



Southern Company Net Zero Q&A Supplement

In September 2020, Southern Company¹ published a report, [Implementation and Action Toward Net Zero](#), outlining our goal of achieving net zero greenhouse gas (GHG) emissions by 2050 with an interim goal to achieve a 50 percent GHG emissions reduction by 2030 relative to 2007 levels. We regularly engage with investors and other stakeholders about potential decarbonization pathways, opportunities and challenges for our company.

In the years since our 2020 report, we have made significant progress toward reaching our interim goal, reducing our GHG emissions by 46 percent as of 2022. During the same period, energy industry fundamentals have changed significantly, including fuel price volatility, rapid demand growth in our service territories, supply chain dynamics and legislative incentives, among others.

As a result of these factors, and in response to investor feedback, we have initiated a process to evaluate our GHG reduction goals. In the interim, this supplement addresses several questions we discuss in our engagements with stakeholders: alignment of our GHG reduction goals with the Paris Agreement, renewable resource economic potential in our jurisdictions and the impact of cold temperatures on generating resources in the Southeastern U.S.

Q – Are Southern Company’s net zero goals consistent with the ambitions of the Paris Agreement?

In 2015, member nations to the United Nations Framework Convention on Climate Change ratified the Paris Agreement, laying out an international policy goal of limiting global average temperature increase to well below 2°C, and pursuing efforts to limit warming to 1.5°C. Nations and local governments have been working on policies to reduce GHG emissions to achieve these goals within their jurisdictions. Companies are working to understand what these goals and policies mean to their business, their low-carbon transition risks, and how to set company emissions targets in line with these international goals (Figure 1).

Figure 1. Relationship between international global climate goals and companies



To understand the relationship between a company’s GHG reduction targets and international global climate goals, EPRI, an independent non-profit energy research, development and deployment organization, has researched and evaluated approximately 3,300 global emissions pathways to date, primarily from the Intergovernmental Panel on Climate Change (IPCC) and International Energy Agency (IEA), including IEA’s Net Zero by 2050 pathway.^{2, 3, 4, 5, 6, 7, 8} This research has found broad ranges of global emissions pathways that are consistent with limiting warming to the global average temperature goals of the Paris Agreement.

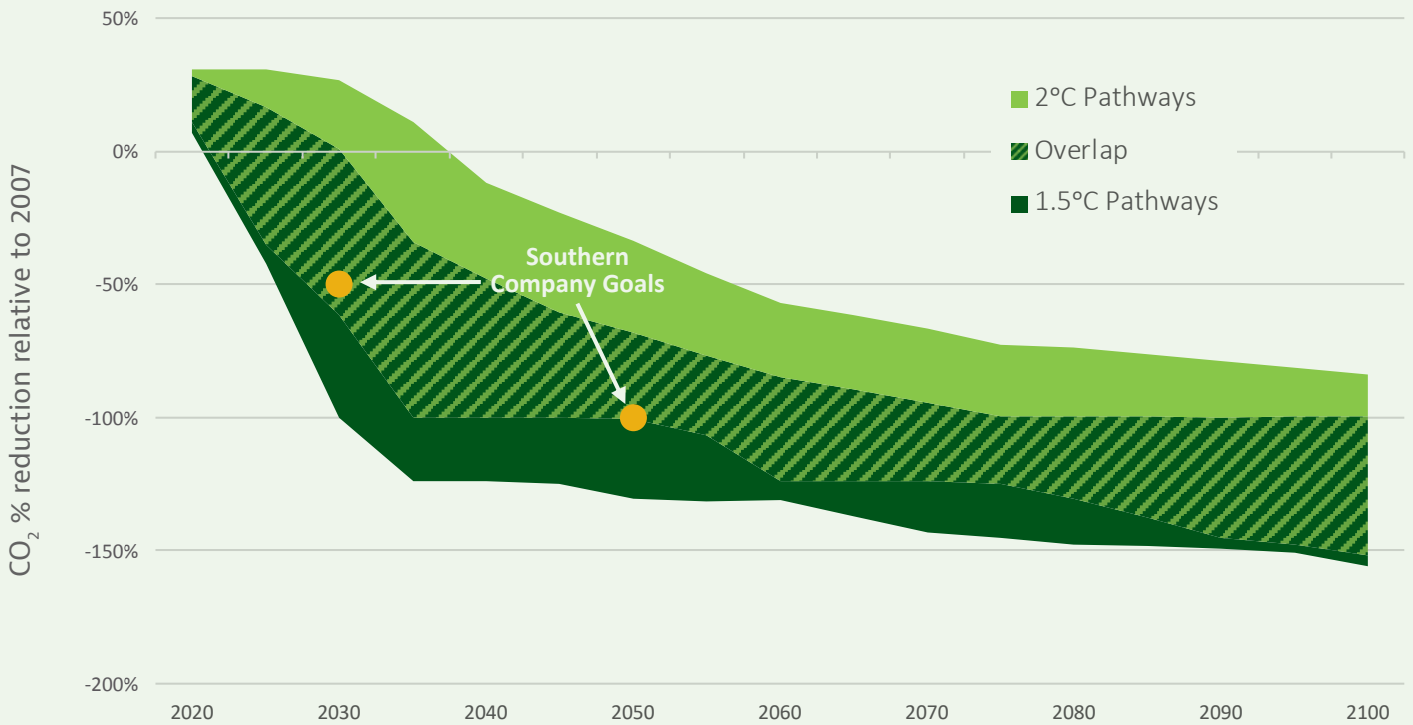


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As noted above, Southern Company’s GHG reduction goals include net zero GHG emissions by 2050 with an interim goal to achieve a 50 percent GHG emissions reduction by 2030 relative to 2007 levels. **When assessing the global emissions pathways consistent with achieving the goals of the Paris Agreement, EPRI’s analysis shows (Figure 2) that Southern Company’s GHG emission goals are consistent (aligned) with the international climate goals specified in the Paris Agreement.**

EPRI is a nonprofit, non-advocacy, scientific research organization with a public benefit mandate. EPRI strives to advance knowledge and facilitate informed public discussion and decision-making. EPRI has decades of recognized scientific expertise in climate scenarios, climate risks, energy and economic transformation, policy evaluation, and sustainability, including participation as scientific experts in the U.S. National Academies of Sciences, Engineering and Medicine, IPCC and Task Force on Climate-Related Financial Disclosures (TCFD) Scenario Guidance Advisory Group.

Figure 2. Comparison of Southern Company’s GHG reduction goals relative to global emissions pathways for limiting warming to 1.5°C and 2°C utilizing EPRI research



The darker green shaded area represents the range of global emissions reduction pathways consistent with limiting global average warming to 1.5°C, the lighter green shaded area represents the range of global emissions reduction pathways consistent with limiting global average warming to 2°C (excluding all pathways that reach the 1.5°C goal), and the hatched area represents the overlap in emissions reductions of the two ranges. Southern Company’s goals fall within the hatched area, demonstrating alignment with the global emissions reduction pathways that are consistent with limiting warming to the Paris Agreement goals.



Q – Why do some utilities have more solar and/or wind generation in their portfolios than others?

Opportunities for economically deploying low-carbon generating resources vary across regions of the U.S. due to a broad range of factors. A key factor is the relative difference in renewable resource potential, although other factors can also be important (e.g., state and local policies, existing generating resource mixes, etc.). Figures 3 and 4 illustrate the amount of sunlight available for solar generation and wind potential for wind turbine generation, respectively, across different regions.

Differences in resource potential have significant implications for the cost effectiveness of low- and non-emitting generation in each region. For example, the solar resource potential in Arizona is significantly greater than in Iowa, so we could expect that electricity generated from solar energy would be more cost effective in Arizona than it is in Iowa. Similarly, since there is greater wind resource potential in Iowa, we can expect that wind energy would be more cost effective in Iowa. For regions like the Southeast, where neither solar nor wind potential is as strong as other regions, cost effectiveness is likely to be less. These differences in cost effectiveness can have a significant impact on the decarbonization strategies of local energy providers, regulators and policymakers.

Q – Should some regions of the U.S. be expected to have different decarbonization pathways than others?

Because of the regional differences in low-carbon generation resource potential (e.g., the wind and solar resource potential discussed above), as well as other resource and policy factors, regions should be expected to have different decarbonization pathways for the electric sector as the U.S. transitions to net zero GHG emissions.

Figure 3. Solar Resource Potential⁹

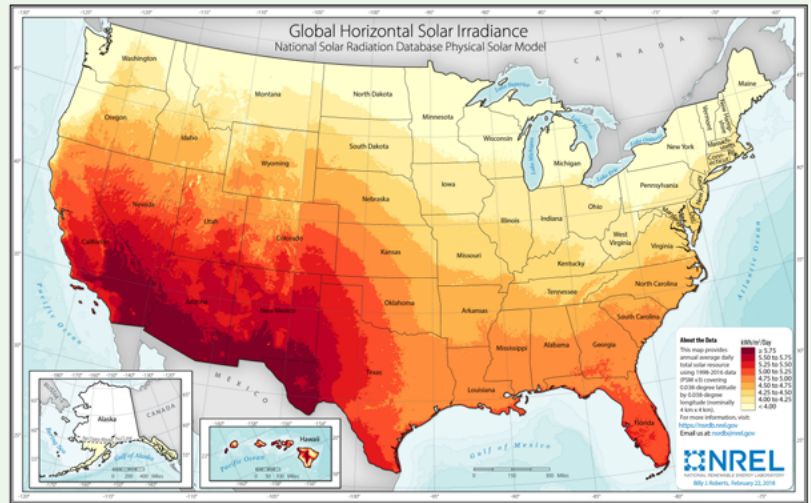
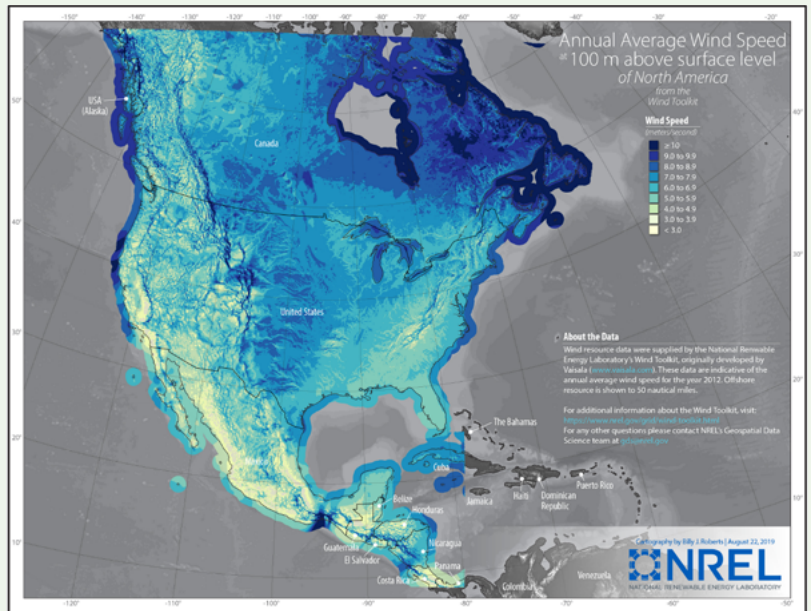


Figure 4. Wind Resource Potential¹⁰

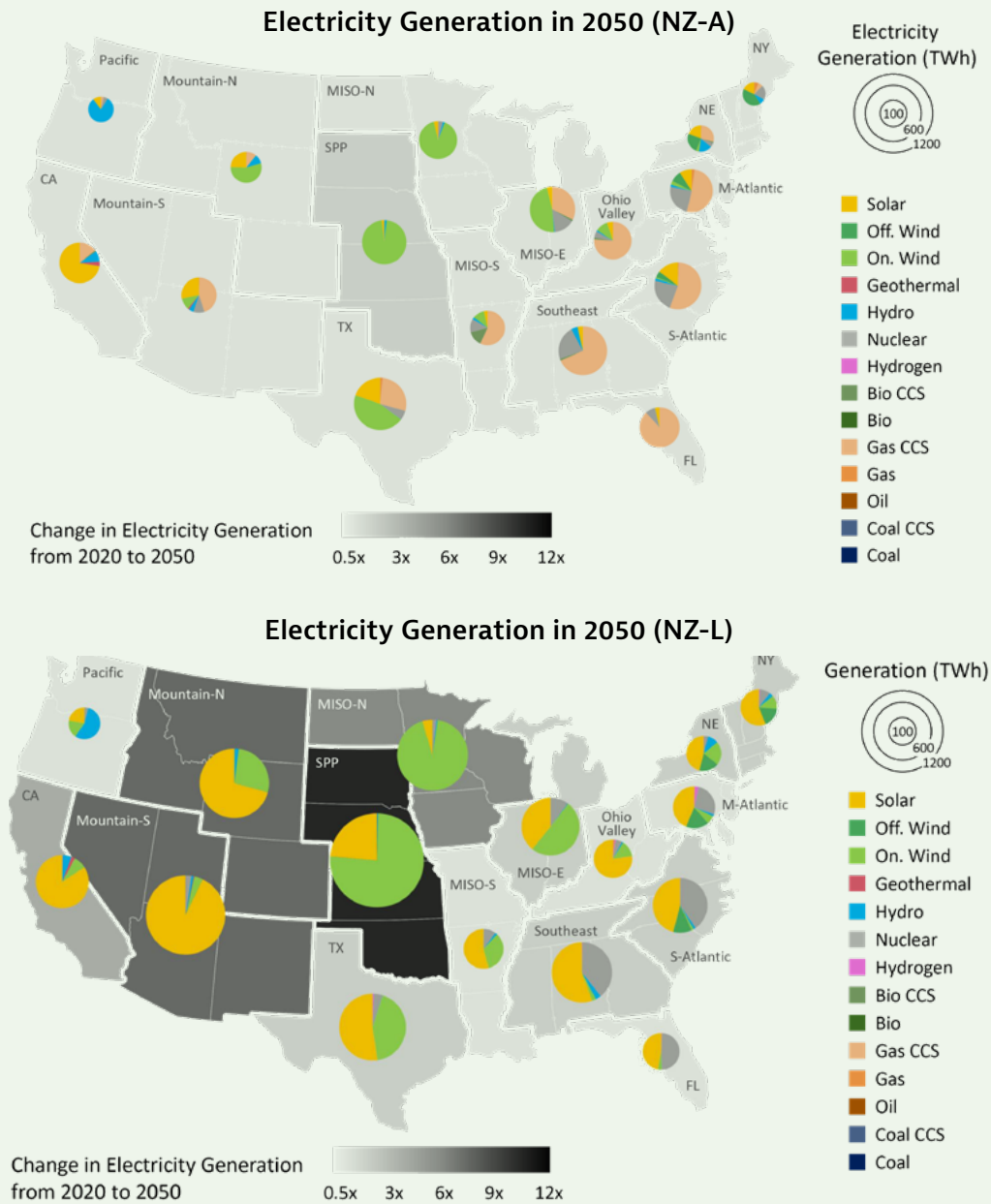




In 2023, EPRI performed an analysis of potential cost-effective pathways by region to achieve U.S. economy-wide net zero GHG emissions under different policy and resource availability conditions.² This analysis found significant differences across regions in the cost-effective approaches to production of electricity in a net zero economy (see Figure 5).

Figure 5. Regional Electricity Generation in 2050 – EPRI Analysis

The NZ-A (Net Zero – All Options) scenario assumes greater decarbonization flexibility with the availability of a broad range of decarbonization options, while the NZ-L (Net Zero – Limited Options) scenario assumes limited flexibility, with carbon capture and storage (CCS) unavailable and biomass feedstocks limited.





The EPRI analysis shows starkly different 2050 cost-effective generation mixes across regions of the country under two different economy-wide net zero by 2050 scenarios. For example:

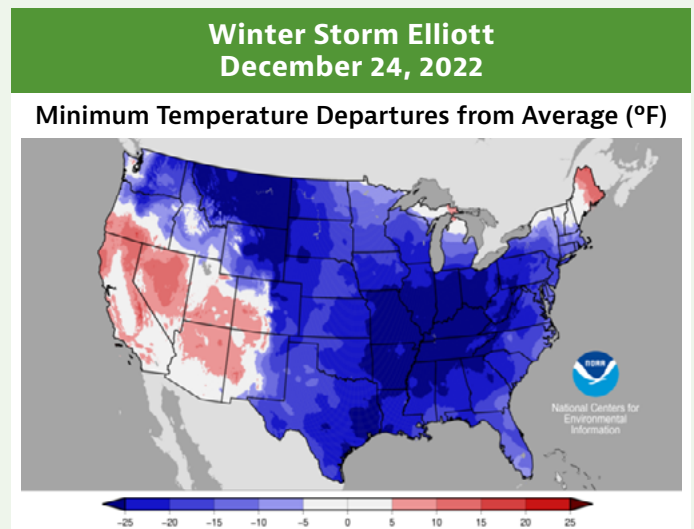
- ▶ In both scenarios shown, the Southwest Power Pool (SPP) region relies substantially more on wind than does the Southeast region.
- ▶ The 2050 Southeast generation mix is significantly impacted by the policy assumptions in each scenario, particularly the availability of decarbonization options.

The EPRI modeling allows for the export of low-carbon generation across regions. The cost of transmission across regions can be high, which can considerably increase the cost of importing renewable generation. In addition, permitting challenges (not included in the EPRI modeling) can affect the ability to build new inter-regional transmission.

Because the cost of low- and no-carbon technologies varies across regions, this analysis illustrates that different regions of the country should be expected to have different cost-effective decarbonization pathways for electricity in a net zero economy. Therefore, regionally different goals and goal timelines should be expected—and encouraged—to facilitate the net zero transition, helping to maintain energy affordability and reliability while promoting local economic growth, jobs and equity. Moreover, given the significant impact of the different policy assumptions in each scenario, this analysis illustrates the importance of continuing to engage constructively with national and local policymakers, as well as the need to continue to invest in low-carbon technologies to preserve and enhance energy-system resilience.

Q – How can cold weather impact generating resources in the Southeastern U.S.?

Weather is an important factor for the utility industry. Not only can it have significant impacts on energy demand, but it can also impact the performance of various forms of electricity generation. Extreme weather events, such as intense cold, heat waves, severe drought, persistent cloud cover, etc., can have varying impacts on different generation technologies. Extreme cold weather events are not a new phenomenon,¹¹ but several long-duration extreme cold events over the last decade, including the 2014 polar vortex event, Winter Storm Uri in 2021 and Winter Storm Elliott in 2022, have presented challenges to regional electric systems across the broader South and much of the Eastern Interconnection. These winter weather events have highlighted risks to the proper functioning of various types of electricity generating equipment, including both fossil-fueled and renewable generation, during extremely cold conditions.



Source: NOAA – nClimGrid-Daily



As highlighted in a recent North American Electric Reliability Corporation report,¹² some examples of operational challenges experienced by the electric utility industry in the face of extreme cold include:

- ▶ Disruption to the normal functioning of instrumentation and control devices and other plant infrastructure
- ▶ Coal and oil handling challenges due to temperature impacts
- ▶ Natural gas supply disruptions
- ▶ Blade icing and lubricant issues for wind turbines
- ▶ Snow cover for solar arrays

In addition to operational challenges that can result from extreme cold, renewable generating resources, such as solar and wind, are variable, and these resources are often not available to serve winter load peaks that frequently occur in the early morning hours. For example, during the Winter Storm Elliot event in December 2022, peak load for the ERCOT region occurred overnight, before solar resources had ramped to their full generating potential. In addition, as the event stretched on, wind output significantly decreased, increasing reliance on dispatchable thermal generating units.¹³

As the renewable fleet within Southern Company's footprint continues to grow, these risks and challenges must be factored into the planning and operation of the electric system to help ensure that we maintain clean, safe, reliable, and affordable electricity for the communities we serve.

Although uncommon, when such operational challenges occur, outage impacts can be significant and widespread. The utility industry continually reviews winter storm impacts to learn important information from each cold weather event. Southern Company's ability to deliver energy to customers when they need it most is underpinned by the vertically integrated model for our electric utilities that incorporates year-round extreme weather preparedness and a diverse generation and fuel mix. Our solid operational planning and execution, supported by constructive regulatory policy and measures, facilitates resilient operations.



While lessons learned from prior events can help guide us in bolstering the resilience of our system, we recognize that future weather events could be even more extreme. That is why we are actively engaged in efforts like EPRI's Climate Resilience and Adaptation Initiative (Climate READi™), which is designed to leverage decades of research by EPRI, U.S. Department of Energy and National Research Laboratories, academic institutions, and others to create a comprehensive, industry-accepted framework to guide electricity system adaptation and resilience decisions and investments.



- ¹ 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.
- ² Rose, S., forthcoming. Assessment of new global emissions scenarios for company low-carbon transition risk and target setting applications. EPRI, Palo Alto, CA. 3002028180.
- ³ Rose, S., and A. Molar-Cruz, 2023. Differences in Regional Decarbonization Opportunities, Uncertainties, and Risks. EPRI, Palo Alto, CA. 3002028181. [epri.com/research](https://www.epri.com/research).
- ⁴ Rose, S., 2022. Developing company emissions reduction targets based on science, and reflections on SBTi: Key insights [epri.com]. EPRI, Palo Alto, CA. 3002024248. [epri.com/research](https://www.epri.com/research)
- ⁵ Taber, J and S Rose, 2022. Opportunities for Decarbonizing Minnesota's Economy: Energy System Supply and Demand Assessment [epri.com]. EPRI, Palo Alto, CA. 3002019333. [epri.com/research](https://www.epri.com/research)
- ⁶ Rose, S., and M Scott, 2020. Review of 1.5°C and Other Newer Global Emissions Scenarios: Insights for Company and Financial Climate Low-Carbon Transition Risk Assessment and Greenhouse Gas Goal Setting. EPRI, Palo Alto, CA. 3002018053. [epri.com/research](https://www.epri.com/research)
- ⁷ Rose, S., and M Scott, 2018a. Grounding Decisions: A Scientific Foundation for Companies Considering Global Climate Scenarios and Greenhouse Gas Goals. EPRI, Palo Alto, CA. 3002014510. [epri.com/research](https://www.epri.com/research)
- ⁸ Rose, S., and M Scott, 2018b. A Technical Foundation for Company Climate Scenarios and Emissions Goals. EPRI, Palo Alto, CA. 3002014515. [epri.com/research](https://www.epri.com/research)
- ⁹ [nrel.gov/gis/solar](https://www.nrel.gov/gis/solar)
- ¹⁰ [nrel.gov/gis/wind](https://www.nrel.gov/gis/wind)
- ¹¹ The polar vortex event that impacted the Southern Company service territory in 2014 reached a minimum system-weighted temperature of 10°F. The coldest system-weighted temperature for the Southern Company territory occurred in 1985, reaching a minimum of -3°F.
- ¹² North American Electric Reliability Corporation. (2023). Inquiry into Bulk-Power System Operations During December 2022 Winter Storm Elliott. Federal Energy Regulatory Commission. [ferc.gov/news-events](https://www.ferc.gov/news-events)
- ¹³ Electric Reliability Council of Texas. (2023). December 2022 ERCOT Cold Weather Operations Report (PUBLIC): Winter Storm Elliott Public Report, Version 1.0. [ercot.com/files](https://www.ercot.com/files)

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. 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, 2022 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; 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 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.