

# Implementation and action toward net zero

September 2020



# About Southern Company

Southern Company is a leading energy company serving 9 million customers through our subsidiaries. Southern Company provides clean, safe, reliable and affordable energy through electric operating companies in three states, natural gas distribution companies in four states, a competitive generation company serving wholesale customers across America, a leading distributed energy infrastructure company, a fiber optics network and telecommunications services. *In this document, the terms we, us, our and the Company all refer to Southern Company.*

## Our Companies

### Electric Utilities

- ▶ Alabama Power
- ▶ Georgia Power
- ▶ Mississippi Power

### Natural Gas Utilities (Southern Company Gas)

- ▶ Atlanta Gas Light
- ▶ Chattanooga Gas
- ▶ Nicor Gas
- ▶ Virginia Natural Gas
- ▶ Complementary non-utility natural gas businesses

Southern Company brands are known for excellent customer service, high reliability and affordable prices below the national average. For more than a century, we have been building the future of energy and developing the full portfolio of energy resources, including carbon-free nuclear, advanced carbon capture technologies, natural gas, renewables, energy efficiency and storage technology.

*Southern Company is a holding company that conducts its business through its subsidiaries. Accordingly, unless the context otherwise requires, references in this document to Southern Company's operations, such as generating activities, GHG emissions and employment practices, refer to those operations conducted through its subsidiaries.*

### Other Companies

- ▶ PowerSecure
- ▶ Southern Nuclear
- ▶ Southern Power
- ▶ Southern Telecom
- ▶ Southern Linc

Through an industry-leading commitment to innovation, Southern Company and its subsidiaries develop the customized energy solutions our customers and communities require to drive growth and prosperity. Our uncompromising values ensure we put the needs of those we serve at the center of everything we do and govern our business to the benefit of our world.

## Our approach to reducing CO<sub>2</sub> emissions

We are lowering carbon emissions in ways that make technical and economic sense for our customers while enhancing the disclosure of our actions and the risk and opportunities for our company during this important transition.

As we described in our April 2018 *Planning for a low-carbon future* report, our approach to reducing carbon emissions is described in three pillars:



Pursue a **diverse energy resource portfolio** to include low-carbon and carbon-free resources, negative carbon solutions and energy efficiency resources



Continue our industry-leading **research and development** (R&D), focusing on technologies that lower greenhouse gas (GHG) emissions



**Constructively engage** with policymakers, regulators, investors, stakeholders, customers and communities to support outcomes that lead to a net zero future

# A Letter from the CEO

“

I continue to be confident that we are prepared and well-positioned to meet the needs of our customers, employees, communities and investors well into the future and will succeed in our transition to a net zero future. ”

Thomas A. Fanning

*Chairman, President and Chief Executive Officer*



---

**We are updating our long-term GHG emissions reduction goal to net zero emissions by 2050**

**We now expect to achieve our 50% reduction goal well in advance of 2030, and possibly as early as 2025**

In April 2018, we issued our *Planning for a low-carbon future report*. At that time, we were one of the first U.S. utilities to set bold, industry-leading goals to reduce carbon emissions. In this addendum to our earlier report, we provide information on our progress and plans to decarbonize the Southern Company system, including an update of our long-term goal to net zero emissions by 2050.

## Southern Company's 2030 and 2050 GHG Emissions Reduction Goals

In April 2018, we set a goal for our electric and gas operations of achieving a 50% reduction in GHG emissions by 2030, as compared to 2007 levels. Driven primarily by low natural gas prices, and through our regulators, we have seen a more rapid transition of our electric generation fleet. As a result, Southern Company's carbon emissions have decreased by 44% through 2019. We now expect to achieve our 50% reduction goal well in advance of 2030, and possibly as early as 2025.

Also in 2018, we set a long-term goal of low- to no-carbon emissions by 2050, which we defined as 80% to 100% reduction in emissions. Since that time, the discourse around decarbonization efforts in the U.S. and beyond – including with our Board and stakeholders – has evolved to incorporate concepts related to negative carbon technologies. As a result of this evolution and our analysis of opportunities to incorporate net zero concepts into our long-term strategy, we are updating our long-term GHG emissions reduction goal to net zero emissions by 2050.

Notably, we have committed to both our 2030 and 2050 GHG reduction goals in the absence of any state or federal mandates. Rather, we pursue these goals because they are good for the customers and communities we are privileged to serve.

Our approach is driven by thoughtful scenario planning, long-term integrated resource plans (IRP) and constructive regulatory decision-making. Our success is enabled by active engagement, thoughtful public policy and industry-leading R&D.

### Our Path to Net Zero by 2050

Working closely with our customers and regulators, we have made significant progress in reducing the emissions profile of our electric generation fleet. For 2019, coal decreased to 22% of our annual energy mix while renewables grew to 12%. For context, this compares to 69% coal and 1% renewables in 2007, our benchmark year.\*

As we look ahead, Southern Company will continue to use a portfolio approach as we seek to decarbonize. We expect our path to net zero to be comprised of several key elements: continued coal transition, utilization of natural gas to enable the fleet transition, further growth in our portfolio of zero-carbon resources, negative carbon solutions, enhanced energy efficiency initiatives and continued investment in R&D focused on clean energy technologies. As an example, across our state-regulated utilities and Southern Power, we

### MAKING PROGRESS TOWARD OUR DECARBONIZATION GOALS



currently have more than 9,000 megawatts (MW) and expect to have approximately 14,000 MW of renewable resources by 2024.

We have already made meaningful shifts to decarbonize our business in a relatively short timeframe, and we are mindful of the impact these changes can have on our customers, communities and employees. Our planning process routinely considers a host of factors, including affordability, reliability, safety, environmental impacts and resilience, as well as broader social and economic community impacts.

\* See the annual energy mix chart on page 10.

Now commonly described as a “just transition,” we have always placed a high priority on protecting the interests of our employees and the communities we are privileged to serve. We will continue to use this approach as we work to decarbonize in the decades ahead.

### **Important Role of Natural Gas in Reaching our Decarbonization Goals**

Natural gas has served a critical role in reducing our GHG emissions while providing clean, safe, reliable and affordable energy to our customers. Given its abundance, affordability and relative carbon footprint, we believe natural gas will play a meaningful role in securing America’s energy future. We also believe that energy policy should consider the full portfolio of resources in a collective effort to achieve net zero emissions by 2050.

As we deploy increasing amounts of intermittent, renewable capacity across our system, natural gas fueled generation is needed to maintain reliability for our electric customers. The direct use of natural gas is a necessity for many of our residential customers, particularly in colder climates. Natural gas also continues to be an important, affordable fuel source for our commercial and industrial customers. Unless and until technology emerges that can affordably and efficiently replace it, natural gas remains an appropriate and responsible fuel source, and one that is critical to the health, safety and comfort of the citizens and communities we serve.

Because we believe natural gas is an important part of our nation’s effective transition to a net zero future, we are committed to playing a leadership role in reducing the environmental impact of natural gas usage. We are focused on opportunities to lead the industry in the use of renewable natural gas, while minimizing fugitive methane emissions across the natural gas supply chain and reducing GHG emissions for end use customers, including electric generation.

### **R&D and Innovation Leadership**

In 2019, our R&D organization celebrated 50 years of delivering innovative solutions and creating value for customers. Southern Company has led the U.S. utility industry in the development, funding and demonstration of innovative research necessary to provide clean, safe, reliable and affordable energy.

Decarbonization continues to be a major focus of our R&D efforts. As just one example, under Southern Company’s leadership and management, the National Carbon Capture Center remains focused on efforts to reduce and capture carbon emissions from electric generation sources. In light of the long-term goal of net zero by 2050, Southern Company will continue its leadership by including negative carbon technologies in our R&D efforts.



## **Constructive Regulation and Public Policy**

Southern Company's success, including efforts to decarbonize our system, are dependent on supportive and constructive regulation and public policy. We have long been a leader in the advancement of ideas and positions in the private and public arenas that are beneficial to our customers, communities and employees.

The work of planning, transitioning and operating our system to meet our decarbonization goals will require continued active and constructive engagement with government officials, investors and a wide variety of other public and private stakeholders. Our success will require the support of policies that encourage and advance innovation while protecting the affordability, reliability and resilience of service to customers.

## **Governance and Risk Oversight**

The significant progress we have made in reducing emissions and the development of a strategy for the future have occurred under the guidance and oversight of a competent and engaged Board of Directors and a committed management team. Together we are keenly focused on the planning and execution required to meet our GHG reduction goals.

The Company's independent Directors provide substantive oversight to our management team on strategy and risk issues across the

environmental, social and governance spectrum, including carbon reduction efforts. Each committee of the Board has responsibility for key elements of risk oversight including future capital investments, stranded and physical asset risk, climate issues, human capital impacts, cybersecurity and policy advocacy.

Importantly, these matters are discussed regularly by our full Board of Directors and at Management Council meetings. In addition, our independent Directors are actively engaged in direct dialogue with key investors and other stakeholders on a variety of topics, including carbon strategy, policy engagement, human capital and executive compensation.

## **Conclusion**

While environmental, social and governance (ESG) issues have received increasing attention by investors over the past few years, at Southern Company these issues have always received the heightened attention they deserve. For us, focus on ESG issues and their alignment with long-term strategy and value creation is about far more than decarbonization. It goes to putting customers at the center of everything we do, building a sustainable workforce and making sure that the communities we serve are better off because we're there. This approach is embedded in our values and our DNA, and we know that it is the right way to drive long-term performance.

I continue to be confident that we are prepared and well-positioned to meet the needs of our customers, employees, communities and investors well into the future and will succeed in the transition to a net zero future. As always, we are committed to providing clean, safe, reliable and affordable energy to the customers we are privileged to serve.

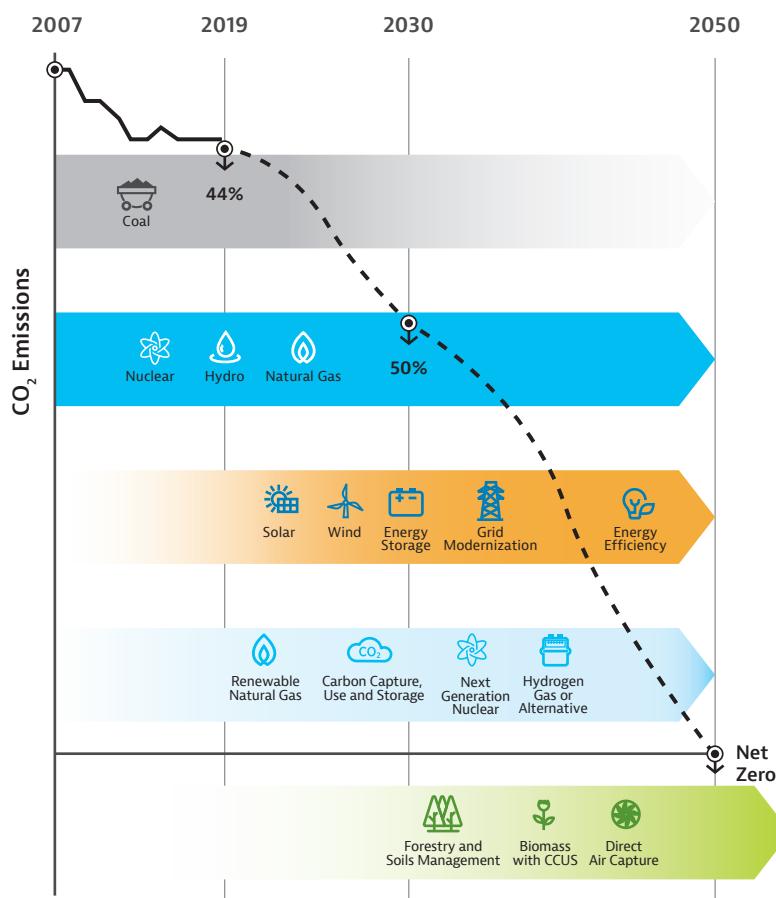
We appreciate your continued interest in Southern Company, welcome your feedback, and look forward to continuing our engagement with all of you.

### Thomas A. Fanning

*Chairman, President and Chief Executive Officer  
September 2020*

#### A Path to Net Zero

We believe a suite of complementary policies will be required to reach net zero by mid-century. These policies should be built around a foundational mission to support the acceleration of energy research, development, demonstration and deployment to enable solutions at equal or lower cost of service to energy customers compared to current conditions. This figure depicts a collection of established and emerging solutions that could be useful in decarbonizing our operations.



#### Coal

While coal has been key to supplying affordable energy to our customers, we are embracing an orderly transition of our coal fleet.

#### Foundational

Nuclear, hydro and natural gas are foundational baseload and flexible components of an orderly transition.

#### Expanding

We are expanding our deployment of renewables and energy storage, modernizing the electricity grid and enhancing energy efficiency programs.

#### Emerging

Emerging technologies, such as carbon capture, use and storage (CCUS), renewable natural gas, next generation nuclear and hydrogen, will be key to achieving our emission reduction goals.

#### Negative Carbon Concepts

Negative carbon concepts, such as natural solutions, biomass energy with CCUS and direct air capture, must emerge and become cost-effective to achieve net zero carbon emissions.

## Report out on Southern Company's portfolio outlook

In our 2018 report, we provided an outlook on each asset category within our portfolio. Below we provide an update on actions taken since April 2018. We have also added negative carbon concepts to the portfolio list. These specific initiatives are in addition to energy efficiency efforts, which span all of our businesses.

Portfolio	Facilitates GHG Reduction	Demand Outlook	Actions Taken Since 2018 Report
 Natural Gas			<ul style="list-style-type: none"> <li>Continued to look for opportunities to increase efficiency of existing natural gas fleet resulting in reduced fuel use and GHG emissions.</li> <li>Natural gas suppliers committed to GHG reductions in their own businesses have a competitive edge in our bid selection process.</li> <li>Converted National Carbon Capture Center to focus on CCUS for natural gas units.</li> </ul>
 Coal			<ul style="list-style-type: none"> <li>Retired approximately 1,900 MW of coal generation in 2019.</li> <li>Additional retirements continue to be evaluated.</li> </ul>
 Nuclear			<ul style="list-style-type: none"> <li>Continued progress on construction of Vogtle Units 3 &amp; 4. Unit 3 is expected to go into service in 2021 and Unit 4 in 2022.</li> <li>R&amp;D efforts focused on advancing 4th generation nuclear technology.</li> </ul>
 Renewables			<ul style="list-style-type: none"> <li>Anticipate adding approximately 4,400 MW of additional renewable generation sources by 2024.</li> <li>More than 14,000 MW of renewables expected online by 2024.</li> <li>R&amp;D efforts focused on lowering renewable operating and maintenance costs.</li> </ul>
 Energy Storage			<ul style="list-style-type: none"> <li>440 MW of battery storage projects operating or under development across the U.S., including 80 MW approved in the 2019 Georgia Power IRP.</li> <li>R&amp;D continues to pursue cost-effective, long-duration storage options.</li> </ul>
 Electric Transmission & Distribution			<ul style="list-style-type: none"> <li>Continued investment in grid modernization including smart grid technology and cybersecurity protection.</li> <li>Strategic reliability enhancements and ageing infrastructure replacement programs that improve system availability, reliability and resilience.</li> </ul>
 Local Natural Gas Distribution			<ul style="list-style-type: none"> <li>Virginia Natural Gas (VNG), a Southern Company Gas subsidiary, began purchasing 20% of its customers' annual natural gas supply from select, low fugitive emissions wells operated by producers in Our Nation's Energy (ONE) Future.</li> <li>Continued investment in methane detection and reduction across the Southern Company Gas footprint, including our leadership role in ONE Future.</li> <li>Continued support for customer programs supporting reduced emissions and efficiency, including the introduction of Greener Life™ carbon offset program in October 2019 by Southern Company Gas subsidiary Georgia Natural Gas.</li> </ul>
 Midstream Natural Gas Transmission			<ul style="list-style-type: none"> <li>Engaging with pipeline investment partners and industry groups on opportunities to reduce methane emissions in this sector.</li> <li>Working with industry groups to standardize methane intensity reporting methodologies.</li> </ul>
 Distributed Energy Infrastructure			<ul style="list-style-type: none"> <li>Continued working with commercial and industrial customers to bring distributed energy resources (DERs) on-line to enhance reliability.</li> <li>Learning from the Smart Neighborhood projects to understand implications of community solar.</li> </ul>
 Negative Carbon Concepts			<ul style="list-style-type: none"> <li>Direct air capture R&amp;D.</li> <li>Enhancing land management practices and stewardship efforts that lead to natural carbon sequestration.</li> </ul>

# Contents

**10**

## Making Progress Toward Our Decarbonization Goals

- 10** Transitioning Electricity Generation Portfolios
- 12** Greenhouse Gas Emissions Reductions

**14**

## A Portfolio Approach to the Continued Decarbonization of the Southern Company System

- 16** Important Role of Natural Gas in Reaching our Decarbonization Goals
- 21** Zero-Carbon Resources
- 23** Energy Efficiency
- 24** Negative Carbon Concepts

**25**

## Industry-Leading R&D That Enables Decarbonization

- 26** Deliver an Affordable, Reliable, Net Zero Energy System
- 28** Optimize Delivery Systems to Support Sector Transformation

In response to growing investor interest in information on how companies are managing climate-related risks and opportunities in line with the transition to a lower carbon economy, both our 2018 report and this 2020 addendum include disclosure responsive to recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).



**29**

## Our Core Business Model Emphasizes a Just Transition

**31**

## Governance and Oversight of Our Decarbonization Efforts

- 31** Board Oversight of Climate-Related Business Strategy, Operations, Risks and Opportunities
- 33** Alignment of Executive Compensation with our GHG Emission Reduction Goals

## TCFD Index

	Pages of 2018 Report	Pages of 2020 Addendum
Metrics and Targets	4, 6–8, 13, 22	3–4, 8, 10–13, 21–22, 29
Strategy	4, 7–12, 18–21	4–7, 14–30
Risk Management	4, 5, 13–16	6, 17, 31–32
Governance	5, 23–25	6, 31–33

## A note about renewable generation

Renewables continue to be a rapidly growing part of the energy we supply to our customers. We own renewable generation facilities and purchase the energy output of renewable generation facilities owned by third parties. When we refer to "renewables" in this document we are referring to wind, solar, hydro, biomass and landfill gas facilities, whether owned by us or owned by third parties and whether we have rights to the renewable energy credits (RECs) associated with energy from the facilities. To the extent Southern Company subsidiaries or affiliates retain or receive the RECs associated with energy from the facilities, they generally reserve the right to use those RECs to serve customers with renewable energy or to sell the RECs, either bundled with energy or separately to third parties.

# Making Progress Toward Our Decarbonization Goals

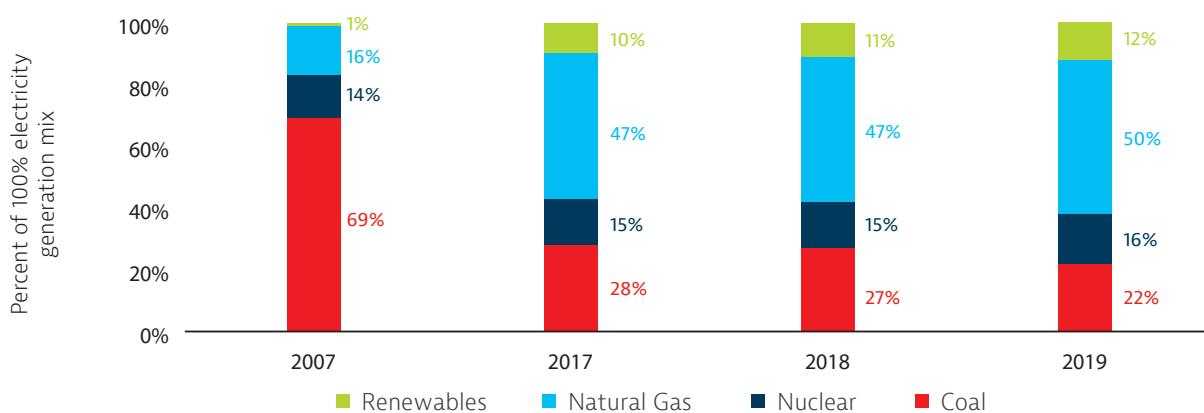
In 2018, we set an intermediate goal to achieve 50% reduction in GHG emissions by 2030, compared to 2007. **Current projections now indicate we could achieve our 50% reduction goal a full five years early, by 2025.** This is due to a variety of factors including recent regulatory outcomes, the disposition of ownership of our Florida assets and a faster than originally anticipated transition of our generation fleet.



## Transitioning Electricity Generation Portfolios

We are one of the only U.S. utilities pursuing an “all of the above” net zero energy strategy. Developing and maintaining a diversified energy portfolio is essential to successfully reducing emissions while also maintaining reliability and affordability for our customers. Since 2007, we have significantly transformed the Southern Company system’s electricity generation mix, with coal decreasing from 69% to 22% and renewables increasing from 1% to 12% of our annual energy mix.

**ANNUAL ENERGY MIX\***



\* Annual energy mix represents all of the energy the Southern Company system uses to serve its retail and wholesale customers during the year. It is not meant to represent delivered energy mix to any particular retail customer or class of customers. Annual energy mix percentages include non-affiliate power purchase agreements.

## Significant Coal and Oil Retirements Since 2007

Since 2007, we have retired or converted

**56 units**  
representing

**9,600 MW**  
of generating capacity

Facility	Action	Total Number of Units	Total Nameplate Capacity (MW)
<b>Barry</b>	Retired Coal/Converted	3	475
<b>Boulevard</b>	Retired Oil/Gas	2	39
<b>Bowen</b>	Retired Oil	1	39
<b>Branch</b>	Retired Coal	4	1,540
<b>Crist</b>	Converted	2	150
<b>Gadsden</b>	Converted	2	120
<b>Gaston</b>	Converted	4	1,000
<b>Gorgas</b>	Retired Coal	5	1,221
<b>Greene County</b>	Converted	2	500
<b>Hammond</b>	Retired Coal	4	800
<b>Kraft</b>	Retired Coal/Oil/Gas	5	303
<b>Lansing Smith</b>	Retired Coal	2	305
<b>McDonough</b>	Retired Coal	2	490
<b>McIntosh</b>	Retired Coal	1	163
<b>McManus</b>	Retired Oil	2	115
<b>Mitchell</b>	Retired Coal/Oil	4	243
<b>Scholz</b>	Retired Coal	2	80
<b>Watson</b>	Converted	2	750
<b>Yates</b>	Retired Coal/Converted	7	1,250
		<b>56</b>	<b>9,583</b>

Importantly, we have achieved this transformation while retaining all employees operating these units that desired to stay. See the section *Our Core Business Model Emphasizes a Just Transition* for additional information about how we consider the interests of our workforce during the transition.

## New Retail Generation Commitments\*

**2,300 MW**

Renewables and Storage

**1,900 MW**

Natural Gas

Current commitments for renewables and storage exceed natural gas.

\* Includes generation in Georgia and Alabama. The Georgia Public Service Commission (PSC) approved new generation procurement in the 2019 IRP and the Alabama PSC approved natural gas generation in 2020.

## Greenhouse Gas Emissions Reductions

Approximately 98% of Southern Company's GHG emissions are CO<sub>2</sub> emissions related to its electric generating fleet. We have substantially reduced both our total GHG emissions and GHG intensity relative to our 2007 benchmark year while maintaining outstanding reliability and affordability for our customers.

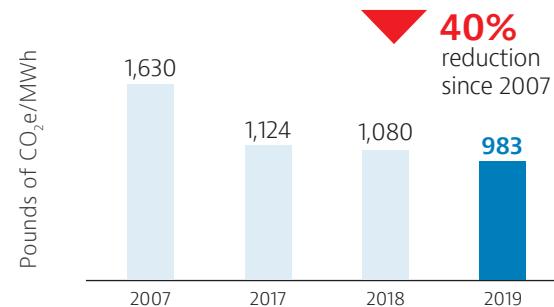
### TOTAL GHG EMISSIONS\*

(based on equity share)



### ELECTRICITY GHG INTENSITY

(based on equity share)



In 2019, we made substantial progress toward our 2030 emissions reduction goal by reducing GHG emissions by 44% from 2007 levels. This compares to the 35% reduction we reported in 2018. In 2019, we retired approximately 1,900 MWs of uneconomic coal-fired generation, sold our Florida assets, brought into service approximately 1,000 MWs of new solar generation and secured approval to procure over 2,000 additional MWs of solar.

Importantly, despite a slight increase in total GHG emissions from 2017 to 2018, our GHG intensity decreased in 2018. This means we generated more electricity in 2018 using lower-emitting resources. Our GHG intensity further decreased in 2019. Since 2007, we have reduced our GHG intensity by 40%.

### High reliability while still reducing emissions

A record-setting heat wave hit the U.S. in 2019 causing millions to seek air-conditioned relief and sending electricity demand soaring.

On Aug. 13, 2019, Southern Company loads hit their highest summer peak in eight years. As the extreme heat persisted, the system continued to book new highs throughout September, hitting three new all-time records for that month, all while delivering record reliability. **The fossil and hydro generation fleet achieved high reliability with peak-season EFOR (equivalent forced outage rate) performance of 0.95%.**

Amid some of the strongest summer loads Southern Company has seen, a diverse fuel mix enabled the system to reduce carbon emissions by more than a third at the summer 2019 peak compared to the strongest demand of 2007. **Increased amounts of generation from natural gas and renewables along with declines in coal generation are major contributors to this reduction.**

This performance marks an important milestone in our transition to net zero operations by 2050.

\* The GHG emission goals are calculated using the equity share approach presented in the World Resources Institute/World Business Council for Sustainable Development GHG Protocol for all of Southern Company's owned facilities. The GHG emissions included are Scope 1 direct facility emissions that are required to be tracked by EPA's Greenhouse Gas Reporting Program (GHGRP) and calculated using methods required by the GHGRP. Additional emissions sources for the gas distribution sector are also included consistent with EPA's GHG Inventory and ONE Future.

## Methane Emissions Reductions

**Southern Company Gas' fugitive methane emissions, inclusive of distribution and storage operations, as well as fugitive methane emissions from equity ownership interstate pipelines, represent less than 1% of Southern Company's Scope 1 GHG emissions.**

Methane emissions from the local natural gas distribution sector represent a small share of total U.S. GHG emissions.

The Southern Company Gas distribution system operates at almost 99.9% efficiency in its delivery of natural gas.

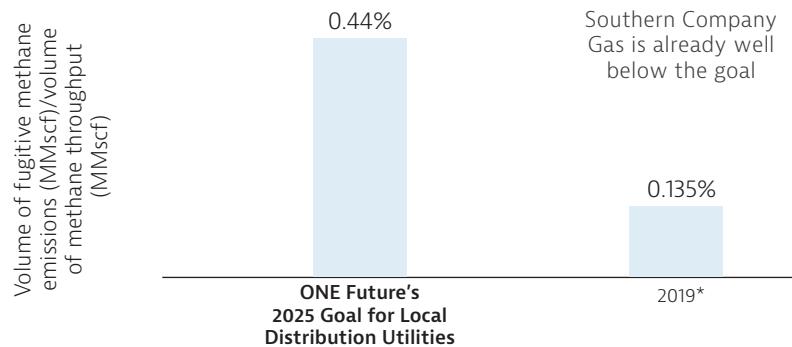
From 1998 to 2018, Southern Company Gas invested more than \$2.2 billion in pipeline and infrastructure replacements that have reduced fugitive methane emissions. During that same timeframe, Southern Company Gas replaced over 6,000 miles of pipe material that is more prone to fugitive emissions (e.g. unprotected steel and cast-iron pipe), resulting in mitigation of more than 3.3 million metric tons of CO<sub>2</sub> equivalent (CO<sub>2</sub>e). Southern Company Gas continues to invest in methane detection and reduction across its footprint.

Southern Company Gas has led the industry in fostering significant progress to voluntarily minimize fugitive methane emissions across the natural gas supply chain. As an example, Southern Company Gas was a founding member of Our Nation's Energy (ONE) Future. ONE Future established a goal of reducing fugitive methane emissions across the entire natural gas supply chain (from production through consumption) to 1% or less. As a part of ONE Future's overall fugitive methane reduction goal, it established a distribution sector goal for fugitive methane emissions from natural gas distribution operations of 0.44% intensity by 2025. **In 2019, Southern Company Gas' ONE Future fugitive emissions intensity rate was 0.135%, already well below the ONE Future goal.**

In October 2019, Virginia Natural Gas announced its plan to become the first natural gas utility in America to provide its customers with natural gas that is 100% sourced, transported and distributed by companies that have pledged to reduce GHG emissions to less than 1% across the natural gas value chain. VNG has already begun purchasing 20% of its customers' annual natural gas supply from select, low fugitive emission wells and aspires to purchase all of its gas from low fugitive emission sources by 2025.

### GAS DISTRIBUTION METHANE EMISSIONS INTENSITY RATE

(based on ONE Future methodologies)



\* For 2019, Southern Company Gas' total local distribution company methane emissions were approximately 1,043 million standard cubic feet (MMscf) and its natural gas throughput was 825,287 MMscf.

# A Portfolio Approach to the Continued Decarbonization of the Southern Company System

Since setting our decarbonization goals in 2018, we have continued to evaluate various pathways to achieve our goals and have engaged in the evolving dialogue regarding the global need to achieve net zero emissions by mid-century. We currently expect to achieve our interim 50% reduction goal well in advance of 2030 and have updated our 2050 goal to net zero GHG emissions.

In exploring decarbonization options for our electric generation fleet over the next three decades, we have developed pathways that could allow us to achieve 80% to 90% reduction. Based on our additional research and

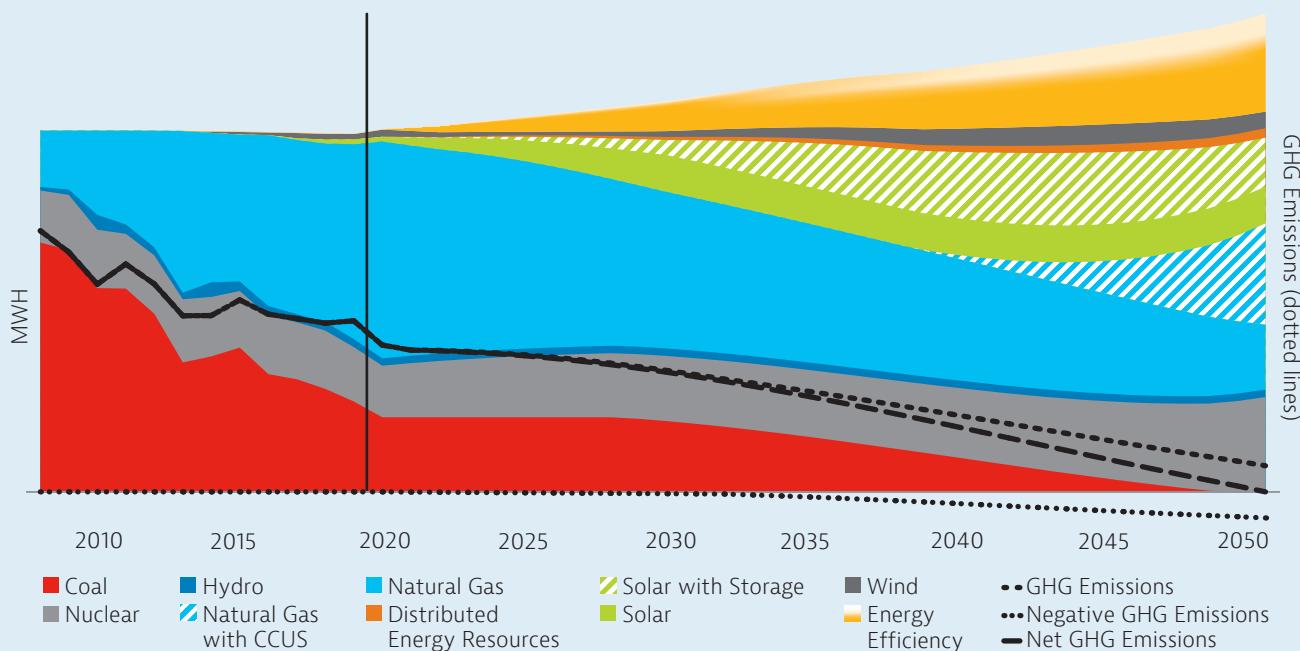
planning, shareholder and stakeholder dialogues, we believe our path to net zero by 2050 will be achieved through:

- ▶ Using natural gas to enable transition to lower emitting generating fleet
- ▶ Expanding zero-carbon resources, including renewables and nuclear
- ▶ Enhancing energy efficiency programs
- ▶ Including negative carbon strategies

To demonstrate a pathway to net zero, we have developed an illustrative example depicted below that exceeds our interim 2030 goal and allows us to

achieve net zero GHG emissions by 2050 with a specific suite of technologies, while adhering to our three-pillar approach. In this example, direct GHG emissions are reduced by 90%. Therefore, a suite of negative carbon solutions to annually remove an amount of existing CO<sub>2</sub> from the atmosphere, equivalent to 10% of our 2007 emissions, are a key part of this net zero pathway. The suite of CO<sub>2</sub> removal solutions is likely to include some combination of natural solutions such as afforestation and reforestation, technology solutions such as direct air capture and technology enhanced natural solutions such as biomass generation with CCUS or enhancement of ocean CO<sub>2</sub> uptake.

**ILLUSTRATIVE EXAMPLE OF THE GENERATION PORTFOLIO OVER TIME WITH REDUCTION IN GHG EMISSIONS AND A SUITE OF NEGATIVE CARBON SOLUTIONS TO REACH NET ZERO BY 2050\***



\* The illustrative example includes increased energy efficiency (including beneficial electrification) across the energy value chain. The extent of future increases in energy efficiency and increased electrification of other sectors is uncertain. However, in the event increased generation is required, we envision that it would be comprised of a resource mix of low- to no-carbon resources similar to those shown in the graphic.

This example is not a prescriptive plan but rather an illustration that contemplates what our electric generation mix could be, subject to approval of our regulators, given some key elements, including: an orderly transition of our existing fossil assets that considers the interests of our customers; R&D resulting in cost reductions in low-, no- and negative-carbon solutions; and constructive energy policy.

The nameplate capacities in 2050 that correspond to the illustrative pathway are also depicted below. Although the generation illustration depicts solar as a modest portion of the portfolio, solar actually represents a substantial component of the nameplate capacity mix. Because we are committed to providing customers with clean, safe, reliable and affordable energy 24/7, we anticipate incorporating storage in

order to capture and later deploy any momentary renewable generation in excess of customers energy demand. This interplay between energy mix, nameplate capacity mix, the dynamic nature of electrical demand and GHG emissions highlights the importance of cost-effective energy storage and dispatchable zero-emissions technology.

## Decarbonization Options

Southern Company supports the development of a comprehensive suite of decarbonization options that may include:

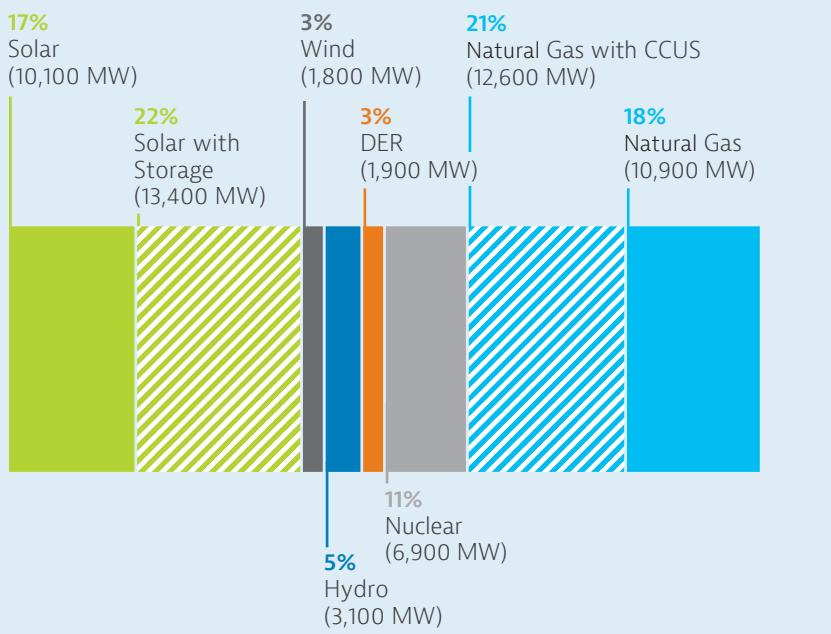
- ▶ Increasingly efficient electrification and efficient natural gas utilization
- ▶ Newly developed, highly efficient and broadly deployed electricity

and natural gas technologies including those for transportation, industrial processes and buildings

- ▶ Energy efficiency and demand side management advancements
- ▶ Solar, wind, energy storage, zero or carbon neutral energy carriers (e.g., hydrogen), renewable natural

- gas (e.g., landfill gas, biogas, etc.) and other carbon-free energy resources developed and operated in centralized and microgrid configurations
- ▶ Advanced nuclear power generation developed with superior safety benefits and polygeneration opportunities (i.e., the simultaneous production of electricity and useful chemicals)
- ▶ Fugitive methane detection and reduction technologies
- ▶ CCUS technologies allowing for carbon-free processes in the electricity and industrial sectors
- ▶ Resilient, fully integrated energy delivery grids allowing for the increased use of low- and zero-carbon energy sources
- ▶ Scalable technologies to remove carbon from the atmosphere
- ▶ Natural solutions including soil management practices, afforestation/reforestation, etc.
- ▶ Technology-enhanced natural solutions

**ILLUSTRATIVE 2050 NAMEPLATE CAPACITY MIX (ABOUT 60,700 MW)**



In addition to doing our part to efficiently transition our generating fleet, we are also engaging with our customers and other sectors to facilitate their GHG emission reduction efforts.

## ■ Important Role of Natural Gas in Reaching our Decarbonization Goals

Natural gas currently serves an important role in Southern Company's business, including reducing GHG emissions. Given its domestic abundance, affordability and relatively low GHG emissions profile, we continue to expect that natural gas will remain a fuel source in our 2050 operations.

The increased utilization of natural gas has played a pivotal role across our system and the U.S. economy in reducing GHG emissions for over a decade.

- ▶ With an emissions profile that is 50% less than coal, natural gas can enable decarbonization and the transition to net zero.
- ▶ The ability to shift electric generation from coal to natural gas fuel cost effectively, primarily in Southern Company's state-regulated electric operations, helped reduce our 2019 GHG emissions by approximately 44% since 2007.

- ▶ Natural gas serves as a critical and flexible resource that can balance our increasing portfolio of intermittent electric generation, such as solar and wind resources, balancing the need for reliable power generation to meet both winter and summer peaks.
- ▶ Natural gas is, and is likely to remain, the only affordable and efficient heating source for many of our customers in cold climates, such as Illinois.
- ▶ Existing pipeline infrastructure currently delivers a low-carbon resource, natural gas, to residential, commercial and industrial customers for end-use consumption, providing clean, safe, reliable and affordable energy across all seasons and geographies.

Through the utilization of natural gas and its associated infrastructure, these GHG emission reduction trends can continue well into the future

positioning Southern Company and the U.S. economy for continued decarbonization.

The Southern Company system continues to see winter peaks growing at a faster rate than summer peaks, thereby contributing to the shift in reliability risk to winter. In the Southeast, these winter peaks typically occur in the early morning hours around 7 or 8 a.m., before the sun has risen enough to enable solar generation to produce any substantial energy. Dispatchable generation such as natural gas, or yet to be developed cost-effective long duration storage, is imperative to affordably maintaining reliability with a high penetration of solar generation.





## Natural Gas for Electric Generation

In our state-regulated electric service territories, we work with our PSCs to ensure that we can continue to provide clean, safe, reliable and affordable electricity. As described in our 2018 report, we use a scenario planning process to inform resource planning decisions.

There are multiple options evaluated to meet any energy and reliability needs, which could include asset retirements, power purchase agreements (PPAs), the acquisition of existing generation assets or the construction of new generation units. By utilizing our scenario planning process and working through our regulators to make decisions in the best interest of our customers, we help to minimize risk in our investment decisions.

The scenario planning process has been instrumental in our decisions to economically retire coal units, add zero-carbon capacity in the form of renewables and nuclear and add more efficient natural gas capacity

to our portfolio. In employing this robust and analytical approach, GHG emissions have dropped by 44% since 2007, and electricity remains affordable and reliable in our service territories.

For more than 10 years, the Southern Company retail electric utilities have utilized a wide set of fuel and carbon price scenarios to inform resource planning decisions. We are developing an additional carbon price scenario to include in our planning process that starts at \$50/metric ton and escalates annually.

When adding natural gas fueled capacity, we are thoughtfully considering the future optionality of these resources in an increasingly carbon-constrained world. We seek to minimize the possibility of stranded asset risk as we make all new infrastructure recommendations and decisions.

For example, in a recent regulatory request for new generation, we recommended and received approval to add a diverse portfolio of lower emitting, reliable natural gas resources.

- ▶ We recently received approval to enter into a PPA with a term length of 19 years for the output of a natural gas-fueled combined cycle generation facility. We also received approval to purchase an existing natural gas-fueled combined cycle generation facility with an assumed remaining useful life of 23 years. Both of these could be replaced with lower carbon or zero-carbon generation that may be viable in the 2040 timeframe, consistent with our goal of net zero by 2050.

- ▶ In addition to these, we also received approval to construct a new combined cycle facility we expect to be among the most advanced combined cycle generating units in the world.
  - The new facility will have one of the lowest CO<sub>2</sub> emissions profiles of any combined cycle generation facility currently in operation and is a candidate for future innovations that could enhance its ability to adapt to a carbon-constrained

future. The turbine vendor is in the early stages of developing the capability for this specific class of turbines to be powered by a hydrogen fuel mix. Dependent on vendor success and system economics, a hydrogen fuel mix could be an option for the facility. Importantly, the combustion of hydrogen produces no CO<sub>2</sub> emissions.

- In addition, in 2015 a successful technical demonstration of the carbon sequestration

capabilities of the geology near the site of the new facility was completed. If at some point in the future carbon capture technologies become a technically feasible and economically viable option for a combined cycle facility, there is good reason to believe the surrounding area could accommodate carbon sequestration.

#### An introduction to the leveled cost of energy

While renewable and conventional technologies have both seen cost improvements in recent years, the capital cost of renewables has decreased more significantly than other generating resources. As a result, renewable resources have become more cost-competitive relative to conventional generation. For example, a recent analysis conducted by Lazard estimated a Levelized Cost of Energy (LCOE) for utility scale solar ranging from 3.2 to 4.4¢ per kilowatt hour (kWh) as compared to an estimated LCOE of 4.4 to 6.8¢/kWh for natural gas combined cycle.<sup>1</sup>

While this comparison correctly indicates a declining cost for renewable resources that merits consideration along with other options, resource decisions are not made solely on the basis of a screening level analysis methodology such as LCOE.<sup>2</sup> Rather, more detailed and rigorous methods including production cost modeling are required to identify and quantify the costs and benefits associated with competing technologies.

LCOE is a traditional **screening** tool for comparing the costs of **similar** generating technology options. LCOE comparisons are more simplistic assessments that do not capture important attributes such as energy value<sup>3</sup> and capacity value<sup>4</sup>, both of which can vary greatly within a particular system throughout a typical day or year.

LCOE will continue to be a useful metric and initial screening tool as part of a more comprehensive approach to the comparison of various generating technologies. However, for decision-making purposes, the performance characteristics of each technology must be evaluated, specifically including how the energy production of a given technology matches the value of energy in each hour of the year and the need for capacity and essential reliability services in each hour of the year. Using more detailed and rigorous analyses to assess such critical considerations, the Southern Company retail electric operating companies continue to work with their respective PSCs to understand all relevant costs and benefits so that generation decisions can be made in the best interest of the customer.

<sup>1</sup> Lazard's Levelized Cost of Energy Analysis - Version 13.0 - November 2019. It bears noting that assumptions such as cost of capital and life of asset (among other things) can have a significant impact on the resulting LCOE values. Lazard's assumption of a 20-year life for a combined cycle unit, for example, is inconsistent with the considerably longer actual life of a new combined cycle.

<sup>2</sup> LCOE is an economic assessment of the **average cost** of an **energy-generating system**, as determined by dividing the costs over its lifetime by its assumed energy output.

<sup>3</sup> Energy value refers to the monetary **benefit, net of incremental costs**, associated with the **amount of electricity** a generator produces during a **specific** period of time.

<sup>4</sup> Capacity value refers to the monetary **value** associated with the ability of an electric generator, based on the temporal electric output of the generator, to defer the need of adding incremental generation to maintain reliability.

## Natural Gas for Delivery, Distribution and End Use

Southern Company Gas has played a leadership role in the natural gas utility industry for decades with a focus on pipeline replacement and technology advancements that seek to minimize fugitive emissions from its system. When combining the attributes of an already modest and declining emissions profile with its relative affordability, natural gas is critical to the future of energy. Further, natural gas storage,

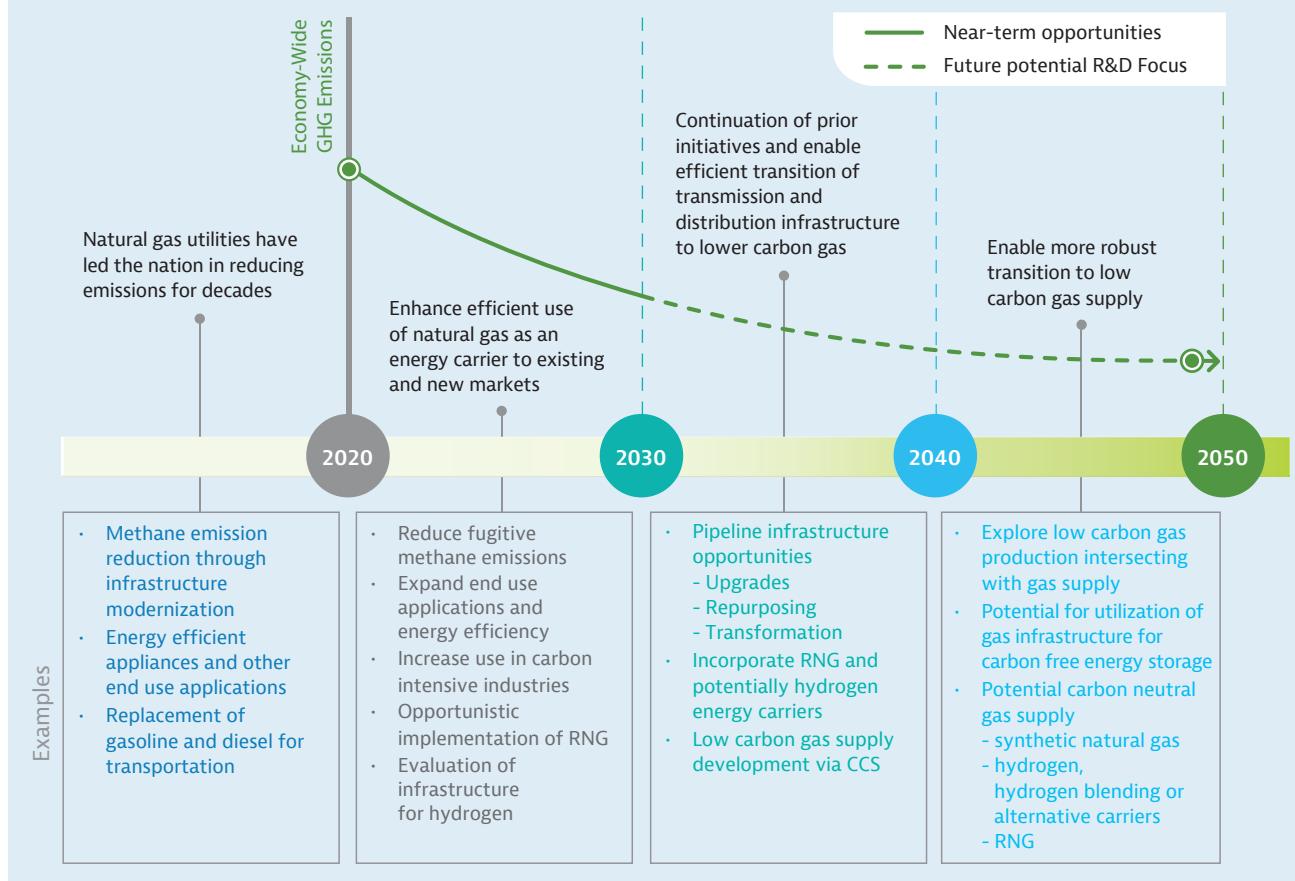
transmission and distribution systems provide energy system resiliency, energy security and independence from reliance on foreign supply.

We see an ongoing role for efficient direct use of natural gas, and our subsidiaries support strong programs to help customers use gas more efficiently and effectively. In addition to reducing methane emissions, our natural gas businesses will be focused

on the following:

- ▶ Expanding already robust energy efficiency programs and the deploying emerging natural gas direct use technologies.
- ▶ Pursuing renewable natural gas (RNG) opportunities that can capture, remove and reuse methane generated from other sources like agriculture and landfills.
- ▶ Promoting natural gas that is produced in a more sustainable way by upstream suppliers.

This graphic illustrates potential ways natural gas distribution companies can help facilitate an economy-wide net zero carbon future. The extent of the timing and application of each of these examples is uncertain, but we believe it is critical to invest in R&D and recognize the benefits of natural gas and the potential opportunities for natural gas infrastructure to support GHG emission reduction goals across the value chain and economy-wide.



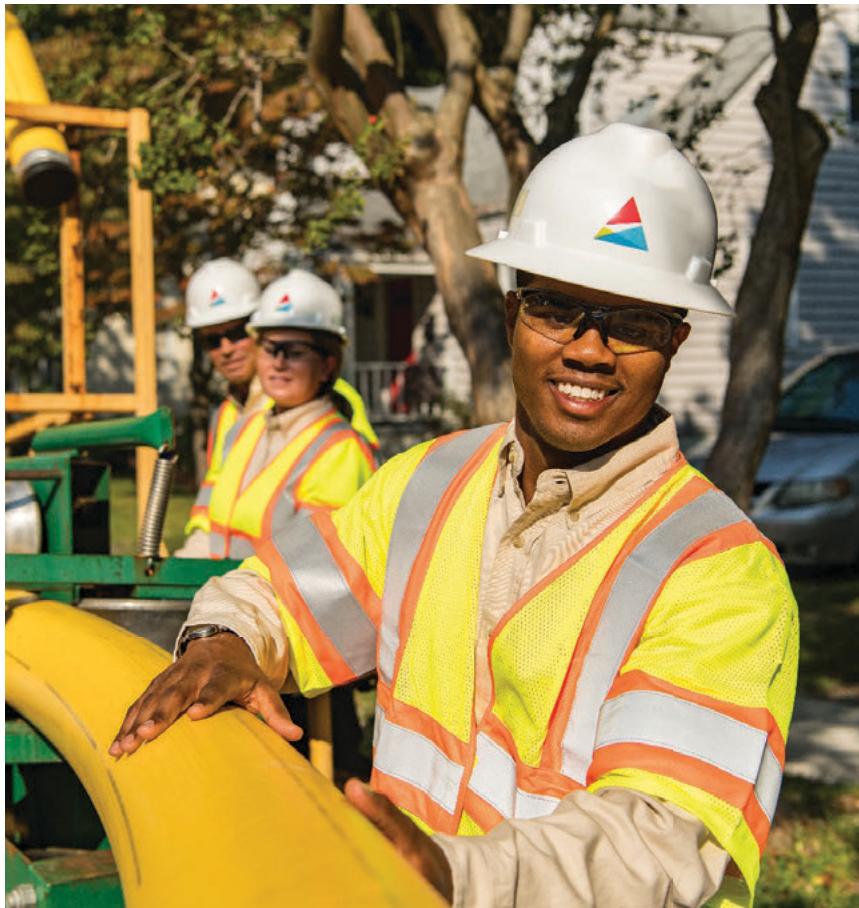
While there are calls by some to eliminate direct use of natural gas altogether, it is our view that such an approach would be an expensive, impractical way to address GHG reduction goals. In addition, there are some sectors and geographic areas that are not amenable to eliminating direct use of natural gas, and there are other key factors to consider.

For example:

- ▶ The industrial sector relies heavily on natural gas for its energy consumption. This sector, along with others like maritime, is difficult to decarbonize.

- ▶ The space heating need of a home or business in a cold climate may be several times the need in a milder climate, and alternatives to natural gas such as heat pumps or electric resistance heat currently lack the capability to cost-effectively operate and heat homes in those cold temperatures.
- ▶ Similar to trends across the country, the states in which Southern Company Gas operates continue to experience customer growth and support for expansion of and investment in our distribution system.

- ▶ Looking toward the future, there is the opportunity to use or repurpose the natural gas delivery infrastructure to carry natural gas blended with RNG, hydrogen or another energy carrier, thus continuing to decrease the carbon intensity of the fuel and utilizing pipelines to transport fuels like RNG that may not otherwise be able to be developed.



#### 2019 Polar Vortex

In late January 2019, the upper Midwest region, including our Nicor Gas service territory, experienced some of the coldest temperatures on record. Jan. 30, 2019, had an average temperature for the day of around 16 degrees below zero, about 40 degrees colder than normal.

On that day, Nicor Gas delivered 4.88 BCF, which was the single largest volume of gas ever delivered in one day in Nicor Gas' history, while still providing natural gas safely and reliably to its 2.2 million customers with no curtailments. To put this in perspective, the delivered volume of gas was about 80% higher than average for that day.

Existing alternative energy options and technologies would not have been capable of meeting a heating demand of this magnitude. It is unlikely that even the most promising emerging technologies for energy resources of any type could effectively meet the heating needs of customers in these cold climates without the use of natural gas.

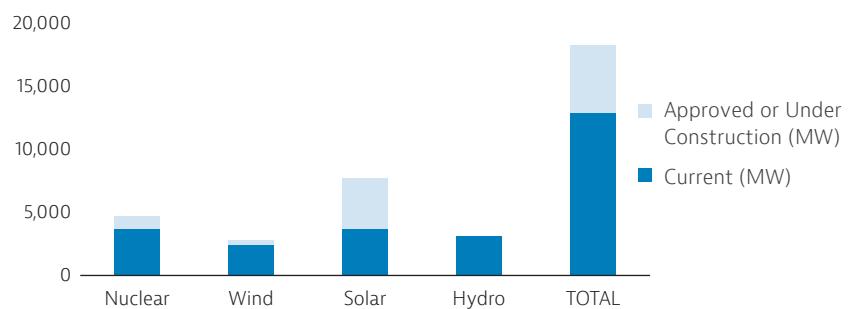


## ■ Zero-Carbon Resources

Our transition to net zero by 2050 will include the expansion of our fleet of zero-carbon resources, including nuclear, solar, wind, storage and hydroelectric facilities. New and emerging technologies are improving the cost profile of many zero-carbon resources. Southern Company and its operating companies will continue to evaluate the feasibility of adding carbon-free megawatts to our portfolio.

Across our state-regulated utilities and Southern Power, **we have over 18,000 megawatts of carbon-free resources currently operating, approved or under construction.**

### SOUTHERN'S CARBON-FREE RESOURCES\*



\* Includes owned capacity and PPAs. For nuclear, includes Alabama Power's Plant Farley units, Georgia Power's 50.1% ownership of Plant Hatch units and Georgia Power's 45.7% ownership of Plant Vogtle units.

## Nuclear

Emission-free nuclear energy increases America's fuel diversity using a low-cost, reliable, 24/7, abundant resource. In 2019, nuclear power supplied about 16% of the Southern Company system's electricity generation from three plants: Plant Vogtle Units 1 and 2 in Georgia, Plant Hatch in Georgia and Plant Farley in Alabama.

Georgia Power is currently working to complete construction of Plant Vogtle Units 3 and 4, which are expected to be in service by November 2021 and November 2022, respectively. Plant Vogtle Units 3 and 4 will be the first new nuclear units built in the United States in the last three decades.

- ▶ Safety: For more than 40 years, Southern Company has remained committed to the safe operation of its nuclear energy facilities with equipment and systems that meet rigorous Nuclear Regulatory Commission (NRC) safety and design regulations. U.S. nuclear facilities are the most heavily regulated in the world, and at our subsidiary Southern Nuclear, we work to meet or exceed federal standards.
- ▶ Environment: In 2019, Alabama Power's nuclear facilities generated more than 14 million MWh of zero-emitting generation, resulting in over 6 million metric tons of avoided carbon dioxide annually. In 2019, Georgia Power's nuclear facilities generated nearly

16 million MWh of zero-emitting generation, resulting in over 7 million metric tons of avoided carbon dioxide annually. Based on continued conversations with our stakeholders, we believe there is a growing acknowledgement that nuclear energy can play an important role in the transition to a net zero economy.

- ▶ Efficiency and Reliability: With a useful life of up to 80 years, nuclear facilities remain a cost-efficient investment for our customers. In addition, nuclear units run 24/7 with minimal outage time. These baseload units are important for system reliability and provide a solid foundation upon which to add intermittent resources such as wind and solar.
- ▶ R&D: In addition to our existing nuclear operating stations, our R&D team is leading efforts to develop fourth generation nuclear technologies which take advantage of innovative reactor designs, fuel technologies, material science and a Southern Company-led, NRC-approved streamlined licensing process for advanced reactors aimed at delivering cost-competitive, clean, emissions-free baseload energy.

## Renewables

Southern Company has made significant investments in its renewable portfolio for over a decade across our regulated electric utility subsidiaries and Southern Power.

## Regulated Subsidiary Renewables

In Georgia Power's most recent IRP approved in July 2019, it received approval to add 2,210 megawatts of renewable generation, which is expected to nearly double Georgia Power's level of renewable generation by the end of 2024. This is in addition to the 2,436 megawatts already in operation or contracted for by Georgia Power. Georgia Power also supports community solar projects and offers a range of solar programs to all customer classes.

Alabama Power was the first of our electric utilities to procure wind energy and currently has about 400 megawatts of wind capacity in addition to solar. Alabama Power is also working to implement renewable energy programs to provide solar energy to customers who want to drive development of new resources without requiring subsidies from other customers. Alabama Power's residents and businesses have the opportunity to purchase renewable energy credits. Since 2017, over 12 million kilowatt hours of clean energy have been used through these programs.

## Wholesale Energy Subsidiary Renewables

Southern Power is the primary wholesale energy subsidiary of Southern Company that owns and operates its renewable resources. Southern Power has been acquiring and developing renewable generating facilities for over a decade, with investments totaling more than \$11 billion.

Southern Power's renewable portfolio\* includes over 4,500 megawatts of wind and solar facilities located throughout the U.S., consisting of 28 solar and 13 wind facilities. Southern Power also recently invested in more than 29 megawatts

of alternative clean technology projects utilizing both energy storage and fuel cell technology, and was selected in May 2020 to construct 160 megawatts of four-hour lithium-ion battery energy storage systems for Southern California Edison.

- \* Southern Power owns its renewable resources either wholly or in partnership with various third parties. Investments and megawatts are shown as 100% of the plant.

Southern Company's regulated electric utilities and Southern Power are increasingly including battery storage in their portfolios. Currently we have 440 megawatts of battery storage projects approved or in development across the U.S.

## Energy Efficiency

Our broad view of energy efficiency also includes improving the efficiency of utilization and lowering the GHG impact of energy utilization as a whole. Examples include the use of natural gas in place of oil or electrification of transportation. As an example, a typical internal combustion engine may only have an efficiency of 15 to 20%. Whereas, a vehicle powered by electricity generated from natural gas combined cycle generation will typically have an efficiency of approximately 50%, thereby resulting in improved overall energy efficiency and reduced GHG emissions.

Southern Company was a founding member of the Alliance for Transportation Electrification, a collaboration among utilities, original equipment manufacturers and others focused on advocating the acceleration of transportation electrification nationwide.

As zero-carbon technologies, RNG and alternative energy carriers are implemented and developed, the GHG reduction benefits will further increase. Energy efficiency actions such as replacing oil with natural gas or electrification result in lower total energy consumption, lower GHG emissions and provide benefits for consumers and business alike.

PowerSecure, a Southern Company subsidiary, is helping customers improve their energy efficiency. As a proven provider of multi-measure energy efficiency projects, PowerSecure has engineered, installed and commissioned more than \$800 million in energy efficiency projects for customers.

The Southern Company system's gas and electric energy efficiency and demand response programs help reduce the volume of natural gas consumed as well as the amount of electric generation that would otherwise be needed.

Southern Company's regulated electric utility subsidiaries have invested approximately \$1.2 billion in energy efficiency and demand response since 2007. These demand-side measures have the ability to reduce peak demands by over 5,600 MW. The Southern Company system has long been one of the industry leaders in demand response, with the ability to reduce peak electrical demand by 8% of our peak loads which has resulted in the Company avoiding the construction of over 2,500 MWs of generation capacity since 2007.

Southern Company Gas' energy efficiency programs have piloted and installed numerous technologies that help our customers use gas more efficiently. For example, since 2011, Nicor Gas, a subsidiary of Southern Company Gas, has a goal of annual savings of more than 16 million therms and a corresponding reduction of more than 840,000 metric tons of customers' CO<sub>2</sub> emissions. Between 2011 and 2021, Nicor Gas expects to invest more than \$375 million in energy efficiency for natural gas customers. In addition, the Nicor Gas Energy Efficiency Program is expected to result in a cumulative \$1.2 billion in new economic impact (direct, indirect and induced spending) through 2021 and is forecasted to support 8,700 jobs through 2021.

### Other Customer Programs

In October 2019, Southern Company Gas subsidiary Georgia Natural Gas introduced a service offering to its customers called Greener Life™, through which Georgia Natural Gas purchase and retires carbon offsets on behalf of participants to completely offset the GHGs released by their natural gas use.

## Negative Carbon Concepts

Meeting or exceeding net zero GHG emissions by mid-century will require additional measures including: accelerating additional zero-carbon resources such as hydrogen and advanced nuclear, additional renewables and dispatchable energy from energy storage technologies, plus CO<sub>2</sub> removal solutions to counterbalance any remaining GHG emissions.

We plan to incorporate negative carbon strategies into our three pillar approach to reducing carbon emissions. For example, a diverse portfolio should not only include operating and energy efficiency resources. It should encompass established and emerging tools that might

assist the U.S. economy transition to net zero carbon emissions. Transportation decarbonization is a worthwhile example.

We will begin to assess the efficacy of removing carbon through natural systems, with a primary focus on natural spaces in our local communities. We will also focus on technologies and technology-enhanced natural solutions for CO<sub>2</sub> removal.

Conserving natural resources is important to Southern Company, which is why we have managed land for natural water filtration, flood buffering, soil health, biodiversity and climate resilience benefits for many years. Paired with our other

carbon-reducing efforts, natural climate sequestration can serve as a sink to reduce atmospheric CO<sub>2</sub> concentrations. Southern Company is evaluating deploying natural carbon sequestration solutions to meet a net zero carbon future including: afforestation, avoided deforestation and land management practices.

Finally, we will continue to constructively engage in policy development to ensure appropriate protocols are in place for quantification of GHG removal and storage. Another policy focus is crediting all GHG emission mitigation solutions, which is vital to any potential emission reduction programs.



# Industry-Leading R&D that Enables Decarbonization

Southern Company remains committed to finding technology solutions for a carbon-constrained future. As an industry leader in R&D for over 50 years, Southern Company is well-positioned to facilitate the transition to a net zero future.

The commitment to a net zero future will demand the development of transformational technology solutions and their integration throughout our business. Our focus is to deliver technologies that eliminate carbon emissions while also increasing customer value and providing affordable energy.

In 2015, Southern Company was a founding member of Energy Impact Partners (EIP), a utility-backed venture capital fund dedicated to accelerating the transition to a clean energy future. EIP invests in early-stage companies (a.k.a. "startups") developing technology or business model innovations that are impactful to the energy and utilities industries, and often this innovation directly relates to decarbonization opportunities. To date, EIP has invested about \$500 million in 34 companies across the energy value chain, resulting in an estimated reduction in GHG emissions of about 772,360 tons per year, 23 million gallons of gasoline, and 1.1 million MWh of electricity. In 2020, Southern Company committed an additional \$50 million for deployment in a second round of EIP funding.



The Southern Company R&D team has a record of developing technology solutions that have successfully improved our business. We achieved these innovations while leveraging partners like the Electric Power Research Institute (EPRI) and U.S. Department of Energy (DOE), thereby magnifying the value of the company's R&D investment for our customers many times over. Over the past decade, Southern Company's R&D investment has returned benefits approaching \$5 billion.

The illustrative pathway outlined earlier in this document highlights the need for low- or no-carbon, cost-effective, versatile generation technologies, which can integrate well with significant non-dispatchable renewable resources. Southern Company R&D has identified critical technology pathways necessary to achieve this outcome and is further refining its strategy for a net zero future to focus on delivering an affordable, reliable net zero energy system and optimizing energy delivery systems to support sector transformation.

## ■ Deliver an Affordable, Reliable, Net Zero Energy System

### Carbon Capture, Utilization and Storage

Our efforts in CCUS through the National Carbon Capture Center highlighted in our 2018 report have expanded to include a greater focus on decarbonizing natural gas-based generation. The center's testing of more than 60 technologies has already reduced the projected cost of carbon capture by one-third, and a major addition to broaden the facility's testing of carbon capture technologies for natural gas power plants is expected to deliver further reductions.

Under its expanded scope, the National Carbon Capture Center is also evaluating utilization technologies, which offer promising ways to transform CO<sub>2</sub> into value-added products – partially offsetting CO<sub>2</sub> capture costs from power generation and providing an alternative to conventional manufacturing processes.

Furthermore, our world-class geologic sequestration research program continues to develop options to support the commercial deployment of CO<sub>2</sub> capture across our service territory. The program has demonstrated the ability to safely store large volumes of anthropogenic CO<sub>2</sub> in EPA-permitted wells.

### Carbon Dioxide Removal

We are also focusing on technologies and technology-enhanced natural solutions for CO<sub>2</sub> removal. The National Carbon Capture Center's mission is further evolving to include direct air capture technologies, which could provide complete flexibility in the location of value-driven atmospheric carbon capture. We are actively scouting technological advancements in direct air capture (DAC) and exploring pilot projects in collaboration with the DOE, universities and DAC technology developers. We are also looking at bioenergy with CCUS.

### Next-Generation Renewable Energy

With the rapid drop in the cost of solar and wind, renewable energy has led in nameplate capacity additions over all other forms of electricity generation. While this trajectory is expected to continue, the uncertainty and variability of current renewable technology will limit the amount of renewable generation the grid can effectively integrate. To address these challenges, our research is working to create a more dispatchable, flexible renewable resource, while improving the performance of renewable technology and continuing to drive down cost.

For example, Southern Company, in partnership with Keystone Tower Systems, has been awarded a DOE grant to construct and demonstrate advanced "tall tower" wind generation – a technology that has the potential to open the Southeast for competitively priced wind development. Other research includes developing probabilistic forecasts for fleet operations to reduce risk and operating costs from photovoltaic (PV) solar, as well as testing and evaluating renewables coupled with energy storage. Our R&D team will continue to push the boundaries of technology to provide and integrate the next generation of renewable resources while maintaining grid stability and reliability.

### Advanced Nuclear Technology

Southern Company R&D is playing an industry-leading role in the development and demonstration of



fourth generation nuclear technology. These designs offer a wide variety of benefits including:

- ▶ Inherent safety – accident scenarios can be managed without operator or outside intervention.
- ▶ Expanded options for spent fuel disposition or utilization – storage requirements are reduced through higher fuel utilization and lower radiotoxicity, and existing spent fuel can be utilized as a fuel source.
- ▶ Multiple product options – through production of high-temperature heat, these designs can support industrial processes and the production of hydrogen or other feedstock chemicals.
- ▶ Transformational economics – safety and higher-efficiency operation provide drastic reductions in capital and operating costs, with the goal of matching or exceeding natural gas combined-cycle cost and performance.

Our R&D team is collaborating with TerraPower on the molten chloride fast reactor, a specific advanced nuclear technology, with the goal of realizing these benefits. Additionally, we anticipate this design to offer load-following capability equal to natural gas combined-cycle technology – making it extremely valuable in a future energy system with high renewable penetration.

Through collaboration with DOE and in close coordination with the Nuclear Regulatory Commission, we are working to modernize the licensing framework for advanced reactor technologies. This new risk-informed, performance-based approach is intended to assure the gold standard of safety going forward for our reactor fleet, while working to ensure the cost and performance benefits of these new designs are fully realized.

## Alternative Energy Carriers

### Renewable Natural Gas

Southern Company Gas is exploring the potential to produce and integrate additional RNG into its system, including pipeline-compatible gaseous fuel derived from biogenic or other renewable sources that have a lower lifecycle CO<sub>2</sub>e emissions than geological natural gas. RNG produced from existing waste streams, such as animal waste, wastewater treatment plants, landfills, food waste and a variety of renewable and sustainable sources (e.g., woody biomass waste, crop residuals and energy crops) and integrated into the natural gas supply chain can reduce sector-wide GHG emissions.

Capturing and finding beneficial uses for these waste streams not only harnesses their energy potential while displacing geologic natural gas, it has the benefit of decarbonizing other sectors, such as the agriculture sector, through avoided emissions.

### Power-to-Gas

Power-to-gas technology can use renewable electricity to create RNG that can be transported in existing natural gas pipelines. These technologies can work in concert with renewable electricity (i.e., solar and wind) to provide energy storage, transportation and utilization solutions.

### Hydrogen

Our more detailed analysis of the requirements to achieve net zero emissions has highlighted the challenge for certain industries where high-temperature process heating, long-haul and heavy-duty transportation and chemical feedstock requirements are difficult

to decarbonize. Additionally, our industry has enjoyed the benefits of low-cost, long-term energy storage associated with our hydrocarbon fuel supply. As we progress toward net zero carbon emissions, alternative, low-carbon energy carriers that can support these needs are essential.

Of special interest is the use of hydrogen, or its derivatives, as a low-carbon energy carrier. Hydrogen is a storable gas with high energy density and zero CO<sub>2</sub> emissions at the point of use, which makes it useful in this area. Blue and green hydrogen can be produced in a variety of low- or no-carbon methods including steam methane reforming with CCUS, electrolysis from renewable or nuclear energy or even thermochemical water splitting from high-temperature heat.

Energy companies like Southern Company are uniquely positioned to develop the technology and infrastructure needed to produce and distribute hydrogen, thus providing decarbonization benefits across the economy. To advance the hydrogen solution, Southern Company is actively engaging domestically and internationally in a portfolio of R&D projects focused on hydrogen production, utilization and distribution.

### Partnerships

In 2019, Southern Company Gas, in partnership with EPRI, began an investigational project into the usage of existing metering and regulation stations relative to blended natural gas and hydrogen service.

In addition, Southern Company is one of the anchor sponsors that have committed financial support to the Low-Carbon Resources Initiative (LCRI), a research and development collaboration between EPRI and the Gas Technology Institute. The LCRI is a worldwide collaborative

looking at hydrogen technologies and applications, along with other low-carbon carriers. Over the next five years, the LCRI will focus on developing pathways to advance

low-carbon technologies for large-scale deployment, including hydrogen and related, low-carbon resources. The goal of the initiative is to enable a risk-informed understanding

of options and technologies enabling significant, economy-wide decarbonization.

## Optimize Delivery Systems to Support Sector Transformation

Changing customer needs and the addition of new resources into the energy mix necessitate technology advances in the delivery of energy. Our continued efforts to make the grid smarter are being augmented by technologies that will improve resiliency as the demands on this critical infrastructure expand to include behind-the-meter and community-, commercial- and utility-scale intermittent resources, and to accommodate large transportation requirements. These resiliency measures will likely lead to increased investment in resources such as energy storage and microgrids, which are a focal point of our R&D strategy.

### Modernized and Resilient Grid

Modernizing the electricity grid remains a focus of our R&D activities. As we continue to expand the use of electricity to adjacent sectors such as transportation to support decarbonization, resiliency and reliability requirements will only be enhanced. R&D has worked closely with EPRI and peer utilities to develop a Grid Modernization Roadmap, which will support investment and technology development efforts along this path. R&D is also collaborating with national labs and universities on new technologies for a resilient and reliable grid in a net zero future. This future grid will accommodate renewable and DERs at a scale beyond how the traditional grid was originally designed.

### Energy Storage

The expanded use of renewable energy and its associated intermittency will require energy storage across a broad range of capacity and duration, i.e., hours, weeks, months or even seasons. Modeling by organizations including the National Renewable Energy Laboratory and EPRI highlight the exponential growth in the cost of integrating these renewable sources without low-cost energy storage. Our R&D activities are targeting integrated storage at affordable costs via emerging technologies such as:

- ▶ Advanced flow batteries – chemical energy storage that can offer longer service life with both power and energy separately scalable. R&D is exploring these and other electricity storage technologies with EPRI and others at the Energy Storage Research Center, while also supporting the deployment of large, grid-scale lithium-ion battery systems.
- ▶ Compressed and liquid air energy storage – larger energy storage options that can be integrated into existing generation technology such as gas turbines.
- ▶ Thermal energy storage – systems that offer economies of scale and a range of integration options, from traditional steam power cycles to electrical heating from curtailed intermittent resources. R&D is exploring techniques using low-cost, readily available materials such as concrete.

### Distributed Infrastructure

Customer-specific needs for resiliency, sustainability or a reduced carbon footprint have created opportunities for the deployment of distributed infrastructure. By understanding the role microgrids can play in supporting customer needs, we can optimize investment to minimize cost with no erosion of customer value.

R&D at Southern Company has supported the development of leading-edge microgrid technology at our Smart Neighborhood in Birmingham, Alabama, where research is exploring the capabilities of a community-scale microgrid in providing primary services, seamless and automatic islanding, PV smoothing, transactive controls, grid protection schemes and more. In Atlanta, we are developing an urban microgrid test bed with Georgia Tech to evaluate how diverse DERs can effectively integrate into and operate as part of the electrical grid.

This demonstration features multiple DERs, including an energy storage system, fuel cell and diesel and natural gas generators.

# Our Core Business Model Emphasizes a Just Transition



Southern Company has, in the best interest of customers, retired or converted to natural gas 73% of its coal units since 2010, and we expect to continue reducing coal capacity as market forces enable replacement with more economic low-carbon and zero-carbon resources. It has always been an imperative for Southern Company to prioritize the well-being of our employees, customers and communities. During a time of transition and transformation, the importance of this philosophy is magnified.

As our generating fleet transitions, the Southern Company system is committed to a just transition of our workforce. Continued education for our employees is supported by Southern Company through on-the-job training and tuition reimbursement. We have robust training programs utilizing internal and external parties to enhance both technical expertise and professional development. Our employees have participated in 5 million hours of training during the last 3 years. During those 3 years, we have invested more than \$10 million in

## Our Goals



### Employees

- ▶ Reassign in similar role, retrain for new roles, relocate as necessary



### Communities

- ▶ Redevelop sites and attract new businesses



### Customers

- ▶ Continue to provide clean, safe, reliable and affordable energy

tuition reimbursement allowing our employees to pursue additional education in a direction of their choosing, including trade schools.

Another way that we accomplish a just transition is through our focus on economic development. Economic development is a core focus of our Company because it ensures the continued growth and improvement of the communities we serve. In fact, Alabama Power and Georgia Power have been repeatedly recognized as "Top U.S. Utilities for Economic Development" by *Site Selection Magazine*.

In 2018, our utilities partnered with state and community organizations to assist hundreds of companies, resulting in the creation or retention of nearly 23,000 jobs and \$7 billion

in capital investment. By focusing on economic development in our region as a whole and with a particular emphasis on communities that may be impacted by plant

closures, we are doing our part to strengthen employment and business opportunities that can serve to support our employees and communities as we decarbonize.



“

Southern Company has been a leader in minimizing impacts on labor. As it has retired coal-fired generation plants, Southern Company has offered comparable-quality jobs to every one of its IBEW members thus far. ”

**Lonnie Stephenson, IBEW International President**

One way that the Southern Company System typically applies just transition concepts is through transparency with employees and communities when we are either reducing maintenance and spending on a generation facility or when we are not committing to implement new environmental controls that have a mandatory future compliance requirement. A reduced spending announcement is not equivalent to making a decision to retire a given generation facility because spending could be increased again in the future or the unit could be brought offline until required environmental controls are installed. However, a reduced spending announcement is a clear sign that a generation facility is a likely candidate for future retirement.

In the past when such a determination was made:

- ▶ The decision was clearly communicated by management to all plant workers who may be impacted.
- ▶ Some employees voluntarily sought positions elsewhere in the company or in the local community.
- ▶ Employment at the impacted plant dwindled through attrition.
- ▶ We relocated remaining employees to nearby facilities and/or offered retraining opportunities upon plant closure, with a goal of comparable employment.
- ▶ Some employees elected early retirement offerings.

While we may not always be able to duplicate this example, thus far, 73% of the coal generation units we owned in 2007 have been retired or converted to natural gas with no instances of involuntary severances associated with the generation unit retirements or conversions.

# Governance and Oversight of Our Decarbonization Efforts



## ■ Board Oversight of Climate-Related Business Strategy, Operations, Risks and Opportunities

Southern Company's Board of Directors evaluates climate-related issues as an integral part of the Board's oversight of business strategy, operations and enterprise risk. Key to this responsibility is oversight of GHG emission reductions consistent with Southern Company's commitment to net zero by 2050.

The Board aims to be "climate competent" and has structured its governance processes to address the array of climate-related risks and opportunities to our business. Each of our Board committees is responsible for various components of strategy, operations, risks and opportunities.

- ▶ The **Operations, Environmental and Safety Committee** oversees strategy on climate-related and environmental and safety policy and planning issues, including business strategies designed to reduce carbon emissions, R&D strategy and programs and policies to protect the environment for employees, customers, contractors and the public. There is quarterly reporting on Plant Vogtle Units 3 and 4 construction progress and robust discussions around integrated resource planning, scenario planning and analysis and its underlying assumptions. The committee receives regular reports on operating units' safety

and environmental activities and engages in robust discussion about carbon emissions, carbon risks, net zero concepts, negative carbon technologies and strategic planning. Since April 2018, routine reports on progress in achieving our GHG emission reduction goals are provided and discussed.

- ▶ The **Nominating, Governance and Corporate Responsibility Committee** oversees and reports to the full Board on the composition and competencies of the Board and its corporate governance policies. The committee oversees the company's practices and positions to advance its

corporate citizenship, including environmental, sustainability and corporate social responsibility initiatives. The committee receives routine updates on Southern Company's ongoing shareholder engagement program and feedback received from shareholders on environmental, social and governance topics, including climate-related risks and disclosures.

- ▶ The **Compensation and Management Succession Committee** is responsible for reviewing and approving compensation plans and programs, including incentive compensation that is tied to environmental and social metrics.

- ▶ The **Audit Committee** oversees the company's financial reporting, audit process, internal controls and legal, regulatory and ethical compliance, which encompasses climate-related controls and compliance issues. In this role, the Audit Committee reviews and guides risk management policies that include climate-related risks.
- ▶ The **Finance Committee** reviews the financial strategy of and strategic deployment of capital by the company, which includes the company's net zero strategy and the associated use of capital to accomplish the GHG emission reduction goals. In this role, the Finance Committee reviews and guides annual budgets and

business plans and oversees major capital expenditures with respect to climate-related issues.

- ▶ The **Business Security and Resiliency Committee** reviews and evaluates cyber and physical risks posed to the system's facilities and operations, including risks posed by severe weather events and the system's ability to withstand, mitigate and recover from the effects of any such events. In this role, the committee oversees efforts to harden the grid and maintain safe and reliable delivery of energy to customers in multiple risk scenarios, including climate-related risks.

In addition, Board members directly engage with our largest investors and with key environmental stakeholders on climate-related topics. These engagements provide valuable insight into climate-related priorities and positions of our shareholders and stakeholders. The Board takes this input into consideration when evaluating strategic priorities.

#### How Southern Company and its Board Demonstrate Climate Competency

- ▶ Board oversight of climate strategy and the related risks and opportunities for our business in the transition of our system's fleet and energy distribution infrastructure
- ▶ Each Board committee considers climate-related issues within the scope of their responsibilities, and the Charter of the Operations, Environmental and Safety Committee includes a specific provision outlining its oversight of "business strategies designed to address the long-term reduction of carbon emissions and related risks and opportunities across the system"
- ▶ Board includes independent directors with skills, qualifications, attributes and experience in climate change, energy science, low- and no-carbon technologies, negative carbon technologies and energy policy, as well as experience in overseeing the transition to a lower-carbon fleet
- ▶ Regular education of all Board members on climate-related topics
- ▶ Integration of climate-related issues into strategic planning and risk oversight throughout the company
- ▶ Tying the CEO's long-term incentive compensation to achieving our carbon emission reduction goals
- ▶ Enhanced disclosures on climate-related issues consistent with TCFD guidelines

## ■ Alignment of Executive Compensation with our GHG Emission Reduction Goals

To demonstrate our commitment to GHG emissions reduction, a meaningful portion of the CEO's long-term incentive award (10% or up to \$2 million) is aligned with the 2030 and 2050 goals to support execution of our business strategy.

### GHG Compensation Metric is Responsive to Shareholder Feedback

After publishing our 2018 report, we heard significant positive feedback from investors on the GHG emission reduction goals for 2030 and 2050

along with the suggestion that the CEO's incentive compensation program be expanded to include metrics aligned with the goals.

In response to the shareholder feedback, the Compensation and Management Succession Committee, working collaboratively with the Operations, Environmental and Safety Committee, implemented a CEO compensation metric beginning in 2019 that is aligned with the goals. The metric supports the company's comprehensive decarbonization strategy, rewards the successful execution of key actions that

transition the portfolio and recognizes the role and responsibility of the CEO in successful execution across the enterprise.

### Description of GHG Compensation Metric

The Committees shared a desire to implement a measurable, **quantitative component** that is aligned with our 2030 goal of 50% reduction in GHG emissions, as well as a **qualitative component** that incentivizes behaviors to get us to our 2050 goal.

**Quantitative Metric:** Performance over the period from 2019 through 2021 is aligned with a trajectory to our 2030 goal of 50% GHG emission reduction as compared to 2007. The metric is calculated as the cumulative net MW change across the Southern Company system from retiring or ceasing routine commitment and dispatch of coal and gas-fired steam units and adding zero-carbon resources during the performance period from Jan. 1, 2019, through Dec. 31, 2021.

2019-2021 Net MW Change <sup>(i)</sup>	Payout % of Target	Estimated % Complete by 2021 of GHG Emission Reduction Goal for 2030
< 2,204 MW	0%	42% of 50% GHG emission reduction goal, equivalent to 84% achievement of 2030 goal
2,641 MW	50%	43% of 50% GHG emission reduction goal, equivalent to 86% achievement of 2030 goal
3,080 MW	100%	44% of 50% GHG emission reduction goal, equivalent to 88% achievement of 2030 goal
3,518 MW	150%	45% of 50% GHG emission reduction goal, equivalent to 90% achievement of 2030 goal

<sup>(i)</sup> Goal is expressed in net megawatt change. Not all megawatts have the same GHG emissions.

**Qualitative Metric:** The metric creates incentives to achieve our 2050 goal through a qualitative assessment by the Compensation and Management Succession Committee and the Board of the CEO's leadership in advancing the energy portfolio of the future. The payout modifier, which is applied to the payout determined under the quantitative metric, is up to 30%.

Southern Company is one of the first companies to implement a GHG reduction metric as part of an executive compensation program. We continue to engage with shareholders for feedback on the metric as we progress toward our 2030 and 2050 goals.

# Conclusion

Our strategy remains to maximize long-term value to shareholders through a customer, community and stakeholder-focused business model that produces sustainable levels of return on energy infrastructure. We continue to believe that we are well-positioned for the transition to a net zero future and the risks and opportunities that are a part of that transition. As we work to achieve our GHG emission reduction goals, we remain committed to our core principles of providing clean, safe, reliable and affordable energy for our customers.

## Additional Information

Additional resources are available on our website:

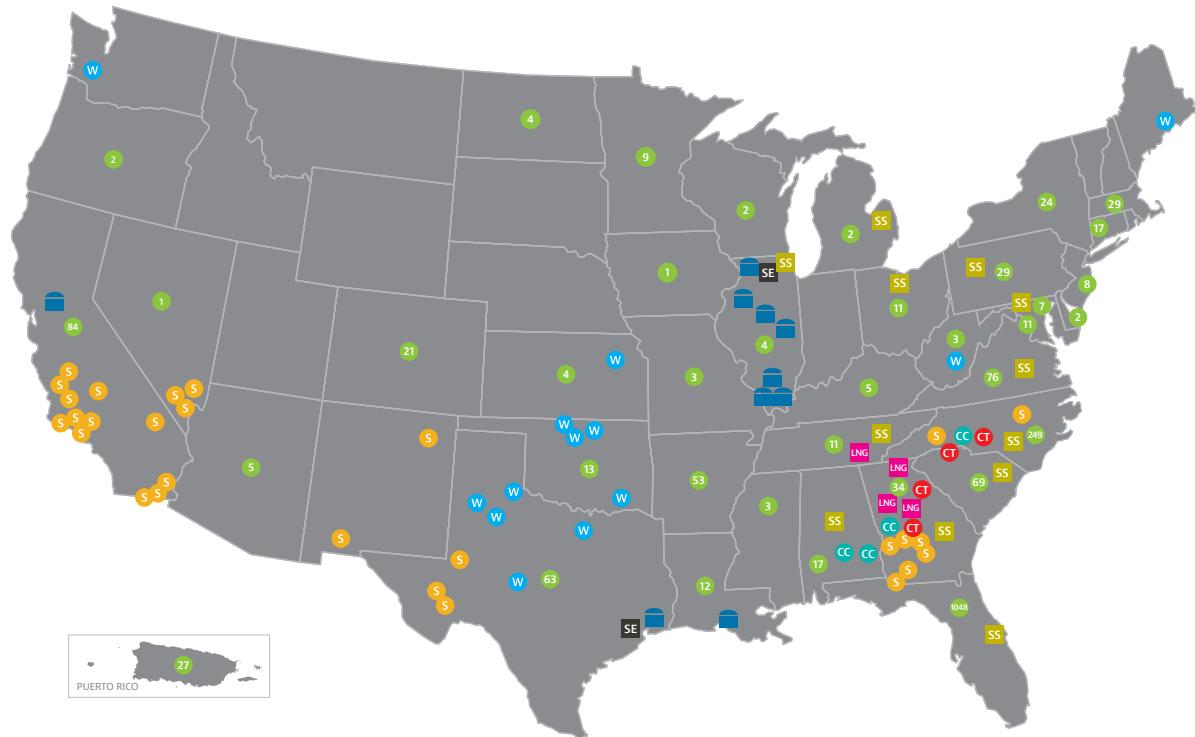
- ▶ Edison Electric Institute (EEI) / American Gas Association (AGA) ESG/Sustainability Reporting Template
- ▶ Corporate Responsibility Report
- ▶ CDP Climate Questionnaire
- ▶ ONE Future Annual Report
- ▶ Proxy Statement
- ▶ Annual Report



## Cautionary Statement Regarding Forward-Looking Information

Certain information contained in this report is forward-looking information based on current expectations and plans that involve risks and uncertainties. Forward-looking information includes, among other things, GHG reduction goals, including expected timing of achievement, costs related to carbon, expected renewable generation growth, unit retirement and replacement decisions, expected generation mix, impact and costs of energy efficiency initiatives and demand side management programs, capital expenditures, expected completion of Plant Vogtle Units 3 and 4, and ability to meet federal standards. Southern Company cautions that there are certain factors that can cause actual results to differ materially from the forward-looking information that has been provided. The reader is cautioned not to put undue reliance on this forward-looking information, which is not a guarantee of future performance and is subject to a number of uncertainties and other factors, many of which are outside the control of Southern Company; accordingly, there can be no assurance that such suggested results will be realized. The following factors, in addition to those discussed in Southern Company's Annual Report on Form 10-K for the year ended Dec. 31, 2019, Quarterly Report on Form 10-Q for the quarters ended March 31, 2020 and June 30, 2020, and subsequent securities filings, could cause actual results to differ materially from management expectations as suggested by such forward-looking information: the impact of recent and future federal and state regulatory changes; the potential effects of the continued novel coronavirus (COVID-19) pandemic; the extent and timing of costs and legal requirements related to coal combustion residuals; current and future litigation or regulatory investigations, proceedings, or inquiries; variations in demand for electricity and natural gas; available sources and costs of natural gas and other fuels; the ability to complete necessary or desirable pipeline expansion or infrastructure projects, limits on pipeline capacity, and operational interruptions to natural gas distribution and transmission activities; transmission constraints; the ability to control costs and avoid cost and schedule overruns during the development, construction, and operation of facilities or other projects, including Plant Vogtle Units 3 and 4, which include components based on new technology that only within the last few years began initial operation in the global nuclear industry at this scale, and including changes in labor costs, availability, and productivity; challenges with management of contractors or vendors; subcontractor performance; adverse weather conditions; shortages, delays, increased costs, or inconsistent quality of equipment, materials, and labor; contractor or supplier delay; delays due to judicial or regulatory action; nonperformance under construction, operating, or other agreements; operational readiness, including specialized operator training and required site safety programs; engineering or design problems; design and other licensing-based compliance matters, including, for nuclear units, the timely submittal by Southern Nuclear of the Inspections, Tests, Analyses, and Acceptance Criteria, standards established by the Nuclear Regulatory Commission, documentation for each unit and the related revises and approvals by the Nuclear Regulatory Commission necessary to support Nuclear Regulatory Commission authorization to load fuel; challenges with start-up activities, including major equipment failure or system integration, and/or operational performance; the ability to overcome or mitigate the current challenges at Plant Vogtle Units 3 and 4 including, but not limited to, those related to COVID-19; legal proceedings and regulatory approvals and actions related to construction projects, such as Plant Vogtle Units 3 and 4 and pipeline projects; under certain specified circumstances, a decision by holders of more than 10% of the ownership interests of Plant Vogtle Units 3 and 4 not to proceed with construction and the ability of other Vogtle owners to tender a portion of their ownership interests to Georgia Power following certain construction cost increases; in the event Georgia Power becomes obligated to provide funding to Municipal Electric Authority of Georgia (MEAG Power) with respect to the portion of MEAG Power's ownership interest in Plant Vogtle Units 3 and 4 involving Jacksonville Electric Authority, any inability of Georgia Power to receive repayment of such funding; the ability to construct facilities in accordance with the requirements of permits and licenses (including satisfaction of Nuclear Regulatory Commission requirements), to satisfy any environmental performance standards and the requirements of tax credits and other incentives, and to integrate facilities into the Southern Company system upon completion of construction; advances in technology; performance of counterparties under ongoing renewable energy partnerships and development agreements; state and federal rate regulations and the impact of pending and future rate cases and negotiations; the inherent risks involved in operating and constructing nuclear generating facilities; the inherent risks involved in transporting and storing natural gas; potential business strategies, including acquisitions or dispositions of assets or businesses, which cannot be assured to be completed or beneficial to Southern Company or its subsidiaries; the ability of counterparties of Southern Company and its subsidiaries to make payments as and when due and to perform as required; the direct or indirect effect on the Southern Company system's business resulting from cyber intrusion or physical attack and the threat of physical attacks; catastrophic events such as fires, earthquakes, explosions, floods, tornadoes, hurricanes and other storms, droughts, pandemic health events, or other similar occurrences; and the direct or indirect effects on the Southern Company system's business resulting from incidents affecting the U.S. electric grid, natural gas pipeline infrastructure, or operation of generating or storage resources. Southern Company expressly disclaims any obligation to update any forward-looking information.

# The Southern Company Footprint



## Southern Power

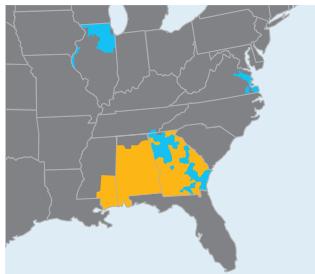
- CC Combined-cycle facility
- CT Peaking facility
- S Solar facility
- W Wind facility

## Southern Company Gas

- LNG LNG facilities
- SE Sequent Energy Management
- SS SouthStar
- N Natural gas storage

## PowerSecure

- # Owned and managed sites per state



## Service territories

- Electric
- Gas

## Gas pipelines

- Southern Natural Gas
- Southern Company Gas
- Pipeline projects