STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

Docket No.: 2019-224-E South Carolina Energy Freedom Act (House Bill 3659) Proceeding Related to S.C. Code Ann. Section 58-37-40 and Integrated Resource Plans for Duke Energy *Carolinas*, LLC	**VOTE SOLAR CROSS EXHIBIT 13**
Docket No.: 2019-225-E South Carolina Energy Freedom Act (House Bill 3659) Proceeding Related to S.C. Code Ann. Section 58-37-40 and Integrated Resource Plans for Duke Energy *Progress*, LLC	

ACHIEVING A NET ZERO CARBON FUTURE

Duke Energy 2020 Climate Report

DUKE ENERGY®

BUILDING A **SMARTER** ENERGY FUTURE®

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Duke Energy published this Climate Report during the COVID-19 (coronavirus) pandemic. Learn about the company's response to this

Executive Summary

As one of the largest electric and gas utilities in the U.S., Duke Energy embraces its responsibility not only to power the communities where our customers live and work, but also to address risks from climate change. Addressing the challenges climate change presents is a mission on which we all agree. We must double down on the hard work that will inform the technology, pace and cost of the transition, while always keeping affordability and reliability for our customers as our guiding beacons. Duke Energy will continue to help lead the effort to develop solutions to this complex challenge.

This report discusses how we are leaning in to this challenge and addressing climate risks by, first and foremost, reducing our own emissions and, secondly, by adapting our system to be more flexible and resilient.[1]

Our plans are guided by new carbon reduction goals that were announced in September of 2019. Duke Energy aims to reduce carbon dioxide (CO_2) emissions from electricity generation at least 50 percent below 2005 levels by 2030 and to achieve net-zero CO_2 emissions by 2050.[2]

We have already made significant progress toward our updated goals, reducing CO_2 emissions 39 percent since 2005, ahead of the industry average of 33 percent.[3] To build our path to net zero, we will work collaboratively with stakeholders and regulators in each of the states we serve to develop specific plans that best suit their unique attributes and economies. This will be an exciting transformation that evolves and adapts over time. This report offers insights into the complexities and opportunities ahead and provides an enterprise-level scenario analysis with an illustrative path to net zero, based on what we know today.[4]

This scenario analysis was conducted using our industry-standard resource planning tools and assuming normal weather (averages over the past 30 years). The major findings of this scenario analysis are:

- We are on track to achieve our 2030 goal of reducing CO_2 emissions from electricity generation by at least 50 percent from 2005 levels.
- The path to net zero by 2050 will require additional coal retirements, significant growth in renewables and energy storage, continued utilization of natural gas, ongoing operation of our nuclear fleet, and advancements in load-management programs and rate design (demand side management and energy efficiency). Importantly, this path also depends on the availability of advanced very low- and zero-carbon

[1] This report, like our 2017 Climate Report to Shareholders, is aligned with the disclosures recommended by the Task Force on Climate-related Financial Disclosures (TCFD).
[2] These goals are enterprisewide. Each jurisdiction will have a different trajectory toward achieving them.
[3] U.S. Energy Information Administration, *Monthly Energy Review*, March 26, 2020.
[4] This scenario analysis does not model specific climate policies but has helped us identify key attributes of policies that will help us achieve our goals. These are discussed in the policy risks section on page 15.

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technologies that can be dispatched to meet energy demand. These "zero-emitting load-following resources" (ZELFRs) will need to be installed as early as 2035. This analysis projects that ZELFRs will make up 12 percent of the capacity mix and supply 30 percent of energy by 2050 due to their ability to operate at full output over extended periods regardless of weather conditions. See sidebar on ZELFRs.

- Our analysis also shows that while we project adding large amounts of renewable energy, natural gas units remain a necessary and economic resource to enable coal retirements and to maintain system reliability as we transition.[5] Natural gas – reinforced by adequate transport capacity – allows us to retire our remaining 16 gigawatts (GW) of coal and transition to net-zero CO_2 emissions by 2050 while maintaining affordability and reliability. Notably, as increasingly larger amounts of renewable energy and other zero-emitting resources are added, Duke Energy's natural gas fleet will shift from providing bulk energy supply to more of a peaking and demand-balancing role.

- We project continuing to need natural gas because, in jurisdictions such as ours where hourly demand for electricity is not well-correlated with hourly renewable generation, renewables are not operationally equivalent to natural gas generation, particularly for prolonged periods of cloudy weather and/or low wind speed conditions.

- We conducted a "no new gas" sensitivity to stress-test this projection. We find that while energy storage can help address the capacity and energy gap created by retirement of coal units, installation and operational challenges arise as we attempt to rely on current commercially available storage technologies to provide intermediate and baseload capabilities.

- For example, to enable coal retirements and accommodate load growth without adding natural gas, Duke Energy would need to install over 15,000 MW of additional four-, six- and eight-hour energy storage by 2030. That equates to a little over 17 times all the battery storage capacity installed nationwide today (899 MW).[6] The largest battery storage facility that exists in the world today is the Tesla-built 100-MW Hornsdale Power Reserve in Australia.[7] A larger 400-MW battery storage facility is currently under development in the Southeast.[8] These are important and encouraging developments, but it is notable that Duke Energy would need to build nearly 40 storage facilities like the one under development in the next nine years to reach

[5] Note that our analysis does include economic hurdles for natural gas to address the risk of stranded assets (see page 23 for discussion).
[6] EIA, U.S. Utility-scale battery storage power capacity to grow substantially by 2023, July 2019. https://www.eia.gov/todayinenergy/detail.php?id=40072 (showing 899 MW of battery storage as of 2019 and projecting 2,500 MW installed by 2023).
[7] https://hornsdalepowerreserve.com.au/
[8] http://newsroom.fpl.com/2019-03-28-FPL-announces-plan-to-build-the-worlds-largest-solar-powered-battery-and-drive-accelerated-retirement-of-fossil-fuel-generation

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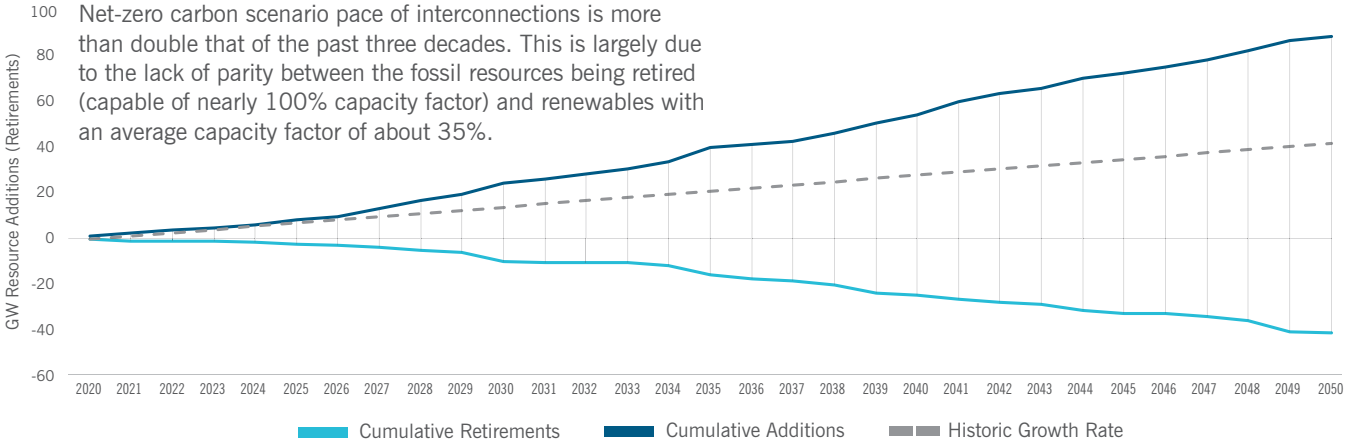
15,000 MW of storage. Due to this tight time frame, challenges would likely include regulatory approvals and permitting, interconnection studies and associated upgrades, and potential supply chain issues, considering the current early stage of the utility-scale battery storage industry.

- Taking this scale of battery implementation to real-world, reliable and affordable operations would require further detailed analysis and on-the-ground experience – among other factors – to determine operational feasibility. We are not aware of any electric utility in the U.S. that has attempted to serve customers reliably at scale with such a high proportion of capacity from energy storage. We discuss the detailed analysis needed before such implementation on page 29.

- If such an amount of storage is possible from an operational standpoint, we found that the incremental costs of achieving net zero under this sensitivity would increase by three to four times above that of the net-zero scenario that utilizes natural gas (even without including the likely significant additional costs for transmission and distribution system upgrades). These costs could especially have an impact on Duke Energy's low- and fixed-income customers and energy-intensive businesses.

- Achieving net zero, even with gas, will require an unprecedented and sustained pace of capacity additions. For example, we will need to add new generation to our system over the next three decades at a pace more than double the rate at which we added generation over the past three decades. This is illustrated in the chart below.



- In the net-zero carbon scenario, renewables (solar and wind) contribute over 40,000 MW of those additions, representing 40 percent of the summer nameplate capacity of Duke Energy's system by 2050 and generating the largest portion of energy. To put this into perspective, Duke Energy's total summer generating capacity today is approximately 58,000 MW and grows to over 105,000 MW by 2050. The requirement for such large needed additions arises because replacing traditional electric generating capacity with renewables plus storage is not a one-for-one proposition. Due to the intermittency of renewables, significantly more capacity must be built, even with storage available, to provide the same level of reliable electricity generation as a fossil plant. Therefore, achieving net zero will also depend on our ability to site, construct and interconnect new generation, transmission and distribution resources at an unprecedented scale in a timely manner.[9]

[9] See University of North Carolina, "Measuring Renewable Energy as Baseload Power," March 2018. https://www.kenaninstitute.unc.edu/wp-content/uploads/2018/05/Kenan-Institute-Report-Measuring-Renewable-Energy-as-Baseload-Power-v2.pdf

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- Our modeling demonstrates that if these resources are integrated into the grid as forecast, we will be able to serve customers under normal weather, which is the way we have planned the system in the past, when the vast majority of resources were dispatchable over long durations (weeks rather than hours). More work is needed to better understand the ability of renewables and storage to meet capacity needs, and how that will change as more of these resources are added to displace conventional generation. We are already embarking on these analyses and expect that collective industry understanding will improve over time.
- While we did not explicitly account for transmission and distribution needs in this analysis, it should be recognized that retirements of certain coal (and, later on, gas) units, as well as the addition of large volumes of renewables and energy storage, will require substantial investments in our transmission and distribution systems. Federal and/or state policy changes may be needed in order to achieve such large transmission and distribution investments in a timely manner.

The actual pathway that Duke Energy takes to achieve net-zero carbon emissions by 2050 will be based on the availability and cost of evolving technologies, federal and/or state climate policies, and stakeholder and regulatory input and approvals. During the 2020s, significant innovation and technological advancement will be critical to ensure we have viable technology options by the 2030s.

To help enable these new technologies, we are committed to working with the private and public sectors to drive research, development and demonstration of technologies such as advanced nuclear; carbon capture, utilization and storage (CCUS); hydrogen and biofuel utilization for power generation; and longer-duration (up to seasonal) storage.

We are embracing this extraordinary challenge, collaborating with regulators, policymakers and other stakeholders to help develop the best policies and options that will reduce carbon emissions and meet the needs of our customers for affordability, reliability and sustainability.

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Zero-Emitting Load-Following Resources

Our analysis makes it clear that advanced very low- or zero-emitting technologies that can be dispatched to meet energy demand are needed for Duke Energy to transition to its net-zero carbon future. There are several technologies that could play the role of zero-emitting load-following resources (ZELFRs), such as:

- **Advanced nuclear** – Advanced nuclear includes a wide range of small modular light-water reactors (SMRs) and advanced non-light-water reactor designs. Small modular light-water reactors are closest to commercial deployment, with early designs targeting commercial operations in the mid-to-late 2020s. Advanced non-light-water reactor concepts are also under development and are expected to be commercially available in the 2030s.
- **Carbon capture, utilization and storage (CCUS)** – CCUS technologies for the power sector are in the early stages of deployment, with a few small-scale projects on coal having achieved commercial operation and several natural gas projects currently in development, spurred by the 45Q tax credit, which provides an incentive for utilizing or storing captured CO_2. Demonstration of CCUS at scale for natural gas power plants is an important milestone for commercial deployment in the power sector, as is building public, environmental and regulatory confidence around the transportation of captured CO_2 and its utilization and geologic storage.
- **Hydrogen and other gases (including renewable natural gas)** – Hydrogen and other low- or zero-carbon fuels are increasingly gaining attention for their potential to contribute to a net-zero carbon grid. For example, many existing natural gas turbines are already capable of co-firing hydrogen, and vendors are focused on developing models capable of firing 100 percent hydrogen. Key opportunities include cost-effectively producing hydrogen (or other gases, including renewable natural gas) from very low- or zero-carbon processes and ensuring safe and effective methods of transportation.
- **Long-duration energy storage** – Long-duration energy storage includes a wide range of thermal, mechanical and chemical technologies capable of storing energy for days, weeks or even seasons, such as molten salt, compressed/liquefied air, sub-surface pumped hydro, power to gas (e.g., hydrogen, discussed above) and advanced battery chemistries. These technologies are at various stages of research, development, demonstration and early deployment

Other technologies will also be important. We continue to explore pumped storage hydro opportunities (a mature technology), as well as advanced renewables (such as offshore wind and advanced geothermal and solar), energy efficiency and demand response.

Duke Energy is actively involved in efforts to advance research, development, demonstration and deployment of advanced technologies. For example, we are a founding member and anchor sponsor of the Electric Power Research Institute/Gas Technology Institute's Low Carbon Resource Initiative, which is a five-year effort to accelerate the development and demonstration of technologies to achieve deep decarbonization. And we have participated in extensive research over the past few years on CCUS, including, for example, a study of membrane-based carbon capture that was conducted at our East Bend facility in Kentucky. We are also involved in both the Midwest Regional Carbon Capture Deployment Initiative and the Midwest Regional Carbon Sequestration Partnership.

We are also a founding member of EEI's Clean Energy Technology Innovation Initiative, which is partnering with several non-governmental organizations (NGOs), including Clean Air Task Force, the Center for Climate and Energy Solutions, and the Bipartisan Policy Center, to identify areas for advocacy on advanced technologies.

Robust and sustained government support is vital to ensure the commercialization of these advanced technologies; Duke Energy will continue to advocate for sound public policies that advance this needed support.

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Introduction

In the following sections, this report highlights Duke Energy's commitment to address climate change:

- **Governance** – discusses Board of Directors oversight, executive compensation and lobbying/political expenditures policies.
- **Strategy** – discusses how various inputs inform and drive Duke Energy's plans to a net-zero carbon future.
- **Risk Management** – addresses Duke Energy's process for identifying physical and transition (policy and economic) risks, and measures for addressing these risks.
- **Metrics** – identifies the company's specific CO_2 reduction goals, progress toward those goals, as well as other greenhouse gas (GHG) metrics.
- **Scenario Analysis** – discusses our analysis of a net-zero carbon emissions scenario to provide insight into areas of near-term and longer-term focus needed to achieve our net-zero 2050 goal.

Governance

Board Committee Oversight

The Duke Energy Board of Directors understands the importance of climate change issues, as well as their significance to our employees, customers and communities, and recognizes the potential impact and opportunities for our business and industry. In 2019, the Board was instrumental in the development of Duke Energy's updated carbon reduction goals, including review and discussion at multiple meetings of the Corporate Governance Committee, along with insights from external experts at a full Board meeting.

Given the wide scope of climate risks, including physical, policy and economic risks, the Board and its committees are all actively involved in oversight, as shown in the table on the next page.

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BOARD OF DIRECTORS RISK MANAGEMENT OVERSIGHT STRUCTURE	
Corporate Governance Committee ▪ Oversees risks related to sustainability, including climate risks ▪ Oversees risks related to public policy and political activities ▪ Oversees the company's shareholder engagement program, receives updates on shareholder feedback and makes recommendations to the Board regarding shareholder proposals, including those related to climate ▪ Evaluates the composition of the Board to ensure a proper mix of skills and expertise to oversee Duke Energy's risks and strategy	**Finance & Risk Management Committee** ▪ Oversees process to assess and manage enterprise risks, including climate risks (page 11) ▪ Oversees and approves major investments that are supportive of the company's climate strategy, such as renewables, grid modernization, natural gas and storage ▪ Oversees financial risks, including market, liquidity and credit risks
Operations & Nuclear Oversight Committee ▪ Oversees risks related to our nuclear fleet, our largest carbon-free resource, as well as risks related to our non-nuclear regulated operations ▪ Oversees operations and environmental, health and safety matters, including improvements at our generation facilities and coal ash basins to better withstand severe weather events (page 12)	**Regulatory Policy Committee** ▪ Oversees regulatory and policy risks related to climate change, including review of federal and state policies at every regularly scheduled meeting (page 15)
Compensation Committee ▪ Oversees risks related to our workforce and compensation practices, including those related to climate	**Audit Committee** ▪ Oversees the company's disclosures, internal controls and compliance risks, including those related to climate ▪ Oversees risks related to cybersecurity and technology

The day-to-day direct management of climate and carbon-reduction policies is the responsibility of the company's federal government and corporate affairs team. This team reports to the executive vice president for external affairs and president, Carolinas region, who is a member of the Duke Energy senior management team and reports directly to the chair, president and chief executive officer. The federal government and corporate affairs group has organizational responsibility for developing Duke Energy's position on federal legislative and regulatory proposals addressing climate change and greenhouse gas emissions and for assessing the potential implications of such proposals to the company – as well as for engaging stakeholders to help shape our climate strategy. In addition, Duke Energy's state presidents have responsibility for developing the company's positions on state-level legislative

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and regulatory proposals addressing climate change and greenhouse gas emissions, and for engaging stakeholders at the state level to help shape the company's climate strategy.

Compensation

The Compensation Committee has designed our compensation program to link pay to performance, with the goal of attracting and retaining talented executives, rewarding individual performance, encouraging long-term commitment to our business strategy and aligning the interests of our management team with those of our shareholders. The Compensation Committee has aligned several performance metrics with our sustainability strategy, including:

- Zero-carbon generation – We incorporate a nuclear reliability objective and a renewables availability metric in our short-term incentive plan to measure the efficiency of our nuclear and renewable generation assets.
- Environmental events – To enhance our commitment to the environment, we incorporate a reportable environmental events metric into our short-term incentive plan.
- Customers – To prioritize the customer experience and their growing demands to be served by cleaner energy, we incorporate a customer satisfaction metric in the short-term incentive plan, which is a composite of customer satisfaction survey results for each area of business.
- Safety – Safety remains our top priority. We include safety metrics in both our short-term and long-term incentive plans based on the total incident case rate of injuries and illnesses among our workers to emphasize our focus on an event- and injury-free workplace.
- Governance – We continue to incorporate sound governance principles and policies in our compensation program that reinforce our pay for performance philosophy and strengthen the alignment of interests of our executives and shareholders.

Duke Energy continues to review its compensation program performance metrics with the Compensation Committee.

Political Contributions and Lobbying

As a public utility holding company, Duke Energy is highly regulated and significantly impacted by public policy decisions at the local, state and federal levels. It is essential for us to engage in public policy discussions to protect the interests of Duke Energy, our customers, employees, shareholders and communities. Participation in public policy dialogues includes contributing to organizations, including trade associations, that advocate positions that support the interests of Duke Energy, our customers, employees, shareholders and communities.

Duke Energy has developed a robust governance program around our public policy engagement. The day-to-day management of our policies, practices and strategy with respect to public policy advocacy is the responsibility of the jurisdictional presidents at each applicable state level and our senior vice president for federal government and corporate affairs, who, along with other senior leaders across the company, make up a Political Expenditures Committee (PEC). The PEC is responsible for annually developing the company's political expenditures strategy and approving, monitoring and tracking our political expenditures. The company's Political Expenditures Policy sets out the principles governing corporate political expenditures and political action committee contributions. Under this policy, the senior vice president for federal government and corporate affairs provides a semi-annual update to the Corporate Governance Committee of the Board. This includes updates on the company's strategy and political expenditures, including payments to trade associations and other tax-exempt organizations that may be using the funds for lobbying and political activities. (See Duke Energy's Corporate Political Expenditure Reports).

In addition to our participation in trade associations for public policy engagement purposes, we participate in industry trade organizations for many non-political reasons as well, including business, technical and industry standard-setting expertise. As member-driven organizations, these trade associations take positions that reflect the consensus views of their members. We may not support each of the initiatives of every organization in which we participate or align in strategy with every position of every organization; however, in our interactions with them, we seek to harmonize the organizations'

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positions on climate change with those of Duke Energy. We believe our continued input into these discussions with organizations with whom we may not always totally agree enables us to educate others on our positions and enables us to better understand their positions.

Strategy

Informing Our View

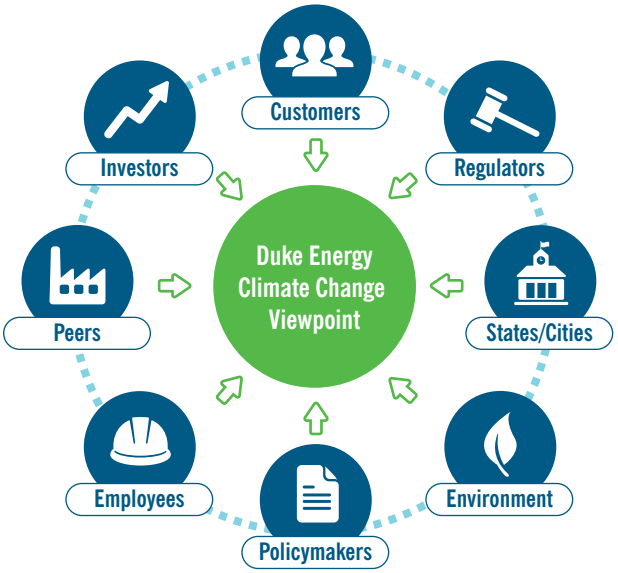
At Duke Energy, we are committed to leading in the effort to address greenhouse gas emissions and to build a cleaner, smarter energy future. As we talk with customers, investors and other stakeholders, reflected in the figure to the right, it's clear that they share that interest. It's also clear that unnecessarily compromising reliability and affordability, especially for our most vulnerable customers, is not an option.

An increasing number of our customers are calling for electricity from non-carbon-emitting sources. For example, Apple, BMW, Facebook and Google are all members of the "RE100," a coalition of companies committed to sourcing 100 percent of their electricity from renewable sources. In some cases, this is through a commitment to match 100 percent of the companies' electricity use with renewable energy purchases.

But it's much more than the interests of our large corporate customers. Counties and cities in Duke Energy's service territories have developed ambitious sustainability or 100 percent renewable energy goals, most by 2050. Further, North Carolina's governor issued an executive order followed by a Clean Energy Plan that calls for reducing greenhouse gas emissions from the power sector by 70 percent by 2030 and to achieve carbon neutrality by 2050. Additionally, climate change remains a prominent topic of discussion in federal political and policy arenas, as can be seen in proposals to address climate change being developed by Democratic and Republican leadership in Congress. The challenge inherent in these goals is not in their establishment, but rather in the development of the right mix of executable options to get the entire economy to net zero by 2050.

Climate change also continues to be a focus of engagement and discussion with the company's shareholders and employees. Both groups want to be sure we are recognizing and responding appropriately to the risks and opportunities that climate change presents.

To continue to power the lives of our customers, support the vitality of communities and exceed the expectations of our customers and stakeholders, we need to deliver energy that is cleaner and smarter than ever before.



Accelerating Our Carbon Reduction Goals

We recognize the long-term challenge climate change presents and that reducing CO_2 emissions in the power sector is a major part of the effort to address this challenge. Given the input discussed above, our assessment of climate-related risks and opportunities, as well as the declining cost of renewables and sustained low cost for natural gas, in 2019 we updated our carbon reduction goal. We are confident that we can achieve at least a 50 percent reduction in CO_2 emissions from electricity generation by 2030 compared to 2005 levels (a more aggressive target than our most recent 40 percent by 2030 goal).

We've also added a longer-term goal of achieving net-zero carbon emissions from electricity generation by 2050. Our goal to attain a net-zero carbon future represents one of the most significant planned reductions in CO_2 emissions in the U.S. power sector. It is also consistent with the scientifically based range of both 1.5 and 2 degrees Celsius pathways, as

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discussed in the sidebar on page 30. Implementing this bold vision requires us to begin planning and executing now. The choices and investments we make near term will be foundational to achieving net zero by midcentury. Continuing to modernize our fleet and grid at a measured pace will help protect customers from dramatic price increases. At the same time, we must pursue innovation by advocating for sustained investments in low- and zero-carbon technologies for this vision to become reality.

Charting the Path

Achieving our carbon reduction goals will require at least five elements. We will continue to:

- **Collaborate and align with our states and stakeholders as we transform**. The steps and timeline for this transition will be unique in each state we serve, and we'll collaborate with customers, communities, policymakers and other stakeholders to determine the best path.
- **Accelerate our transition to cleaner energy solutions**. We're planning to at least double our portfolio of solar, wind and other non-hydroelectric renewables by 2025. We'll continue to need dispatchable, load-following, low-cost natural gas to speed the transition from coal and maintain affordability and reliability. New natural gas infrastructure will be required to fuel this transition and balance renewables. We'll continue expanding energy storage, energy efficiency, as well as electric vehicle infrastructure to support decarbonization of the transportation sector, now the largest CO_2-emitting sector.
- **Continue to operate our existing carbon-free technologies, including nuclear and renewables**. Our nuclear fleet's nearly 11,000 MW of carbon-free generation in the Carolinas – enough to serve nearly 7 million homes – is central to our ability to meet these goals. In September 2019, we announced that we will seek to renew the operating licenses of the 11 reactors we operate at six nuclear stations for an additional 20 years, which will extend their operating lives to and beyond midcentury.
- **Modernize our electric grid**. The company is investing in a multiyear effort to create a smarter and more resilient grid that can protect against extreme weather and cyber or physical attacks. These grid improvements also support adding more renewables while avoiding outages and providing customers more control over their energy use.
- **Advocate for sound public policy that advances technology and innovation**. This includes advanced renewable energy, longer-duration (up to seasonal) storage, new nuclear technologies, low- and zero-carbon fuels and effective ways to capture carbon emissions. The company will also support permitting reforms that will enable the deployment of new technologies and construction of critical infrastructure, both needed to address climate change.

As we partner with customers, policymakers, regulators and stakeholders in our respective states to make our transition, our integrated resource plans, financial plans and other regulatory filings will progressively reflect our proposed path (in accordance with the time frames mandated for each).

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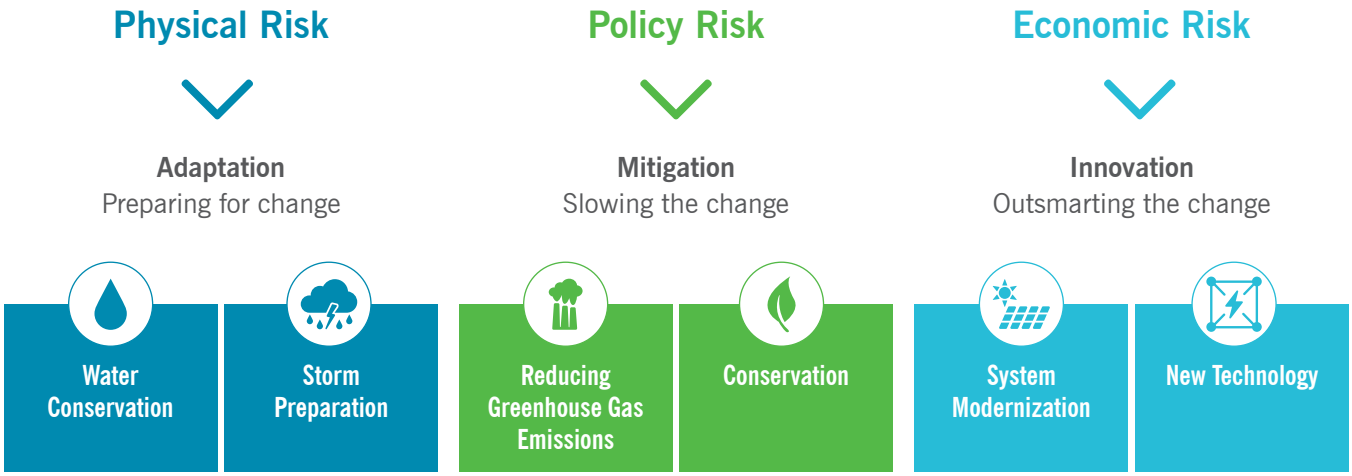

For example, Duke Energy has already retired 51 coal units totaling more than 6,500 MW since 2010, and we plan to retire an additional 900 MW by the end of 2024. In rate cases filed in 2019, we proposed to shorten the book lives of another approximately 7,700 MW of coal capacity in North Carolina and Indiana. We are also converting three of our largest coal plants in the Carolinas to run partially or fully on natural gas, providing resiliency and reducing carbon emissions. We recognize the importance of our power plants to the communities that host them and the workforce that operates them. As we retire coal plants, we will continue to strive to transition impacted employees to new opportunities and will work to match communities with appropriate resources.

Taking a Comprehensive Approach

Addressing the complex challenge of climate change requires more than just carbon emissions reductions. Our holistic approach to addressing physical and transition (policy and economic) risks associated with climate change includes three key areas of focus: adaptation, mitigation and innovation.

- Adaptation – Duke Energy is taking steps to prepare for the changing global climate, including water conservation and storm preparation.
- Mitigation – We are working to slow climate change with a variety of carbon reduction and land conservation efforts.
- Innovation – Duke Energy is helping drive the new technologies necessary for a net-zero carbon future.

Risk Management

Our Approach

Climate change risks – including physical and transition (policy and economic) risks – are included in the company's Enterprise Risk Management (ERM) process. The ERM process is used to identify, assess, quantify and respond to a comprehensive set of risks in an integrated and informed fashion. ERM provides a framework to manage risks while achieving strategic and operational objectives and continuing to meet the energy needs of our customers.

Duke Energy performs a comprehensive enterprise risk assessment on an annual basis to identify potential major risks to corporate profitability and value, including risks related to climate change. To inform the annual risk assessment, the ERM group works with subject matter experts to identify and characterize key risks, including climate- and environmental-related risks. In addition, our chief risk officer meets with business unit leadership to discuss risks on a quarterly or semi-annual basis. The ERM group shares the annual enterprise risk assessment with the Board and reports regularly to the Finance and Risk Management Committee.

To assure Duke Energy is incorporating climate, technology and economic risks into our long-term planning, we annually, biennially or triennially (depending on the state) prepare forward-looking integrated resource plans (IRPs), or similar regulatory filings, for each of our regulated electric utility companies. These 10- or 20-year plans help us

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evaluate a range of options, considering forecasts of potential future climate policies, future electricity demand, fuel prices, transmission improvements, new generating capacity, integration of renewables, energy storage, energy efficiency and demand-response initiatives.

In recognition of the increasing role of distributed energy resources, the company is expanding its planning and is developing new Integrated Systems and Operations Planning (ISOP) tools that will inform and evolve the current IRP process. This effort will significantly enhance the coordination of modeling and analysis across generation, transmissions, distribution and customer program planning functions. ISOP is motivated by the expectation that advancements in technology and declining costs will make non-traditional solutions such as energy storage increasingly competitive relative to traditional resources. ISOP will include enhancements to modeling processes necessary to accommodate renewable growth and value new technologies, such as energy storage, electric vehicles and advanced customer programs. In the areas of distribution planning, ISOP builds on our objective of enabling higher levels of distributed energy resources by developing planning tools that can fully leverage the intelligent grid control capabilities of our grid modernization efforts.

Physical Risks

Extreme weather events – including hurricanes, heavy rainfall, more frequent flooding and droughts – can impact our assets, electric grid and reliability. Due to the location of some of our service territories, we must be especially vigilant about adapting to these risks.

Storms and Heavy Rainfall Events

We are making strategic improvements to make the power grid more resistant to outages from severe weather and flooding, and adding new technologies that make the grid more resilient:

- Upgrading utility poles and power lines to make them more resistant to power outages and able to withstand higher winds and more extreme conditions.
- Using data to identify the most outage-prone lines on our system and placing those lines underground. In Florida, we recently announced a ten-year plan to underground and make other improvements to power lines that run through heavily-vegetated areas, and have stated a goal of either undergrounding or hardening all feeders and laterals by 2050. We are also upgrading underground routes to allow for more remote restoration opportunities.
- Installing a smart-thinking grid that can automatically detect power outages and quickly reroute power to other lines to restore power faster than ever. In 2019, self-healing technologies prevented more than 600,000 extended outages across the company's six-state electric service area and saved customers more than 1 million hours of total outage time.

We have developed mitigation measures that are being installed to keep substations better protected and in operation during severe storms. These measures include:

- Improved barriers that better withstand flooding to keep these essential systems operating.
- Targeted relocation of equipment – while barriers are usually the most effective solution, in some instances we will relocate equipment to nearby property that is outside the area prone to flooding.
- Remote communication, monitoring and restoration capabilities – we are installing new technology to monitor the health of key systems in substations, as well as self-healing capabilities that can help to reduce the number of customers impacted by a substation outage, even if crews are not able to physically reach the substation.

We have made improvements at our power plants to ensure they are capable of withstanding heavy rainfall events and flooding. For plants near the coast, these actions also help protect against potential sea level rise impacts:

- Raised the foundation of the new Citrus Combined Cycle Station in Florida to protect the station from hurricane storm surges.
- Increased structural hardening and improved equipment protection at the Brunswick Nuclear Station in North Carolina to better resist flood impacts.

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- Evaluated and prioritized our fossil sites for possible flood risks and performed detailed modeling of the top four sites against 100- and 500-year storms and riverine flooding; additionally, updated our site-specific natural disaster preparation procedures.

In addition to our extensive mutual assistance partnerships with other utilities and contractors to bring additional resources in quickly to support our crews responding to major outage events, we have also improved our storm preparation and response capabilities:

- Improved storm and damage forecasting capabilities enable us to stay ahead of the storm, identifying likely areas of impact and moving resources into place ahead of the storm to respond faster.
- The use of drones to better assess damage and support crews in the field.
- Improved communication and control capabilities to give crews in the field more information and assistance when they need it.
- Improved customer communication tools to help keep customers informed about outage response and estimated times of restoration.

Water Availability

Many sources of electricity require significant amounts of water for cooling purposes. A prolonged drought could therefore risk reliable electricity generation.

Several of Duke Energy's fossil and nuclear power plants in the Carolinas are located on hydroelectric reservoirs that the company operates. Of course, water availability is an important consideration in those watersheds, both to Duke Energy and to others. In these areas, we collaborate with local water utilities, environmental groups and recreation enthusiasts on watershed and drought planning. Our hydroelectric projects also have drought response plans (known as "low inflow protocols" (LIPs)) embedded in their Federal Energy Regulatory Commission (FERC) operating permits; the LIPs work to conserve water in the reservoirs and protect all water intakes in the watershed, including those for Duke Energy's facilities, until it rains again. Duke Energy's hydroelectric projects also have procedures in place for managing operating conditions during "high inflow" (high rainfall) events.

Except for emergency situations, Duke Energy endeavors to maintain lake levels within the ranges set forth in its FERC licenses under normal operating conditions. Lake levels are closely monitored, and operational adjustments are made based on various factors, including weather forecasts.

Other Duke Energy facilities are protected from drought because they have closed-cycle cooling and/or operate on large sources of water or on cooling reservoirs; one (the Brunswick Nuclear Station) withdraws water from an estuarine environment and so is not susceptible to drought-related risks. We have also implemented equipment and operational changes at nuclear and coal plants to reduce potential drought-related risks.

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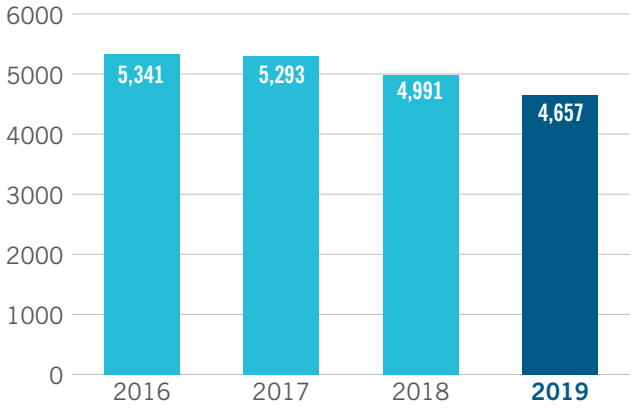
In 2018, we adopted a new goal to reduce annual water withdrawals by our generation fleet by 1 trillion gallons from the 2016 level by 2030.

Water Withdrawn for Electric Generation (billion gallons)



Our transition to cleaner energy by replacing coal and natural gas plants that use once-through cooling systems with natural gas combined-cycle plants that use closed-cycle cooling systems, and with renewables, reduces the amount of water withdrawn and thereby reduces the risk to operations from potential future droughts.

Ash Management Program

Duke Energy has instituted a comprehensive ash management program that ensures that waste facilities, which are typically located at generating stations near waterbodies for cooling water, operate properly even in extreme weather. Scientific studies of our ash basins and landfills, dam safety inspections, emergency planning, ongoing environmental monitoring efforts and more – performed by the company and independent experts – address the operational, environmental, strategic and financial risks associated with effectively managing coal ash today and for decades to come.

Permanently closing ash basins is the most effective step we can take to address climate risk. The scope, scale and speed of the company's work to close basins make us an industry leader. Under our comprehensive ash management plan, we have:

- Completed extensive ash basin and cooling pond dam improvements across our fleet, which have enhanced dam safety and provide greater protection from severe weather.
- Stopped all flows into ash basins as part of the coal ash basin closure process (except at the Gallagher plant, which will retire in 2022), and the basins are being dewatered. This and other closure preparations have dropped the level of water in the basins significantly, creating space to accommodate significant rainfall.
- Excavated nearly 28 million tons of ash enterprisewide since basin closure began, with more than 5 million tons moved in 2019 alone. We have completed excavation of the basins at our Dan River, Sutton and Riverbend stations. As announced in January 2020, Duke Energy, state regulators and community groups agreed to a plan to permanently close the company's remaining coal ash basins in North Carolina primarily by excavation.

We are also utilizing operational experience and best practices from across the industry to modify and improve our facilities.

- Prior to severe weather, the company takes several steps to prepare for potential ash basin response, including pre-staging equipment and trained professionals, actively reducing water levels if needed and placing construction materials on-site to respond quickly if repairs are necessary.
- At the retired Sutton Plant in Wilmington, a special synthetic turf rated to withstand hurricane-force winds is being used to cap each landfill cell because it provides additional protection against erosion and strong winds that occur in the region.
- We've expanded or built new emergency spillways at cooling ponds at three facilities near the coast (H.F. Lee, Weatherspoon and Sutton) to safely move water through the system if necessary in order to prevent damage to the facilities. The company has robust emergency action plans for each facility covering ash basins and certain dams, which detail specific protocols to address a variety of situations, including severe weather events. These plans are reviewed annually with emergency managers and first responders, shared with regulators and updated as needed.

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Policy Risks

Federal or state policies could be enacted to put a legal constraint on power plant emissions, add a price on carbon or mandate certain energy mixes. Other policies may be needed to enable our net-zero transition, such as those to facilitate the siting and cost recovery of needed transmission and distribution upgrades.

Since the publication of our 2017 Climate Report, the U.S. Environmental Protection Agency repealed the 2015 Clean Power Plan and finalized its replacement, the Affordable Clean Energy (ACE) rule. States will determine how the rule will be implemented, so we will better understand any potential impacts to our system once states finalize their plans over the next two years.

In addition, several bills have been introduced in the 116th Congress that seek to establish a price on CO_2 emissions, and House Energy and Commerce Committee leadership has introduced the Climate Leadership and Environmental Action for our Nation's (CLEAN) Future Act. This draft legislation includes a mandate to transition to 100 percent clean electricity by 2050. Other legislative approaches provide substantial support for the development of technologies needed for the net-zero transition, such as the American Energy Innovation Act. It is unclear when or if any of these proposals will be enacted by Congress.

Federal policymakers could also impose mandates that restrict the availability of fuels or generation technologies – such as natural gas or nuclear power – that enable Duke Energy to reduce its carbon emissions.

At the state level, the North Carolina governor recently directed the development of a state Clean Energy Plan that proposes to explore a variety of policies and actions that will seek to reduce carbon emissions, modernize the utility regulatory model and advance clean energy economic development opportunities. The North Carolina Clean Energy Plan calls for a 70 percent reduction in greenhouse gas emissions in the power sector by 2030 and aims to achieve carbon neutrality by 2050. Duke Energy is actively participating in the stakeholder process to inform and shape the final policy proposal. The stakeholder process is currently slated to provide recommendations to the governor by year-end 2020. It is likely that proposals generated through the process would require legislative or regulatory action to be adopted.

In Indiana, legislation was enacted in 2019 that established a 21st Century Energy Policy Development Task Force. The task force is comprised of members of the House and Senate as well as gubernatorial appointees representing various energy-related stakeholders. The statute requires the Indiana Utility Regulatory Commission (IURC) to examine Indiana's future energy resource needs; existing policies regulating electric generation portfolios; how shifts in electric generation could impact reliability, resilience and affordability; and whether state regulators have appropriate authority regarding these matters. This report is due in July 2020. The IURC has a contract with Indiana University for a second study, not required by statute, to examine the impact

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of plant closures on local communities. The task force's recommendations are due to be reported to the General Assembly and the governor by December 2020.

Duke Energy has long advocated for climate change policies that will result in reductions in CO_2 emissions at reasonable costs over time. We support market-based approaches that balance environmental protection with affordability, reliability and economic vitality.

Duke Energy's View on Effective Carbon Policy

It's our view that effective policies to reduce CO_2 emissions should include these principles:

- Cost-effective
- Market-based
- Equitable
- Provisions for all emitting sectors
- Environmentally effective
- Promotes technology development
- Politically sustainable

While it is unclear what specific policies will receive formal consideration in Congress, our analyses have identified some key policy attributes that we believe will allow us to achieve our net-zero goal while allowing us to maintain lower costs for our customers. These attributes will also help to incentivize the adoption of new, low- and zero-emitting technologies. Therefore, we believe climate policy should:

- Incentivize a zero-carbon trajectory at the lowest cost, rather than simply imposing a price or dictating a certain generation mix.
- Recognize that nuclear and natural gas generation remain essential to transitioning to an affordable and reliable net-zero carbon future.
- Recognize that regardless of whether (and which) market-based mechanism is adopted, robust and sustained support for research, development, demonstration and deployment of advanced technologies is critical.

Duke Energy factors policy risk into our strategies by evaluating carbon price scenarios in the development of our integrated resource plans. Since 2010, Duke Energy has included a price on CO_2 emissions in our IRP planning process to account for potential climate legislation or regulation. Incorporating a price on CO_2 in our IRPs allows us to evaluate existing and future resource needs against a potential climate change policy risk in the absence of policy certainty. We use a range of potential CO_2 prices (including no CO_2 price) to reflect a range of possible policy outcomes.

Other policies may be needed to enable our zero-carbon transition. For example, without streamlined permitting of transmission and distribution, the

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buildout of large volumes of renewables and energy storage will be a greater challenge.

Economic Risks

Our continued efforts to drive carbon out of our regulated electric utilities' operations help mitigate Duke Energy's financial exposure to potential future climate legislation or regulation. However, potential regulations or legislation to address climate change may require Duke Energy's regulated electric utilities to make additional capital investments to comply and could increase operating and maintenance costs. (Our commercial unit, Duke Energy Renewables, is already 100 percent carbon-free.) As with costs incurred for complying with other types of environmental regulations, our regulated electric utilities would plan to seek cost recovery for investments related to carbon reduction through regulatory rate structures.

To mitigate the risk of stranded assets, we will engage with regulators – and with stakeholders – prior to retiring existing assets or making investments in new generating capacity. This robust regulatory approach supports our future ability to recover costs as we position our fleet for the transition to lower carbon emissions.

Another area of economic risk for our strategy is technology risk. As noted earlier, a critical part of our net-zero carbon strategy is the need for new technologies that are not yet commercially available or are unproven at utility scale. If these technologies are not developed or are not available at reasonable prices, or if we invest in early-stage technologies that are then supplanted by technological breakthroughs, Duke Energy's ability to achieve a net-zero target by 2050 at a cost-effective price could be at risk.

To reduce this risk, we are investing in new technology research, including the Electric Power Research Institute/Gas Technology Institute's Low Carbon Resource Initiative, which is a five-year effort to accelerate the development and demonstration of technologies to achieve deep decarbonization.

We also support policies to increase technology research, development, demonstration and deployment at the federal level. For example, Duke Energy has supported, on its own and through trade associations, including the Edison Electric Institute and the Nuclear Energy Institute, a package of technology-promoting legislation in the 116th Congress.[10] We are also a founding member of EEI's Clean Energy Technology Innovation Initiative, which is partnering with several NGOs, including Clean Air Task Force, the Center for Climate and Energy Solutions, and the Bipartisan Policy Center, to identify areas for advocacy on advanced technologies.

As we deploy increasing amounts of renewables, siting risk becomes a consideration – both for the renewables themselves and for the transmission infrastructure needed to enable the energy generated to travel to load centers. This could force Duke Energy to adopt more expensive or less optimal (from an operational standpoint) options.

Climate policies or activities to mitigate physical risks can add material costs to the price of electricity and customer bills. This could in turn affect projected electricity utilization increases (such as from growth in demand and electrification of other sectors), as well as Duke Energy's most vulnerable customers.

Another area of economic risks is risks related to insurance. Property insurance companies have said publicly that they intend to stop providing insurance to companies that have above a certain amount of coal generation, or have said that they will only provide coverage if a company has a plan to decrease that over a reasonable period of time.[11] As noted above, Duke Energy has retired significant amounts of coal capacity and has plans to retire more. The below discussion of our strategy to meet our net-zero CO_2 emissions goal shows that coal will be phased out of our generation fleet.

Opportunities

Duke Energy is focused on the challenges climate change presents. We stand ready to meet those challenges while also recognizing concern about climate change can mean opportunities for our regulated electric utilities to make investments in renewables, energy efficiency, energy storage,

[10] See October 3, 2019, letter from Edison Electric Institute, the Nuclear Energy Institute and 26 other trade organizations to leaders McConnell and Schumer supporting a package of seven technology-promoting bills; October 15, 2019, letter to Speaker Pelosi and leaders McCarthy, McConnell and Schumer from Duke Energy and 24 organizations and companies supporting the Nuclear Energy Leadership Act; and March 2, 2020, letter from EEI, NEI, the U.S. Chamber of Commerce and 36 other organizations supporting the S. 2657, the American Energy Innovation Act.

[11] See, for example, "Liberty Mutual to Limit Coal Underwriting, Investments; Names First Sustainability Officer," Insurance Journal, December 16, 2019.

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grid modernization, as well as in electric vehicle infrastructure. Duke Energy's commercial renewables business can benefit from increased interest in renewables throughout the country. And new technologies to reduce emissions represent both a risk and an opportunity.

Renewable Energy

Customer demand for electricity from renewable sources has increased due, in part, to concerns about climate change. Duke Energy has responded with initiatives in both its regulated and commercial renewables businesses and will continue to seek additional opportunities. In addition, regulatory or legislative policies related to climate change can prove to be a driver for opportunities for increased deployment of renewable generation sources.

Our commercial renewables business, Duke Energy Renewables, operates wind and solar generation facilities across the U.S., with a total electric capacity of approximately 4,000 MW. The power produced from commercial renewable generation is primarily sold through long-term contracts to utilities, electric cooperatives, municipalities, and commercial and industrial customers. Our five-year capital plan, rolled out in February 2020, included a $2 billion investment, net of tax equity financings, and we plan to continue to invest in this business beyond the next five years.

Opportunities for increased renewable energy also benefit our regulated generation business, where we have installed and are operating approximately 460 MW of solar and anticipate at least 660 MW to be added in the next three years. We also purchase substantial amounts of renewable energy in the form of long-term purchased power contracts, backed by the strength of our balance sheet. These purchases totaled nearly 4,000 MW at the end of 2019, and we are projected to add nearly 2,300 MW in the next three years.

Policies have also been approved in several of our states to encourage increased use of renewable energy, including, for example, our Green Source Advantage program for renewable energy in North Carolina (to which the city of Charlotte has signed on) and the Renewable Energy Credit (REC) Solutions programs in several of our regulated jurisdictions (in the latter, we work with large customers to procure RECs to meet their renewables needs).

Energy Efficiency

Some of the most effective carbon reductions we can make involve helping customers avoid energy usage in the first place. Again, regulatory or legislative policies related to climate change can prove to be a driver for opportunities for increased deployment of energy efficiency. These opportunities are available for both our regulated and commercial businesses.

Our Carolinas utilities rank first in the Southeast in energy efficiency.[12] Our overall energy efficiency initiatives have helped customers in our regulated jurisdictions reduce energy consumption and peak demand by nearly 19,000 gigawatt-hours and 6,700 MW, respectively, since 2008. This cumulative reduction in consumption is more than the annual usage of 1.58 million homes, and the peak demand reduction is equivalent to more than 10 power plants each producing 600 MW. Learn more about energy efficiency.

Energy Storage

Battery storage and microgrids are key technologies that can help better integrate solar into the grid while, among other uses, improving customer reliability and grid security, as well as reducing economic impacts to customers through the ISOP framework described above. Duke Energy plans to invest roughly $600 million over the next five to 10 years to expand battery storage by almost 400 MW. The company also has more than 2,000 MW of pumped storage hydro power, another energy storage method that can provide long-term storage. We plan to install upgrades at our Bad Creek pumped storage hydro facility in South Carolina to increase its capacity by more than 300 MW.

Grid Modernization and Infrastructure Expansion

Climate change presents opportunities for Duke Energy to continue to modernize its grid to benefit customers both for resilience against the physical risks from climate change and for increased utilization of renewables. This opportunity can mean increased investments in both transmission and distribution assets, as well as in energy storage, as discussed above.

[12] Southern Alliance for Clean Energy, "Energy Efficiency in the Southeast: 2019 Annual Report," January 2020, https://cleanenergy.org/blog/energy-efficiency-in-the-southeast-2019-annual-report/.

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Smart meters are just one example of how Duke Energy is working to modernize the grid for the benefit of our customers. Duke Energy has installed smart electric meters for more than 80 percent of its customers. With these meters, and time-of-use rates, customers can plan their energy use so that they can save energy and money. Time-of-use rates encourage customers to use energy when demand is lower, which can make energy more affordable for customers while helping the company maintain reliability during peak periods. The company is currently piloting several new time-of-use rates in North Carolina and has proposed several variations of pilot programs in Indiana. These pilots are designed to work in conjunction with newly-installed smart meters to provide price signals at times of peak demand to customers. The pilots will allow the company to develop new, cutting-edge rate designs that will work with renewables and electric vehicles.

Electric Vehicles

Part of our contribution to reducing overall greenhouse gas emissions also involves helping lower emissions from the transportation sector. We've proposed a bold $76 million initiative in North Carolina, to date the largest investment in electric vehicle infrastructure in the Southeast. This will include nearly 2,500 new charging stations that will lead to a statewide network of fast-charging stations and will help fund the adoption of electric school buses and electric public transportation. Similar pilot programs are being considered by regulators in South Carolina ($10 million), Indiana ($10 million), Ohio ($16 million) and Kentucky ($3 million). We also expect to have installed more than 500 charging stations in Florida by 2022. Duke Energy is also adopting electric vehicles into its fleet, having acquired roughly 600 vehicles thus far. Learn more about the benefits of electric vehicles.

New Technologies

To get to net-zero carbon emissions, while keeping energy affordable and reliable, new technologies that are economically competitive at commercial scale are necessary. Technologies such as CCUS, longer-duration (up to seasonal) energy storage, new nuclear technologies, and yet-to-be-imagined discoveries, as well as innovative use of greener fuels such as renewable natural gas and hydrogen will be important. To take advantage of these opportunities, we are supporting policies that will advance new technologies and investing in research and development for these important innovations, as discussed on page 5.

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Metrics and Targets

Greenhouse gases (GHG) emitted by Duke Energy facilities include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and sulfur hexafluoride (SF_6). The burning of fossil fuels to generate electricity is by far the primary source of Duke Energy's GHG emissions, producing emissions of CO_2, CH_4 and N_2O. The other sources of Duke Energy GHG emissions include CH_4 emissions from natural gas distribution operations, and emissions of SF_6, an insulating gas used in high-voltage electric transmission and distribution switchgear equipment.

As of year-end 2019, Duke Energy has reduced CO_2 emissions 39 percent from electricity generation since 2005, ahead of the industry average of 33 percent.[13] In 2019, we accelerated our carbon reduction goal from 40 percent to more than 50 percent by 2030. We also added a longer-term goal of achieving net-zero carbon emissions by 2050. Progress toward our CO_2 and other sustainability goals will continue to be updated on an annual basis in our Sustainability Report.

In the following tables, we adhere to the World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Corporate Protocol Standard, which classifies a company's GHG emissions into three "scopes." Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy (that is consumed by the reporting company). Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company.[14]

Scope 1 Emissions

Greenhouse Gas Emissions from Electricity Generation (thousand short tons CO_2 equivalent (CO_2e))

	2005	2017	2018	2019	2030 Goal	2050 Goal
CO_2	153,000	105,000	105,000	93,000	76,500 *(At least 50% below 2005)*	Net-zero
CH_4[15]	420	230	218	186	–	–
N_2O[16]	731	391	369	361	–	–

All data based on ownership share of generating assets as of December 31, 2019.

Methane Emissions from Natural Gas Distribution (thousand short tons CO_2e)

	2016	2017	2018	2019
CH_4	184	175	176	185

Sulfur Hexafluoride Emissions from Electric Transmission and Distribution (thousand short tons CO_2e)

	2016	2017	2018	2019
SF_6	573	536	337	535

SF_6 emissions fluctuations are due to maintenance, replacement and storm repair needs.

[13] U.S. Energy Information Administration, *Monthly Energy Review*, March 26, 2020.
[14] See https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf.
[15] No goal is established for methane emissions from electricity generation – see methane sidebar.
[16] No goal is established for N_2O emissions from electricity generation; emissions of this gas will decline with reductions in fossil fuel use.

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Reducing Methane Emissions

Duke Energy has been an industry leader in driving down methane emissions. Since 2001, Duke Energy's Piedmont Natural Gas unit has been a member of EPA's Natural Gas STAR program, which emphasizes best management practices to voluntarily reduce methane emissions and report those reductions. In 2016, all of Duke Energy's gas operations became founding members of EPA's Methane Challenge.

Duke Energy is also monitoring, through its memberships in the Edison Electric Institute (EEI) and the American Gas Association (AGA), the development of the EEI/AGA Natural Gas Sustainability Initiative (NGSI), an initiative that focuses on the measurement and disclosure of methane emissions throughout the entire natural gas supply chain.

To reduce methane emissions and improve the safety and reliability of the natural gas system in Ohio and Kentucky, Duke Energy implemented the Accelerated Main Replacement Program (AMRP) in 2000. The program's purpose was to replace cast iron and bare steel pipelines (and associated services) with plastic or coated steel pipe.[17] The program was completed in Kentucky in 2010 and in Ohio in 2015. Piedmont Natural Gas had already completed a similar program when it merged with Duke Energy in 2016. We also recently completed an accelerated service line replacement program in Kentucky in which approximately 30,000 service lines were replaced. In total, Duke Energy's Natural Gas Business Unit has replaced 1,454 miles of cast iron pipe on its distribution system with either plastic or cathodically protected steel.

It should be noted that the methane emissions we report above (a total of less than half of one percent (0.5%) of our CO_2 emissions from electricity generation, on a CO_2 equivalent basis) are, as required by EPA, based on EPA emissions factors. For emissions from electricity generation, EPA emission factors are applied to the amounts of the various fossil fuels we combust. For emissions from our natural gas distribution system, methane emissions are calculated by applying EPA emission factors (for different pipe materials) to the miles of natural gas pipelines we operate, and to the number of services. We also quantify leaks based on leak survey data. Given this, as our natural gas distribution system expands, emissions (all other things being equal) will tend to increase. We are carefully evaluating our sources of methane emissions and potential avenues to reduce them further.

[17] In natural gas parlance, "service" means the service pipe that carries gas from the main pipe to the customer's meter.

Scope 2 and 3 Emissions

In 2019, Duke Energy reported to CDP (formerly known as the Carbon Disclosure Project) 25,600 tons of Scope 2 CO_2 equivalent emissions for 2018. These are estimated from power purchases for Duke Energy facilities that are not served by Duke Energy itself.

In 2019, Duke Energy reported to CDP the following categories of Scope 3 CO_2 equivalent emissions for 2018:

Category	Thousand short tons CO_2e
Fuel and energy-related activities (not reported in Scope 1 or 2). This is an estimate of CO_2 emissions associated with electricity Duke Energy purchased for resale.	11,122
Use of sold products. These are CO_2 emissions from the use of natural gas that Duke Energy delivers to its end-use customers.	19,811

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Net-Zero Scenario Analysis

The following analysis examines a scenario, including sensitivities, for achieving our net-zero CO_2 emissions goal by midcentury, along with the potential impacts on the generation portfolio of our regulated electric utilities. This analysis was conducted using the same industry-standard expansion planning and hourly production cost modeling tools that we use for integrated resource planning. The analysis, however, did not include transmission and distribution modeling that would be required to assess cost and technical feasibility of interconnecting such large quantities of renewables with operational feasibility.

It should be emphasized that the scenario analysis presented is intended only to provide an enterprisewide directional illustration of the impact of changes in the generation fleet. The results presented are indicative of potential options to meet Duke Energy's targets but **do not represent specific utility resource plans and will change over time as new information becomes available**. We will work collaboratively with stakeholders and regulators in the states we serve as we develop future resource plans pursuant to regulatory requirements.

Key Assumptions and Considerations

Any analysis that goes out three decades includes numerous uncertainties and assumptions. Because it is based on currently available technology and cost information, the company's IRP process provides a relatively more certain view through 2030. Projecting beyond that time frame requires assumptions for how technology, electricity demand and costs may evolve several decades in the future. To follow the spirit of the IRP process in the modeling from 2030 to 2050, the technologies considered were limited to those in which we have reasonably high confidence in their likely commercial availability and in current projections of their costs. With those caveats, our net-zero scenario analysis makes the following assumptions:

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NET-ZERO SCENARIO ASSUMPTIONS	
System Load	Average annual increase of 0.46 percent from 2020 to 2050. This is based on an EPRI study done for the Carolinas that assumes significant adoption of energy efficiency measures in buildings and industry, resulting in flat electricity demand through 2050 (offsetting all load growth due to new customers).[18] On top of this, the study assumes significant transportation electrification, resulting in the 0.46 percent per year load growth we assume here. While this study was done for the Carolinas, similar adjustments in the load forecast were applied to all our jurisdictions.
Existing Nuclear	All existing nuclear capacity is relicensed and authorized to operate for an additional 20 years (for a total operating life of 80 years). Existing nuclear generation is assumed to be capable of reducing output by up to 20 percent to aid in balancing generation and load.
Accelerated Coal Retirements	All coal units in the Carolinas, except those that have been or are being modified to run fully or partially on natural gas, are retired by 2030. All remaining coal units except the Edwardsport Integrated Gasification Combined Cycle plant are retired by 2040. Edwardsport is retired by 2045. For the net-zero carbon scenario, Cliffside 6 was assumed to operate exclusively on natural gas by 2030, until its retirement in 2048. Note that these are modeling assumptions and do not necessarily match retirement dates filed in regulatory proceedings. Future resource plans will be developed working collaboratively with stakeholders and regulators in the states we serve, pursuant to regulatory requirements.
Natural Gas Assets	To test the economics of the model, all natural gas combined-cycle units built in the 2020s are assumed to have a 20-year book life. Beyond 2030, all natural gas additions are assumed to be combustion turbines ("peakers") only. We also explored a sensitivity where no new natural gas electricity generation was added.
Markets	No market Regional Transmission Organization energy purchases or purchased power agreements are assumed beyond 2035 due to the uncertainties of how the markets and other utilities' resource plans will evolve that far into the future. This is a conservative approach to ensure that customer load is served. Actual plans would consider market purchases if they were the most economical.
Fuel Prices	Coal prices are projected to continue to remain low into the future, but a slightly higher, though still relatively low, natural gas price trajectory in the near- to mid-term continues to support gas as baseload or intermediate generation ahead of coal. Nuclear prices remain low relative to both coal and gas and support continued operation of Duke Energy's existing nuclear fleet.

[18] Electric Power Research Institute, "North Carolina Efficient Electrification Study: Task 1 Energy System Assessment," November 2019.

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Technology Prices[19] (approximate overnight capital costs)	▪ Combustion Turbines – $550/kilowatt (kW) (represents multi-unit site) ▪ Combined Cycle – $650/kW (represents 2x1 advanced class) ▪ Small Modular Nuclear Reactor – $5,500/kW ▪ Natural gas combined cycle (NGCC) with CCUS – $2,000/kW (cost is at the fence line; cost to transport CO_2, which is highly dependent on location, as well as the cost of injection, would be additional) ▪ Solar – $900/kW ▪ Wind – $1,300/kW (on shore) to $2,400/kW (offshore) ▪ Pumped storage hydro – $2,500/kW (existing reservoirs) ▪ Lithium-ion storage – $900/kW (4 hour) to $1,600/kW (8 hour) – consistent with the NREL annual technology baseline and excludes allowance for degradation, limits of depth of discharge, and owners and interconnection costs **NOTES:** Interconnection costs for these technologies were not explicitly considered in the scenario analysis. This assumption yields an optimistic view of the costs of adding large quantities of renewables to the grid. Typical costs of transmission access for various types of renewables are shown below as a percentage of total project costs: ▪ Conventional generation – 10 percent (constrained area) ▪ Solar – 20 percent (bundled solar in constrained area) ▪ Wind (offshore and out of state) – 25-50 percent (location-dependent) ▪ Batteries – 20 percent (depends on location and primary use) Transmission access cost is expected to increase with greater amounts of renewables and will be dependent on location, type, amount and existing infrastructure. Due to uncertainty in these factors, projections of future transmission access costs were not included.

[19] These prices are in line with NREL's Annual Technology Baseline: https://atb.nrel.gov. Escalations are based on the Energy Information Administration's Annual Energy Outlook 2019.

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Battery Storage	Batteries are assumed to be available to store energy for four, six or eight hours. It is also assumed that there are no limitations on the supply chain for batteries and that they can be interconnected in a timely manner and without cost constraints. To ensure safe operation of batteries and account for degradation throughout the life of the assets, there is an assumed overbuild of batteries to provide the proper safety margin in the depth of discharge; this overbuild was incorporated in the analysis but was not reflected in the "technology prices" section above for purposes of comparability with publicly available information. Seasonal battery storage and associated cost information is not currently available and its development is uncertain, so it is not assumed in the model. We view ongoing research into battery storage as vital to reducing costs and enabling longer-duration storage, but because the timing of technological breakthroughs for battery storage remains unclear (as do the costs of battery storage after the breakthroughs), we did not speculate on the timing or cost impact of a breakthrough in battery technology in this limited analysis.
Technology Innovation	ZELFRs are assumed to be commercially available for deployment in the mid-2030s. ZELFR is a generic placeholder in this modeling effort for a gap in commercially available utility-scale technology to complement very high penetration of renewables. ZELFRs must be flexible to respond to dynamic changes in both load and renewable generation, and must also be capable of sustained generation over long durations to handle severe weather events like "polar vortex" cold events and long-duration generation outages such as those that can occur after hurricanes. For purposes of cost analysis, costs for ZELFRs were based on small modular nuclear reactors as the most feasible option given that 2027 is the expected commercial operation date for the first NuScale SMR reactor and that we have reasonable confidence in the current cost data. For an operational assessment (not based on cost), we also analyzed a generation mix that assumes ZELFRs are combined-cycle power plants that use natural gas, hydrogen or biofuels (such as renewable natural gas), with CCUS as appropriate. In reality, a combination of several technologies will likely be utilized.

Net-Zero Scenario Analysis Results

As discussed above, this analysis was conducted using the same industry-standard expansion planning and hourly production cost modeling tools that we use for integrated resource planning, and assumes normal weather. **It is important to note that the following results are solely illustrative and reflect only one of the possible generation mixes that would result in net-zero emissions by 2050.** We have projected ZELFRs in two ways: (1) with ZELFRs being relatively less-flexible resources, such as a small modular nuclear reactor (SMR), and (2) with ZELFRs being flexible and easily dispatchable (like a NGCC with CCUS). This analysis assumes ZELFRs are half SMRs and half NGCC with CCUS. (It should be noted that NGCC with CCS could also be biofuels or hydrogen.)

These results do not represent definitive utility resource plans. Each utility's resource plan will be developed in conjunction with regulators, policymakers and stakeholders, and will require regulatory approval under our legal mandate to provide affordable and reliable energy.

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The following charts show the company's 2019 actual regulated electric utility capacity mix and potential 2030, 2040 and 2050 capacity mixes (in GW) under a net-zero carbon scenario analysis.

Duke Energy Regulated Generating Capacity, GW

2019

42% Gas (25 GW)
27% Coal (16 GW)
15% Existing Nuclear (9 GW)
8% Renewables* (5 GW)
5% Purchase/Sales (3 GW)
3% Storage (2 GW)

2030

49% Gas (36 GW)
20% Renewables* (15 GW)
12% Existing Nuclear (9 GW)
12% Coal (9 GW)
6% Storage (4 GW)
1% Purchase/Sales (1 GW)

2040

39% Gas (34 GW)
35% Renewables* (31 GW)
10% Existing Nuclear (9 GW)
8% Storage (7 GW)
7% ZELFRs (6 GW)
1% Coal (1 GW)

2050

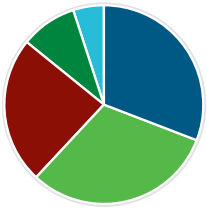
44% Renewables* (47 GW)
23% Gas (24 GW)
12% Storage (13 GW)
12% ZELFRs (13 GW)
9% Existing Nuclear (9 GW)

*Renewables include hydro, wind, solar, landfill gas, biomass, etc.

The following charts show the company's 2019 actual regulated electric utility generation (energy) mix and potential 2030, 2040 and 2050 generation mixes (megawatt-hours) under a net-zero carbon scenario analysis.

Duke Energy Regulated Generation, MWh

2019



39% CO_2 Reduction

31% Gas
31% Existing Nuclear
24% Coal
9% Purchase/Sales
5% Renewables*

2030

52% CO_2 Reduction

42% Gas
30% Existing Nuclear
14% Renewables*
11% Coal
3% Purchase/Sales

2040

78% CO_2 Reduction

29% Renewables*
29% Existing Nuclear
25% Gas
16% ZELFRs
1% Coal

2050

95% CO_2 Reduction

36% Renewables*
30% ZELFRs
28% Existing Nuclear
6% Gas

*Renewables include hydro, wind, solar, landfill gas, biomass, etc.

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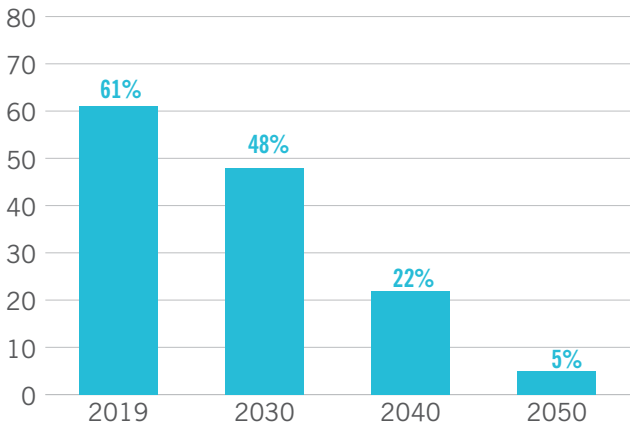
The following chart shows a projection of how Duke Energy's CO_2 emissions will decline as our electric generating fleet transforms.

Percent of 2005 CO_2 Emissions



Key Insights

We are on track to achieve our 2030 goal of reducing CO_2 emissions from electricity generation by at least 50 percent from the 2005 baseline. The trajectory to make very deep reductions in CO_2 emissions by 2050 in line with our net-zero goal will depend on the availability of advanced low- and no-carbon technologies. Some emissions may be more cost-effectively addressed through the purchase of offsets; we project that would be about 8 million tons in 2050 (approximately 5 percent of our 2005 emissions).[20] Other key insights from the extensive modeling that was conducted to analyze this scenario include:

- **Renewables must be diversified and balanced with energy storage.** Renewables will play a key role in meeting the need for carbon-free energy. Diversity of renewables helps to reduce the need for storage, but even with a balanced portfolio of wind, solar and energy storage, further additions of renewables above a certain point – which varies among each of our modeled jurisdictions – have diminishing value and ultimately become uneconomic for carbon reduction. For example, for solar, this is due to the inability to shift the timing of renewable generation (which peaks midday) to match early- and late-hour peak energy demand. See page 29 for external studies that have reached a similar conclusion, including a study of the impacts of integrating increasing amounts of renewables into Duke Energy's Carolinas territories performed by the National Renewable Energy Laboratory.
- **Maintaining existing nuclear is critical.** Achieving net-zero CO_2 emissions by 2050 requires our existing nuclear fleet to be granted subsequent license renewals. The first Duke Energy nuclear power plants will approach the end of their current operating licenses in the early 2030s.

[20] Carbon offsets are the reduction of greenhouse gas emissions to the atmosphere. These can include modified agricultural practices, tree planting and reductions in other sectors. The market for carbon offsets decades in the future is very uncertain, but given its likely importance for the power sector and other large energy producers/users, we hope and believe that a robust market will emerge. We are monitoring negotiations under Article 6 of the Paris Agreement, where rules for carbon trading and the use of offsets will be developed.

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- **ZELFRs will need to be installed by 2035.** In order to achieve our net-zero goal, ZELFRs are needed starting in 2035 to retire older fossil generation, maintain grid reliability and balance the intermittency of renewables.[21] These technologies need to be developed and refined over the next 10 years so that we can confidently plan to use these to serve our customers reliably while achieving net-zero carbon emissions. In the net-zero carbon scenario, ZELFRs make up 12 percent of capacity and supply 30 percent of energy due to their ability to operate at full output over extended periods regardless of weather conditions. The need for dispatchable net-zero carbon resources is driven by the fact that renewable resources are not well-correlated with the winter load shape that drives resource planning requirements for much of the Duke Energy fleet; in addition, the current cost and scale of energy storage technology makes backing up very large amounts of renewables with storage over long durations impractical. If ZELFRs become available and economically feasible prior to 2035, this would provide opportunities to accelerate coal retirements and achieve additional carbon reductions at a relatively low cost.

- **Unprecedented, sustained pace of capacity additions will be needed.** The net-zero carbon scenario requires Duke Energy to add new capacity at a rate double that achieved nationwide during the highest-growth decade in U.S. history, and more than double the rate at which Duke Energy added capacity over the past three decades. Moderate load growth combined with coal and gas retirements, along with the intermittency of renewables and the need for storage capacity, are key drivers for these unprecedented capacity additions. Replacing traditional electric generating capacity with renewables plus storage is not a one-for-one proposition. Due to the intermittency of renewables, significantly more capacity must be built, even with storage availability, to provide the same level of reliable electricity as a fossil plant.[22] This build rate will be challenging from many aspects, including permitting and regulatory approvals, labor, supply chain and interconnection needs.

- **Benefits of natural gas to facilitate the retirement of coal and balance renewables.** Natural gas continues to play a critical role in achieving our 2030 and 2050 carbon reduction goals. Deploying low-cost natural gas helps speed the transition from coal and balance the intermittent nature of renewables. Even in 2050, natural gas capacity needs to remain on the system to maintain reliability, especially during times of peak electricity demand. However, the mission of the gas fleet will change from supplying 24/7 power today to a peaking and demand-balancing function by 2050. This remaining gas generation is projected to represent 5 percent of 2005 emissions, netted to zero through carbon offset purchases.

  We conducted a sensitivity analysis that assumed our regulated electric utilities are not allowed to build any additional natural gas generation. This constraint would make maintaining reliable and affordable electricity very challenging, while providing a modest 5 percent decrease in cumulative CO_2 emissions between 2020 and 2050.

  This "no new gas" sensitivity presents significant challenges, some of which may be very difficult to overcome, including interconnection and operational and supply chain issues associated with unprecedented additions of energy storage over a very short period of time, as well as regulatory approvals, permitting, construction and greater costs to customers. For example, Duke Energy alone would need to add more than 15,000 MW of energy storage by 2030, more than 17 times the entire battery storage capacity (899 MW) of the entire United States today.[23] Our analysis shows that the incremental cost would be three to four times that of the net-zero scenario that includes gas, and would require the construction and operation of enormous amounts of renewables and energy storage. And this analysis

[21] This capacity is especially important in our Midwest and Florida jurisdictions as they do not currently have nuclear capacity.

[22] See, for example, University of North Carolina: "Measuring Renewable Energy as Baseload Power," March 2018. https://kenaninstitute.unc.edu/publication/measuring-renewable-energy-as-baseload-power/. To equal 1 MW of natural gas combined-cycle generation, the company would need to add 5 MW of solar with 4 MW of four-hour lithium-ion batteries. The true costs of renewables are therefore substantially higher than the levelized cost of electricity reported in many studies that do not include the cost of backup power.

[23] EIA, U.S. Utility-scale battery storage power capacity to grow substantially by 2023, July 2019. https://www.eia.gov/todayinenergy/detail.php?id=40072.

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does not include the substantial transmission and distribution upgrade costs and permitting challenges necessary to enable the increased interconnection of energy storage and renewables. Aside from the implications of the cost impacts to our customers, especially low-income customers and energy-intensive businesses, the dependence of the "no new gas" sensitivity on a rapid addition of energy storage increases the possibility that existing resources would need to be relied upon for a longer time frame than anticipated.

Before considering the "no new gas" sensitivity as a serious alternative, it would be necessary to perform more extensive analysis to address the fact that production cost models have "perfect foresight" (with respect to weather, unplanned generation outages, etc.), while in the real world, operators do not know when such changes will occur and may not have the energy storage in the needed state (of charge or discharge) to manage actual conditions. Based on our historical experience with pumped-hydro energy storage, we understand that relying more heavily on renewables and limited-duration energy storage for capacity (the role dispatchable resources have traditionally played) will increase the complexity of planning and operating the system. Further, highly technical analysis is needed to ensure that the "perfect foresight" assumption is not masking potential system reliability challenges that would need to be addressed.

- **Focused efforts will be required to improve forecasting and portfolio balancing capabilities.** The challenges of balancing load with increasing levels of renewable generation will warrant exploration of opportunities to reduce renewable forecast error and improve our ability to react. Improving the accuracy of renewable generation forecasts will reduce the need for backup requirements (either storage or quickly ramping natural gas). Opportunities to improve forecast accuracy could include advanced sensing/monitoring equipment as well as continued advancements in wind and irradiation forecasting techniques. In order to react more quickly, we are focused on improving the flexibility of our generation fleet, which can be achieved by installing more flexible and dispatchable resources; we are also reviewing potential market opportunities to better enable our grid to accommodate more intermittent, carbon-free resources. We are also exploring opportunities to add flexibility on the demand side through innovative customer programs and rate design.

Third-Party Renewables Studies

Several recent studies have examined the potential penetration of renewables in the power system. These studies, including one performed by DOE's National Renewable Energy Laboratory (NREL) of Duke Energy's Carolinas system, all conclude that further additions of renewables above 40%-50% of energy served have diminishing value and become increasingly uneconomic for carbon reduction. The studies also find that diversity of renewable resources (wind and solar) enables larger shares of carbon-free generation. Several of these studies are listed below.

- MIT: "Deep Decarbonization of the U.S. Electricity Sector: Is there a Role for Nuclear Power?" September 2019. https://globalchange.mit.edu/publication/17323
- NREL: "Duke Energy Carolinas and Progress: Zero-Emission Resource Integration Study," December 2019. www.nrel.gov/docs/fy20osti/74337.pdf
- MIT: "Storage Requirements and Costs of Shaping Renewable Energy Toward Grid Decarbonization," Joule, November 2019. https://www.sciencedirect.com/science/article/abs/pii/S2542435119303009.

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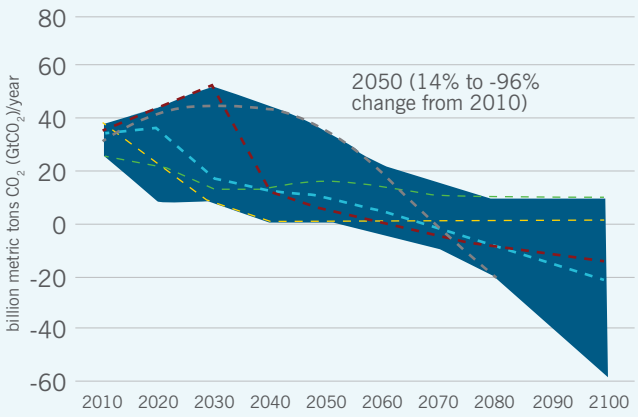
Duke Energy Carbon Reduction Goals and 1.5 and 2 Degree Celsius Global Emissions Scenarios

Many stakeholders are interested in companies' analyses of scenarios that will limit global average warming to 2 degrees Celsius or lower. To inform our view of scenarios and how these relate to our climate goals, Duke Energy has been engaged for nearly two years with the Electric Power Research Institute (EPRI) in a project evaluating scientific understanding of the relationship between company scenarios and global climate goals. The purpose of the project is to develop a strong technical foundation for company analysis and decision-making on scenarios and climate goals. Among other things, the project has assessed the relevant science through a number of studies and derived insights for companies and stakeholders.[24] We find, upon a review of EPRI's conclusions, that the scenario we analyze in this report to achieve our net-zero climate goal is consistent with scenarios limiting global average temperature increase to less than 2 degrees Celsius, and is also consistent with scenarios that limit global average temperature increase to less than 1.5 degrees Celsius.

The EPRI studies find, among other things, that there are many emissions pathways consistent with limiting warming to any particular global average temperature due to uncertainty about future economic conditions, technology advances, energy consumption, other emissions and elements that affect climate change, physical system dynamics, and policy action. For example, the figure above (figure ES-2 from EPRI's 2018 study) shows the range for 408 global emissions pathways derived from peer-reviewed literature that are consistent with limiting warming to less than 2 degrees Celsius.



Global net CO_2 emissions pathway range for pathways consistent with limiting global average temperature to less than 2C. Range for 408 scenarios (shaded area) and illustrative select scenarios (dotted lines) shown. Source: Rose and Scott (2018)

Similar to global economy-wide emissions outcomes, EPRI also concludes that "large ranges of global electricity carbon dioxide (CO_2) emissions pathways and budgets are consistent with limiting warming to 2°C." In addition, the EPRI studies find that the global and sectoral results provide only partial representations of uncertainty, with key uncertainties relevant to individual companies absent (e.g., uncertainty about policy design details and company-specific circumstances).

Importantly, the EPRI study goes on to compare this literature-derived range of pathways with single pathways used by the Science-Based Targets initiative (SBTi) and the United Nations Environment Programme's Finance Initiative.[25] The study concludes that while these single pathways lie within the ranges of the pathways described above, they do not capture the "uncertainty evident in the literature regarding global emissions pathways consistent with limiting warming to 2°C." The factors behind the different pathways are uncertainties relevant to companies and important to consider, in addition to the uncertainties absent (e.g., alternative policy designs).

[24] Rose, S.K., M. Scott, 2018. Grounding Decisions: *A Scientific Foundation for Companies Considering Global Climate Scenarios and Greenhouse Gas Goals*. EPRI. Palo Alto, CA. 3002014510; Rose, S.K., M. Scott, 2020. *Review of 1.5˚C and Other Newer Global Emissions Scenarios: Insights for Company and Financial Climate Low-Carbon Transition Risk Assessment and Greenhouse Gas Goal Setting*, EPRI, Palo Alto, CA. 3002018053.

[25] *Ibid* 2018, Appendix A.

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Given that Duke Energy's net-zero by 2050 target is within the range of the scenarios shown in the EPRI analyses, the company believes that the scenario analyzed is consistent with limiting global warming to 2 degrees Celsius. Further, we believe the target is also consistent with limiting warming to 1.5 degrees Celsius according to EPRI's 2020 study. Note, however, that the EPRI analyses find that global scenarios have limited value as benchmarks for assessing company strategies for a variety of reasons, including that the aggregate scenarios do not represent the unique circumstances, uncertainties and risks relevant to individual companies. Furthermore, given that future markets, technology and policy are uncertain, as noted in the net-zero scenario analysis above, exactly how we will achieve our net-zero goal is uncertain; the analysis shown in this report is illustrative of pathways we might take.

Looking Ahead

The actual pathway that Duke Energy takes to achieve net-zero carbon emissions by 2050 will be based on evolving technologies, costs, demand for electricity, public policy, stakeholder input and regulatory approvals. During the 2020s, significant innovation and technological advancement will be critical to ensure we have the viable technology options needed by the 2030s to achieve a net-zero carbon future by the 2050s. As we have done for more than a century, we will collaborate with regulators, policymakers and other stakeholders to evaluate the best options to meet the needs of our customers, while balancing affordability, reliability and sustainability.

Cautionary Statement Regarding Forward-looking Information

This document includes forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934. Forward-looking statements are based on management's beliefs and assumptions and can often be identified by terms and phrases that include "anticipate," "believe," "intend," "estimate," "expect," "continue," "should," "could," "may," "plan," "project," "predict," "will," "potential," "forecast," "target," "guidance," "outlook" or other similar terminology. Various factors may cause actual results to be materially different than the suggested outcomes within forward-looking statements; accordingly, there is no assurance that such results will be realized. These factors include but are not limited to:

- State, federal and foreign legislative and regulatory initiatives, including costs of compliance with existing and future environmental requirements, including those related to climate change, as well as rulings that affect cost and investment recovery or have an impact on rate structures or market prices;
- The extent and timing of costs and liabilities to comply with federal and state laws, regulations and legal requirements related to coal ash remediation, including amounts for required closure of certain ash impoundments, are uncertain and difficult to estimate;
- The ability to recover eligible costs, including amounts associated with coal ash impoundment retirement obligations and costs related to significant weather events, and to earn an adequate return on investment through rate case proceedings and the regulatory process;
- The costs of decommissioning nuclear facilities could prove to be more extensive than amounts estimated and all costs may not be fully recoverable through the regulatory process;

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- Costs and effects of legal and administrative proceedings, settlements, investigations and claims;
- Industrial, commercial and residential growth or decline in service territories or customer bases resulting from sustained downturns of the economy and the economic health of our service territories or variations in customer usage patterns, including energy efficiency efforts and use of alternative energy sources, such as self-generation and distributed generation technologies;
- Federal and state regulations, laws and other efforts designed to promote and expand the use of energy efficiency measures and distributed generation technologies, such as private solar and battery storage, in Duke Energy service territories could result in customers leaving the electric distribution system, excess generation resources as well as stranded costs;
- Advancements in technology;
- Additional competition in electric and natural gas markets and continued industry consolidation;
- The influence of weather and other natural phenomena on operations, including the economic, operational and other effects of severe storms, hurricanes, droughts, earthquakes and tornadoes, including extreme weather associated with climate change;
- The impact of the COVID-19 pandemic;
- The ability to successfully operate electric generating facilities and deliver electricity to customers including direct or indirect effects to the company resulting from an incident that affects the United States electric grid or generating resources;
- The ability to obtain the necessary permits and approvals and to complete necessary or desirable pipeline expansion or infrastructure projects in our natural gas business;
- Operational interruptions to our natural gas distribution and transmission activities;
- The availability of adequate interstate pipeline transportation capacity and natural gas supply;
- The impact on facilities and business from a terrorist attack, cybersecurity threats, data security breaches, operational accidents, information technology failures or other catastrophic events, such as fires, explosions, pandemic health events or other similar occurrences;
- The inherent risks associated with the operation of nuclear facilities, including environmental, health, safety, regulatory and financial risks, including the financial stability of third-party service providers;
- The timing and extent of changes in commodity prices and interest rates and the ability to recover such costs through the regulatory process, where appropriate, and their impact on liquidity positions and the value of underlying assets;
- The results of financing efforts, including the ability to obtain financing on favorable terms, which can be affected by various factors, including credit ratings, interest rate fluctuations, compliance with debt covenants and conditions and general market and economic conditions;
- Credit ratings of Duke Energy and its registered subsidiaries may be different from what is expected;
- Declines in the market prices of equity and fixed-income securities and resultant cash funding requirements for defined benefit pension plans, other post-retirement benefit plans and nuclear decommissioning trust funds;
- Construction and development risks associated with the completion of Duke Energy's capital investment projects, including risks related to financing, obtaining and complying with terms of permits, meeting construction budgets and schedules and satisfying operating and environmental performance standards, as well as the ability to recover costs from customers in a timely manner, or at all;
- Changes in rules for regional transmission organizations, including changes in rate designs and new and evolving capacity markets, and risks related to obligations created by the default of other participants;
- The ability to control operation and maintenance costs;

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- The level of creditworthiness of counterparties to transactions;
- The ability to obtain adequate insurance at acceptable costs;
- Employee workforce factors, including the potential inability to attract and retain key personnel;
- The ability of subsidiaries to pay dividends or distributions to Duke Energy Corporation holding company (the Parent);
- The performance of projects undertaken by our nonregulated businesses and the success of efforts to invest in and develop new opportunities;
- The effect of accounting pronouncements issued periodically by accounting standard-setting bodies;
- The impact of United States tax legislation to our financial condition, results of operations or cash flows and our credit ratings;
- The impacts from potential impairments of goodwill or equity method investment carrying values; and
- The ability to implement our business strategy, including enhancing existing technology systems.

Additional risks and uncertainties are identified and discussed in Duke Energy's reports filed with the SEC and available at the SEC's website at sec.gov. In light of these risks, uncertainties and assumptions, the events described in the forward-looking statements might not occur or might occur to a different extent or at a different time than described. Forward-looking statements speak only as of the date they are made and Duke Energy expressly disclaims an obligation to publicly update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

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