

## Section 4. Analysis – Carbon Price Scenarios

### Background

As outlined in Section 3, throughout the 1990s, Southern Company was active in discussions on climate change policy. The company developed expertise on the issue and did occasional studies of the implications of various proposed climate change policies for the U.S. and for the company.

In the late 1990s, Southern Company began to add climate change policy scenarios to its ongoing analysis of regulatory and legislative scenarios for the control of SO<sub>2</sub>, NO<sub>x</sub>, and mercury. For the environmental compliance strategy development studies conducted in 2001-2003, the company included potential CO<sub>2</sub> price signals. The fact that price signals were included in planning studies does not indicate any specific views of the company as to the likelihood of specific climate change policies that might or might not be adopted in the future.

As part of Southern Company's process of developing an environmental compliance strategy during 2004,

the company conducted a more extensive analysis of the effects of CO<sub>2</sub> price signals that might come from various potential climate change policies.

This analysis was conducted by a cross-functional team that included representatives from the planning, governmental affairs, environmental strategy, and environmental assessment departments. Senior-level environmental officers oversaw the effort on an ongoing basis, and reviews were provided by senior management of the company and the Board of Directors. A two-day workshop was held with the Board of Directors for their review.

### External Involvement

The analysis began with interviews of some two dozen climate change policy experts – from think tanks, government, and academia. The discussions focused on the potential for various climate change policies, including market-based cap-and-trade systems, emissions taxes, and technology mandates. The experts described for the company a range of price signals that might result from potential policies to address climate change, including the possibility that there would be no policy that assigns a price signal to CO<sub>2</sub> emissions. The price signal scenarios are discussed below. The issues related to electricity generation technology are discussed in Section 5.

### Price Signal Scenarios

The analysis considered four possible scenarios, with each one represented by a set of prices for CO<sub>2</sub>. These prices were chosen to span the range the external experts considered to be plausible, including the possibility that there is no price on CO<sub>2</sub>. As stated above, they are not necessarily views held by the company as to the likelihood of climate change policies that may or may not be adopted in the future, but were merely used to represent a range of views to allow modeling.

Specifically, in one scenario, all prices were zero to reflect the view of some of the external experts that there will be no policy to limit or “price” CO<sub>2</sub> emissions. The remaining three sets assumed that, either through a market-based cap-and-trade program (like the acid rain program for SO<sub>2</sub>), or through an explicit tax, CO<sub>2</sub> emissions are assigned a price that is reflected as a cost in the production process.

### External Experts

Individuals with the following organizations met with Southern Company personnel.

- **EPRI** - EPRI's climate research considers the costs and benefits of mitigation policy alternatives and evaluates technology options for reducing greenhouse gas emissions.
- **MIT Joint Program** - The MIT Joint Program integrates both natural science and social science so that results can be especially relevant for policymakers.
- **Resources for the Future**. Resources for the Future is a research institute focused on environmental, energy, and natural resource topics. RFF research on climate change evaluates the social costs and benefits of policy options.
- **Federal policymakers**
- **Environmental advocacy organizations**

As illustrated in Figure 15, the analysis considered the following price signals (all stated in 2004 dollars and expressed as dollars per metric ton of carbon):<sup>9</sup>

- **No price signal.** This scenario does not put a price on CO<sub>2</sub> emissions.
- **Lower.** This price signal begins at \$5 per metric ton of carbon in 2015 and rises at 8% per year (above inflation).
- **Constant.** This price signal begins at \$22 per metric ton of carbon in 2013 (and rises at the rate of inflation).
- **Higher.** This price signal begins at \$30 per metric ton of carbon in 2010 and rises at 5% per year (above inflation).

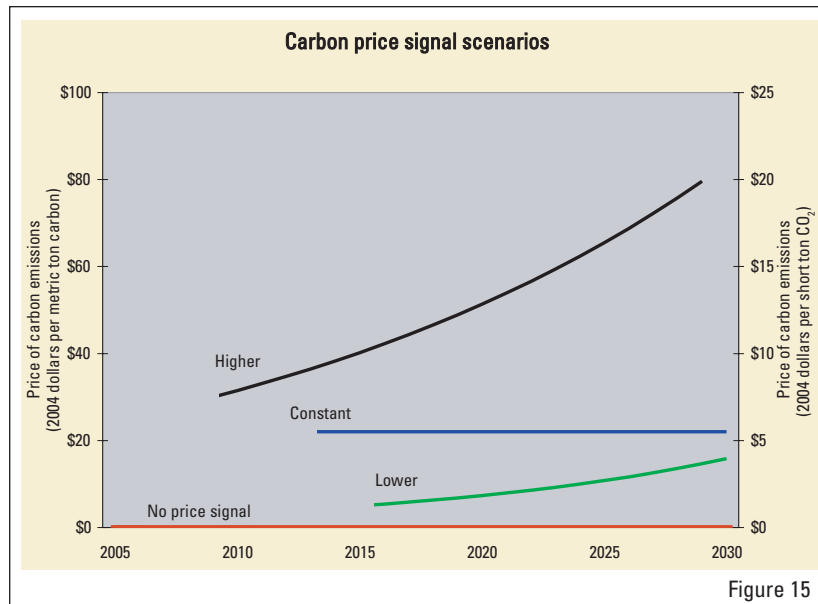


Figure 15

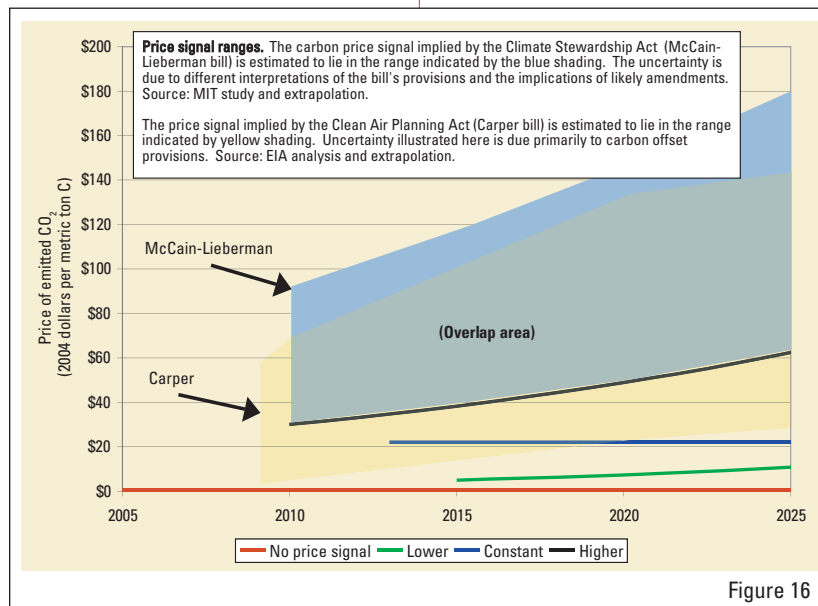


Figure 16

In this analysis, these prices for CO<sub>2</sub> emissions are imposed on all sectors of the U.S. economy that emit CO<sub>2</sub>, including transportation, industry, agriculture, and electricity generation. Faced with such a price signal, society directs efforts toward avoiding CO<sub>2</sub> emissions. These efforts entail higher costs for energy, as well as for products and services. These costs can be estimated by using computer models that capture how the many parts of the U.S. economy are interrelated and how they respond to the price signals.<sup>10</sup> The results from this cost analysis are discussed later.

These scenarios were compared with published estimates of the carbon prices that would result from certain recent legislative proposals which would mandate CO<sub>2</sub> emissions reductions. The proposals included the 108th Congress version of the Climate Stewardship Act of 2005, S.342, sponsored by Senators John McCain (R-AZ) and Joe Lieberman (D-CT). This bill would create a CO<sub>2</sub> cap-and-trade program covering about 80% of all U.S. emissions, including all electricity generation. There are many important aspects of the proposal that are unspecified, so there is a wide range of possible CO<sub>2</sub> price signals. A second proposal to which the company's price signal scenarios were compared – the Clean Air Planning Act, sponsored by Thomas Carper (D-DE) — was introduced in the 108th Congress as S. 843, but has not been reintroduced in the 109th

<sup>9</sup> Another common method of expressing a carbon price is in dollars per metric ton of CO<sub>2</sub>. Because the carbon in coal combines with oxygen when it is burned, forming CO<sub>2</sub>, CO<sub>2</sub> is about four times as heavy as carbon. Therefore, a \$1 price signal for CO<sub>2</sub> is roughly equivalent to a \$4 price for carbon. (A metric ton is 1,000 kilograms, about 2,200 pounds.)

<sup>10</sup> Such an analysis reflects many simplifying assumptions that characterize intricate relationships in the economy of the U.S.

Congress. This bill would create a cap-and-trade program to control CO<sub>2</sub> emissions from electricity production, along with stringent requirements for SO<sub>2</sub>, NO<sub>x</sub>, and mercury emissions.

Figure 16 on the previous page shows the comparison of the Southern Company price signal scenarios with estimates published by various analysts of the price signals that would result from these two legislative proposals.

The four carbon price signals were analyzed using national economic and energy models maintained by Charles River Associates (CRA). (See Appendix 3 for additional information on the modeling; see Appendix 6 for information on CRA.) These peer-reviewed modeling methods capture the direct and indirect effects of pricing CO<sub>2</sub> emissions in the U.S.

The changes in fuel prices, emission allowance prices (for SO<sub>2</sub>, NO<sub>x</sub>, and mercury), and changes in electricity demand produced by the national modeling for the price signal scenarios were applied to Southern Company's internal modeling processes.

The results of this analysis include the following (more details are contained in Appendix 3, including infor-

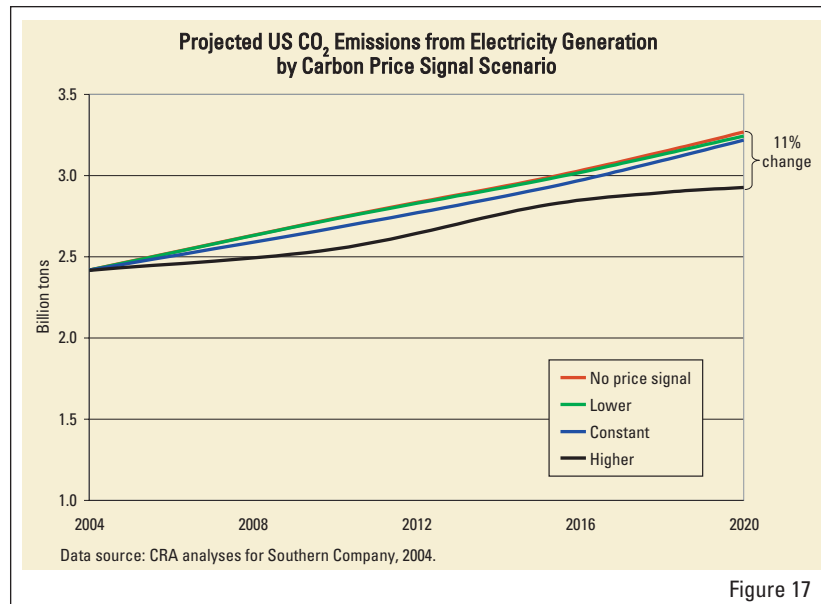


Figure 17

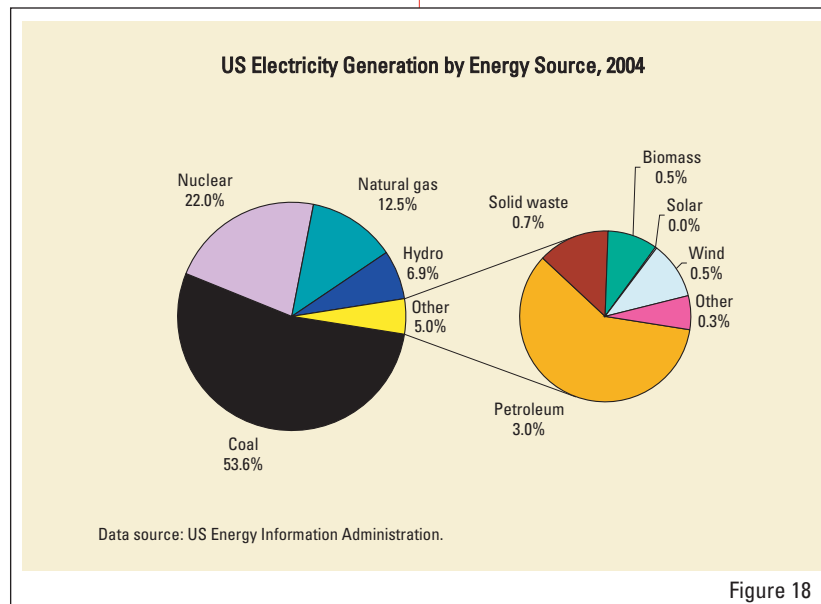


Figure 18

mation on the impact of the price signal scenarios on national emissions and Southern Company SO<sub>2</sub>, NO<sub>x</sub>, and mercury emissions):

### National Results Emissions

In the U.S., electricity generation currently emits about 2.5 billion tons of CO<sub>2</sub> annually. U.S. emissions are projected to grow about 35% between now and 2020, as the economy and demand for electricity grows. The price signal scenarios analyzed here would reduce, but not reverse, this growth. As shown in Figure 17, the rate of growth in U.S. CO<sub>2</sub> emissions from electricity generation is reduced as the price signal increases. However, under all price signal

scenarios, CO<sub>2</sub> emissions from electricity generation continue to increase through 2020.

### Electricity generation

Nationally, about 4 trillion kilowatt hours of electricity were produced in 2004. The energy for producing this electricity came from several sources, as illustrated in Figure 18.

Electricity demand (and generation to serve that demand) in the U.S. has been growing at about 2.3% per year and is projected to continue to grow at this

pace, as the economy grows, through 2020. U.S. electricity generation in 2020 is expected to be about 5.3 trillion kilowatt hours, some 30% higher than today.

Figure 19 shows the sources of energy used to produce electricity in the U.S. in 2020 for each of the four CO<sub>2</sub> price signal scenarios considered in this analysis. The analysis considered all currently available technologies and included projections about their costs, availability, and performance throughout the study period.

Newer technologies, such as coal-based integrated gasification combined cycle (IGCC), wind, biomass, and new nuclear power plants, were also included in the analysis. Specific assumptions were made about the cost and availability of each of these new technologies. For example, while coal-based IGCC is currently being deployed at the small commercial scale, large-scale IGCC is projected to be available in the 2010-2015 timeframe, and IGCC with carbon capture and sequestration is not projected to be available on a commercial scale until 2025, or after the period of this analysis (see DOE’s Clean Coal Technology Roadmap, Figure 34 on page 34).

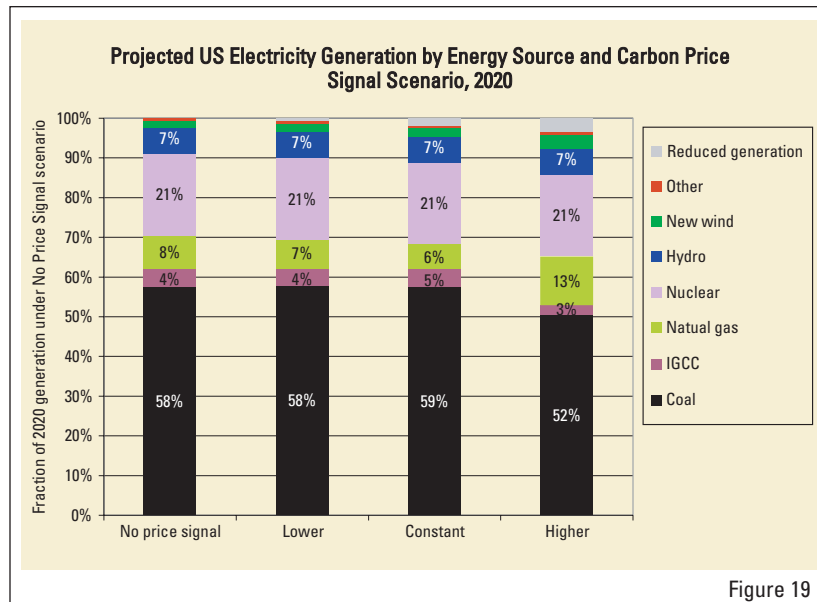


Figure 19

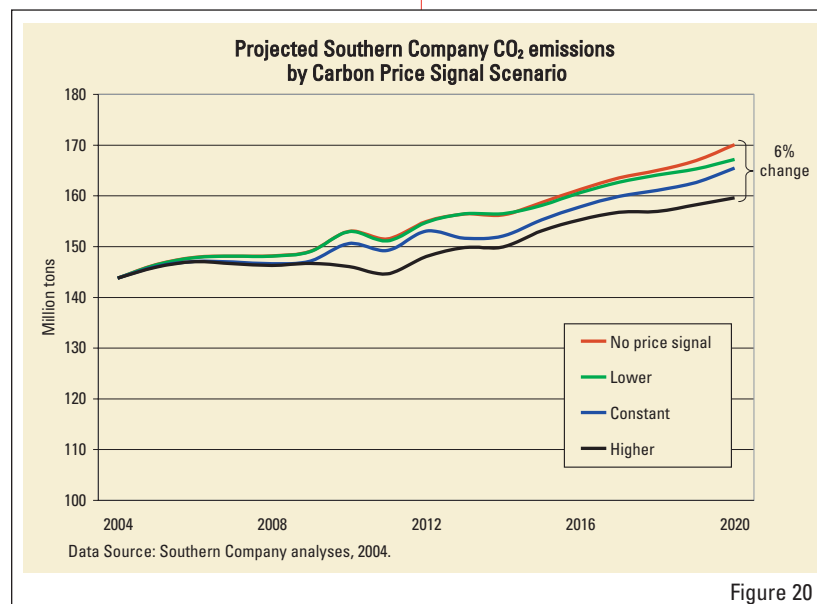


Figure 20

Similarly, while new, non-CO<sub>2</sub> emitting nuclear power plants were found to be economical and assumed to be built, limitations were placed on the number of new nuclear plants that could be built during the period of the analysis, because of uncertainty about costs and siting. New wind installations were also limited to amounts that were felt to be realistic in each geographic region. Further discussion of these options is contained in Section 5.

The projected sources of U.S. electricity generation in 2020 under the price signal scenarios are shown in Figure 19. Because of the increasing price of electricity, overall demand decreases as the price signal

increases (labeled “reduced generation” in Figure 19). This is the major reason for the reduction in U.S. CO<sub>2</sub> emissions shown in Figure 17. The projected sources of electricity generation shift from coal (both conventional pulverized coal and IGCC) to other sources like natural gas, as the price signal increases. The amount of generation supplied by nuclear and hydroelectric power remains approximately the same under all price signal scenarios; new wind generation doubles, though it remains a small portion of overall generation.

**Southern Company Results**

**Emissions**

Southern Company currently emits about 145 million tons of CO<sub>2</sub>. With projected growth in electricity demand (as discussed in Section 1), these emissions are projected to increase by about 20% by 2020.

The CO<sub>2</sub> price signals analyzed would reduce, but not reverse the growth, in Southern Company CO<sub>2</sub> emissions, as shown in Figure 20. The overall reduction in projected 2020 emissions for the “Higher” price signal scenario case is about 6%.

**Electricity generation**

Southern Company produced about 188 billion kilowatt hours of electricity in 2004. The energy for producing this electricity came from coal, nuclear, natural gas, and hydro-electric, as illustrated in Figure 21.

The analysis used forecasts of the cost and availability of existing options, as well as projected costs and availability of new options in the Southeast, such as coal-based IGCC, wind, solar, biomass and new nuclear generation. The options generally fall into two categories – those that can produce energy on a large scale and those available on a more limited basis. The costs of the large-scale options – coal, natural gas, new nuclear – are similar; however, assumptions were made

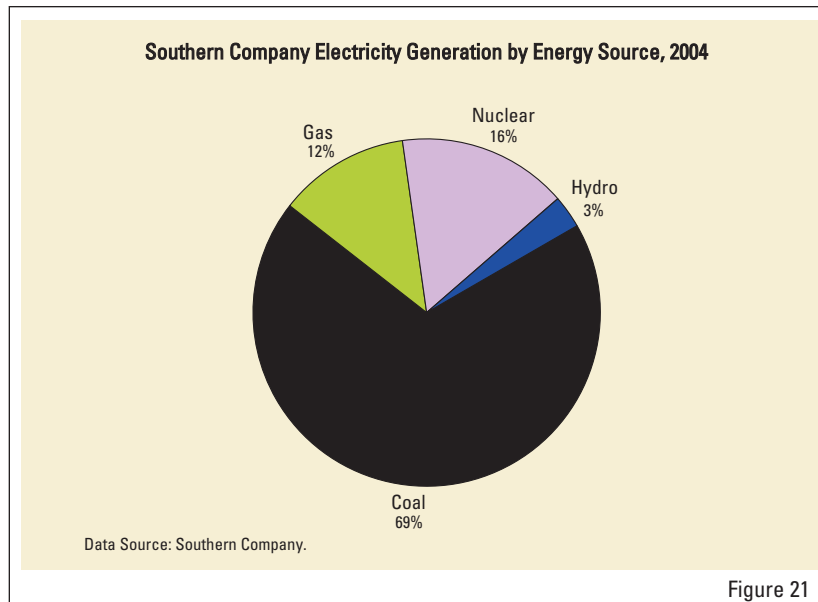


Figure 21

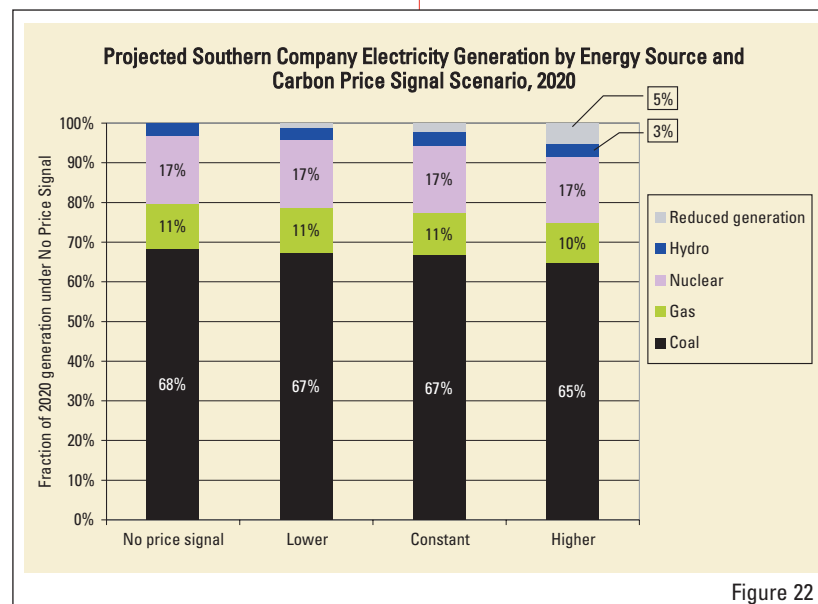


Figure 22

that did not allow the addition of new nuclear capacity for Southern Company because of current uncertainties about costs, licensing, and siting. The availability of the other large-scale options – coal and gas – was not limited. The smaller-scale options, such as wind, solar and biomass, were limited to amounts practical in the Southeast.

When these forecasts and assumptions are combined with scenarios that include CO<sub>2</sub> prices, the projected sources of electricity generation for Southern Company are shown in Figure 22. As shown, the sources are similar to those used today. Importantly, CO<sub>2</sub> price signals did result in some price-

induced reduction in the projected growth in electricity demand. Reduction in demand growth is the main reason for the projected reduction in the company’s CO<sub>2</sub> emissions shown in Figure 20.

As stated, the base analysis included assumptions that did not allow the construction of new nuclear capacity for Southern Company because of current uncertainties about costs, licensing, and siting. However, a sensitivity analysis was performed that assumed Southern Company built two new, 1,200 MW nuclear units in 2015 and 2016. The CO<sub>2</sub> emissions projection that

results from those additions, in the “No Price Signal” case, is shown in Figure 23.

As can be seen, adding two new nuclear units in 2015 and 2016 reduces Southern Company’s CO<sub>2</sub> emissions in 2020 by about 7% – an amount greater than that achieved by the “Higher” price signal scenario.

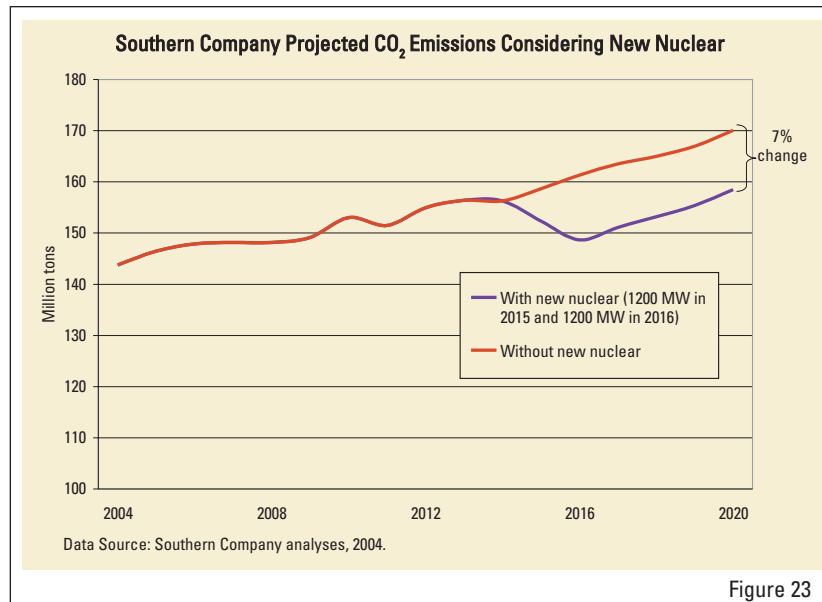


Figure 23

**Long-term plans for pollution control investments**

Adopting a CO<sub>2</sub> price signal would increase the cost of using coal-fired power plants relative to other generating options. This – depending on the level of the price signal and the relative cost of other options – would tend to shift generation to lower- (or non-) CO<sub>2</sub> emitting options such as gas-fired generation and new nuclear (if that is available).

Based on the degree to which CO<sub>2</sub> price signals would reduce projected generation at individual units – and the projected cost of additional pollution control equipment – the analysis indicated that there are two categories of coal-fired units at Southern Company. The first category is those units at which generation would be so reduced – and the cost of additional pollution control equipment would high enough – that the company would need to carefully consider further

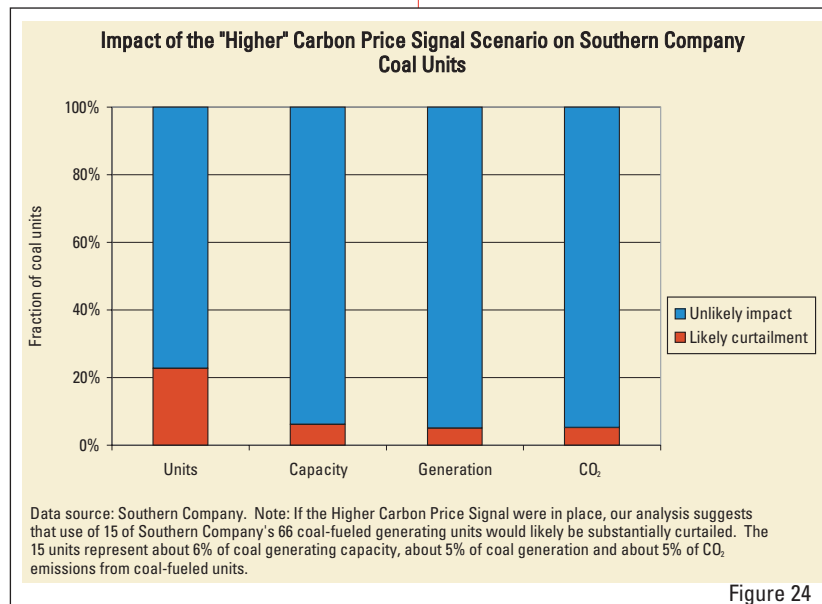


Figure 24

investment in pollution control equipment. The second category is those units at which there would be little to no reduction in generation. For the “Higher” price signal scenario, data on the two categories of units are shown in Figure 24.

Figure 24 shows that the pollution control investment decisions planned in the near term for Southern Company’s larger units, which represent the vast majority of its generation, continue to make sense even under the most stringent CO<sub>2</sub> price signal scenario. If the “Higher” price signal were in place, about 15 (20%) of Southern Company’s 66 coal-fired units would have a large enough reduction in generation that further investments

in pollution control technology at those units would need to be thoroughly evaluated. However, those units represent only about 5% of the company’s current coal-fired generation. Any needed changes to current plans would be identified by the annual strategy updates discussed in Section 1.

**Electricity prices**

Adding a CO<sub>2</sub> price signal would increase the price of electricity. In the “Higher” price signal scenario, the average cost of electricity in the U.S. would increase by about 12% over what it would otherwise be in 2020.

This analysis also examined the increased cost of electricity for Southern Company customers. For the price signal scenarios the company analyzed, the increase in the amount electricity customers would pay is shown in Figure 25 (while there is no guarantee of retail rate recovery, this assumes the company is allowed to recover all of the costs through electricity rates). When the potential CO<sub>2</sub> price signals were applied to Southern Company’s projected CO<sub>2</sub> emissions, the annual cost increases range from \$280 million to \$1.7 billion in 2020. For the “Higher” price signal scenario, electricity customers would pay about 14% more than they would without a CO<sub>2</sub> price signal.

**Shareholder value and competitiveness** Impacts on Southern Company shareholder value and competitiveness from implementing a specific carbon price signal would depend on two factors. First, these impacts are highly dependent upon the details of the design of any CO<sub>2</sub> policy. The important details include whether the program covers all sources of CO<sub>2</sub> emissions or just the power sector, and whether (in a cap-and-trade program) allowances are allocated only to emitters, to emitters and non-emitters, or are auctioned. As discussed in Section 3, the company is involved in policy development activities to try to protect shareholder interests and its competitive position. The second factor that will affect shareholder value is the regulatory treatment afforded to

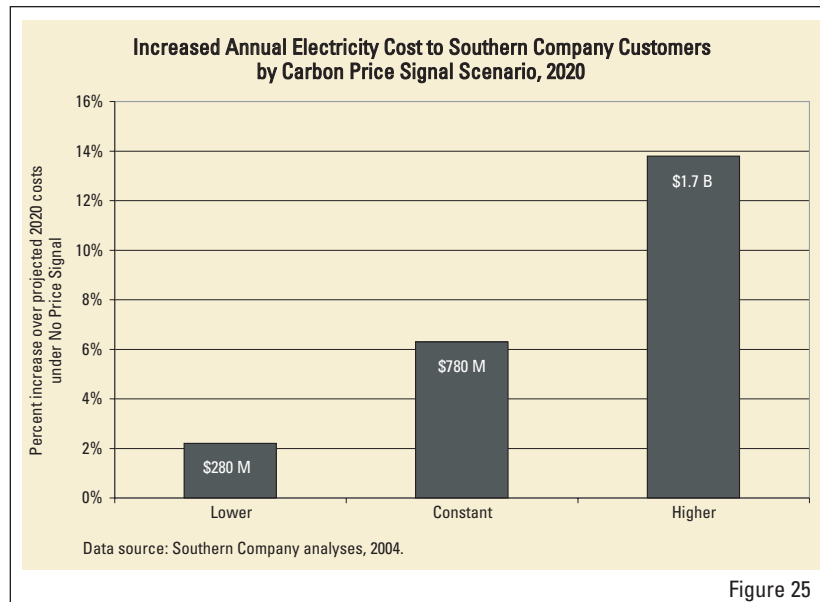


Figure 25

the program costs by the retail ratemaking bodies in Southern Company’s area. The company tries to make sure investors are aware of developments in these areas.

Quantifying these effects is difficult because program design details are uncertain and retail rate recovery is not guaranteed.

### Conclusions

As discussed earlier, Southern Company and national CO<sub>2</sub> emissions continue to grow – and electricity generating sources remain about the same – even with a costly carbon price signal. The fact that significant penetration of new, lower-emitting generation sources is not reflected in the future national and Southern Company generation choices (Figures 19 and 22) is due to their high cost or limited availability. Clearly, new electricity generation options must be developed and commercialized to allow the climate change issue to be addressed in a way that is based on sound science and economics and that maintains and ensures adequate, reliable, and affordable supply of electricity. In light of the foregoing analysis, Southern Company believes that generation technology development is a more prudent way to use society’s resources to address these issues than imposition of mandatory carbon reduction policies.

The next section discusses Southern Company’s review of the available technology options.

## Forward looking statement cautionary note

Much of the information contained in this report is forward-looking information based on current expectations and plans that involve risks and uncertainties. Some of the forward-looking information relates to scenarios that seek to predict future environmental rules and regulations, Southern Company's ability to address those rules and regulations in a cost-effective manner, solutions for addressing such rules and regulations, costs involved in addressing those rules and regulations, and continued economic growth in Southern Company's service territory. 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 December 31, 2004, and subsequent securities filings, could cause results to differ materially from management expectations as suggested by such forward-looking information: the impact of recent and future federal and state regulatory change, including legislative and regulatory initiatives regarding deregulation and restructuring of the electric utility industry, and also changes in environmental, tax and other laws and regulations to which Southern Company and its subsidiaries are subject, as well as

changes in application of existing laws and regulations; current and future litigation, regulatory investigations, proceedings or inquiries, including the pending Environmental Protection Agency (EPA) civil actions against certain Southern Company subsidiaries; the effects, extent and timing of the entry of additional competition in the markets in which Southern Company's subsidiaries operate; variations in demand for electricity and gas, including those relating to weather, the general economy and population and business growth (and declines); available sources and costs of fuels; ability to control costs; advances in technology; state and federal rate regulations and the impact of pending and future rate cases and negotiations; internal restructuring or other restructuring options that may be pursued; 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 to obtain new short- and long-term contracts with neighboring utilities; the direct or indirect effect on Southern Company's business resulting from terrorist incidents and the threat of terrorist incidents; interest rate fluctuations and financial market conditions and the results of financing efforts, including Southern Company's credit ratings; the ability of Southern Company and its subsidiaries to obtain additional generating capacity at competitive prices; and catastrophic events such as fires, earthquakes, floods, hurricanes or other similar occurrences. Southern Company and its subsidiaries expressly disclaim any obligation to update any forward-looking information.