

Acid rain case study

Business



Acid Rain: The Southern Company (A) Problem Statement In 1992, executives at the Southern Company have three years to formulate a robust and complex strategy that will involve massive capital outlay and substantial modifications to processes and procedures as it works to comply with provisions enacted in 1990 to the amendments of the Clean Air Act, while simultaneously ensuring they remain sustainable and profitable. Analysis The Southern Company is an American based electric utilities company in Alabama, Georgia, Florida, and Mississippi.

It is the fourth largest in the U. S. The case surrounds the challenges the company's Bowen plant in Georgia faces as it attempts to conform to the new 1990 Clean Air Act Amendments.

The Bowen plant is a coal fired plant capable of producing enough power to serve residential, commercial, and industrial demands of over one million people. The Clean Air Act recognizes sulfur as a contributor to the acid rain problem and enacted a goal to reduce total national sulfur dioxide emissions to half of 1990 levels.

The Act describes the cap and trade approach whereby companies are permitted to pollute a certain amount of sulfur dioxide compared to levels of electricity output they produce. Rainwater is naturally acidic with a pH of around 5.7. Acid rain can be defined by anthropogenic acidification caused by nitrogen compounds and sulfur dioxide, formed as particulate matter released in man-made products such as smoke stack emissions and automobiles.

Environmentalists have grown more concerned about the effects of acid rain which contains lower than normal pH levels in water.

The effects of the lowered pH as surface water streams into rivers and threatens aquatic species, disappearance of sensitive coral reefs, disrupts microorganisms and natural acid buffers in soil, weakens tree roots, causes leaf loss, and corrodes limestone and buildings. The case serves to examine the methods and alternatives for which sulfur dioxide is utilized, and the relation with its pollution within coal-fired energy plants. Through new provisions passed in the Clean Air Act of 1990, the Southern Company's Bowen plant in Georgia will require strategic action in order to comply with the new law.

They must reduce their sulfur dioxide emissions from 262, 800 tons per year to 254, 580 per year, as well as steeper reductions in subsequent years.

If it does not, it will be allowed to buy allowances from other plants or companies to meet the legislative requirements. Conversely, the Bowen plant can work to significantly lower sulfur dioxide emissions and sell their excess pollution allowances to other plants or companies. To this end, the case discusses three options the Bowen plant is investigating in order to comply with the new Clean Air provisions, which are: 1.

Option 1: Burn high-sulfur coal without scrubbers and purchase allowances 2.

Option 2: Burn high-sulfur coal with scrubbers and sell allowances 3. Option

3: Burn low-sulfur coal and have potential to sell allowances The Southern Company must consider certain ambiguities as they evaluate their options.

First, the pricing of pollution allowances are established estimates and could vary depending on projected levels and future government protocol.

Second, if the Bowen plant selects the option that would produce the greatest amount of pollution, it would counter the intent of the Clean Air Act and therefore, even if the option chosen is most advantageous from a profitability standpoint, the company should consider a balance of profitability and adherence to the progression of global conservation. The Southern Company has certain advantages in working toward a solution to bring their plants up to code and in line with new regulations. They have four plants in the southeast, representing a strong energy producing market share in the region.

Each plant is in a different stage of code adherence, so the company has flexibility as it considers its options for the Bowen plant.

As a standard, the coal plants have low variable costs, and operate continuously with reliability. The Bowen facility offers affordable electricity, serving residential, commercial, and industrial segments. Some of the company's weaknesses is they manage a large scale operation and a single strategic business decision may have downstream effects on other plants.

In addition, they have dependencies on their external coal suppliers, the fact that their current operations and capital equipment only support emissions of sulfur dioxide requiring government regulation. As Coase indicates, "when property rights are not defined and enforced, or when transaction costs are high, the contentious parties can call on government to deal with

the issue" (Myer), which is exactly what has occurred. Coase reminds us that external effects are reciprocal.

There would be no acid rain harm if it were not for economic pursuit that values environmental use.

In contrast, there would be no discharge of waste were it not for economic activity that values environmental use. Therefore, the focus of the acid rain dilemma is on the producers and users of electricity and the owners of coal companies and their employees, not the owners of the buildings, property tax collectors, environmentalists, or other interest groups wanting to place restrictions on environmental users. Recommendation: The recommendation for this case is largely represented in the Excel spreadsheet that accompanies this paper.

Specifically, the lines 2 through 12 on the spreadsheet cite the assumptions that are common among all three options. Option 1: Burn High-Sulfur Coal without Scrubbers: Purchase Allowances Without utilizing the scrubbers, 266, 550 tons of sulfur dioxide will emit into the atmosphere.

It is impossible to meet input requirements of 8, 338 tons of coal and still emit low enough levels to meet the Clean Air Act standards. Bowen's coal varies widely both in delivered prices per ton and in heat content per pound; therefore prices are expressed in dollars per ton.

From 1992-1995, high sulfur Kentucky coal burned at \$41. 46 per ton. From 1995-2016, the price was expected to fall to \$39.

82 per ton. They would have to purchase pollution allowances in addition to paying the operating costs for this option. Summary of Assumptions| Description of Value | Cost per Ton – High Sulfur Coal (bottom of pg. 3)| 1992-1995 cost per ton is \$41. 46; 1996-2016, price drops to \$29.

82| Cost per Ton – Low Sulfur Coal (pg. 5)| For option 3: Starting in 1996, cost for low sulfur is \$30. 37 per ton. | Estimated Price of Allowances (pg.)| 1995 allowance is \$250; and increase 10% in 1996 on through 2016| Tons of High Sulfur Coal per Year (pg.

4-top)| Annual hi-sulfur coal needed to sustain operations (reference cell C8) 8. 338M tons| Tons of Low Sulfur Coal per Year (pg. 5)| Annual low-sulfur coal needed to sustain operations (reference cell C9) 8. 391M tons| Sulfur Dioxide allowances received /yr. (pg.

2)| 254, 580 tons of sulfur dioxide in 1995-1999; and 122, 198 in years 2000-2016| Revenue from electricity sales (pg. 4, option 2)| Reference value for option 2 that contributes to loss of 2% revenue (see option 2, line 41).

1551000000 kw*0. 056) = 1206856000| OPTION 1: HIGH-SULFUR COAL WITHOUT SCRUBBERS| Description of Value| Sulfur Dioxide Emitted (pg. 4)| Bowen plant burns 1. 6% sulfur by weight, burning 8.

338M tons, generating 266, 550 tons of sulfur dioxide emissions. All years included| Allowances Bought (pg. 2)| Option 1 would require Bowen to buy allowances. Figure is 266, 550 tons of sulfur dioxide generated minus the 254, 580 allowances afforded, starting in 1995 – 2016| Allowance Cost (pg. 3)| Price of allowances bought times the price, starting in 1995 – 2016 | Fuel Cost| N/A|

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Additional Operating Cost| N/A| Lost Revenue| N/A| Pre-tax Total| Adds allowance, fuel, additional operating, and lost revenue costs (lines 19 through 22)| After-tax Cost| Adds 37.

7% tax rate starting in 1995 through 2016| Capital Cost| N/A| Depreciation| N/A| Total| After tax cost + capital cost - depreciation (if applicable)| PV| Present value year over year| NPV = | 266. 38 Millions| Option 2: Burn High-Sulfur Coal with Scrubbers and sell allowances Wet limestone flue gas desulfurization (FGD) equipment, commonly referred to as scrubbers, are as large as generators and expensive to install. The gas with 90% of the sulfur dioxide removed would then be vented to the air. Bowen could install the scrubbers during Phase 1 period, and allow them to sell allowances to other utility plants. During Phase 2, Bowen will have to meet the new requirements and would delay capital outlays of installing the scrubbers by five years, however, in Phase 1 period they would have to buy allowances or burn lower-sulfur coal. OPTION 2: HIGH-SULFUR COAL WITH SCRUBBERS| Description of Value| Sulfur Dioxide Emitted| Bowen plant burns 1.

% sulfur by weight, burning 8. 338M tons, generating 266, 550 tons of sulfur dioxide emissions before scrubbers installed. Thereafter, beginning in 1995, emissions drop to 26, 655| Allowances Bought| Option 2 would require Bowen to buy allowances. Figure is 26, 650 tons of sulfur dioxide generated minus the 254, 580 allowances afforded, starting in 1995 - 2016, hence allowance cost is much less than option 1, due to less emissions generated| Allowance Cost| Price of allowances bought times the price, starting in 1995 - 2016 | Fuel Cost| N/A|

Additional Operating Cost (pg. 7)| Scrubbers add 0.

13 per kwh to operating costs for purchase of limestone and disposal of sludge| Lost Revenue| Additional energy consumption costs impact revenue by 2%| Pre-tax Total| Adds allowance, fuel, additional operating, and lost revenue costs (lines 36 through 39)| After-tax Cost| Adds 37. 7% tax rate starting in 1995 through 2016| Capital Cost| \$143. 85M in year 0, \$503. 61M in year 1, \$71. 97M in year 2| Capitalized Value| \$143. 85M in year 0, \$503. 61M in year 1, \$71. 7M in year 2 = added| Depreciation| Capitalized value * 14% depreciation (1995 - 1999); 2% depreciation (2000-2016)| Tax Benefit from Depreciation| Straight line depreciation | Total| After tax cost + capital cost + tax benefit from depreciation | PV| Present value year over year| NPV = | 309. 90 Millions| Option 3: Burn Low-Sulfur Coal. Compared with the coal burned at Bowen that contained an average weight of 1. 6% sulfur, the low-sulfur coal contains only 1% by weight, but its cost is greater than the expected 1996 cost of high-sulfur coal.

There is a capital expenditure of \$22. million to change the electrostatic precipitation used to control airborne particulate matter. Prices will rise after the year 2000 because in Phase 2 its price was expected to rise as the tighter control drove up demand. It will take more low-sulfur coal per year to generate electricity versus high-sulfur coal. The low-sulfur coal would still emit 167, 650 tons of sulfur dioxide per year which is less than half the 266, 550 tons of high-sulfur coal. The problem with low-sulfur coal is that it is rare and expensive to mine.

OPTION 3: LOW-SULFUR COAL WITHOUT SCRUBBERS| Description of Value|

Sulfur Dioxide Emitted| Bowen plant burns 1. % sulfur by weight, burning 8.

338M tons, generating 266, 550 tons of sulfur dioxide emissions before

scrubbers installed. Thereafter, beginning in 1995, emissions drop to 26,

655| Allowances Bought| Option 3 would require Bowen to buy allowances.

Figure is 26, 650 tons of sulfur dioxide generated minus the 254, 580

allowances afforded, starting in 1995 – 2016, hence allowance cost is much

less than option 1, due to less emissions generated| Allowance Cost| Price of

allowances bought times the price, starting in 1995 – 2016 | Fuel Cost|

Additional low-sulfur fuel cost begin in 1996 – 2000 (\$30. 7 per ton), and new

rate from 2000 – 2016 (\$34.

92 per ton)| Additional Operating Cost| N/A| Lost Revenue| N/A| Pre-tax Total|

Adds allowance, fuel, additional operating, and lost revenue costs (lines 55

through 58)| After-tax Cost| Adds 37. 7% tax rate starting in 1995 through

2016| Capital Cost| \$22. 1M one-time purchase for electrostatic precipitators

| Depreciation| Straight-line depreciation beginning in 1997 of 14%| Tax

Benefit from Depreciation| Capitalized value * 14% depreciation (1997 –

2000)| Total| Straight line depreciation |

PV| Present value year over year | NPV = | 176. 98 Millions| From the

suggested assumptions presented above, and the detail from the discounted

cash flow Excel spreadsheet, a recommendation is evident to suggest the

best option for the Southern Company to adopt, which is option 2 that yields

the highest net present value. Continuing the processes of burning high

emitting sulfur dioxide coal, with the investment of scrubbers is the most

cost effective solution given the company's conclusion to retire the plant in 2016.

The company must now decide whether to install pollution control equipment and generate excess permits for sale to other companies, or to emit larger quantities of sulfur dioxide, save capital costs, and purchase pollution permits.

Considering the discounted cash flow analysis of a make versus buy decision, the company should also consider issues of expected cost minimization, questions of economic and political uncertainty, and the value of flexibility. The analysis depends on assumptions of the behavior of emissions permit prices over time, which a discussion of externalities (acid rain) links to the company's cost of capital.

Various factors complicate the decisions, including real options characteristics, emissions market evolution, substitute investment prices, and public policy. The company should develop a comprehensive risk assessment process that includes all the areas of significant risks to the Company, including potential price impacts on customers, reliability risk, regulatory risk, impacts on customer behavior, reputational risk, etc. These integrated processes consider multiple environmental considerations and requirements rather than solely on the greenhouse gas regulations.

Even though the Southern Company does not have a greenhouse gas emissions reduction target, they should be committed to improving their environmental performance and the communities it serves by being a good environmental steward and working to conserve valuable natural resources.

Further, Southern Company employees, customers, and the public, and the protection of the natural environment should be among the Company's highest priorities. The Southern Company is going to face major challenges throughout their daily operations as they implement option 2.

The first challenge will be their ability to conduct traditional electricity business operations effectively while transforming the Bowen plant. The new regulations, changes in the energy environment, and transmitting electricity securely are all reasons that could affect their earnings.

The Southern Company must work toward balancing the required costs and capital expenditures with their customer's prices during the renovation period, with ability to sustain future profit margins.

To begin the process of exercising Option 2 will require a firm commitment to install scrubbers and that plan needs to begin now with the creation of Requests for Proposals (RFP's). Company executives have estimates of how long will it take to implement the scrubbers but do not address if they will require additional manpower to handle the maintenance for the scrubbers. The company should be prepared to add new labor which will stimulate additional jobs which will make for a positive public relations story.

Option 2 will also place the company in a position light with the ability to sell allowances versus worrying about buying allowances.

As society progresses, so too is the sensitivity to pollution and operating a plant that exceeds the Clean Air Act requirements will position the company more favorably in the industry. The need to cut emissions to conform to Clean Air Act requirements and the anticipated high costs to conform will

likely result in an emerging market for emissions trading. To this end, trade allowance prices are likely to increase, thereby potentially generating additional revenues for the company.

The company should consider capitalizing on partnerships with environmentalists or green conscious companies by creating a marketing campaign that promotes the purchase of pollution credits so they are not sold to other polluters. Such a campaign could allow people and companies to buy pollution credits to support their social causes, such as students and schools and universities, as well as individuals buying credits for birthday, wedding, or retirement gifts.

Because of the Clean Air Act provisions, coal-firing generating facilities must reduce their greenhouse gas pollution before 2016; it is probable that the company should consider that coal-firing plant operations will not be profitable in the future. Therefore, in addition to implementing option 2 to conform to reduced emission coal fired electricity production, the company needs to consider exploration of other emerging markets for producing energy such as oil, nuclear power, natural gas, and renewables. The strategy process should anticipate cost, emissions, and performance characteristics of each of these options, as appropriate, for individual units.

Further, the company should develop environmental strategy schedules that include long term emission control plans. Another avenue the Southern Company should be aware of is its ability to create mergers with other power-generating companies.

It is likely in subsequent years, with regulation, alternative fuel sources, and technology advancement changing industry dynamics, power generating companies may see this special characteristic of mergers and acquisitions, which can significantly reduce costs while increasing generating capacity and market share.

In closing, all three options are going to cause a certain amount of operating energy, management headache, and expense. It is option 2 that appears to be the least painful in that it forces the Southern Company to elevate their Bowen plant with the newest technology with the installation of scrubber systems, while also stimulating labor growth. It also allows the greatest ability to produce excess allowances (except for option 3) that can be sold for revenue.

Option 3 is too unstable with the company having to terminate contracts with coal suppliers and convert to a low-sulfur coal product which is scarce and more costly. When the Bowen plant retires its operations in 2016, the company should have mostly converted from coal to newer energy sources, and can liquidate the remaining assets for a higher value versus not making equipment conversions with options 1 and 3.

Finally, option 2 can be viewed positively by environmentalists, shareholders, and employees by signifying a committed investment in the Bowen plant.

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