicity, nationality, and language are not the only drivers of unequal vulnerability; income, age, disability, and location within the State also cause inequities. Low-income households, including those of many seniors on fixed incomes, have few financial resources necessary to fix damage from hazards, afford increasing energy bills, afford the cost of temporary housing, or absorb fluctuations in the cost of food. In addition, over 25 percent of adults in North Carolina have some type of disability.[239] Disabled individuals may require caretakers or other specialized assistance with daily tasks that may be unavailable in the face of climate stressors like natural disasters. Seniors who lack a smartphone or familiarity with social media may also have limited channels to receive emergency communications. Furthermore, several population stressors may also combine with vulnerabilities and climate hazards to worsen the public health impacts from climate change discussed above. Age, minority and veteran status, income, and existing health conditions all influence vulnerability to climate change impacts on health.[240]

Just as the whole of the impact of climate change on the natural world is unfortunately greater than sum of the different individual impacts, the same is true of its impacts on society. This reality should inform the Commission's consideration of the impacts reviewed above as well as the actions it takes to confront climate change.

9. Conclusion

Without action to reduce greenhouse gas emissions, the effects of climate change on North Carolina will be severe. The scientific evidence presented in this report demonstrates that large changes in North Carolina's climate, much larger than at any time in the State's history, are currently taking place and will continue without aggressive decarbonization. North Carolina's climate is getting hotter: average annual temperatures, very warm nights, and very hot days will continue to increase across most of the State, after having increased significantly over the past

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turn reinforce discriminatory beliefs, values, and distribution of resources, which together affect the risk of adverse … outcomes." *Id.* at 4-3.

[238] Zack Colman & Daniel Cusick for E&E News, *2 Hurricanes Lay Bare the Vulnerability of America's Poor*, SCI. AM. (Oct. 1, 2018), https://www.scientificamerican.com/article/2-hurricanes-lay-bare-the-vulnerability-of-americas-poor/.

[239] *Disability & Health U.S. State Profile Data for North Carolina (Adults 18+ years of age)*, CTRS. FOR DISEASE CONTROL & PREVENTION (Sept. 12, 2019), https://www.cdc.gov/ncbddd/disabilityandhealth/impacts/north-carolina.html.

[240] N.C. Resilience Plan at 5G-2.

several decades. Sea levels up and down the State's coast are rising and will continue to rise, which will increase the damaging power of tropical storms, lead to widespread flooding, and exacerbate ongoing coastal erosion. The intensity of tropical storms is increasing in the Atlantic, resulting in stronger hurricanes and heavier accompanying precipitation impacting North Carolina, a trend that is expected to continue. In addition to storms, there is an upward trend in the frequency and severity of both heavy rainfall events and periods of drought, which in turn will increase the frequency and severity of inland flooding and wildfires, respectively.

Unless the State takes action to reduce carbon emissions, it will not be possible to reduce or avoid the effects of climate change. The dynamics described above will combine in the coming decades to threaten the public health of North Carolina, by causing more illnesses from extreme heat, poor air quality, and vector-borne pathogens. As a result of these climate change impacts, the State will also suffer enormous economic losses from infrastructure and property damage, and the State's agriculture, forestry, tourism, and fishing industries will be devastated. Socially vulnerable, low-income, marginalized, and underserved North Carolinians will suffer from these impacts disproportionally. Finally, the State's diverse ecosystems and wildlife are transforming, and climate change impacts will continue to redistribute or decimate many populations. Hardly any facet of life in the State will be left untouched and the consequences will be dire, for people as well as for the natural world we depend on for our very survival.