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BUCKEYE POWER & LIGHT COMPANY

Don Peters was manager of the Production Fuels Department of Buckeye Power & Light Company (BP&L), a small utility in southeastern Ohio. BP&L had three steam electric power plants—located in Athens, Zanesville, and Steubenville—whose primary energy source was coal. Each month, coal for those plants was purchased from a heterogeneous collection of vendors in Ohio, Pennsylvania, and West Virginia, ranging in size from small father-and-son operations to large mining companies. Peters was responsible for the monthly coal-procurement process, including how much to purchase from each vendor and which specific plant (or plants) each vendor should supply.

In October 1986, Peters' immediate task was to determine November's coal-procurement schedule. BP&L had recently retained the services of a consulting firm to analyze aspects of its operations, including the coal-procurement process. Peters hoped to use the opportunity of the consultant's analysis to rethink the entire procurement process. He also hoped the report would shed some light on two related issues that had been a source of controversy within the department.

Coal

Compared with oil, natural gas, and nuclear energy, coal was a relatively cheap source of fuel during the 1980s. Coal is a combustible rock formed by the underground compression of partially decomposed plant matter over millions of years. There are four major types of coal, classified according to energy content: lignite (lowest energy content), sub-bituminous, bituminous (most widely used as a fuel source), and anthracite (highest energy content). Coal's energy content (or thermal value) is measured in British thermal units (Btus). (One Btu is the amount of heat needed to raise a pound of water one degree Fahrenheit.) Pure bituminous coal typically contains on the order of 15,000 Btu per pound (Btu/lb).

There are three major determinants of the quality of coal. One is *total moisture content*. There are two distinct types of moisture associated with coal. *Free* moisture lies on the surface of the coal. Its presence, which depends primarily on conditions in the mine and in transit, is an

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important parameter in the design of coal-handling and -preparation equipment. *Inherent* moisture is trapped within the pores of the coal itself and is present even when the surface of the coal appears dry. Both types of moisture reduce energy content.

A second determinant of coal quality is *ash content*. Ash is the incombustible residue that remains after the coal is burned. Like moisture, a high ash content increases shipping, handling, and preparation costs while reducing thermal value. Additional equipment and expense is required periodically to remove ash from a coal-fired furnace. Failure to do so adequately has a long-term impact on the life of a furnace.

The third major determinant of quality is *sulfur content*. When coal is burned, sulfur oxides are released, creating pollution and contributing to the corrosion of vital plant parts. Some sulfur can be removed prior to burning by "washing" the coal. To further control pollution, "scrubbers" can be attached to smokestacks to filter out a substantial number of sulfur oxide particles. During the 1980s, the maximum level of sulfur oxide pollution was regulated by law. Each coal-fired plant was thus forced to restrict the amount of sulfur in the coal it burned on the basis of the specific pollution-control equipment it was using.

BP&L's Coal-Procurement Process

Each month, vendors interested in supplying one or more of BP&L's coal-fired power plants completed an offer sheet specifying the amount of coal they had to sell along with its quality and price. Quality was expressed in terms of Btu/lb and moisture, ash, and sulfur content. Vendors were asked to quote a per ton price, transportation included, for each power plant they were willing and able to supply. The Production Fuels department took all offers, adjusted them for past performance (particularly the amount of coal available for purchase, which was often overstated and had to be adjusted downward), and summarized the results in a document called the offers edit report (**Exhibit 1**).

At the same time, each of the three coal-fired power plants submitted its requirements for the upcoming month. Corporate policy dictated that a plant have sufficient Btu's on hand each month to satisfy 120% of expected demand. Exactly how many Btus to order for the upcoming month depended on both the estimated ending inventory of coal in the current month (stated in terms of Btus) and the expected demand during the upcoming month.

Each plant also provided minimum acceptable quality standards for moisture, ash, and sulfur content. Each of those was stated in terms of a weighted average of all coal delivered to the plant in the month. For example, 1,000 tons of coal with 2% sulfur content and 500 tons of coal with 1% sulfur content would produce an overall 1.67% sulfur-content level; this number was not allowed to exceed the sulfur standard. The sulfur standards were set by law; moisture and ash standards were left to the discretion of the individual plant managers, who were familiar with the costs associated with handling the increased levels of moisture and ash at their respective plants.

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The Production Fuels Department was responsible for taking the offers edit report and the plant requirements, summarized in the plant requirements edit report (**Exhibit 2**), and arriving at an overall coal-procurement plan. Peters, as manager of the department, had the flexibility to negotiate with both vendors and plant managers to strike a better overall deal for the company. For example, he could negotiate price reductions and/or quantity increases with vendors. Similarly, he could make plant managers aware of particularly restrictive quality requirements and negotiate to have them relaxed. Ultimately, Peters was responsible for approving the overall coal-procurement plan.

Recently, the Production Fuels Department had been struggling with two issues related to the coal-procurement process: long-term contracts and safety-stock levels.

Long-Term Contracts

Because of a utility's need to have a guaranteed source of fuel, long-term contracts with coal vendors were a long-standing industry practice. A long-term contract with a vendor obligated the utility to buy a minimum amount of coal each month from that vendor at the contract-specified price. The balance of the utility's needs were met by purchasing additional coal on the spot market.

Prior to 1973, BP&L had purchased approximately 65% of its coal on long-term contract. The energy crisis of the 1970s and resulting surge in demand for coal and coal prices had precipitated an upward trend in that figure. By 1986, BP&L was purchasing 80% of its coal on long-term contract (vendors in late 1986 with whom BP&L had long-term contracts and the contract amounts are indicated in **Exhibit 1**).

As the energy crisis eased, however, the availability of coal became less of a concern. Moreover, by 1986 prices on the spot market were running about $6 per ton less than long-term contract prices. Many people in the Production Fuels department thought that the percentage of coal purchased on long-term contract should be reduced, perhaps back to the 65% level.

Peters estimated that returning to the 65% figure would allow BP&L to reduce the amount of coal purchased on long-term contract by 12,000 tons. If such a reduction were to be made, it was not clear to Peters which of the current long-term contracts should be reduced and/or eliminated.

20% Safety Stock

Running out of coal forced a utility to purchase energy from a neighboring utility at a premium price. In August, for example, BP&L had sold 10 billion surplus Btus on an emergency basis to a utility in western Pennsylvania for $20,000. A rash of such purchases by BP&L in the 1970s had driven the company to raise its required safety-stock level from 15% to 20%.

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Since the safety stock had been increased, however, none of BP&L's plants had ever been forced to purchase outside energy. In fact, over the past three years, actual monthly energy demand had rarely exceeded 110% of expected demand. Some BP&L officials attributed this situation to improved forecasting techniques, while others thought it represented a leveling off of demand.

Whatever the reason, many at BP&L were now pushing to reduce the safety-stock level back to 15%. Peters recognized that such a reduction would save BP&L carrying costs on the coal needed to supply 5% of overall Btu demand. From October's coal-procurement numbers, Peters estimated that the average cost of a billion Btus at each plant were as follows:

Plant	Average cost of 1 billion Btus
Steubenville	$1,740
Zanesville	$1,610
Athens	$1,625

He wondered if those were the appropriate costs to use, and if so, how to balance the cost savings against the increased possibility of running out of coal.

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Exhibit 1

BUCKEYE POWER & LIGHT COMPANY

Offers Edit Report for November

Vendor	Quantity Available (tons)	Btu/Lb	Moisture	Ash	Sulfur	Plant	$/Ton
Willis Bros.	2,500	10,980	6.2%	21%	1.2%	Ath	$30.80
MacMillan	9,000	11,590	6.0%	20%	0.9%	Ath	$36.80
K. Barnes	3,000	11,550	6.4%	18%	1.1%	Ath	$34.00
Foster &	27,000	12,065	6.1%	12%	1.0%	Stb	$42.00
Hughes						Zan	$41.60
						Ath	$45.60
Western	22,500	12,210	6.2%	14%	0.9%	Stb	$43.92
						Zan	$42.70
						Ath	$41.48
Pellham	6,000	11,240	6.8%	18%	1.8%	Stb	$33.15
McIntyre	3,000	11,000	6.3%	17%	2.2%	Stb	$32.00
Monongahela	30,000	12,640	5.8%	10%	0.8%	Stb	$44.10
Consolidated						Zan	$45.36
Pope	3,600	12,570	6.4%	10%	1.0%	Zan	$35.00
Lyon Valley	2,700	11,950	6.8%	12%	0.9%	Zan	$33.12
Crescent Rock	2,300	12,080	6.6%	13%	1.1%	Zan	$32.40

Long-Term Contracts:
MacMillan (minimum of 8,000 tons)
Foster & Hughes (minimum of 20,000 tons)
Western (minimum of 16,000 tons)
Monongahela Consol. (minimum of 18,000 tons)

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Exhibit 2

BUCKEYE POWER & LIGHT COMPANY

Plant Requirements Edit Report for November

Plant	Btus (billions)	Maximum Allowable Weighted Average		
		Moisture	Ash	Sulfur
Steubenville	800[1]	6.0%	15%	1.0%
Zanesville	500	7.0%	11%	2.0%
Athens	600	7.0%	18%	1.0%

[1] Number of Btus that, when added to October's expected ending inventory, would equal 120% of November's expected demand.

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