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Planning for a Changing Energy Landscape

Highlights

- The energy landscape has changed in significant ways that materially impact this Carolinas Resource Plan: considerable new load and a higher planning reserve margin increasing capacity needs, an active policy and regulatory landscape along with the electric industry's exit from coal generation driving an increasingly clean set of resources, the Inflation Reduction Act of 2022 and Infrastructure Investment and Jobs Act incentive opportunities that directly benefit customers, inflation and supply chain challenges, along with technology advancements and consumer trends influencing resource assumptions and timing.

- The Carolinas continue to grow, attracting not only residential customers but also major industrial and commercial employers, whom — like many existing customers — have a need for an increasingly clean generation mix in order to locate or expand in the Carolinas. In addition to that growth, we also have retiring coal capacity that must be replaced by equally reliable resources to maintain or improve reliability before that baseload capacity retires, i.e., "replace before retire."

- This next decade represents a critical execution phase in the energy transition. Meaningful and sustained execution progress must be made to avoid both too rapid a transition resulting in potential reliability risks associated with inadequate power supply and too slow of an exit from coal generation resulting in commodity price, fuel transportation, and fuel security risks. In addition, the Companies have time-limited incentive opportunities through the Inflation Reduction Act of 2022 and Infrastructure Investment and Jobs Act to make the energy transition more affordable for customers.

- Execution plans and near-term actions define necessary steps for which the Companies need decisive regulatory action in order to progress on an orderly energy transition in a timely manner — taking a balanced and "all of the above" approach to resources and solutions, managing risks, and costs — and seizing opportunities along the way.

In this Chapter, Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP" and together with DEC, the "Companies") summarize the various ways the changing energy landscape has influenced this combined Carolinas Resource Plan's ("Plan," "Resource Plan") inputs and results. It addresses areas such as load growth resulting from exceptionally strong economic development in the Carolinas, heightened reliability needs particularly during extreme cold weather, the risks of the coal value chain that must be managed as we retire the remaining coal-fired generation over the coming years, historic investment, production, and tax incentives through the Inflation Reduction Act of 2022 ("IRA") and Infrastructure Investment and Jobs Act ("IIJA"), technology advancements, and consumer trends. Finally, this Chapter summarizes keys to a reliable and orderly energy transition, advancing an orderly energy transition through meaningful and sustained Plan execution, and the constructive stakeholder and regulatory actions enabling execution.

Energy Transition Already in Progress

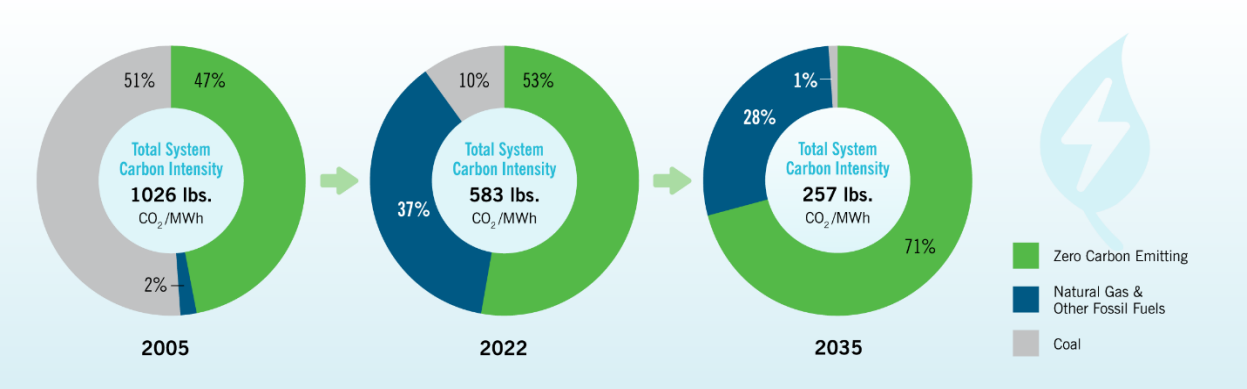
The electric utility industry across the United States is in the midst of a significant energy transition, retiring coal units and moving towards increasingly clean energy resources, many of which have operational characteristics very different from traditional baseload resources. The Companies, along with most utilities across the country, have been and continue to reduce reliance on coal resources as they are replaced with lower-emitting resources. Between 2012 and 2021, approximately 85 gigawatts ("GW") of the country's coal-fired fleet was retired, and roughly a quarter of the country's remaining operating fleet, nearly 50 GW, is projected to retire by 2029.[1]

The Companies' orderly transition away from reliance upon coal resources began nearly twenty years ago and continues today as the utility industry grapples with price, fuel transportation, and fuel security risks, as well as recent state and federal policy and regulatory changes that are now accelerating the transformation of the resource mix (illustrated below in Figure 1-1). Since 2010, the Companies collectively have retired approximately 4,400 megawatts ("MW") of aging coal-fired generation, consisting of 35 units, and converted approximately 3,150 MW of coal capacity, consisting of eight units, such that they can use natural gas as a fuel. At the same time, the Companies have continued to invest in and expand a diverse set of existing and replacement emissions-free resources including the 11 nuclear reactors at 6 sites, 26 hydro-electric facilities, and almost 1,000 solar facilities that are now online and serving customers. Pursuing the subsequent relicensing of the nuclear fleet provides the Companies the option to operate these plants for an additional 20 years. Relicensing of the Companies' hydroelectric units began nearly two decades ago and has been largely successful. In 2022, DEC began the multi-year process of relicensing the Bad Creek hydroelectric facility for another 40–50 years. Bad Creek is one of the largest energy storage assets in the world which, after

[1] U.S. Energy Information Administration (EIA), Today in Energy for November 7, 2022, available at https://www.eia.gov/todayinenergy/detail.php?id=54559.

completing runner upgrades to increase the power capacity of the station, will total nearly 1,700 MW. The Companies are making progress on battery storage, starting operations of the first transmission-connected Battery Energy Storage Systems in the Carolinas. Furthermore, in the last decade, the Companies' solar resources have grown to approximately 4,650 MW[2] of installed capacity in the Carolinas, continuing Duke Energy's leadership in solar energy. The Companies are strategically integrating transmission planning with long-term resource plans, identifying critical path network upgrades and related costs to enable a reliable energy transition (details in Appendix L (Transmission System Planning and Grid Transformation)).

Figure 1-1: Combined DEC and DEP Energy Transition in Progress



In light of this progress, just in the months since development of previous resource plans and updates, the energy landscape has changed in ways that have created material impacts to this Plan's analytical inputs and ultimately in resource plan timing and outputs. This sustained pace and volatility of change in the planning environment highlights the importance of keeping power supply reliability and customer affordability at the forefront while balancing risks with execution pacing during this critical period in the Companies' states' energy futures.

The Companies' transition from reliance upon emissions-intensive resources is reasonable, prudent, and consistent with risk mitigation practices throughout the broader electric power industry. However, this is a transition that must be managed carefully. The energy landscape is rapidly changing just as the Companies' energy transition reaches a critical inflection period with robust and significant economic development and anticipated load growth while retiring the remaining coal-fired generation by 2035, all of which is located in North Carolina, but which serves companies in both states. During this period of coal retirement, the Companies must bring into service enough diverse and equally

[2] Installed solar as of end of year 2022.

reliable resources to both accommodate the growth needs of the states' businesses and economies and maintain or improve the reliability of the grid at every hour of every day and all seasons of the year, including during extreme weather events. This puts a strong emphasis on developing a meaningful and sustained Plan execution over the next 15 years to support a resource retirement and build cycle not undertaken in recent history — requiring decisive near-term actions, supporting development and investment in the intermediate-term, and retaining flexibility to meet evolving conditions in the long-term. This resolute, meaningful, and sustained Plan execution will allow the states to grow, invest, and flourish for decades to come.

Planning Impacts of a Changing Energy Landscape

The energy landscape is changing in significant ways and several changes directly influence long-term planning inputs and results as summarized in Table 1-1 below. In the next 10 to 15 years, forecasted load has increased materially due to robust economic development levels not seen in previous planning cycles, anticipated population growth in the Carolinas and electric vehicle adoption forecasts. The planning reserve margin to provide physical power supply adequacy and reliability has increased, accounting for extreme weather needs and less reliance on neighboring systems. More broadly, an active policy and regulatory landscape resulting in more stringent environmental regulations, coupled with the electric industry's exit from coal, is driving the need to plan for an increasingly clean set of resources. Furthermore, economic and financial inputs are impacting resource costs in the Plan. The IRA provides for extended clean energy production and investment tax credits that directly benefit customers along with $67 billion in additional federal clean energy grants[3] and the IIJA provides for $65 billion in transmission and grid investment and over $7 billion in electric vehicle charging investment.[4] At the same time, upward pressure is impacting resource costs as inflation and macro-economic uncertainty have increased and supply chain challenges have impacted all resources. Finally, technology advancements and consumer trends drive planning assumptions — particularly how the potential timing, scale and impact specific technologies and demand-side and customer solutions may have on reliability, affordability and emissions reductions. For example, the Companies must consider the potential timing of commercially-available and scaled long-duration storage or when new advancements in electric vehicle charging optimization and vehicle-to-grid may be available and at what scale.

[3] The White House, Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action, Version 2, January 2023, available at https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/.

[4] The White House, Fact Sheet: The Bipartisan Infrastructure Deal, November 2, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/11/23/fact-sheet-the-bipartisan-infrastructure-law-will-revitalize-main-street/.

Table 1-1: Changing Energy Landscape and Related Plan Implications

	Change	Drivers	Plan Implications
	Growth Approximately 8% energy demand increase by 2030	• Robust economic development across the Carolinas • Population growth • Electric vehicle adoption	More resources needed to serve load growth
	Maintaining or Improving Reliability Planning Reserve Margin increased from 17% to 22%	• Cold weather events and learnings • Fleet transition - dispatchable retirements, more variable-energy resources • Reduced ability to rely on neighboring system assistance, particularly in extreme weather	More resources needed to ensure reliability
	Policy and Regulatory Landscape Changes that cross-cut planning assumptions and objectives	• States: NC HB 951, SC Act 62 • Federal Actions: Congress, EPA, FERC and NERC, DOE, among others • Infrastructure siting and permitting	Need to balance planning objectives and consider scope and timing of inputs and assumptions
	Exit from Coal Significant commodity price, transportation, and fuel security risks related to ongoing industry exit from coal	• Coal ash and EPA regulations • Changing economics and supply chain constraints • Evolving generation and dispatch equation • Escalating cost and risk of coal retirement schedule extensions	Replace before retire: Plan retirement dates and equally reliable capacity replacements, identify significant risks of delaying exit from coal
	Financial and Timing Impacts Incentives, higher costs, and longer lead times	• IRA and IIJA tax, investment, and program incentives opportunities • Inflation, financing, labor and supply chain constraints • Longer infrastructure siting, permitting and supply chain timelines	Integrate into plan inputs - incentives directly benefit customers, upward inflationary and supply chain cost pressures
	Technology Advancements Varying perspectives and uncertainty on the viability and/or timing of solutions	• Advanced nuclear and offshore wind timing • Hydrogen and long duration storage development	Set assumptions in plan and monitor risks and signposts in plan execution
	Consumer Trends Varying perspectives on potential impact of customer solutions on plan assumptions and execution	• Large commercial and industrial customers' environmental objectives • Interest in more clean energy and demand-side options, energy optimization • Energy stewardship and community impact considerations	Set assumptions in plan and monitor impacts

Growth in Demand Through Strong Economic Development, Load Forecast

The Companies are forecasting annual energy demand increases from previous forecast cycles of 8% by 2030 and 11% by 2035 — ultimately translating to 19 terawatt hours of energy and an increase in non-coincident winter peak of over 3 GW of capacity needs. In the next 15 years, load growth is projected to surge by around 35,000 gigawatt-hours — for perspective, more than the annual electric generation of Delaware, Maine and New Hampshire combined. The Carolinas region has seen substantial economic development due to the commitment and efforts of state, county and local leadership — a reliable and stable electric supply factors into those efforts. Now many of those economic development projects are translating to demand growth as large site developments launch construction and become commercial through 2030. The size, scale and speed of economic development of larger projects has dramatically increased over the past two years. In addition to emerging electric vehicle-related manufacturing, battery production, and associated supply chain projects, steel production, semi-conductors and large-scale data centers are "re-emerging." There are new residential customers coming onto the system through continued population growth in the Carolinas. Finally, by 2035 the impacts of forecasted growth of electric vehicle adoption adds another significant increase in projected load, as commercialization and economic development of transportation electrification advances with federal and state policy and incentive support — as already seen in recent economic development activities across the Carolinas. Details on load forecasts and related analysis and assumptions are in Appendix D (Electric Load Forecast).

Increased Power Supply Adequacy and Reliability Needs with Higher Reserve Margin

The Companies maintain a minimum physical reserve margin to ensure reliability during unexpected conditions related to extreme weather, especially during extreme cold winter days, load growth projections, and generation unplanned outages. As the Carolinas' energy needs grow due to economic development, population increases and the adoption of electric vehicles, resource adequacy to ensure reliability at all times and seasons, particularly in extreme cold, must keep pace. Extreme cold weather events and recent outage events during Winter Storm Elliott in December of 2022 placed a heightened focus on resource adequacy and reliability across the region. As the Companies' resource mix and those of neighboring operating areas transition from conventional dispatchable baseload generation, like coal, to variable-energy renewables and energy-limited storage, all operating entities will be closely evaluating and adjusting long-term planning needs to provide adequate energy and capacity. Maintaining reliability is critical to the success of the states' energy future, particularly during extreme weather events, as systems across the region shift to winter risk planning.

For this Resource Plan, the Companies commissioned Astrapè Consulting to perform an updated analysis of the Companies' physical reliability needs in the 2023 Resource Adequacy Study

(Attachment I). Based on the Companies' experience and resource-specific data, the study resulted in a DEC and DEP combined case increase in the reserve margin from 17% to 22% in order to meet a one day in 10-year loss of load expectation. The study included unit outage and winter capacity risk based on historical outage data during key cold weather events through December 2022, which included Winter Storm Elliott data. The study also revealed a decrease in neighboring areas ability to assist Duke Energy's systems during times of peak winter needs, as neighboring systems have shifted towards winter risk planning and are retiring dispatchable resources, making capacity during extreme weather constrained across the entire region. As an example, during Winter Storm Elliott, PJM Interconnection, L.L.C curtailed firm, planned purchases to DEC and DEP in order to avoid shedding load in their operating area. For these reasons, and as more fully addressed in the study, increasing the reserve margin to 22% is a reasonable and necessary step in the planning process that assumes a combined view of the Companies, as in the previous 2020 Resource Adequacy Study, and is in alignment with regional peer operators.

Policy and Regulatory Landscape Necessitates Balancing Requirements and Risks Across Planning Objectives

In the past several years, both the states and federal government entities and agencies such as the Environmental Protection Agency ("EPA"), Federal Energy Regulatory Commission ("FERC"), North American Electric Reliability Corporation ("NERC"), Department of Energy ("DOE"), Securities and Exchange Commission, the United States Congress and state legislatures, transportation and commerce agencies have all been active in the energy space. These entities' actions result in a matrix of cross-cutting dependencies that the Companies must consider as they develop long-term resource plans — some of which are mandated by law and regulation, and others that are policies driving investments in technology development (both at large scales and in distribution and consumer energy integration), economic development, renewables, transportation electrification and energy efficiency. In an integrated system, sometimes these actions align on both objective and timing, and other times run counter to one another, resulting in trade-offs in cost, risk, timing, reliability and execution the Companies must weigh and balance.

Recent federal actions since the previous Plan updates highlight just how much is changing, with the passage of the IIJA and IRA providing historic levels of investment and tax incentives for transmission, nuclear, renewables, hydrogen and vehicle electrification, EPA's Clean Air Act Section 111 Proposed Rule regulating greenhouse gas ("GHG") from fossil fuel-based resources, and the Fiscal Responsibility Act of 2023 addressing permitting of the Mountain Valley Pipeline. FERC is taking

several actions related to grid security, reliability, and extreme weather preparedness.[5] Federal and state actions continue to show interest in advancing transportation electrification, driving investments and economic development in industrial sector growth for electric vehicles and components, such as battery manufacturing and vehicle assembly. The IRA is providing significant investment incentives for clean hydrogen production and the IIJA allocated $8 billion for the DOE to develop regional Hydrogen Hubs.[6] This active policy and regulatory landscape require the Companies to balance planning objectives and scope and timing of planning inputs and assumptions as further described in Chapter 2 (Methodology and Key Assumptions).

Addressing environmental justice and community impacts related to anticipated plant retirements and the siting of new resources is increasingly being integrated into policy and regulations, as seen in components of the IRA and IIJA. These activities occur as part of execution activities and project-related work, and Duke Energy has developed environmental justice principles and protocols[7] to guide siting activities and state teams are facilitating meaningful local engagement for infrastructure projects.

Industry Exit from Coal Driving Need to Balance Significant Levels of Risks

The Companies are slated to retire and replace over 8,400 MW of coal-fired generation capacity by 2035, all of which is located in North Carolina and serves the entire DEC and DEP systems with reliable dispatchable generation. Retirement of the coal generation is predicated upon the recognition that economics and environmental regulations are driving the ongoing decline of the coal industry and the infrastructure supporting it, leading to a necessary exit out of coal and that coal generation capacity must be replaced with equally reliable sources. This shift is also occurring at the same time plants are aging and being operated in a way they were not intended; especially given the price volatility the Companies have seen over the last few years in the coal markets. These operational realities put additional stress on aging units. Maintaining reliability of coal generation through an uncertain retirement schedule requires an orderly and balanced approach that preserves the viability of supply and transportation as well as the health of the power plant through the balance of a plant's operational

[5] FERC Docket Nos.: RD23-2-000 Evaluation of the Physical Security Reliability Standard and Physical Security Attacks to the Bulk-Power System, AD23-8-000 FERC-NERC Joint Inquiry into Winter Storm Elliott, RM22-10-000 Transmission System Planning Performance Requirements for Extreme Weather, RM22-16-000 One-Time Informational Reports on Extreme Weather Vulnerability Assessments, AD21-13-000 FERC Climate Change, Extreme Weather, and Electric System Reliability.

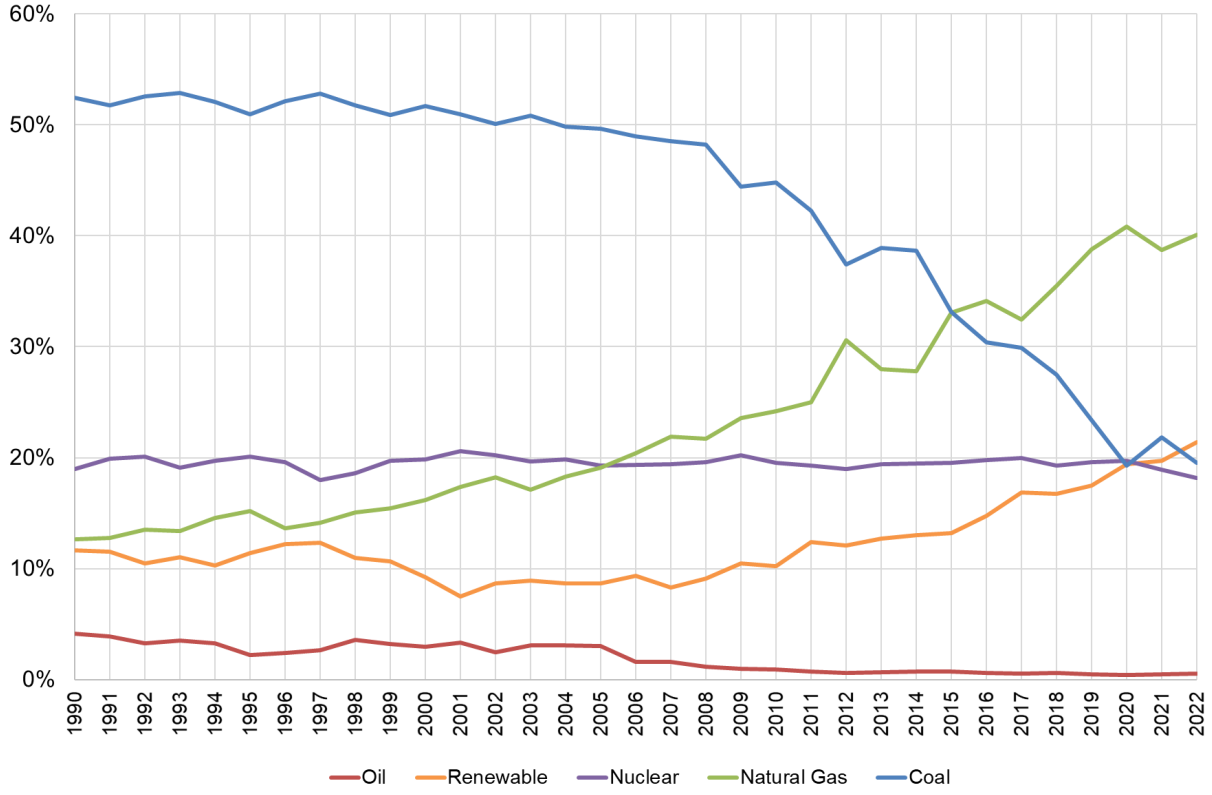
[6] Duke Energy is one of five utilities participating in the Southeast Hydrogen Hub funding application. See Appendix K (Natural Gas, Low-Carbon Fuels and Hydrogen) for more information on recent federal actions on natural gas and hydrogen.

[7] See more information on Environmental Justice and Just Transition in the Duke Energy 2022 Impact Report and the Companies' environmental justice principles at https://p-micro.duke-energy.com/esg/vibrant-communities/environmental-justice.

life — if retirement schedules extend, commodity cost, transport availability and general fuel security risks increase. The changing economics of coal including coal supply and transportation constraints, the evolving impacts on coal unit commitment and dispatch resulting from these constraints, impacts of increased policies and regulations and the implications for the Companies coal facilities are detailed in Appendix F (Coal Retirement Analysis).

These are realities recognized by utilities across the country. There have been significant coal generation retirements across the nation as power generators transition their fleets to lower carbon energy sources, such as renewables and natural gas as depicted below in Figure1-2. Announcements regarding additional planned retirements for the nation's aging coal facilities contribute to the continuing deterioration of the domestic coal supply chain as coal production is reduced, redirected to the international market or closed completely due to lack of forecasted domestic demand. As thermal coal production continues to decrease, risks to coal supply availability and customer fuel costs increase.

Figure 1-2: National Electric Production by Source



Source : Energy Information Administration as of February 23, 2023

For Duke Energy, any delays in coal retirement timing, particularly if plant operation is extended into the mid and late 30s, would most likely result in the need for continued coal supply after the coal industry has reduced thermal coal production in response to the utility industry's continued transition away from coal generation. Access to the commodity, the reagents utilized to treat emissions resulting from use of the commodity and transportation have high potential to deteriorate or disappear. These declines in supply availability and market uncertainty create future risks for coal supply assurance and ultimately increase reliability and cost risks for customers. For these reasons, it is extremely important that the Companies plan and execute an orderly energy transition.

Financial Incentive Opportunities Coupled with Inflationary and Lead-Time Challenges Impacting Resource Cost Assumptions

Just in the intervening months since development of previous resource plans, both headwind and tailwind factors have impacted resource cost assumptions. For tailwinds, the Plan considers available incentives, particularly those investment tax credits, and production tax credits being finalized from the recent passage of the IRA that directly benefit customers. As previously discussed, the IIJA and IRA present an important set of opportunities, bounded by prescribed time limits, to take advantage of resource or programmatic incentives on behalf of customers for nuclear, hydrogen, carbon capture and sequestration, enabling grid investments, renewables, hydrogen and transportation electrification. Input assumptions incorporating IRA incentives are captured Chapter 2 of the Plan.

For headwinds, the macro-economic environment is continuing to experience inflation and a period of general uncertainty, increasing financing costs and labor and material costs back through supply chains supporting all resources — even back into primary materials such as rare earths, copper, and steel production.[8] Just since the last resource plan submittals, overnight capital costs range from 20% to 60% higher depending on technology, as detailed in Appendix E (Screening of Generation Alternatives). Moreover, lead-times to implement infrastructure are extending to account for siting and permitting activities, increasingly recognized by state and federal government leaders as a challenge to advancing the energy transition. Inflationary pressures, siting and permitting lead times in combination with supply chain and labor constraints puts emphasis on proactively monitoring risks and signposts and ensuring a continued "check and adjust" feedback loop across resource planning and execution as discussed later in this Chapter.

[8] Current 2023 Producer Price Indices for all commodities remain elevated above 2020 levels based on Federal Reserve Bank of St. Louis published PPIACO data.

Technology Advances Critical to Orderly Energy Transition and Diverse Power Supply

A key element to a reliable energy transition is a complementary set of technologies that provide customers risk and cost hedges across the Companies' fleets. An orderly energy transition relies upon a diverse power supply that can meet growth and future needs of the system as aging assets are retired. The Companies are involved and closely monitoring various technology advancements, some of which are integrated into planning assumptions and others not yet as detailed in Appendix E. There are varying perspectives around technology viability, timing of availability, cost and risk across a myriad of technologies — some that are commercially proven but not yet implemented in the Carolinas, such as onshore and offshore wind, some that are in commercial development, such as advanced nuclear small modular reactors, and others that are in various pilot phases, such as long-duration storage and hydrogen. Technology advancements are critical as coal retires and diverse, increasingly clean, and operationally compatible technologies are needed to maintain or improve system reliability, particularly as we move closer towards carbon neutrality. The Plan must make assumptions based on the best available information and through industry and stakeholder networks monitor those assumptions during Plan execution — and adjust in future planning cycles with more and better information. Additional information on resource planning assumptions is in Chapter 2 and in Appendix C (Quantitative Analysis).

Consumer Trends Increasingly Influencing Plan Supply Choices and the Demand-Side Options

Customers have an increasing awareness and desire for energy stewardship, requiring the Companies to consider the source and impact of energy choices on the environment and communities, in addition to ensuring an affordable and reliable energy supply. A 2022 Pew Research Poll found a majority of Americans (69%) are in favor of taking steps toward carbon neutrality by 2050 at the same time a majority (67%) want to keep a mix of both renewables and fossil fuels energy resources.[9] These polling results reflect consumers' fundamental understanding of an orderly energy transition. At the same time, customers are increasingly wanting options to participate in the energy transition through access to renewables and the ability to influence and optimize system needs through energy efficiency, demand-side tools, and customer program participation. Indeed, the Companies have seen a clear trend of economic development interests and existing large industrial and commercial customers demanding renewables and emissions reductions to meet their ambitious clean energy goals. Consumer electrification patterns continue in both heating that more recently is impacting winter

[9] Pew Research Center, "Americans Largely Favor U.S. Taking Steps To Become Carbon Neutral by 2050," March 2022, available at https://www.pewresearch.org/science/2022/03/01/americans-largely-favor-u-s-taking-steps-to-become-carbon-neutral-by-2050/.

peaking needs and forecasted adoption of electric vehicles driving considerable new demand for charging through the intermediate term. Related to siting and execution of infrastructure projects, stakeholders, customers, and communities are engaging in environmental justice and impacted community activities. They are expressing increasing interest in not just personal energy stewardship on the consumption side, but broader community-based energy stewardship related to local environmental, economic and social impacts of the energy transition.

There is a wide range of perspectives on the potential outcomes, system impacts, adoption rates, and cost impacts of consumer electrification patterns, energy efficiency, demand-side tools and customer programs. Similar to technology advancements, the Plan must make assumptions on relative impact to load that these demand-side changes and customer-based programs may have based on the best available information and through industry and stakeholder networks. The Companies continue to advance their commitment to providing customers with clean energy options and demand-side tools to influence load and "shrink the challenge" of the energy transition as described in Appendix H (Grid Edge and Customer Programs). The Companies will monitor the quantifiable results of these trends, programs, and adoptions rates and make necessary adjustments in future planning cycles. Additional information on resource planning assumptions is in Chapter 2, Appendix C and Appendix D.

Keys to An Orderly Energy Transition in a Changing Energy Landscape

Several key enablers that ensure the energy transition advances in a balanced, prudent, and reasonable manner in the face of a dynamic planning environment are described in Table 1-2 below. Retiring coal in a timely manner and replacing with a diverse set of power supply resources, all facilitated by strategically planned transmission is central to the plan. The Companies remain committed to addressing the demand-side of the equation — seeking solutions to reduce and optimize consumption, particularly in the face of demand increases due to economic development, population growth, and electric vehicle adoption in this Base Planning Period.[10] In an integrated system, an "all of the above approach" and balanced portfolio approach is necessary as solutions work in concert to meet the planning objectives and provide important risk hedging through diversity of supply.

[10] The Base Planning Period is the 15-year resource planning horizon that meets North Carolina and South Carolina long-term planning requirements.

Table 1-2: Keys to Orderly Energy Transition

	Key	Benefit / Plan Reference
	Coal unit retirements after timely commissioning of equally reliable resources during this critical execution phase of the energy transition	Optimal timing mitigates energy transition risks of ensuring reliability through "retire before replace" while also balancing the escalating risks of a prolonged exit from coal. *Appendix F (Coal Retirement Analysis), Appendix M (Reliability and Operational Resilience), Chapter 3 (Portfolios)*
	New hydrogen-capable dispatchable natural gas resources	Incremental resources with associated fuel supply provide a bridge to maintain reliability, facilitate gas generation plants blend or ultimately run on hydrogen, while also reducing emissions and allowing for integration of increasing levels of renewables. *Appendix K (Natural Gas, Low-Carbon Fuels and Hydrogen), Appendix M (Reliability and Operational Resilience), Chapter 4 (Execution Plan)*
	Strategic grid planning and investment	Strategic transmission planning facilitates timely and reliable generation replacement, retirements, and accommodation of new load growth. *Appendix L (Transmission System Planning and Grid Transformation)*
	Balanced integration of renewables and storage across the system	Leveraging pumped hydro storage, the largest available long-duration storage technology, and batteries with solar and wind across the system contributes to power supply diversity, operational flexibility, provides for an important fuel hedge for customers in complement to the dispatchability of gas generation - all while reducing emissions. *Appendix I (Renewables and Energy Storage), Chapter 4 (Execution Plan)*
	Extension of existing nuclear and planning for advanced nuclear	The operational performance capabilities and significant long-term system benefits of carbon-free nuclear has been proven in the Carolinas for decades – the next generation of nuclear is an essential element of the energy transition. *Appendix J (Nuclear), Chapter 4 (Execution Plan))*
	Continued advancement of energy efficiency, demand-side tools and innovative customer programs	Grid edge and customer programs influence load and shrink the energy transition challenge by reducing, optimizing and shifting energy consumption. *Appendix H (Grid Edge and Customer Programs)*

Meaningful and Sustained Plan Execution Advances Reliable Solutions for a Changing Energy Landscape

The Companies and other utilities in all regions across the country are similarly situated, developing plans and executing this energy transition that maintains reliability for customers in a changing energy landscape. The President and Chief Executive Officer of NERC recently stated that the reliability risk profile for customers is increasing due to the "disorderly transformation of the generation resource base," performance issues with resources replacing conventional baseload generation, increased demand due to electrification, and extreme weather events.[11] Entities across the country are feeling the tension between retirement of coal and timely commercial operation of adequate replacement resources to meet reliability, adding additional sufficient resources to accommodate growth through electrification and economic development, while executing in changing policy, regulatory, economic and technology conditions.[12,13,14] Working with the North Carolina Utilities Commission and Public Service Commission of South Carolina and stakeholders in a collaborative, constructive, and stable regulatory construct, the Companies are in a strong position to control the pace and composition of the energy transition to preserve reliability – thus, ensuring an orderly energy transition for customers. However, meaningful and sustained progress to advance the execution of the energy transition must be made in this next decade, a critical execution phase, to ensure the Companies can meet planning objectives and mitigate risks of the changing energy landscape for customers (further discussed in Chapter 4).

[11] Testimony of NERC President and Chief Executive Office James B. Robb before the United States Senate Committee on Energy and Natural Resources on June 1, 2023, available at https://www.energy.senate.gov/services/files/D47C2B83-A0A7-4E0B-ABF2-9574D9990C11.

[12] PJM's board of managers directed immediate work to ensure resource sufficiency based on the concerns of extreme weather events, substantial resource retirements expected through 2030, assumptions for increased demand and electrification, and a stalled process to add new resources. See Energy Transition in PJM: Resource Retirements, Replacements & Risks, PJM, February 24, 2023, available at https://www.pjm.com/-/media/library/reports-notices/special-reports/2023/energy-transition-in-pjm-resource-retirements-replacements-and-risks.ashx.

[13] MISO launched resource adequacy reform in 2022 in response to concerns of resource mix changes resulting in potential insufficient capacity. See MISO Update on Resource Adequacy to Missouri Public Service Commission, August 17, 2022, available at https://psc.mo.gov/CMSInternetData/Agenda%20Presentations/2022%20Presentations/8-17-2022%20MISO%20Update%20on%20Resource%20Adequacy.pdf.

[14] NYISO cautioned that electrification and economic developing is increasing demand, however, fossil fuel generation is retiring faster than renewable resources are entering service leading to declining reliability margins. See 2023 Power Trends: A Balanced Approach to Clean and Reliable Grid, NYISO, available at nyiso.com/documents/20142/2223020/2023-Power-Trends.pdf/7f7111e6-8883-7b10-f313-d11418f12fbf.