

Acid rain: the southern company



**ASSIGN
BUSTER**

The Southern Company, after the announcement of the Clean Air Act of 1990 amendments, faces increasing pressure to reexamine their operations at the Bowen coal-fired plant in Georgia. Amongst the three viable options given, the option of continuing burning high-sulfur coal, while accounting for the difference between sulfur-dioxide allowed by the Clean Air Act and the predicted production amount by buying allowance from other companies, provided the highest NPV value of \$4, 642 million.

Although calculations provided gives this option significant advantages over the others in terms of overall profit and least cost, the main assumption the option established on is that there exists enough allowance on the open market to maintain regular production. This assumption is less than realistic due to the fact that most companies, given similar production outputs, will choose to overproduce without scrubbers. There might be a shortage of allowance outstanding, let alone a price spike of allowance per ton of sulfur dioxide due to increasing demand. Therefore there are still many contingencies needed to be made before executing option one.

1. What is the impact of the Clean Air Act Amendments of 1990 on the Southern Company's Bowen Plant?

The Clean Air Act Amendments aimed to control acid rain by reducing sulfur dioxide emission. The act will be enforced starting in 1995. Each plant's emission allowance was limited. Companies could buy the extra amount they needed or sell the amount leftover in the open market. The Southern Company's Bowen plant was only given 254, 580 tons of emission allowance each year through 1995 to 1999 and 122, 198 tons of emission each year

after 2000. Bowen had to figure out an economical way to meet up the Amendments' rules.

2. What possibilities does Southern Company have in complying with the new law?

3 Options

There were three possible solutions for Southern Company to meet the requirements of the Clean Air Act Amendments of 1990. They can keep burning high-sulfur coal, installing scrubber, or replacing high-sulfur coal by low-sulfur coal, transported from Kentucky or West Virginia. However, these three solutions all have their own pros and cons.

Using high-sulfur coal would require Bowen plant to buy extra sulfur-dioxide allowance even if it could save the expense of investing in scrubber.

Installing scrubbers required a 3-year installation investment and scrubber running fee, although Bowen could get subsidies from selling extra allowance. Replacing high-sulfur coal by low-sulfur coal needed extra capital investment, even though Bowen didn't need to buy much sulfur-dioxide allowance. Later, we will figure out the most efficient way by calculation.

First, Southern Company could let Bowen keep burning high-sulfur coal without scrubbers. Bowen's annual sulfur dioxide emission amount is 266,550 tons. Then Bowen needed to buy allowance from other Southern Company plants or from the open market. The extra amount it needed before 2000 was 11,970 and 144,352 tons each 5-years after 2000.

Second, Southern Company could install scrubber for Bowen in order to avoid buying extra emission allowance. If they finished installing the scrubber before 1995, the expense would be \$143.82 millions in 1992, \$503.62 millions in 1993, and \$71.97 millions in 1994. Bowen could then sell extra allowance to other plants. If they finished installation in 1999, the installation would cost Bowen to buy extra allowance through 1995 to 1999.

Lastly, Bowen could use low-sulfur coal from Kentucky or West Virginia. The low-sulfur coal contained only 1% sulfur, much lower than high-sulfur coal did. This would free Bowen from buying allowance before 2000, even have extra allowance for sale. But Bowen still needed to buy allowance after 2000. Using low-sulfur coal could avoid the cost of scrubber installation and running, however, price of low-sulfur was higher. The price would be \$30.37 per ton before 2000 and \$34.92 per ton after 2000, much higher than the price of high-sulfur coal, which was \$29.82 per ton.

3. What is Southern's "least cost" alternative? In answering this question, you should focus on the two high-sulfur coal options (i. e., with and without a scrubber). You should look at the present value of both scenarios, using the data in the exhibits.

As shown in the excel spreadsheet, the alternative with highest present value and lowest cost turns out to be option 1 (i. e., burn high-sulfur coal without a scrubber). In this option, the revenue ; expense breakdown is relatively simpler than that of option 2. Specifically, we assume that the annual output of electricity, operating revenue per KWH, and thus the annual

consumption of coal and operating cost per KWH, stay constant over the 25-year-period.

In calculating each year's operating cash flow, we paid special attention to the cost of buying emission allowance. The price of allowance rises 10% annually in the period of 1995-2010 and then stays at 2010 price. Also, given the data of permitted sulfur emission in both phase 1 ; 2, we were able to calculate the annual cost of purchasing allowance. Finally, after subtracting the tax expense, we discount all the future cash flows back to the year of 1992 at the rate of 10% and got a present value of about \$4, 642 million.

In option 2, things become more complicated in the following aspects. First of all, the installation of scrubber can start in 1992 to meet both phase 1; 2 requirements or it can wait until 1997 to begin the installation process and meet only the phase 2 requirement. Secondly, since the scrubber is installed, the plant is able to generate electricity with very low emission so it can sell the extra allowance and contribute to the operating revenue.

If the installation starts in 1992, it takes 3 years for the process to complete and the company would be able to generate revenue by selling allowance each year after 1995. In addition to the operating cost mentioned in option 1, the company has to afford a 2% reduction of revenue to support the scrubber and pay extra \$0. 0013 per KWH to operate the scrubber.

On top of that, the scrubber depreciates at 14% in the first 5 years and at 2% in the remaining 15 years. After subtracting the tax expense and discounting all the cash flows, we got a present value of \$4, 339 million. If the installation starts 1997, the company has to buy allowance in the period

of 1995-1999 and then it can sell allowance from 2000-2016. Taking the installation cost, operating cost, allowance cost/revenue and all other expenses into consideration, we discounted all the cash flows and got a present value of \$4, 537million.

In conclusion, in terms of the highest present value and the lowest cost, option 1 seems to be the better alternative for the company.