The Updated Carbon Plan for North Carolina's Energy Future Once Again Fails to Make the Grade

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Prepared by People Power North Carolina

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REPORT CARD

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Student Name:
North Carolina Utilities Commission

SUBJECT	GRADE
Serve as an Independent, Transparent, Dynamic, and Objective process that holds Duke Energy Accountable to Meeting and Exceeding North Carolina's Carbon Reduction Goals (page 4)	Incomplete
Center Stakeholder Feedback (page 6)	D-
Address Historic Harm from Fossil Fuels and Dirty Energy (page 8)	F
Lead to Fair and Affordable Electricity Bills (page 11)	F
Maximize Near-Term Deployment of Renewable Resources and Storage (page 14)	D-
Set an Ambitious Timeline for Closing Coal (page 21)	F
Allow No New Gas (page 23)	F
Capture Maximum Benefits of Customer-Owned Resources (page 26)	F
Ensure Reliable and Resilient Electricity Service for All Customers (page 30)	D
Avoid Risky Bets on Unproven Technologies (page 32)	F

Introduction and Background

Duke Energy filed a Carolinas Resource Plan in August 2023 with the North Carolina Utilities Commission (NCUC), as required by the NCUC's Carbon Plan Order issued in 2022.[1] NCUC's order requires this plan to demonstrate the least-cost pathway[2] to meet North Carolina's emissions reduction goals, set forth by HB 951. Duke's plan covers both electricity systems, Duke Energy Progress and Duke Energy Carolinas, the company operates in North Carolina and South Carolina (a concurrent filing was made with the Public Service Commission of South Carolina). In this filing, Duke presents modeling of several different scenarios, along with detailed documentation of analytical methods, assumptions, and modeling results. Again, these modeling assumptions completely ignore the 50 year legacy of dumping toxic pollution on marginalized communities.

In the updated Carbon Plan, Duke proposes three Pathways to carbon neutrality. These three Pathways are largely the same, with the main difference being in Pathway 1, also known as the only plan that reaches the goals set by HB 951. Duke's Carolinas Resource Plan recommends a 5-year delay in compliance with the statutory goal of 70% carbon emissions reductions by 2030, set forth by HB 951 and reflected in the NCUC Carbon Plan Order in 2022. However, the modeling that supports Duke's recommendation to delay compliance is deeply flawed. Among many other issues, the modeling imposes artificial limits on commercially available clean energy technologies like solar, wind, and energy storage, uses renewable energy project cost assumptions that are much higher than well-accepted industry benchmarks, and artificially inflates the cost of the only scenario that achieves the emissions reduction mandate of 70% by 2030.

In January 2024, Duke filed updated modeling based on material changes in Duke's forecasted demand growth in the Carolinas. Duke made changes to other modeling assumptions in this filing, including new constraints on energy storage deployment and relaxed constraints on new gas. Furthermore, Duke now projects that load growth in the Carolinas is eight times higher than they previously estimated only months prior. However, Duke provided only limited technical documentation for this updated modeling and this rationalization of load growth.

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[1] NCUC, Order Adopting Initial Carbon Plan and Providing Direction for Future Planning, Docket No. E-100, SUB 179, 2022, https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=7b947adf-b340-4c20-9368-9780dd88107a

[2] Note that the "least cost" pathway does not include the staggering costs of damages from fossil fuels, which fall disproportionately on our most vulnerable communities. These costs have been ignored by both utilities and regulators for at least 50 years. The "external" -- or uncounted -- costs of damages from coal-fired electricity are 17-27 cents/kWh for coal (Epstein, Harvard, 2011), and 4-18 cents/kWh for fossil gas (Shindell, Duke University). Author Dr. Paul Epstein notes in the above study that the total damages from fossil fueled electricity are ~$500 billion per year, which equals the total revenues that utilities collect from customers every year per the U.S. Energy Information Administration. (See Table 3.)

This iteration of the Carbon Plan lacks a sense of urgency in dealing with the climate emergency that is already impacting North Carolina residents, particularly the elderly, low-income communities, and communities of color who testified to that effect in NCUC public hearings held across the state. If the NCUC truly wants to ensure that our energy decisions are "reasonable and prudent," it should quickly phase out fossil fuels and make a much more robust and rapid commitment to renewables, battery storage, and energy efficiency.

This document reviews key assumptions and modeling choices that influence Duke Energy's conclusions in their Carbon Plan / Integrated Resource Plan. We also grade Duke Energy's efforts to transition the state of North Carolina to a clean energy future and the willingness of the NCUC to enforce legislative mandates toward carbon neutrality. Below is our analysis of the failures we see in the updated Carbon Plan followed by a call to action for the NCUC to implement aggressive renewable energy solutions to meet our carbon reduction mandates.

A Carbon Plan in the public interest should...

1. Serve as an Independent, Transparent, Dynamic, and Objective process that holds Duke Energy Accountable to Meeting and Exceeding North Carolina's Carbon Reduction Goals

Grade: Incomplete

Summary
The NCUC is responsible to all NC ratepayers and should hold Duke accountable for meeting and going beyond the goals of HB 951. An independent NCUC will not depend on Duke to establish a baseline plan but will equally consider research and alternative plans from experts sponsored by intervenors and public staff. The NCUC should identify barriers to meeting the required goals and make policy decisions addressing those barriers. The Commissioners should consider all analysis and evidence submitted to ensure that their decision-making is based on objective analysis, and they should not allow Duke Energy's submissions to override other submitted proposals.

Discussion
This area is currently graded as "incomplete but trending downward" as we have not seen how

NCUC will act as the CP/IRP hearings and intervening sessions play out. The grading is trending towards the negative due to the NCUC trying to limit individual intervenors' ability to litigate and restricting them to making public comments. As of this writing, the NC Attorney General's office has filed objections to that proposed rule change.

The NCUC process should build on, not abandon, prior Carbon Plan progress and process. Here are the statutory goals set forth for Duke: 1) a 70% reduction in carbon dioxide (CO2) emissions by 2030; 2) carbon neutrality by 2050. Upon the passage of HB 951, Duke had agreed that these limitations were feasible. However, within the last two years, Duke has gone back on this decision, now opting for a less ambitious plan that is projected to meet these mandates by the mid-2030s. This proposed new Carbon Plan disregards Duke's 2030 statutory target and further endangers carbon neutrality by 2050 by relying on unproven technology and methane gas. Instead of requiring transparency and pushing for aggressive action, the NCUC has allowed Duke to set its interpretation of the laws based on biased modeling assumptions while limiting public participation.

NCUC should consider all analysis and evidence, and ensure that decision-making is based on objective analysis, not biased assumptions. Duke Energy's submitted analysis makes several major assumptions that bias the conclusions of their modeling towards methane gas, including artificial limits on the deployment of renewable energy and storage resources (see Principle 5), an arbitrary cost premium on new resources in the only scenario that meets the goals of HB 951 (see Principle 5), high renewable energy and storage cost assumptions (see Principle 5), inadequate consideration of the longer term requirement for carbon reduction in the choice of resources (see Principles 5, 7, and 10), overstatement of the winter reliability of gas-fired power plants (see Principle 7), insufficient consideration of energy efficiency and customer resources as an option to meet increased demand (see Principle 8), and reliance on deployment of technologies that have no commercial track record and have high cost and execution risks to achieve emissions reductions goals (see Principle 10). Duke uses this modeling to support their recommendation to delay compliance with HB 951 goals, build significant new gas capacity, and constrain the rate of deployment of new solar, wind, and energy storage.

A significant problem for objectivity, recognized by the Commission in 2022, has not been corrected by Duke as the Commission requested.[3] The modeling uses a technique – short period optimization - that biases the results in favor of gas. It does not consider that we will need to reduce the use of gas over the lifetime of the plant to meet the carbon goals. By only considering the short term economic value of gas without carbon constraints, it exaggerates the values of gas units relative to carbon-free resources (e.g. solar and wind).

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[3] Commission Order on Docket No. E-100, Sub 179, Dated 12/30/2022. " 5. That in its first proposed biennial CPIRP Duke shall make all reasonable efforts to maximize its modeling optimization period, and seek to model a 15-year, or greater, optimization period;" Greater detail regarding this problem can be found in multiple places in the record for this docket, particularly in Docket E-100, Sub 179 Brad Rouse Post Hearing Brief and Partial Proposed Order, 10/24/2022.

Objective analysis would consider all sources of bias and correct them in some way, which Duke's Carbon Plan proposal does not do. The Commission should give heavy weight to intervenor modeling exercises that correct this flaw. Models are only as good as the inputs that provide the results, and when these models ignore what we care about, they are not useful. When utility modeling excludes the high cost of damages to energy-burdened communities, including health and environmental damages, the models only serve the utilities and shareholders, not those of us who are forced to purchase dirty energy and continue to harm our friends and neighbors with toxics in our air and water.

Sadly, during the last Carbon Plan cycle, the NCUC elected to essentially accept Duke Energy's version of a Carbon Plan instead of fully considering the public comments and the more comprehensive and accurate models and analyses provided by intervenors. Furthermore, intervenors during the last Carbon Plan process submitted alternative modeling, which detailed a cleaner way to meet Duke's legislatively mandated carbon reduction goals at lower cost. The NCUC did not consider this modeling and, instead, rubber-stamped Duke's original plan. This act was a failure to be objective and equally consider all arguments, setting a harmful precedent for what information is weighed more heavily by the NCUC. We are in a climate crisis now. After the current public comment period and intervening sessions are completed, we hope that the NCUC will make a decision based on the urgency of the climate crisis we are in and not side with Duke Energy, which is overly focused on profit and is failing to aggressively embrace renewable energy resources.

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2. Center Stakeholder Feedback

Grade: D-

Summary

Feedback surrounding Duke Energy's current impacts on local communities was and has continued to be ignored when it comes to the NCUC. The Commissioners have continued to approve Duke Energy's requests for profit increases and fossil fuel buildouts, from the rate hike hearings to the recent net metering case currently under appeal in court.

While the Commissioners hold hearings for stakeholder feedback, our comments, questions, and concerns are never centered in the final decisions, despite being the ones who will feel the most direct impact from Duke Energy's failures. This process was written to prioritize the wishes of Duke Energy and ignore the financial and environmental burden that falls on the shoulders of North Carolinians. To improve, the NCUC must reevaluate Duke's Carbon Plan and act as the regulator it was created to be. Comments from the general public must be further incorporated into the Carbon Plan process to relieve North Carolina customers and residents from pollution burdens and soaring bill impacts.

Discussion

Despite the NCUC receiving 139 testimonies at public hearings and 489 written comments[4], including comments from 45 scientists[5], during the first Carbon Plan hearings, the Commissioners did not sufficiently consider the feedback in their final order for the original Carbon Plan. While the NCUC does offer the opportunity for public comment, the opportunities are limited and not accessible to all residents in North Carolina. In 2022, there were six opportunities for public comments, including a virtual hearing that allowed 30 people to speak. This year, there are only five hearings, with the virtual hearing now limited to 20 speakers. This change limits the opportunity for the public to testify at these hearings, especially for anyone living in a rural area who may not be able to travel or does not have access to reliable internet. If the NCUC truly wanted to prioritize stakeholder feedback, they would change the process to include more public hearings in both rural and urban communities and offer multiple virtual sessions so any interested parties had the opportunity to have their voices heard.

Previously, of the 139 individuals who testified at the public hearings and the 489 who submitted written comments, the final statement from the Commission was that “public witnesses offered eclectic opinions varying from disapproval to approval of Duke’s Carbon Plan proposal” (p. 13). Comments made on the impacts of environmental justice, questioning the reliability of natural gas and the volatility of its pricing, pollution from natural gas and nuclear plants, the lack of solar and storage, the almost complete absence of wind energy, and the lack of funds integrated from the Inflation Reduction Act were completely ignored.

Despite the setbacks, stakeholders have continued to push back against Duke’s cost assumptions for solar energy storage, arguing that third-party cost assumptions were more reasonable than those developed by Duke.[6] While the energy utility has made some adjustments before its initial filing, Duke still used cost assumptions that were significantly higher than industry-accepted estimates. Stakeholders have also repeatedly raised concerns about linking the timing of achievement of the 70% emissions reduction goal with the availability of advanced nuclear reactors, which were largely dismissed, citing Duke’s belief that new nuclear plants could be built by the mid-2030s.[7] Duke has failed to include sufficient residential and commercial solar and battery storage in its plan. Both large solar farms and distributed

[4] Sierra Club, Duke Energy NC Carbon Plan - Next Steps
[5] NC WARN, Shindell et al to Cooper and Good, “Scientists appeal for North Carolina to close, not expand, fossil fuels for electricity”, November 14, 2022, p. 3, 4
[6] Great Plains Institute, Duke Energy’s 2023 Carolinas Resource Plan Stakeholder Meeting, March 16, 2023 Meeting Summary, p. 10, 21.
[7] Great Plains Institute, Duke Energy’s 2023 Carolinas Resource Plan Stakeholder Meeting, June 13, 2023 Meeting Summary, p. 18.

generation need to be prioritized in the Carbon Plan. Stakeholders pointed out that Duke's base case assumptions limiting the amount of new solar that could be added to the grid were insufficient to achieve 70% carbon emission reductions by 2030, but Duke maintained these limits in their modeling.[8] More discussion on Duke's arbitrary resource caps and modeling limits, specifically on renewable resources, can be found in Principle 5.

Time and time again, the Commissioners in the NCUC have blatantly taken the side of Duke Energy rather than listening to stakeholders or adhering to the law. Recently, the Commission was accused of ignoring H.B. 589, a 2017 state law mandating the NCUC order an independent net metering cost-benefit analysis, instead relying on Duke Energy's biased calculations.[9] The NCUC approved Duke Energy's previous version of the Carbon Plan regardless. According to state law, the NCUC should only consider sources that contribute to a "least cost" future, rather than unproven sources for which costs are largely unknown.[10] The NCUC is hosting public hearings for this version of the Carbon Plan in April, even though only one of Duke's proposed portfolios would achieve the HB 951 requirement of reducing carbon emissions by 70% from 2005 levels by 2030 and it is not the preferred portfolio that Duke recommends.[11]

Furthermore, the Commission's reliance on the Public Staff as the primary voice of the public, rather than directly addressing the views of hundreds of concerned citizens, undermines the democratic process. Despite holding conferences to assess the sufficiency of Duke-led stakeholder meetings, environmental justice concerns were conspicuously absent from the discussion. Testimony from a public hearing specifically highlighting deficiencies in Duke's environmental justice outreach for the Carbon Plan was met with only a superficial acknowledgment in the final decision.

Inadequate engagement by Duke with impacted communities before plan submission further exacerbates the issue. Stakeholders' feedback on Duke's cost assumptions for solar and energy storage was largely ignored, with Duke persisting in using higher-than-industry-standard cost estimates. Concerns about the timeline for achieving emission reduction goals and the adequacy of solar additions to the grid were similarly dismissed.

Overall, the Commission's deference to Duke Energy at the expense of meaningful public engagement raises questions about the transparency and accountability of the regulatory process. While steps have been taken to involve the public, they have been inadequate and the ultimate decision-making appeared skewed in favor of corporate interests rather than the

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[8] Great Plains Institute, Duke Energy's 2023 Carolinas Resource Plan Stakeholder Meeting, June 13, 2023 Meeting Summary, p. 14.
[9] NCWARN, "Duke Energy on Defense at NC Court of Appeals over Regulators' Agreement to Slash Solar Incentives" — News Release from NC WARN & EWG, February 7, 2024
[10] News From The States, "Duke Energy's wins at the state Utilities Commission are holding back necessary climate progress", January 18, 2024
[11] NC Sustainable Energy Association, "Response to Duke Energy's Proposed Combined Carbon Plan and Integrated Resources Plan (CPIRP)", December 5, 2023

concerns of the communities affected.

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3. Address Historic Harm from Fossil Fuels and Dirty Energy

Grade: F

Summary

Even though this is a new Carbon Plan, there has been little work done to address the extensive, systemic harms done to BIPOC (Black, Indigenous, People of Color) and frontline communities by the legacy of fossil fuels. This harm is further reinforced by Duke's replacement of coal with methane gas instead of siting renewable energy plants and storage to leverage existing transmission infrastructure at brownfield sites.

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Discussion

For far too long, certain communities in North Carolina have borne the brunt of the consequences of our overreliance on fossil fuels. Those communities are frequently poor, rural, and/or BIPOC, and must deal with other forms of pollution besides fossil fuels. Furthermore, many communities around coal plants are economically dependent on the careers and financial benefits provided by the facilities. As a result, negative effects on health and economic development have been tolerated, ignored, or accepted as "collateral damage" in exchange for short-term local benefits and statewide priorities. A just and sustainable transition to a clean energy economy must center the voices and needs of impacted communities. A Carbon Plan process that is in the public interest must reflect these needs and provide a clear path forward for communities burdened by coal and methane gas infrastructure.

As covered more extensively in principle 2, there are doubts that the North Carolina Utilities Commission actively considers the opinion of the public. This is especially evident in this Carbon Plan process, as the NCUC has limited the number of public hearings and the number of speakers at these hearings in comparison to the previous Carbon Plan. In 2022, there were six hearings in total, but this year there are 5. The virtual hearing last cycle was capped at 30 speakers, and this year's virtual hearing is capped at 20. This specifically limits the ability of folks who do not live near an urban area to share their experiences.

Furthermore, the Carbon Plan process considers Duke's plan to address our energy needs in complete isolation from executive leadership decisions and from the actions of other utilities. Over the last four years, there have been commitments from the Governor to cement environmental justice into the inner workings of the State, and the North Carolina Utilities Commission should not and cannot be exempt from these responsibilities. On January 7, 2022, Governor Roy Cooper issued Executive Order No. 246, requiring that "each Cabinet agency, supported by the Governor's Office, shall develop an agency public participation plan informed by stakeholder input. The plan shall include best practices for community engagement, meaningful dialogue, and efficient mechanisms to receive and incorporate public input into agency decision-making."[12]

In 2023, the Governor's Office deepened its established commitment to environmental justice through Executive Order 292. This order re-establishes vital methods of public participation and environmental justice forums to protect residents across the state from disproportionate impacts of environmental hazards and reduce systemic barriers.[13] While these orders are not binding, it is evident that the actions of state leadership and the historical context of North Carolina demand extensive, thoughtful incorporation of environmental justice into all aspects of our future. The failure of the Utilities Commission and Duke Energy to consider this need directly harms overburdened communities and furthers environmental injustice.

While this Carbon Plan is focused on Duke's plans, the Utilities Commission must analyze these proposals with knowledge of other buildouts within the state contributing to the pollution burden. For instance, in Person County, there are now multiple fossil fuel projects proposed between Duke and Dominion. Dominion's Moriah Energy Center would store over 25 million gallons of liquefied natural gas in the county and has already drawn strong opposition from local residents.[14] Dominion has also proposed a domestic gas pipeline within the state to bring millions of gallons of more gas into this same county.[15] Finally, Duke's Carbon Plan has outlined the near-term future of Person County to include two gas plants. This is a clear example of a disproportionate impact falling on this community which has already shouldered the burden of coal plants.

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[12] "Governor Cooper Signs Executive Order Detailing next Steps on Path to a Clean Energy and Equitable Economy for All North Carolinians." NC Governor Roy Cooper, 7 Jan. 2022, governor.nc.gov/news/press-releases/2022/01/07/governor-cooper-signs-executive-order-detailing-next-steps-path-clean-energy-and-equitable-economy.

[13] "Governor Cooper Issues Executive Order Directing Bold Action to Advance Environmental Justice within State Government." NC Gov. Cooper, 24 Oct. 2023, governor.nc.gov/news/press-releases/2023/10/24/governor-cooper-issues-executive-order-directing-boldaction-advance-environmental-justice-within.

[14] "Person County Residents File Complaint against Proposed Harmful Moriah Energy Center." Southern Coalition for Social Justice, 6 Feb. 2024, southerncoalition.org/person-county-residents-file-complaint-against-proposed-harmful-moriah-energy-center/.

[15] Sorg, Lisa. "Three Large Natural Gas Pipeline Projects Are Proposed for NC: Where They Are and What's Next." NC Newsline, 1 Mar. 2024, ncnewsline.com/2024/03/01/three-large-natural-gas-pipeline-projects-are-proposed-for-nc-where-they-are-and-whats-next

To be clear, fossil fuels do not need to replace fossil fuels. There is incredibly valuable infrastructure within these areas that can be reused to connect more renewable energy to the grid and provide more sustainable career opportunities for folks economically reliant on fossil fuels. Duke Energy has undertaken projects like these before within the state, with a solar installation replacing a coal plant on its original site.[16] Siting renewables instead of gas also reduces the potential for future burdens on these communities.

Duke has proposed hydrogen as a replacement for gas, stating in the Carbon Plan that existing infrastructure can be retrofitted. This is unproven at the utility scale. Failure in infrastructure can result in gas leaks and additional toxic exposure to these communities. Replacement of fossil fuels with renewable energy lowers the pollution burden on impacted communities, provides pathways to clean jobs, and reduces the need for infrastructure that will eventually be rendered obsolete.

Finally, despite the massive load growth and buildout, the Carbon Plan provides a very small allotment of resources toward low-income programs to reduce the energy burden that these disadvantaged groups face. Duke and the NCUC are missing an excellent opportunity to help our low-income neighbors reduce their energy burdens, thereby providing a counterweight to the historical harms that these communities have experienced. Expanding and improving pathways to more energy-efficient homes, buildings, and appliances can reduce the overall consumption of energy and provide direct benefits to low-income communities extending past lower energy bills.

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4. Lead to Fair and Affordable Electricity Bills

Grade: F

Summary

Duke's plan implies significant costs and risks for electricity customers while minimizing the benefits of energy efficiency and other demand-side investments in reducing customers' electricity bills. Duke assumes significant demand growth from large manufacturing sites and data centers, but as we've seen from the recent rate hike approval, residential customers are the ones who bear the brunt of rising costs. According to Duke's Supplemental Planning Analysis, residential customers will see an additional average increase of $80 per month on

[16] Duncan, Charles. "Duke Plans New, Renewable Life for a Retired Coal Plant in Western N.C." Spectrum New, 31 May 2023, spectrumlocalnews.com/nc/charlotte/news/2023/05/31/duke-plans-new--renewable-life-for-a-retired-coalplant-in-western-n-c-?cid=share_clip.

their bills by 2038 if the NCUC adopts Portfolio 3.[17] This is the portfolio with the slowest transition to clean energy of the three Duke initially proposed. This extreme price hike is unsustainable. Duke's proposed gas buildout further exposes North Carolinians to stranded assets and cost recovery mechanisms already approved by the NCUC. Duke's plan not only puts customers on the hook if gas prices spike but also if proposed nuclear projects run over budget and if the natural gas plants are not able to fully transition to green hydrogen.

Discussion

Duke's demand growth is driven by large industrial, manufacturing, and data center loads, but residential customers are exposed disproportionately to rising costs.

A primary driver of Duke's new resource needs is demand growth from large customers, like manufacturing, industry, and data centers. However, historically Duke has allocated rising costs primarily to residential customers. According to EIA data, residential customers of Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) saw average rates rise by 6% and 17%, respectively, while costs for industrials rose by roughly half as much (3% in DEC, 6% in DEP). Recently approved rate hikes will raise residential electricity bills by over 12% between 2024 and 2026.[18] As industrial and other large sources of demand drive the need for additional system resources, these rising costs must be allocated to the types of customers that are causing them. Duke quite recently updated its demand forecast in January 2024 due to the projected increased needs of large customers (data centers and manufacturing facilities). As a result, the average residential customer will face a monthly bill increase of $54 by 2033 and $80 by 2038, significantly higher than the $35 by 2033 and $55 by 2038 from earlier modeling. Residential customers are expected to bear increasing costs as large data centers and manufacturing customers are added to Duke's system.[19] This also brings into question the appropriateness of Duke's rate design, since under fair and equitable rate design it is industrial customers who should bear the cost of increased load growth of industrial customers.

Duke's plan could further expand energy efficiency and focus efficiency investments on customers that face the highest affordability challenges.

As Duke's customers see increasing electricity rates, efficiency and demand side management investments become more important to reduce the impact of these increases on total customer bills. However, despite rapidly growing electricity demand and Duke's concerns about the ability to build and connect new resources to the grid, Duke's plan does not increase deployment of

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[17] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 42. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=bfb12788-90ea-4352-97d6-3f3a7134b5ad

[18] Duke Energy, "Duke Energy Progress receives approval for new rates in North Carolina, implements new programs to help customers", September 2023, https://news.duke-energy.com/releases/duke-energy-progress-receives-approval-for-new-rates-in-north-carolina-implements-new-programs-to-help-customers

[19] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 42. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=bfb12788-90ea-4352-97d6-3f3a7134b5ad

energy efficiency. Electric bills are, simply, the electric rate times usage. Thus, the deployment of more energy efficiency can reduce electric bills even if rates are higher. Duke needs to reflect this benefit by incorporating more energy efficiency and customer-sited resources (solar and batteries) in their scenario results.

Duke Energy Carolinas and Duke Energy Progress have historically saved more energy from utility energy efficiency programs than neighboring southeast utilities, achieving between 0.75% and 1% incremental energy savings per year in recent years.[20] Going forward, Duke expects to achieve energy savings equivalent to 1% of the "eligible" load. However, as Duke explains, "the Companies believe that in future resource planning, the Companies should adjust eligible load to remove sources of load growth like electrification of transportation and economic development-related load to ensure that the utilization of an annual minimum EE savings assumption does not create an unrealistic and unattainable long-term forecast of EE savings."[21] In other words, since Duke does not consider many sources of load growth in their "eligible load," the percentage of energy savings to total load is actually much less than 1%.

Further, in Duke's recent updated load growth estimate, gross retail sales increase while the amount of expected energy efficiency investment decreases. While the gross retail sales forecast for Duke's combined system in 2030 increases by nearly 10% (from 142 TWh to 156 TWh), Duke's expected impact of energy efficiency in 2030 drops by roughly 12% (from 6.0 to 5.2 GWh).[22] [23]

Duke's analysis of energy efficiency opportunities suffers from additional flaws. First, while Duke's modeling of electric vehicle demand growth and the potential for Utility Energy Efficiency programs accounts for new Inflation Reduction Act ("IRA") incentives, Duke's load forecast does not account for potential end-use energy efficiency investments that may be made outside of Duke's Utility Energy Efficiency programs.[24] This can include distributed generation, weatherization, and other programs. Second, Duke increases their demand forecast in future years as energy efficiency savings from prior years' investments "roll off".[25] This implicitly assumes that after Duke's assumed lifetime for energy efficiency investments, efficiency gains are reversed back to Duke's baseline demand forecast. However, given the passage of the IRA and increasing appliance efficiency standards, it is unlikely that consumers will replace aging efficient equipment with less-efficient equipment. The result is that Duke potentially overstates demand by ignoring factors that structurally increase energy efficiency over time.

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[20] Duke Energy, Carolinas Resource Plan, Appendix H: Grid Edge and Customer Programs, 2023, p. 5.
[21] Duke Energy, Carolinas Resource Plan, Appendix H: Grid Edge and Customer Programs, 2023, p. 9.
[22] Duke Energy, Carolinas Resource Plan, Chapter 2: Methodology and Key Assumptions, 2023, p. 20,23.
[23] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 21-22. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=bfb12788-90ea-4352-97d6-3f3a7134b5ad
[24] Duke Energy, Carolinas Resource Plan, Appendix D: Electric Load Forecast, 2023, p. 10.
[25] Duke Energy, Carolinas Resource Plan, Appendix D: Electric Load Forecast, 2023, p. 8-9.

Energy efficiency has the potential to significantly improve energy affordability, especially when investments are targeted to households that experience high levels of energy burden. In North Carolina, electricity bills make up the vast majority of household energy spending. The average North Carolina household spends roughly 2% of household income on energy bills, while residents of low-income neighborhoods in Mecklenburg County regularly spend over 6% of income on energy bills. Among low-income residents, energy bills make up a much higher proportion of household budgets. State-wide, households with incomes under 80% of the area median income spend 6% on energy bills, but this rises to 9% in Person County and 12% in Richmond County.[26] Electricity costs are regularly in the $1400 to $1600 per year range, even for low-income households. Therefore, targeted energy efficiency through appliance upgrades, weatherization and insulation, and improved heating and cooling systems would have an outsized impact on energy affordability for many North Carolina households.

Duke's plan would increase exposure to gas price risks, cost overruns of new nuclear, and missed opportunities to save money with accelerated renewables deployment.

As described in the sections below, Duke's plan would increase risks to customers. Duke's reliance on gas resources increases the extent to which Duke's customers are exposed to volatile gas markets, which have experienced significant price fluctuations in just the last several years (see Principle 7). In addition, Duke's plan relies on small modular nuclear reactor (SMR) technology that is not yet commercially available and has a history of significant increases in projected costs (see Principle 10). Duke's plan is setting up a series of risky bets, but ultimately customers will be on the hook if these bets go wrong.

5. Maximize Near-Term Deployment of Renewable Resources and Storage

Grade: D-

Summary

To properly meet or exceed the carbon reduction mandates of House Bill 951 (2021), both Duke Energy and the NCUC must take drastic and ambitious measures to deploy and construct renewable energy sources. Both the first approved and second proposed Carbon Plans have failed to do so. Duke consistently underestimates the amount of solar, wind, and battery storage it can deploy. Instead, Duke falls back on fossil fuels that will lead to sunk costs for consumers.

[26] Data from DOE Low-Income Energy Affordability Data Tool, https://www.energy.gov/scep/slsc/lead-tool

Duke's modeling limits wind, solar, and energy storage to unreasonably low levels, overstates the cost of these resources, and places arbitrary 20% cost adders for renewables on the portfolio that meets the carbon goals. Together, these assumptions make portfolios that achieve the goals of HB 951 appear infeasible and expensive, biasing Duke's modeling results toward delayed deployment of resources and risky bets on technology that is not yet commercially available.

While the update to this Carbon Plan filed in January recommends a substantial (2400 MW) amount of new offshore wind, the collective amount of renewable energy planned is still insufficient for meeting North Carolina's carbon reduction mandates. Ultimately the Carbon Plan proposed by Duke continues to fail to invest in renewables and storage to their maximum potential.

Discussion

<u>Duke's modeling sets arbitrary and unsupported limits on solar, wind, and energy storage resources.</u>

Duke's analysis uses a capacity expansion model that selects the lowest-cost mix of resources that meets the electricity demand and assumed reliability needs of Duke's system, based on the assumptions and constraints Duke inputs into the model. Included in these assumptions are Duke's assumed limits on how much new generating capacity of various types can be built each year.

As discussed below, these limits[27] on new renewables and energy storage are extremely conservative and inconsistent with national trends in the deployment of clean energy technologies. By limiting new renewable energy and storage in the face of significant demand increases, Duke is implicitly planning to significantly scale up less cost-effective and more polluting fossil fuel resources to meet demand, rather than taking full advantage of lower-cost clean energy resources.

Solar:

Duke assumes that solar can be built at a rate of 1,350 MW per year from 2028 to 2030, 1,575 MW per year in 2031, and 1,800 MW per year in 2032 onward. Duke also assumes that additional incremental solar cannot be built before 2028, beyond the utility's already planned procurements for near-term resources. Duke's limits appear to be informed by an analysis of the number of individual interconnections per year that would be required to build a certain amount of aggregate capacity.[28]

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[27] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 28. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=bfb12788-90ea-4352-97d6-3f3a7134b5ad

[28] Duke Energy, Carolinas Resource Plan, Appendix L: Transmission System Planning and Grid Transformation, 2023, p. 19. And Duke Energy, Carolinas Resource Plan, Appendix I: Renewables and Energy Storage, 2023, p. 8.

There are several issues with the limits that Duke's modeling imposes on new solar resources.

First, Duke does not consider the potential to expand upcoming requests for proposals ("RFPs") for resources that will be able to come online in 2027 or sooner. In the face of rapidly rising demand projections, Duke ignores the opportunity to procure additional clean energy in ongoing processes.

Second, Duke's analysis of the number of new solar interconnections that would be required to achieve a certain amount of capacity assumes that the average new solar project would have a capacity of 80 MW or less. However, across the US, new solar projects are frequently built that are multiples of this size. For solar projects built in the US in 2023, 62% of total capacity came from projects over 100 MW, and 39% from projects over 200 MW.[29] If Duke is limited by the number of new interconnections that can be executed each year, it can simply procure and build larger solar projects to dramatically increase the amount of solar added to the grid. Duke acknowledges this fact in their updated analysis but only applies this logic to slight increases in the amount of solar that can be added after 2032, after HB 951's deadline for a 70% reduction in emissions.[30]

Duke's limits on new solar are small relative to the total size of Duke Energy's system. Duke expects a combined Carolinas peak system electricity demand of 36.1 GW (2030), implying that Duke's annual solar additions limit in 2028-2030 would amount to a nameplate capacity of under 4% of system peak demand. However, other large electricity systems have added new solar at a substantially faster rate. Texas's ERCOT market added roughly 6 GW of new solar generating capacity between September 2022[31] and September 2023[32] a value that is 7% of ERCOT's peak electricity demand of 85.5 GW. ERCOT has added significant capacity and is expected to add more in 2024, primarily through large projects with between 100 and 250 MW per project. Duke has room to significantly increase the amount of new solar capacity added to the grid.

This conclusion is directly supported by research Duke has conducted, along with an alternative model submitted during the last Carbon Plan. **A study that Duke Energy commissioned from the National Renewable Energy Laboratory, but did not file with the NCUC, showed that Duke could most economically meet the carbon reduction targets mandated by law by**

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[29] *EIA, Form 860m, December 2023*

[30] "The Supplemental Planning Analysis assumed the same solar resource limits as the initial Plan through 2031 but increased solar availability to 1,800 MW per year across DEC and DEP starting in 2032 and beyond. This increased resource availability recognizes the potential for larger projects to increase annual solar capacity availability." Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 25. https://starw1.ncuc.gov/NCUC/ViewFile.aspx?Id=bfb12788-90ea-4352-97d6-3f3a7134b5ad

[31] ERCOT, Monthly Operational Overview, September 2022, https://www.ercot.com/files/docs/2022/10/25/ERCOT%20Monthly%20Operational%20Overview%20September%202022.pdf

[32] ERCOT, Fact Sheet, January 2024 (data as of September 2023), https://www.ercot.com/files/docs/2022/02/08/ERCOT_Fact_Sheet.pdf

tripling the proposed solar on its grid by 2030.[33] This study suggested Duke should target 9 GW of new solar by 2030, instead of the 3.1 GW that Duke suggested and that the NCUC went along with. Modeling submitted by stakeholders from the last Carbon Plan has shown that with modest increases in the solar limit, Duke could build 7500 MW by 2030 and 10,700 MW by 2032.[34] This increase would directly put Duke on the same path as other utilities and has already been shown to be a reasonable step forward.

Finally, other large utilities are planning a much more rapid deployment of renewable energy. For instance, Florida Power and Light (FPL), which serves approximately the same amount of electricity demand as Duke's combined Carolinas system, plans to add roughly 20 GW of solar between 2023 and 2032, more than double the 9 GW planned by Duke's dual state system by 2033. While both utilities currently meet 6-7% of electricity demand with solar, FPL plans to reach 35% by 2032, compared with Duke's 18% by 2033.[35] [36]

Wind:

Onshore wind is one of the lowest-cost resources available, and because onshore wind resource potential is highest at night, it contributes to a diverse and reliable grid by complementing solar generation, which has its highest potential during the day. Duke completely ignores the potential to connect new onshore wind before 2031, and then allows only 300 MW in 2031 and 450 MW per year after 2032, limited to a total capacity of 2,250 MW. Duke's analysis of wind suggests that onshore wind has never been developed in North Carolina. However, the 200 MW Desert Wind Farm has been online since 2016.[37] In addition, PJM is studying interconnection requests for an additional 339 MW of wind in North Carolina to connect by 2026.[38] The PJM wholesale electricity market accounts for a very small portion of North Carolina's electricity system, but more wind could come online in PJM's portion of the state by 2026 than Duke anticipates is possible by 2032.

However, we recognize that onshore wind resource potential varies by location and it is a more variable generation resource than offshore wind. Offshore wind resource potential is highest on winter mornings and summer evenings, which contributes to a more balanced generation mix that can support spikes in energy demand. Additionally, with the number of restrictions for military training and readiness in airspace, the Mountain Ridge Protection Act of 1983, and the

[33] O'Neil, Connor. "Integrating Carbon-Free Generation in the Carolinas." NREL, October 5, 2022, www.nrel.gov/news/program/2022/integrating-carbon-free-generation-in-the-carolinas.html.

[34] The Brattle Group, Inc., "Duke Energy Resource Mix to Meet 70% CO2 Reduction by 2030 in NC," August 16, 2022, NCUC Docket E-100 Sub 179

[35] FPL, "FPSC Ten-Year Site Plan Workshop FPL TYSP Comparison," 2023, https://www.floridapsc.com/pscfiles/website-files/PDF/Utilities/Electricgas/TenYearSitePlans//2023/FPL_Presentation.pdf

[36] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 39.

[37] EIA 860m, December 2023

[38] Data from PJM Interconnection Queue, Accessed February 2024: https://www.pjm.com/planning/service-requests/services-request-status

unpredictability of localized permitting, large tranches of onshore wind may face long lead times and site challenges. Offshore wind is still an excellent option for large-scale decarbonization and can reduce the potential for Duke to fall back on methane gas. Deployment of offshore wind must be similarly prioritized for this Carbon Plan. Duke has proposed 2400 MW of offshore wind, but significantly more offshore wind will be required to successfully achieve carbon neutrality by 2050.

Duke's limits on new wind are largely driven by the assumed development timeline for new wind, assuming Duke is developing wind capacity themselves and not relying on independent power producers to deliver those wind projects through contracted projects. Rather than request proposals from third-party developers to inform development timelines and costs, Duke assumes it undertakes site selection, resource characterization, permitting, interconnection, and construction of new wind itself, with a development process of at least 7 years.[39] We urge the NCUC to consider both Duke's own expansion of offshore wind and spend significant time investigating the potential for power purchase agreements from third-party developers with experience in constructing offshore wind facilities in the Northeast, which could speed up the timeline for new projects.

In addition, Duke references a study on onshore wind conducted by DNV Energy USA Inc. (DNV) on wind potential in the Carolinas, accounting for key siting constraints. Duke notes that DNV identified 90 sites that met Duke's most restrictive wind siting criteria (which include proximity to existing transmission and a wide variety of screens based on land suitability and restrictions), which informed their cumulative wind limit of 2,250 MW.[40] However, at a typical wind farm size of 100-150 MW, Duke is implying that their cumulative maximum wind potential involves building at only 15-23 sites, far below the 90 developable sites in Duke's service area. In addition, Duke entirely ignores the potential for wind imported from other territories, like the PJM market area, where 15 GW of wind projects are seeking interconnection to the grid as of the end of 2022.[41]

Finally, offshore wind transmission is also feasible and readily available. For onshoring offshore wind transmission, New Bern benefits from an offshore wind injection capability of well over 1000 MW for well under $0.20 per Watt. New Bern also benefits from already having five 230k lines, two of which head in the direction of the DEP Raleigh load center. In addition, DEP has a partial right-of-way available from New Bern to Wommack and a full 500kV ROW from Wommack to Wake.[42] We are confident that Duke can further expand its commitments to offshore wind and scale down its reliance on methane gas.

Energy Storage:

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39 Duke Energy, Carolinas Resource Plan, Appendix I: Renewables and Energy Storage, 2023, p. 19.
40 Duke Energy, Carolinas Resource Plan, Appendix I: Renewables and Energy Storage, 2023, p. 21.
41 Berkeley Lab, "Generation, Storage, and Hybrid Capacity in Interconnection Queues," 2023, https://emp.lbl.gov/generation-storage-and-hybrid-capacity
42 [NCTPC Report on the NCTPC 2020 Offshore Wind Study]

It is no secret that the deployment of energy storage on the nationwide grid is rapidly accelerating. According to EIA's Short Term Energy Outlook, the US added over 8 GW of battery energy storage capacity in 2023 and expects to add 14 GW in 2024.[43] Furthermore, over 80% of new electric generation capacity in the United States is solar or solar plus storage.[44]

Energy storage with lithium-ion batteries is a mature technology with a rapidly scaling supply chain and significant amounts of new capacity being installed on the grid. Globally, the International Energy Agency expects battery manufacturing capacity worldwide to more than double between 2022 and 2025, and quadruple between 2022 and 2030.[45] North Carolina is seeing significant battery supply chain investments: Toyota plans to build a $14 billion battery factory capable of producing 30 GWh of lithium-ion batteries per year by 2030,[46] while lithium mining company Albemarle plans to restart mining operations and build a $1.3 billion lithium processing plant in NC.[47]

Despite the growing market and the increasing presence of a lithium supply chain within the state of North Carolina, Duke Energy has restricted battery storage in this Carbon Plan. In Duke's Supplemental Planning Analysis, they dramatically limited how much battery storage the model could select to 200 MW in 2027, 500 MW in 2028 and 2029, and 1000 MW in 2030 and later.

In North Carolina alone, there are 90 MW of energy storage currently under construction and owned by NC's electricity cooperatives.[48] If cooperatives with less capital availability can procure this amount of battery storage, it is difficult to believe that a company of Duke's magnitude could not drastically exceed this goal. Duke's limit of 200 MW in 2027 (equivalent to a single large battery project), 500 MW in 2028 and 2029, and 1000 MW in 2030 onward are completely arbitrary and seem to be designed to limit the deployment of a cost-effective and economic resource in favor of Duke's preferred capacity resource, gas.

<u>Duke arbitrarily inflates the cost of new resources in the only scenario that meets state policy goals.</u>

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[43] Solar and Battery Storage to Make up 81% of New U.S. Electric-Generating Capacity in 2024 - U.S. Energy Information Administration (EIA), www.eia.gov/todayinenergy/detail.php?id=61424. Accessed 6 Mar. 2024.
[44] Id.
[45] IEA, Lithium-ion battery manufacturing capacity, 2022-2030, 2023. https://www.iea.org/data-and-statistics/charts/lithium-ion-battery-manufacturing-capacity-2022-2030
[46] PR Newswire, "Toyota Supercharges North Carolina Battery Plant with New $8 Billion Investment," 2023, https://www.prnewswire.com/news-releases/toyota-supercharges-north-carolina-battery-plant-with-new-8-billion-investment-301972734.html
[47] WUNC, "Charlotte-based Albemarle builds an integrated lithium business in NC to power the world", 2023, https://www.wunc.org/2023-12-08/charlotte-based-albemarle-builds-an-integrated-lithium-business-in-nc-to-power-the-world
[48] EIA 860m, December 2023.

Duke's modeling presents only a single scenario, P1, that complies with the requirements of North Carolina's carbon reduction policy. However, Duke significantly increases the cost of this scenario by arbitrarily inflating the cost of new resources by 20%, but only in this scenario. Duke describes this cost adder as follows: "To procure and deploy new resources in the unprecedented volumes required for P1 Base [...] Companies would expect to incur costs well above those captured in the generic unit cost forecasts used in the resource planning analysis. As a proxy for these unknown market conditions, the Companies added a 20% cost risk premium to the capital costs for the scope, scale, and pace of resource additions in P1 Base for the purposes of this comparison."[49] In Duke's initial modeling, this assumption raises the cost of the P1 scenario by $5 billion in net present value revenue requirement through 2038 (a 7% increase relative to P1 without this cost premium), and $12 billion through 2050 (a 9% increase),[50] accounting for more than half of the cost difference relative to the P3 scenario that delays compliance with HB 951 goals by five years. In Duke's supplemental modeling filed in January 2024, Duke only presented a version of the P1 scenario with this cost premium and did not provide information about the impact of this assumption.

Duke's 20% cost premium, applied to Duke's already overstated cost assumptions for renewables and storage, results in significant and unjustified costs for these resources. For example, for solar photovoltaics, Duke assumes overnight capital costs of $1850 per kW.[51] The cost adder in Duke's only HB 951-compliant scenario, P1, functionally assumes the cost of new solar is increased by $370 per kW. As Duke assumes overnight capital costs for 4-hour battery energy storage of $2250 per kW,[52] this cost premium assumption adds $450 per kW in additional costs for energy storage, only in the P1 scenario, again without any characterization of what these costs represent or why they are justified.

The premise that renewable energy and energy storage capital costs increase as deployment increases is deeply flawed. Research has shown that renewable energy technologies benefit from learning by doing, with costs that fall with increased deployment. For example, in recent research on utility-scale renewable energy projects in the U.S., Bolinger et. al. find that each doubling in cumulative deployment results in a 15% reduction in levelized cost of energy for wind, and a 24% reduction for solar.[53] With scale and repeated execution of projects, developers gain more experience, develop more efficient development and construction processes, reduce operations, maintenance, and financing costs, and more, all of which put downward pressure on costs, rather than incur a cost premium as Duke assumes.

<u>Duke's cost assumptions for renewables and storage resources are higher than industry-accepted estimates.</u>

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[49] Duke Energy, Carolinas Resource Plan, Chapter 3: Portfolios, 2023, p. 26.
[50] Duke Energy, Carolinas Resource Plan, Chapter 3: Portfolios, 2023, p. 26.
[51] Duke Energy, Carolinas Resource Plan, Chapter 2: Methodology and Key Assumptions, 2023, p. 33.
[52] Duke Energy, Carolinas Resource Plan, Chapter 2: Methodology and Key Assumptions, 2023, p. 35.
[53] Bolinger et. al., "Levelized cost-based learning analysis of utility scale wind and solar in the United States," iScience 25, 2022.

Duke's cost assumptions for renewables and energy storage are significantly higher than industry-accepted estimates. The National Renewable Energy Laboratory maintains a database of projected electricity generation technology costs, updated each year.[54] NREL's 2023 data accounts for significant increases in project costs due to supply constraints in 2021-2022. The data also accounts for projections in technology costs out to 2050 under moderate technology development or more advanced rates of cost reductions over time. This data provides a benchmark forecast for future technology costs with which to compare Duke's assumptions.

Duke's technology costs for solar, onshore wind, and battery energy storage are 31%, 43%, and 19% higher than NREL's moderate case for 2023, respectively. In addition, solar and wind cost assumptions are significantly above the industry average actual project costs in 2022, adjusted for inflation. At the same time, Duke assumes costs for combustion turbines ($750-900/kW) and combined cycle gas plants ($800-1250/kW) that are on par with or below industry averages.

By assuming high costs for new clean energy resources, Duke's modeling is significantly increasing the cost of scenarios that allow for greater installation of solar and wind. In addition, high solar, wind, and energy storage costs lead to modeling outcomes that are biased toward new gas capacity additions and delayed coal retirements.

During Duke's stakeholder process, stakeholders raised concerns about high storage cost assumptions, with one commenter noting that "Cost assumptions provided by Duke are consistently 20% higher than what technical representatives are seeing when they work with integrators and get pricing."[55] While Duke reduced storage cost assumptions from what was initially presented to stakeholders, the cost assumptions used in the analysis are still significantly higher than other industry estimates.[56]

Final Words on Renewable Deployment:
While the nationwide grid presently has about 20% renewables[57] sourcing for all power supplied, Duke is sitting at about 8%.[58] The window to reach our carbon reduction mandate is rapidly shrinking, and Duke Energy's reluctance to commit to mature renewable energy sources

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[54] NREL, Annual Technology Baseline, 2023, https://atb.nrel.gov/electricity/2023/data
[55] Great Plains Institute, Duke Energy's 2023 Carolinas Resource Plan Stakeholder Meeting, March 16, 2023 Meeting Summary, p. 21.
[56] Duke originally recommended a battery capital cost assumption of $2,690 per kW in 2023, which was later revised down to $2,250 per kW in 2023. While this was a 16% adjustment, Duke's 4-hour battery assumptions remain much higher than other industry estimates. See Duke Energy, "Carolinas Resource Plans - Stakeholder Meeting 2", Presentation, March 16, 2023.
[57] Gearino, Dan. "Renewables Projected to Soon Be One-Fourth of US Electricity Generation. Really Soon." Inside Climate News, 19 Jan. 2023, insideclimatenews.org/news/19012023/inside-clean-energy-us-renewables-generation/.
[58] Patel, Sonal. "Duke Energy to Shed 3.4-GW Unregulated Renewable Business Segment in $2.8B Deal." POWER Magazine, 15 June 2023, www.powermag.com/duke-energy-to-shed-3-4-gw-unregulated-renewable-business-segment-in-2-8b-deal

is a failure to meet legislative requirements. By not ordering more renewables and storage now and underestimating potential cost savings from these resources with Inflation Reduction Act funding, and given the long lead times involved in new projects (securing land leases, rights-of-way, equipment, engineering, construction, grid interconnection, commissioning, etc), the NCUC is effectively voiding the opportunity to have significantly more renewables on the grid in 2030. Commentary from the Energy Transition Institute concludes that the Commission's Carbon Plan "effectively gives up from the outset on meeting the state's decarbonization goal by 2030."[59] Duke and the NCUC lack the ambition, vision, and drive to aggressively deploy clean energy technology to meet the needs of North Carolina.

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6. Set an Ambitious Timeline for Closing Coal

Grade: F

Summary

Duke Energy plans to retire or convert to gas the remainder of its coal fleet by 2036. With some adjustments, the company has set an optimal retirement date for each of its coal plants within its capacity expansion modeling. However, Duke's analysis has made it clear that coal retirement timelines are heavily influenced by other modeling assumptions, such as the rate of new solar, wind, and energy storage additions, along with the assumed costs of renewable energy and storage technologies. Duke's overall assumptions favor new gas plants, rather than relying on a transition to renewable energy, which would negate any positive impact created by the retirement of the coal plants.

Discussion

As mentioned previously, Duke's extensive analysis of coal retirements in Appendix F of the Carolinas Resource Plan goes into great detail about what Duke calls Pathways 1, 2, and 3. In its selected Pathway, Duke plans to retire or convert to gas the remainder of their coal fleet by 2036. With some adjustments, Duke evaluated the optimal retirement date for each of its coal plants with its capacity expansion modeling. However, Duke's analysis makes it clear that coal retirement timelines are heavily influenced by other modeling assumptions, such as the rate of new solar, wind, and energy storage additions, the assumed costs of renewable energy and storage technologies, and assumptions that favor new gas plants.

In Duke's initial filing, the P1 scenario that meets the state's emissions reduction policy goal by 2030 retires all of Duke's remaining coal fleet in 2029 or 2030, except Marshall 3 and 4 in 2034.

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[59] Norris, Tyler, and Steven Levitas. "Can NC Still Achieve Its Power Decarbonization Goal by 2030?" Energy Transition Institute, 9 Jan. 2023, energytransitions.org/articles/f/can-nc-still-achieve-its-power-decarbonization-goal-by-2030.

Fossil-Free NC

Duke's recommended P3 scenario only retires four out of 11 coal units before 2030, leaving significant coal capacity online and operating for several more years.[60] Duke's modeling choices, such as choosing to delay compliance with the state emission reduction policy and limiting the amount of solar, wind, and energy storage that can be built, result in continued operation and continued pollution from Duke's coal plants.

In its most recent filing, Duke moved up the retirement of its Roxboro 4 unit in Person County to 2029.[61] This was a swap for another unit at Roxboro, unit 2, which was delayed to 2034, so they could use the transmission capacity of units 4 and 1 for their proposed Person County Energy Complex methane gas plant. However, this slight change is not enough. Coal's damages far outweigh its economic benefits to Duke Energy's customers. Duke Energy and its shareholders are the only ones who benefit from keeping these extremely dirty coal plants online for an additional 5-13 years. Since some of these units are relatively small — less than 400 MW — they can be easily replaced with renewable energy resources.

While Duke's 17-page analysis goes into great detail about its various modeling inputs and mentions that obtaining a reliable coal supply is getting more difficult, Duke completely avoids real issues that real people care about – coal's staggering externalities. Energy justice means taking a hard look at the stunning damages that have been inflicted on our most vulnerable communities for well over 50 years. For Duke — or anyone — to assert that these damages are inconsequential and thus should not be accounted for is both astounding and willfully blind to the obvious damages from burning so much coal.

Duke Energy Carolinas and Duke Energy Progress currently run some of the oldest and dirtiest coal plants in the U.S. Marshall, the oldest set of four coal units, totals 2,078 MW on its own.[62] These extremely polluting plants have already been in service for nearly 60 years, with retirement not coming for another 6 to 13 years. Duke's "newest" coal unit is already 41 years old, despite its original operating timeline being ~40 years or less. These old coal units introduce toxic heavy metals and other air toxins to the environment that are very detrimental to human health, both for workers and communities.

In 2011, Harvard's Dr. Paul Epstein wrote a seminal study detailing the full-cost accounting for the life cycle of coal. This review showed a stunning $345 billing in health damages in a single year.[63] According to Epstein, there are $74.6 billion in health burdens on communities in Appalachia each year, $187.5 billion on air pollution, and $29.3 in damages from mercury pollution. As Dr. Epstein said in an article when the study was released, "This [meaning the cost of these damages] is not borne by the coal industry, this is borne by us, the taxpayers. The

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[60] Duke Energy, Carolinas Resource Plan, Appendix F: Coal Retirement Analysis, 2023, p. 13-14.
[61] Energy News Network, "Facing demand increase, Duke Energy seeks to delay its 2030 climate target in North Carolina", Elizabeth Ouzts, February 1, 2024
[62] Duke Energy, Carolinas Resource Plan, Appendix F: Table F-1: Coal Unit Statistics and Initial Modeling Coal Retirement Dates, 2023, p. 9
[63] Reuters, "Coal's hidden costs top $345 billion in U.S.-study", Scott Malone, February 16, 2011

public cost is far greater than the cost of the coal [fired electricity] itself. The impacts of this industry go way beyond just lighting our lights." Unfortunately, the cost of coal on our health and communities has only increased. Coal has shifted from being one of the cheapest to one of the most obviously expensive sources of electricity we could use.

The costs of coal are more obvious now than ever before. One can't help but notice that our weather is rapidly changing and that extreme weather events are beyond obvious. Ocean and land temperatures are increasing ever faster, alarming climate scientists. We must shut down the coal plants in North Carolina as soon as possible to mitigate the climate disaster Duke has already contributed to.

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7. Allow No New Gas

Grade: F

Summary

Duke's Supplemental Planning Analysis recommends the addition of nearly 9 GW of new gas-fired capacity by 2035, the majority of which (6.8 GW) is in the form of large combined cycle power plants that are designed to be online and running continuously. There are several drivers of this significant gas growth. Duke assumes significant demand growth while limiting or excluding other options to meet growing demand, such as additional renewable energy, energy storage, energy efficiency, and customer-sited resources. Duke also inflates the reliability contribution assigned to gas plants while ignoring the execution risks around securing firm fuel supply to ensure fuel is available during extreme winter weather. Finally, Duke ignores the risks and costs associated with converting a large amount of baseload gas resources to green hydrogen while dismissing the potential for stranded assets or future shocks to ratepayer costs.

Discussion

Resource planning is fundamentally about designing an electricity system that can meet the needs of the electricity system reliably, at a low cost, and while meeting environmental goals. Reliability-related assumptions are among the most opaque in a resource planning process and can significantly impact the results of modeling. Duke's modeling emphasizes one key reliability objective - having enough capacity to cover expected peak electricity demand, plus sufficient buffer to account for the impact of extreme conditions on electricity demand and available supply. This buffer is called a planning reserve margin.

Duke's proposed gas capacity additions are selected in Duke's modeling in part to meet the winter peak demand and reserve margin needs of Duke's system. As described in Duke's resource adequacy study, Duke proposes to increase their planning reserve margin from 17% above expected winter peak demand to 22% above expected winter peak demand. As Duke's resource adequacy study lays, this increase is driven by 1) changes in expected demand forecast error, 2) a reduction in the amount of capacity available outside of Duke's service area to support Duke's needs in times of grid stress, and 3) performance of fossil fuel units during periods of extreme winter weather, such as Winter Storm Elliot. The high degree of outages during cold weather is the single biggest factor driving the increase in the planning reserve margin, accounting for half of the 5% increase.[64]

Even though the propensity of coal and gas plants to fail at higher rates during extreme cold is driving up Duke's assumed reliability need, Duke fails to account for this risk in their assumption of those resources' reliability contribution. While Duke uses a probabilistic modeling approach for wind, solar, and energy storage reserve contributions,[65] that approach is not used to determine the reserve contribution of gas and other thermal resources, despite their propensity to fail when the grid needs them most. Instead, gas appears to be assigned a uniform forced outage rate that does not depend on prevailing weather conditions.

In other jurisdictions, there is growing recognition of the reliability risk associated with gas in cold weather conditions. The PJM market recently updated its capacity accreditation methodology to account for this reliability risk. They found that rather than a capacity accreditation of 95% based on average outage rates, gas combined cycle and combustion turbines had an effective capacity credit of 80% and 61% respectively, primarily driven by the high rate of failure of these resources during extreme winter conditions.[66] Recent extreme winter weather has disproportionately impacted gas plants, through a combination of disruptions to fuel supply and frozen equipment at plants. During February 2021's Winter Storm Uri, gas plants represented 55% of all generation outages experienced in Texas and other parts of the South-Central region impacted by the storm.[67] In 2022 during Winter Storm Elliot, 63% of generation outages were at gas plants.[68] Research for the Union of Concerned Scientists finds that across many extreme winter weather events, gas represents a disproportionate share of outages, relative to total capacity.[69]

Between 2017 and 2021, DEP spent an average of $279 million on coal and $705 million on

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[64] Astrape Consulting, "2023 Resource Adequacy Study for Duke Energy Carolinas & Duke Energy Progress," 2023, p. 9-10.
[65] Astrape Consulting, "Duke Energy Carolinas and Duke Energy Progress Effective Load Carrying Capability (ELCC) Study," 2023.
[66] PJM, "ELCC Class Ratings for the 2025/2026 Base Residual Auction", 2023, https://www.pjm.com/-/media/planning/res-adeq/elcc/2025-26-bra-elcc-class-ratings.ashx
[67] FERC, "The February 2021 Cold Weather Outages in Texas and the South Central United States | FERC, NERC and Regional Entity Staff Report", November 2021, https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and
[68] FERC, "Winter Storm Elliott Report: Inquiry into Bulk-Power System Operations During December 2022," 2023, https://www.ferc.gov/media/winter-storm-elliott-report-inquiry-bulk-power-system-operations-during-december-2022
[69] UCS, "Gas Malfunction: Calling into Question the Reliability of Gas Power Plants", 2024, https://www.ucsusa.org/sites/default/files/2024-01/Gas%20Malfunction_brief_1.8.pdf

natural gas in terms of purchased fuel and transport costs, while DEC spent an average of $600 million and $467 million on coal and natural gas, respectively. We anticipate that this number is higher considering the price increases to methane gas in 2022.

Duke also ignores the volatility of gas market prices. Global gas markets are inherently unstable, driven by supply boom and bust dynamics and geopolitical uncertainty. As recently as the summer of 2022, gas prices at Henry Hub (the main pricing point for gas in the U.S.) exceeded $9 per million Btu, nearly 300% higher than prices 18 months earlier. In comparison, Duke's base fuel price assumptions for gas assume gas remains between $4-5 per million But through the mid-2030s, and even Duke's high gas price sensitivity does not reach price levels seen in 2022 until 2037. This effectively ignores the risk to customers of an additional run-up in gas prices, even in the face of declining investment in new gas supply, increasing linkage with global gas markets through under-construction gas export terminals, and continued geopolitical uncertainty.

While Duke conducted a sensitivity analysis using high and low gas price assumptions, this sensitivity analysis was not conducted for the P1 scenario that meets North Carolina's state policy goals, obscuring the potential benefit of a more rapid transition to clean energy in reducing customers' exposure to risky gas markets.

Duke's planned gas depends entirely on the timing and availability of capacity on the Mountain Valley Pipeline and subsequent pipelines to deliver gas to North Carolina. Duke's Supplemental Planning Analysis makes a significant change to the outlook for gas availability. While Duke's initial modeling excluded Mountain Valley Pipeline (MVP) from their base gas availability assumptions, Duke now assumes that MVP is completed and available to supply new gas capacity in their base assumptions. Duke justifies doubling the number of new combined cycle plants that can be built based on this new gas supply.[70]

Duke expects MVP to be completed in 2024, but the main MVP route terminates in Virginia. Additional pipelines, such as the Mountain Valley Pipeline Southgate and Dominion's T15 Reliability Project, will be needed to deliver the gas supplied by MVP to plants in Duke's service territory. These proposed pipelines are not yet fully permitted or under construction.[71] [72] [73] While Duke's assessment of gas supply focuses on the completion of the main MVP project, Duke does not discuss the challenge of completing two additional infrastructure projects needed to supply new gas plants in North Carolina.

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[70] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 24-25.
[71]Virginia Mercury, "Mountain Valley proposes shrinking Southgate extension", January 2024, https://virginiamercury.com/2024/01/02/mountain-valley-proposes-shrinking-southgate-extension/
[72] Virginia Mercury, "The feds extended the deadline for the Southgate pipeline extension. Here's a refresher", December 2023, https://virginiamercury.com/2023/12/26/the-feds-extended-the-deadline-for-the-southgate-pipeline-extension-heres-a-refresher/
[73] Dominion Energy, "T15 Reliability Project," https://www.dominionenergy.com/projects-and-facilities/natural-gas-projects/t15-pipeline

In addition, Duke's proposed new combined cycle plants are slated to be added between 2029 and 2033. It is unclear whether Duke intends to reserve capacity on this pipeline for five years for future projects, or whether capacity on the pipeline is likely to be fully subscribed by other firm gas customers in the region.

Finally, Duke plans to convert gas plants to hydrogen but ignores the cost and feasibility of this transition. Duke states that they plan to fully convert their gas-fired generation fleet to burn 100% hydrogen by 2050. However, they do not incorporate anticipated costs of converting new and existing gas plants to be able to burn 100% hydrogen and do not analyze the feasibility of supplying enough hydrogen to operate baseload combined cycle solely on this fuel.

Duke's modeling indicates that by 2050, 6% of electricity production is anticipated to be fueled by hydrogen.[74] Duke does not provide demand projections in their updated modeling through 2050, but assuming this 6% share is applied to Duke's 2038 projected demand, Duke could require an estimated 900 million kg of hydrogen per year, nearly 10% of today's hydrogen consumption in the U.S. This supply would need to be produced, transported and delivered to Duke's gas power fleet (likely through dedicated infrastructure). In addition, Duke's planned hydrogen plants would be run infrequently, requiring a significant fuel delivery infrastructure that would sit idle for much of the year, potentially at significant expense. This is evident in Duke's projections that gas would be 39% of its resource use in the 2030s down to the 6% hydrogen in 2050. Building unneeded infrastructure serves no point besides generating corporate profits. Duke has proposed the construction of new gas at the financial detriment of North Carolina ratepayers, businesses, and communities.

Moreover, to mitigate climate emissions from hydrogen production and meet the goals set out in each of its plans, this hydrogen supply would need to be produced from an emissions-free process, such as using carbon-free electricity to power electrolyzers. The volume of hydrogen production necessary to fuel Duke's proposed new combined cycle units would require over 8 GW of electrolyzer capacity and substantially more renewable energy capacity to power those electrolyzers, comparable to the scale of new renewables and energy storage Duke finds challenging to deliver. Duke's proposed Carbon Plan does not account for the scale of hydrogen implied by their plan, or the costs and feasibility of delivering this quantity of hydrogen by 2050.[75]

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8. Capture Maximum Benefits of Customer-Owned Resources

Grade: F

[74] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 39.

[75] Calculation assumes electrolyzer efficiency of 50 kWh/kg, and 60% electrolyzer capacity factor for renewable-powered electrolysis.

Summary

Duke Energy claims that transitioning to natural gas is the “least cost” option to achieving the state’s climate goals, but independent research debunks this claim. Building solar and storage resources without additional natural gas would yield $8 to $12 billion in electricity savings by 2030 and $18 to $23 billion in savings by 2050, according to the 2022 Carbon Plan report by independent research and consulting firm Synapse Energy Economics, Inc.[76] Additionally, a study by the National Renewable Energy Laboratory calls instead for tripling the amount of solar and onshore wind power to meet the state’s carbon reduction goals and reduce total customer costs.

Duke’s modeling significantly understates the potential of customer resources, including battery energy storage, rooftop solar, and flexible or controllable sources (meaning a power system can respond to changes) of electricity demand.[77] At the same time, Duke’s modeling assumes significant increases in electricity demand and minimizes the amount of new utility-scale renewable resources that can be installed. By ignoring the full weight of customer-side potential and imposing other constraints, Duke falsely models significant gas expansion as the only way to meet electricity demand. This unnecessary additional gas infrastructure is costly for people and the planet.

Discussion

<u>Duke excludes the impact of several of its active programs, leading to inflating grid demand and minimizing grid stress reduction associated with the programs.</u>

While Duke includes the impact of several of its active programs (discussed more below), these programs are understated, leading to decisions that assume these programs are not as impactful as they are.

Duke outlines several currently active programs that the utility is implementing. These programs enable the utility to reduce peak electricity system needs by shifting the consumption of electricity across time or utilizing customer-sited resources. However, despite spending ratepayer resources on these programs to realize benefits associated with reducing peak electricity system needs, Duke explicitly does not include the real impact of these programs in their modeling. This directly results in an overstatement of peak electricity needs.

For example, Duke lists three significant programs that are active or under development that are not accurately represented in the modeling.

First, Duke’s “Behind the Meter Residential Storage Program” utilizes customer storage to deliver 60 MW of additional grid capacity, which Duke expects to be available in 2024. However,

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[76] Carbon-Free by 2050
[77] HOW TO CAPTURE THE FULL BENEFITS OF FLEXIBLE DEMAND FOR YOUR BUSINESS

Duke does not include the peak load reduction impact of this program in its modeling,[78] effectively negating these benefits.

Next, Duke's Water Heater Program allows wifi-connected water heaters to "respond" to signals from the utility and be used to reduce peak grid demand. This program is under development, and Duke does not include the potential impact of this program in its modeling.[79]

Finally, Duke has a series of programs aimed at managing electric vehicle charging to avoid periods of high grid use. This looks like using time of use and critical peak pricing (meaning electricity rates are higher at certain times of peak use), managed charging pilots, and vehicle-to-grid pilots.

Electric vehicle (EV) charging is a significant contributor to the growing electricity demand for Duke. Duke estimates 3.1 million MWh of electricity demand in 2030, contributing 127 MW to Duke's winter peak electricity demand (growing to 9.4 million MWh and 507 MW by 2035).[80] Even though Duke undertakes a significant discussion of how to manage charging to reduce peaks while creating positive grid benefits, Duke assumes EV charging only contributes to the need for additional resources.[81] By assuming rapid demand from EVs, while ignoring the potential for their positive value to the grid including reducing load, Duke assumes the need for additional electricity capacity that may ultimately not be needed.

Duke's modeling does not allow customer-owned solar to increase in response to growing demand.

Customer-owned solar can contribute to Duke's resource needs, especially when combined with distributed storage and technologies like those described above. For instance, Google's Project Sunroof estimates that in select urban areas in North Carolina, there is rooftop potential for 34 GW of solar in general, over 3.5 times the total amount (utility-scale plus rooftop) of solar Duke plans to add by 2033. This rooftop capacity could produce over 43 million MWh of electricity each year,[82] enough power for 3.5 million households.

Duke's modeling assumes a low forecast for customer-owned solar, which was further lowered in Duke's updated analysis. Duke assumes that by 2038, its combined Carolinas service

[78] Duke Energy, Carolinas Resource Pan: Appendix H, Grid Edge and Customer Programs, 2023, p. 21.
[79] Duke Energy, Carolinas Resource Pan: Appendix H, Grid Edge and Customer Programs, 2023, p. 21.
[80] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p. 19-22.
[81] See discussion on EV charging programs and profiles in Duke Energy, Carolinas Resource Pan: Appendix H, Grid Edge and Customer Programs, 2023, p. 30-45.
[82] Google Project Sunroof, 2024, https://sunroof.withgoogle.com/data-explorer/place/ChIJgRo4_MQfVIgRGa4i6fUwP60/

territory will receive 1.9 million MWh per year of electricity from rooftop solar,[83] just 4 percent of the estimated potential.

While rooftop solar is typically more expensive than utility-scale solar, there are several reasons why Duke's plan should consider much greater adoption of rooftop solar. First, Duke is assuming significant barriers to adopting new utility-scale solar and ensuring sufficient transmission capacity to deliver that solar to customers. Rooftop solar doesn't have these barriers. Additionally, in 2024, the North Carolina Court of Appeals heard Duke Energy's challenge to the recent "net metering" settlement agreement. Under the settlement, solar panel customers will be compensated at a lower rate during "off-peak hours" ("time-of-use rates") than they were under the previously higher retail rate. Improving the retail rate for customer-owned solar should also be part of incentivizing customers to adopt this valuable resource.

A study conducted in 2014 by Nevada's Public Utility Commission estimated that individual solar installations would reduce demand on the grid, leading to fewer costly grid upgrades. The individual solar installations provided $166 million in savings for both net metering and non-net metering customers over the lifetime of all customer-owned generation systems installed through 2016. That same year, Mississippi's utility commission conducted a study that found that customers who generated their own electricity lowered rates for all customers, relieved pressure on the state's grid during peak demand times, and helped utility companies avoid costly infrastructure upgrades. Supporting these findings, a 2016 report from the Brookings Institution, an independent think tank in Washington, D.C., concluded that "net metering is more often than not a net benefit to the grid and all ratepayers."

While Duke's limits on new solar connections for solar farms are not reasonable (as discussed under Principle 5), rooftop solar provides an additional way to add new solar resources to the grid outside of these limits. However, this option is not considered by the modeling. Rooftop solar, especially when paired with distributed energy storage (batteries) and flexible resources, can provide significant additional value by being close to the source of demand. This resource reduces transmission and distribution lines, avoids capital investment in transmission and distribution infrastructure, and, when paired with storage, provides customer-level reliability and resilience benefits. These additional sources of value can partially offset the cost associated with rooftop solar.

<u>Duke ignores the large potential for customer-sited storage.</u>

Similarly, Duke's analysis ignores the potential for customer-sited storage (battery storage). As described above, Duke has an active pilot for customer-sited storage (called PowerPair), expected to deliver 60 MW of capacity in 2024 (which is not reflected in Duke's modeling). However, the potential for this program goes far beyond this pilot. Customer-sited battery

[83] Duke Energy, "Supplemental Planning Analysis", January 31, 2024, NCUC Docket E-100 Sub 190, p.17.

energy storage can be sited for many different types of customers, from small installations accompanying rooftop solar systems to larger systems at commercial and industrial sites. Customer-sited storage can provide multiple sources of value to the utility and customers, not only reducing the need for generating capacity, but avoiding transmission and distribution infrastructure investment and providing reliability benefits to customers. Duke's modeling does not include the PowerPair program at all, let alone a broadly implemented version of this pilot. The Commission should fast-track a broader implementation of this program as part of the 2024 Carbon Plan.

Duke's combined Carolinas system serves over 4.4 million customers. If just 10 percent of these customers installed customer-sited storage capacity, at an average capacity of 7 kW per installation, Duke could realize over 3 GW of capacity alongside significant other benefits.

Other utilities are implementing customer-sited storage programs. For example, Green Mountain Power in Vermont covers nearly two-thirds of the installed cost of a new Tesla Powerwall system. While this program was initially limited to roughly 5 MW of capacity per year, Green Mountain Power and its regulator recently lifted the cap to make the program open to all of the utility's 270,000 customers.[84] Green Mountain Power has a peak demand of approximately 2% of that of Duke's. Scaling this program up proportionally to a utility the size of Duke would imply a potential for 1 GW of distributed energy storage in just 3 years. Other models exist to allow third parties to combine customer-sited storage resources into virtual power plants (VPPs), under contract with a utility to support the grid.

Duke effectively ignores this opportunity entirely in its plan.

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9. Ensure Reliable and Resilient Electricity Service for All Customers

Grade: D

Summary

In the face of increasing climate-related natural disasters, Duke must consider reliability for all as a factor in evaluating the Integrated Resource Plan (IRP). However, Duke takes a narrow view of reliability in its analysis, focused entirely on having excess electricity in times of crisis, as opposed to alleviating the impact of reliability issues on consumers. Most reliability issues occur

[84] Utility Dive, "Vermont PUC lifts caps on Green Mountain Power battery storage programs with Tesla, others", August 2023, https://www.utilitydive.com/news/vermont-puc-green-mountain-power-gmp-battery-storage-programs-tesla/692052/

at the distribution level, from storm damage and equipment failures. Such issues can be mitigated through distributed energy resources at the household and community level.

Discussion

As described in Principle 7, Duke's analysis acknowledges the reliability risks of gas plants associated with extreme weather. This winter reliability risk is the largest driver of the increase in Duke's winter reserve margin, but more critically: when power supplies fail and prices spike during cold weather, the impacts fall primarily on customers. However, despite acknowledging the winter reliability risk of gas plants when determining the total amount of reserve needed, Duke assumes that new gas plants are as reliable during extreme winter conditions as they are at other times of the year.

By overstating the reliability contribution of gas plants, Duke is increasing the risk to customers of future reliability issues caused by fuel supply challenges and plant-level outages. When these reliability issues occur during extreme weather, customers can be left unable to heat their homes in the cold, unable to prevent burst pipes, or saddled with high costs associated with emergency fuel and electricity purchases Duke makes to keep the lights on.

Additionally, as described above under Principle 8, Duke understates the potential of customer-sited resources like solar, storage, and energy efficiency. These resources have enormous value in providing customers with reliability and resilience at the point of electricity consumption. Rooftop solar, paired with battery energy storage, can allow customers to back up critical loads and meet basic needs during extended outages, regardless of whether those outages are caused by distribution-level storm damage or transmission-level shortages of supply. During non-outage conditions, these resources can provide energy, capacity, and other grid services.

Moreover, energy efficiency investment can make buildings more resilient during extreme hot or cold weather, ensuring the comfort and safety of residents during outages and reducing the risk of further damage from frozen water pipes. Research from the Pacific Northwest National Lab found that bringing buildings up to meet modern energy efficiency codes can vastly improve their comfort and habitability during extreme heat and extreme cold weather events.[85] These investments are also good examples of investments that improve resilience and reliability at the same time.

Duke's framing of reliability and resilience rests entirely on having sufficient utility-scale supply to meet demand, even under extreme weather conditions. Except for the assumptions about the reliability of new gas-fired power plants, Duke implicitly solved for a bulk electricity system that could cover their rapidly growing demand forecast under a wide range of conditions, meeting a

[85] PNNL, "Enhancing Resilience in Buildings Through Energy Efficiency," 2023, https://www.energycodes.gov/sites/default/files/2023-07/Efficiency_for_Building_Resilience_PNNL-32727_Rev1.pdf

standard of one shortfall event in ten years. However, Duke's plan fundamentally ignores the fact that the majority of customer outages are caused by distribution-level issues. According to EIA data, in 2022 Duke customers in North Carolina and South Carolina experienced an average of two outages and 8.8 hours of outage per year, compared with a national average in 2022 of 1.4 outages, and 5.5 hours of outage per year.[86] Duke spends a significant amount on bulk power supply reliability and not enough incentivizing customers to reduce the outages that happen through programs like PowerPair - distributed solar plus batteries that improve resilience and reduce the bulk power outage risk at the same time.

It is both possible and necessary to design our energy systems with reliability and resilience as core values while aggressively deploying renewable energy. This Carbon Plan must consider the events of Winter Storm Eliott and prioritize solar, wind, and battery storage that supported our grid when fossil fuel plants failed.

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10. Avoid Risky Bets on Unproven Technologies

Grade: F

Summary

Much of Duke's proposed Carbon Plan relies on technologies that are not yet commercially available and have unknown future costs and timelines. This Carbon Plan is highly dependent on small modular reactors (SMRs), assuming that these resources will be available by 2035 at relatively low cost. However, every SMR project under development in the United States has been subject to delays and cost increases. Multiple projects have also been cancelled. Any hiccups in the proliferation of SMRs would force a delay in carbon reductions and force Duke to fall back on the use of methane gas to retain reliability further harming fossil fuel communities and further jeopardizing our chances of reducing climate pollution.

Similarly, the low-cost projections for Duke's gas plant expansion rely on assumptions about the future availability and affordability of green hydrogen to ultimately substitute for gas. Since there is currently almost no supply of green hydrogen and no infrastructure to deliver future supply to the generation facilities where it will be needed, Duke's plan assumes an almost inconceivably fast buildout of both supply and infrastructure to meet that future demand. This limitation is compounded by the fact that it would take a vast amount of renewable generation resources to power the creation of clean hydrogen, which is ironic considering Duke's extreme limits on renewable energy deployment. In this Carbon Plan, Duke merely assumes that all of the infrastructure would convert cleanly to hydrogen rather than requiring significant retrofits.

[86] Based on EIA 861 2022 data.

Discussion

Duke understates the costs of SMRs, relative to real-world projects.

At the same time that Duke's plan artificially inflates the cost of solar and wind installations, it significantly underestimates the costs for small modular nuclear reactors (SMRs). Duke references four SMR projects that are currently in development in their supporting appendix: GE Hitachi's project with TVA, NuScale's recently-canceled SMR in Idaho, X-Energy's SMR in Texas, and Terrapower's project in Wyoming. While public cost estimates for the GE-Hitachi SMR project are not available, the other SMRs in development had public cost estimates between $11,600/kW and $20,100/kW, nearly twice to over three times the capital cost assumed by Duke.[87] [88] [89]

Unfortunately, when Duke takes an undue risk that does not work out, the consumers are on the hook to pay for the failed bet.

If small modular reactors are more expensive than originally planned, North Carolina ratepayers could see huge bill increases. The cost overruns of nuclear power in the American South are well documented. In South Carolina, two major utilities spent over 9 billion dollars on a nuclear site that was never opened.[90] These costs were passed on to consumers. In Georgia, the Vogtle plant has taken 14 years to build and has cost 35 billion dollars. $7.6 billion of these costs were passed on to consumers. If the NCUC believes that we will be immune from this overrun history based on the word of our utility, we urge the Commission to put Duke Energy on the hook for overruns, not the ratepayers.

To further underestimate the true impacts of small modular reactors, Duke fails to mention the risks and costs associated with nuclear waste. In the United States, nuclear power plants have produced more than 88,000 metric tons of spent nuclear fuel, which is highly radioactive and

[87] California Energy Markets, "NuScale's SMR Costs Jump 53 Percent; UAMPS Members Remain Committed," January 2023, https://www.newsdata.com/california_energy_markets/regional_roundup/nuscales-smr-costs-jump-53-percent-uamps-members-remain-committed/article_e1aa55da-937f-11ed-90fc-0ba22de948e3.html

[88] X-Energy, "X-energy and Ares Acquisition Corporation Announce Strategic Update to Business Combination Terms to Reinforce Long-Term Value Creation Opportunity and Alignment with Shareholders," June 2023, https://x-energy.com/media/news-releases/x-energy-ares-acquisition-corporation-announce-strategic-update-to-business-combination-terms

[89] Reuters, "Bill Gates' $4 bln high-tech nuclear reactor set for Wyoming coal site," November 2021, https://www.reuters.com/business/energy/bill-gates-4-bln-high-tech-nuclear-reactor-set-wyoming-coal-site-2021-11-17/

[90] Amy, Jeff. "Timeline: How Georgia and South Carolina Nuclear Reactors Ran so Far off Course." AP News, AP News, 25 May 2023, apnews.com/article/nuclear-power-georgia-vogtle-reactors-8fbf41a3e04c656002a6ee8203988fad?utm_source=copy&utm_medium=share.

must be carefully managed and sequestered.91[91] New research is also emerging that indicates SMRs generate higher amounts of spent fuel and accompanying radioactive waste than traditional nuclear plants.[92] This directly risks the health of plant operators and the well-being of local communities. Furthermore, there is no solution to reduce the amount of nuclear waste generated besides burying it underground. An increased reliance on SMRs, like Duke's Carbon Plan suggests, is not in accord with a sustainable future.

Duke understates the uncertainty around the commercial availability of SMRs.

Duke's plan calls for advanced permitting and expedited construction of SMRs, but cost overruns along with cancellations and delays that have already been seen elsewhere make SMRs an unsafe bet for North Carolina's future energy security and affordability. To date, there are no examples of SMRs installed in the United States. In addition to serious questions about the costs and timelines for new SMR construction, there are also concerns about fuel supply chains. As with the feasibility of the SMRs themselves, there are not yet any assurances that there will be sufficient fuel to supply the reactors. Domestic sources are currently under development, but Russia still controls all important sources of nuclear fuel. It is unclear when we can expect a robust supply that does not rely on geopolitical adversaries.

Simply put, Duke places too much confidence in an unproven set of resources, which risks the entire outcome of the Carbon Plan. The potential failure of these resources to ever mature risks our compliance with the carbon reduction mandates laid out in HB 951.

Duke plans to convert gas plants to hydrogen but ignores the cost and feasibility of this transition.

See discussion under Principle 7: Allow No New Gas. It cannot be overstated that hydrogen is unproven at a utility scale and will require different infrastructure and fuel supply pathways than those used currently for methane gas. We urge the North Carolina Utilities Commission to deny the possibility that hydrogen conversion of methane gas plants and infrastructure is a core component of North Carolina's energy future.

[91] Shwartz, Mark. "Small Modular Reactors Produce High Levels of Nuclear Waste." Stanford News, 15 Mar. 2023, news.stanford.edu/2022/05/30/small-modular-reactors-produce-high-levels-nuclear-waste/.
[92] Krall, Lindsey, et al. "Nuclear Waste from Small Modular Reactors." PNAS, 17 Mar. 2022, www.pnas.org/doi/full/10.1073/pnas.2111833119.

Fossil-Free NC

Duke Energy and the North Carolina Utilities Commission have received a failing grade.

What can we do about it?

It is incredibly important that as many North Carolina residents, specifically Duke Energy customers, speak at the public hearings dedicated to the Carbon Plan. For more information on those public hearings, please visit our partner CleanAireNC's website to learn more and register to speak.

We encourage folks to sign up for updates from People Power North Carolina and Fossil Free NC. If approved, this Carbon Plan could yield several more opportunities for public comment, including:

- Upcoming rate increase cases to pay for Duke Energy's proposed fossil fuel buildout
- Duke's applications for permits to build new methane gas plants (CPCN proceedings)
- Proposed methane gas pipelines by Dominion (T15) and Williams (SSEP)

We need you, and any organizations you are affiliated with, to get involved and make sure North Carolina achieves a truly clean energy future in a timely manner.