

Do Trading and Power Operations Mix?

by John E. Parsons, MIT Sloan School of Management

Trading operations are an important part of many power companies, especially in those parts of the globe that have moved to competitive markets in power. Despite some common trappings, such as a room of traders surrounded by screens tracking prices and market data, the actual roles played by these operations vary widely. At some companies, the trading operation is little more than the sales office of the generation company. At others, the trading operation plays a central role in the company's physical asset strategy, helping generation owners to optimize the utilization of their assets and helping customer supply businesses to source power on advantageous terms. At still others the trading operation is more akin to a hedge fund, running a book of trades that earn financial gains or losses independent of any physical asset optimization at the parent company. And, of course, some companies house trading operations incorporating a bit of each activity.

How well do these different types of power trading operations perform?

This paper argues that power generation and customer supply can benefit from a sophisticated trading operation so long as trading is organized as a support function and not as a separate profit center. Running a trading operation as a separate profit center alongside generation and customer supply poses a danger to the overall business. The source of the problem is the difficulty in measuring the profitability of trading. In particular, it is difficult to determine the capital required for the trading business. Quite often the capital required is wildly underestimated, so that the trading operation is actually relying on the capital provided by the other businesses with which it shares a balance sheet. The only way to be completely sure that a trading unit's profit is measured accurately is to separate it completely from the other businesses and force it to raise its own capital.

The record of U.S. companies with power trading operations has been uneven and illustrates well the danger of mismeasuring the capital required for trading. In the late 1990s, a large number of companies made trading operations the centerpiece of their strategy and for a short time were the darlings of the stock market. Then in the early 2000s,

this market segment collapsed as the record of profitability was revealed to be a mirage. In a few cases the mirage was manufactured by fraud, but in several others the culprit was an underestimate of the capital required for trading. More recently, in 2007, Constellation Energy restructured itself to promote its trading operation as the centerpiece of its growth strategy. Less than a year and a half later, in mid-2008, the company found itself in a costly liquidity crisis originating from its trading operation.

The next section of this paper looks in more detail at how trading operations can be organized as a support function to a power company's generation and customer supply business, and then at the different role of a trading operation that is a profit center. I then discuss the issue of measuring profitability and the unique challenges for trading operations organized as a profit center. Finally, I return to the record of profit center trading operations at U.S. power companies to demonstrate how central the problem of mismeasuring the capital required for trading has been in shaping the history.

The Different Types of Trading Operations

How does a trading operation fit into the business model of a power company? What does the trading operation contribute?

A good reference point for answering these questions is Constellation Energy, a company that, from its inception in 2000, operated one of the premier trading operations in the industry.¹ In 1999, when the state of Maryland passed legislation to enable a competitive electricity wholesale market, the Baltimore Gas & Electric (BGE) company reorganized itself to take advantage of the new opportunity. It created the holding company called Constellation Energy to contain both the legacy regulated electricity and gas distribution business—operated under the old name, BGE—and a new “merchant” operation containing two main lines of business, generation and customer supply. The company moved aggressively to grow its merchant business in a competitive electricity market both within and beyond its original territory.

Through 2006, Constellation's trading operation was run as a cost center and its mission was to support the two lines of business in the merchant. Organizationally, it was positioned

1. All of the material contained here about Constellation Energy is sourced from a longer case study, “Do Trading and Power Operations Mix? The Case of Constellation

Energy Group 2008,” Center for Energy and Environmental Policy Research Working Paper 08-014, November 2008.

Figure 1 Constellation's Stock Performance 1999-2008.



as an activity of the customer supply business, although it also provided support to generation. Constellation's annual 10K reported separate profit figures for (i) generation, (ii) customer supply, and (iii) BGE, the regulated distribution utility, but there was no separate profit figure for trading. Trading helped to maximize the margin earned supplying load and generating power; but it did not have any separate capital allocation, and did not measure a separate profit.

The trading operation possessed at least four distinct capabilities that improved the profitability of both generation and customer supply. First, Constellation had to invest in sophisticated information technology systems necessary to properly understand the complicated patterns of load and electricity prices; and, of course, the information technology itself is nothing without the human and organizational capital required to organize, analyze and make sense of the data. Both load and price vary dramatically through the day, through the week, and through the calendar year. There are important geographical patterns to be taken into account, along with patterns of congestion on the transmission system. And there are patterns of volatility to each of these variables which must be mastered as well. Mastering this data was essential to the operation of both generation and customer supply.

Second, Constellation had to master the administrative task of arranging delivery of the power, including the protocols and procedures of the markets where its generation facilities or its customers were located along with the markets where it sourced power from other companies. It had to measure and monitor delivery and prices, and manage the back office tasks necessary to bill or pay for power.

Third, Constellation needed real-time knowledge of the wholesale marketplace and the value of providing power and

the cost of sourcing power at different locations and times. A good trading operation provides more precise information about the cost of serving different loads and so enables the supplier to better price its services.

Fourth, Constellation had to be able to offer the power on the price terms its customers demanded. This involved providing some short-term insurance in the form of relatively fixed price terms for the power it will deliver. Sourcing fluctuating quantities of power from a volatile wholesale market and delivering it at fixed prices requires a sophisticated risk management operation. Constellation would evaluate the risk impounded into the contract terms it negotiated with the local utility and repackage these risks and offload them into the financial marketplace through a sophisticated hedging program. Constellation's risk management operation would assess what price the financial market places on risk, and use that information to determine the pricing terms Constellation offered to potential customers. Included among the risks that the company would evaluate is the credit risk of the counterparties with which it did business, since that credit risk would mostly remain on Constellation's books. The supplier must have a strong enough balance sheet to hold the counterparty credit risk that it accepts.

On the basis of these four capabilities, trading could help maximize the value of Constellation's generation and customer supply lines of business. The dramatic fluctuations in price of power across time and location mean that a kilowatt hour of power is not just a kilowatt hour of power. The value depends on where and when the electricity is delivered. Different generating units can produce different time profiles of power. Some units can be turned on and off more quickly than other units. Units can be designed, retrofitted and operated to maximize their flexibility. Maintenance and shutdowns can

be scheduled when the power is least valuable. All of these management decisions need to be made based upon a constant stream of information and analysis about the value of power in the competitive wholesale market. The trading unit's intelligence about the marketplace and prices was a valuable tool for optimizing the use of the generating assets.

While Constellation's generation unit retained responsibility for the day-to-day operation and maintenance of its power plants, the trading unit would cooperate with generation to set the company's plan for operation and dispatch of the individual units and assumed much of the responsibility for the logistics of delivering the power into the wholesale market. The trading unit also negotiated long-term contracts for sale of power from several of the plants. Finally, the trading unit maintained a contact list of other generators that it looked to on a shorter-term basis to obtain power, while also seeking it from the very short-run and anonymous wholesale marketplace. These same skills enabled Constellation to source power from third parties more cheaply and to bid more effectively for contracts to supply the power needs of local utilities.

From 1999-2006, Constellation's stock outperformed its peers dramatically. Figure 1 shows an index of Constellation's stock return against the S&P500 utilities index. Whereas the S&P500 utilities index earned less than an average annual rate of 5.4% per year between from the beginning of 1999 through the end of 2006, Constellation's stock earned an average annual rate of more than 17%. The company was well known for the high quality of its trading and risk management operation.

In January 2007, Constellation management premiered a new organizational structure that dramatically changed the relationship between the trading operations and the other business units. Trading was promoted to a separate profit center sitting side-by-side with generation and customer supply. The services of this new profit center, which was called "Global Commodities," included the following: (i) risk management services provided to Constellation's own generation and customer supply units as well as to outside customers; (ii) structured products, which were more complex risk management services marketed outside the firm; and (iii) a proprietary trading portfolio, including a portfolio of financial securities as well as direct investments in upstream natural gas production, bulk shipping and coal supply. The newly expanded activities of the trading were advertised as the main source of growth for the company going forward.

What is different about this profit center trading unit? In particular, what new activities and risks are involved, and how do these change the capital requirements of the company?

Obviously, some of these activities are the same as a trading operation run as a support function to a generation unit or a customer supply unit. The trading operation would now charge an internal transfer price for the services it had always been providing. Selling the same services to

outside customers is just an outward-facing extension of this previously internal-facing service. In both cases, much of the capital required for the business is the investment in information systems together with the human and organizational capital required to operate the business. In addition, in offering risk management services to outside customers, Constellation accepted exposure to credit risk and would have to hold risk capital against this exposure.

The major new activity in this business unit was the proprietary trading portfolio. Here Constellation was seeking to directly profit from what it believed to be its own superior information about key market variables. To do this, it must purposefully put selected market risks onto its balance sheet. While the company would also presumably try to minimize exposures to risks about which it has no superior information and hence no expectation of superior profit, its basic objective is to expand its exposure to those risks about which it thinks it has superior information. This makes running a proprietary trading portfolio a fundamentally different business from other trading functions which are generally focused on hedging or reducing the market risks put onto the company's balance sheet.

Constellation considered its direct investments in upstream natural gas production, bulk shipping, and coal supply to be an extension of its proprietary trading portfolio. For example, its investments in upstream gas were predicated on its superior valuation information derived from its risk management expertise. Constellation would then restructure the gas field's development strategy and operations, provide some financial hedging, and then flip the property. This explains the curious fact that what looked like fundamentally hard asset businesses, comparable in other regards to the separate electric generation unit, were consolidated under the trading operation. The value created by these energy investments was expected to derive from Constellation's trading skills, and not primarily from Constellation's own expertise in drilling for natural gas, operating ships, or managing coal logistics.

Even before it established trading as a separate profit center, Constellation had allowed the trading operation to run a very small portfolio of proprietary trades. But with the new structure, the proprietary trading portfolio expanded rapidly. Constellation reported that the VaR on the small proprietary trading portfolio it had maintained in 2004 was only \$2.6 million (measured as the 99% confidence bound on a 1-day holding period loss). Now, with the reorganization the size of Constellation's exposure grew significantly. By year-end 2007 the VaR had already grown to \$11 million, which is an annual average growth rate of 62%. In 2004, the gross margin on proprietary trading and related activities was only \$93 million. By 2007 this had grown to \$435 million, which is an annual average growth rate of 67%. Constellation also significantly expanded the new trading unit's natural gas and coal operations.

Mismeasuring Profitability

Profitability, or the rate of return, is the ratio of the profit earned over the capital employed:

$$\text{rate of return} = \frac{\text{profit}}{\text{capital}} .$$

For a trading operation, problems arise in measuring both the numerator, profit, and the denominator, capital, although by far the most troubling of the two is the measurement of capital.

The problem of profit attribution across business units is a familiar one across many industries, but it has its particular manifestations in power companies with profit center trading operations.

For example, one of the usual responsibilities of the trading operation is to serve as a source of intelligence about the market value of the power being produced and sold. When the trading operation is organized as a support function for generation and supply, it provides this intelligence in a disinterested and impartial way. However, once the trading operation is set-up as a profit center, the intelligence it provides must also be used to determine which unit should get the credit for profit earned in generation and customer supply: how much of the profit earned from a sale is attributable to the generator and how much to the trader? This creates an inherent conflict of interest that is difficult to manage.

Another example arises when the trading operation shares control of the company's physical assets with other business units. The trading business tends to exploit the physical assets or supply and related commitments of the other business units as it executes its proprietary trades. Because it claims to be leveraging unused assets, it is not charged a "fair" price for its use. This leveraging almost never involves simply making use of unused facilities. Moreover, because the trading operation, in its other capacity, is supposed to be providing market intelligence and helping to shape the investment and operating decisions of the firm, its interest in the performance of its proprietary portfolio reshapes the recommendations made. There is feedback with the trading operations having input to the original investments made in these facilities, and to the terms of contract rights; and the trading operation's use of these facilities alters how the facilities are used generally, crowding out or compromising other uses. The additional costs are charged to the other operating business units, although the investments are made for the purpose of expanding or benefitting the proprietary trading. The management of the trading operation often takes a leading role in shaping the strategy for the integrated business, although the trading unit's own performance is evaluated on the basis of only one piece of the overall business.

Finally, much of the profitable proprietary trading

actually relies upon information derived from the company's generation and customer supply businesses. This same problem arises at many financial firms where the flow of business from market-making enables the company to earn profits by taking positions.²

In my experience, power companies where trading operations are run as a profit center have run into each of these problems with accurately attributing profit to the trading operation.

A bigger and more particular problem is the determination of how much capital the trading operation requires—the denominator in the rate-of-return calculation. For many non-financial businesses, determining the capital required is straightforward: for example, to run a generation business it is the cost of constructing or purchasing the generation plants plus the amount of working capital needed to keep the operations moving smoothly. For some financial business, determining the capital required is also straightforward: for example, to run a retail bank requires an investment in storefront facilities plus important back office and technology infrastructure, as well as an investment in human resources.

For trading operations, however, determining the capital required is more complicated, especially for proprietary trading. The initial capital that must be put down is easy enough to determine. The problem is anticipating how much additional capital may turn out to be required under difficult circumstances. The simplest example with which to illustrate the issue is a trader who opens a long position in a futures contract. If prices decline, the trader will have to answer calls for variation margin in order to hold onto the position. If the price reverses and ends higher than when the position was opened, the trader will recoup all of those contributions plus a profit, but the trader can do so only if it can weather the interim call on capital. Determining the capital required involves forecasting potential price movements and the consequent potential losses on a position.

One widely used metric popularized in the banking industry is Value-at-Risk (VaR), which describes the scale of losses that can be expected with a given probability over a given time horizon. In general, the time horizon is relatively short because the VaR was designed for relatively liquid financial portfolios that can be easily adjusted. Management at many commodity trading operations often import from the financial industry tools like VaR without sufficient regard for the particularities of the company's commodity operations. Commodity trading portfolios often include very illiquid positions in physical assets. This illiquidity undermines the relevance of tools such as VaR which assume a position can be sold quickly. Reliance on VaR leads to significant underestimation of the complicated contingent capital requirements

2. See Alberic Braas and Charles Bralver, Oliver Wyman & Co., "An Analysis of Trading Profits: How Most Trading Rooms Really Make Money," *Journal of Applied Corporate Finance*, Vol. 2 No. 4 (Winter 1990).

necessary to support illiquid physical positions; and as a consequence, management generally underestimates the capital required to back its commodity trading. The 2008 financial crisis alerted many practitioners to the limitations of VaR even for portfolios of financial securities, but these limitations are multiplied many times over when applied to commodity trading operations.

Without the finesse provided by VaR's assumption that a portfolio can be easily liquidated, we are thrown back on a very complicated contingent capital calculation in order to properly assess a trading operation's required capital. Few companies have actually tried to make this calculation in earnest. One remarkable manifestation of this lapse appeared in the 2010 Annual Report of the German-headquartered power company E.ON. The company provided a breakdown of its profit and capital by business unit, including the trading unit, so that readers could compare the realized rate of return at each unit against the unit's hurdle rate and see where value had been produced. The remarkable twist was the fact that the trading unit showed a profit, but the company allocated to the unit no capital whatsoever. The sum of capital allocated across the other business units equaled the total capital of the company as a whole. Profits without capital produces an infinitely high rate of return. Of course, the E.ON management would not be silly enough to report an infinite return. Instead, they artfully avoided the problem, saying "Due to the structural particularities of the trading business, Energy Trading's ROCE and value added have very limited information value and are therefore not included here." The structural peculiarity they are referring to is precisely the difficulty in determining the amount of capital required to support the trading operation.

External capital markets are one helpful tool for disciplining the determination of how much capital is required. Both investors in the business and counterparties to the trading will want to know that the trading operations are well capitalized. Unfortunately, this benefit is lost when a trading operation shares a balance sheet with other lines of business that have hard assets, such as power plants. The external capital markets implicitly treat the hard assets as collateral for the trading positions, so that the capital required for the trading unit is now less obvious and easily minimized.

Recurring Trouble at Power Companies

The mismeasurement of capital played a role in the collapse of trading at several power companies in 2000-2003. The company that had pioneered trading as centerpiece of its strategy was Enron, which leveraged its position as a natural gas trader to enter into the electricity trading and other businesses. Advertising its strategy as "asset light," its skill

in trading was supposed to be the source of its profitability. A slew of other companies remade themselves along similar lines. Notable among them were Dynegy, Williams, Aquila, El Paso, and Mirant. Although each owned physical assets, they made their skill as a trader the centerpiece of their strategy, and trading was run as a separate profit center, independent in many ways from the management of the specific physical assets owned by the company. For a period of time, the stocks of these companies had very high valuations, and the companies were touted as the leaders of the industry.

In 2000-2002, a sequence of events turned the fortunes of the industry upside down. These began with the California energy crisis of 2000-2001, followed immediately by the Enron accounting scandal and bankruptcy in 2001, and then a nationwide compression of generation margins in power wholesale markets in 2001-2002. None of these directly reduced the profitability of trading itself, but they all forced a re-evaluation of the amount of capital required to back the trading operation. Running a profitable trading operation requires a high credit rating, which the parent companies had, thanks to high quality generation assets. When the decline in the value of generation assets impaired the credit rating off the parent corporation, the trading operations could no longer piggyback off of the parent's balance sheet. In order to continue operation, they needed to have their own capital. Suddenly, trading operations that had appeared to be profitable when capital had seemed to be free were now shown to be unviable when capital needed to be raised from the market specifically to fund trading as a stand-alone business. The trading operations at Dynegy, Williams, Aquila, El Paso and Mirant were all closed down in 2002-2003.³

At other utilities where trading had grown, but not yet become the centerpiece, the operations were scaled back dramatically. Suddenly proprietary trading was out of fashion at power companies. Instead, they assured investors that their traders took no speculative positions, trading only "around their physical assets" in order to maximize the value of those assets.

When Constellation was originally formed, it had planned to mimic the strategy of making trading the centerpiece of its growth plan, but was forced by the events in the marketplace to subordinate trading to a support function—that is, until the 2007 reorganization. When Constellation introduced its newly independent trading unit, it compared this profit-center business to those operating within banks like Bear Stearns, Goldman Sachs, and Lehman Brothers. Based on the historical returns at these "comparables," Constellation established a required rate of return on equity for this business unit of 14-20%. It estimated the risk capital required to support the new unit at between \$900 million and

3. More detail on the specific events at each company can be found in the Appendix to Parsons, John E., "Do Trading and Power Operations Mix? The Case of Constellation Energy Group 2008." *Journal of Energy Markets*, 5(1), Spring 2012.

\$1.1 billion, and forecasted 2007 EBITDA for this business of \$342 million. This implied an extraordinary 31% rate of return on equity, which Constellation's management was proud to advertise. This was an outrageous forecast—one that should have been recognized as *prima facie* evidence that the unit's capital requirement was seriously underestimated, and a portent of the disaster to come.

The events in 2008 demonstrated in three ways that Constellation had seriously underestimated the level of capital required by the newly promoted trading operation. First, the VaR on the operations radically increased as commodity prices rose. Due to the nature of the its operations, it could not scale down its trading to stay within the original capital budget. Second, the company was surprised to discover that it had wildly underestimated the contingent capital requirements of its new coal trading operations. Third, as the company tried to cope with its sudden liquidity needs, it was unable to unload a significant quantity of its trading assets on a schedule consistent with the assumptions of its VaR calculations and liquidity analysis.

Commodity prices began to rise sharply beginning in 2007. The rise escalated dramatically in the first half of 2008. From the start of 2007 to mid-2008, the natural gas price more than doubled, while the coal price doubled just in the first half of 2008. These price increases translated into a higher exposure on any given physical position. The VaR on a NYMEX gas futures contract rose from \$0.73/MMBtu to \$0.97/MMBtu, a 32% increase. The VaR on a standard NYMEX power futures contract rose from \$5.42/MWh to \$7.96/MWh, a nearly 50% increase. The VaR on a standard NYMEX coal futures contract exploded from \$1.52 to \$15.04, a startling 880% increase. A measure of VaR per physical unit is relevant for a company managing a physical commodities business since the company is not free to scale its positions in dollar terms as a company managing a purely financial portfolio would. This is one of the distinguishing features of a commodity company that traders schooled in financial institutions overlook. This rise in VaR in 2007-2008 was remarkable. It translated into increasing collateral requirements in order to continue in business, straining the company's liquidity.

Factors specific to Constellation's recently expanded coal business added to the liquidity pressure. Many of Constellation's contracts that went out of the money had clauses requiring margin payments, while many of its contracts that went in the money did not. Therefore, Constellation experienced a net cash draw, even when the net mark-to-market position was little changed. This sort of asymmetry might seem unusual to traders in certain purely financial markets,

but they are not uncommon for certain types of commodity trading operations. This is part of what makes certain commodity trading operations so distinctive.

In addition to cash management risk arising from this asymmetry, Constellation's trading operation was also exposed to counterparty credit risk. Many of the counterparties Constellation did business with in the coal industry were below investment grade, so that as the positions went in-the-money, Constellation had to recognize increasing credit exposure to low rated counterparties. During the first quarter of 2008, Constellation experienced a major default by one of its coal counterparties, and this seriously impacted its earnings that quarter. This was the first direct wholesale credit loss Constellation had reported in its history.

On top of this immediate liquidity drain, Constellation faced an additional contingent liquidity call in the event of a credit rating downgrade below investment grade. At year-end 2006 this figure stood at \$1.288 billion. At year-end 2007 it was \$1.336 billion. During the first quarter of 2008 this amount more than doubled, to \$3.234 billion. During the second quarter of 2008 it increased by another \$1.336 billion to a total of \$4.570 billion.⁴

These figures swamped Constellation's available sources of liquidity. The news release in August 2008 sparked the market speculation that Constellation would not be able to meet such a call, driving down its stock price. This, in turn, prompted the credit rating agencies to consider downgrading Constellation, which, of course, would trigger the feared capital call. Constellation's only available option was to hurriedly raise the new capital or pare down the operations requiring the collateral, or both. Constellation attempted to sell key components of the trading operation, including the upstream natural gas assets and a sizeable fraction of its coal business as well.

The problem facing the company, however, was that few of these transactions could be executed swiftly enough to match the speed with which it was potentially obligated to post collateral. In its presentations, Constellation had generally focused on the VaR calculated assuming a one-day holding period. In its 10K it also reported the VaR calculated assuming a ten-day holding period. These turned out to be completely inadequate measures of the company's total exposure since the underlying commodity portfolio was much less liquid than these calculations assumed. Consequently, the whole company was forced into a fire sale.

Figure 1 shows the dramatic collapse of value in the company's stock starting in early 2008 but accelerating dramatically in the last two months. From the end of July 2008 to mid-September, Constellation's stock lost 71% of its

4. Constellation had originally understated the contingent capital requirement for the first quarter and had to file a restatement. The figures here are all as restated.

value, erasing nearly all of the outperformance of the previous decade. In mid-September 2008, Constellation negotiated an emergency \$1 billion cash injection and a sale of the entire company to Warren Buffet's Mid-American Energy Holdings for just \$4.7 billion or \$26.50/share. Less than two months before, the stock had been selling for \$82/share.⁵

Conclusion

A sophisticated trading and risk management operation can be an important part of a power company operating in a competitive wholesale marketplace. The complicated dynamics of power prices and the complex operations of generation assets and supply obligations place a premium on a careful assessment of the risks and return in this market. Trading operations provide essential support to help optimize the value of physical assets and supply obligations.

Trading operations can also be a profit center in their own right. However, determining the amount of capital required for a proprietary trading portfolio and certain other elements

of a trading business can be very complicated. It is easy to mismeasure the capital required, usually minimizing the capital required and exaggerating the profitability of trading.

External capital markets can provide important discipline, forcing a trading operation to obtain sufficient capital. This discipline is lacking when profit center trading operations share a balance sheet with other business units, especially units with physical assets like generation. Then, it is easy for the trading operation to piggyback on the capital of the other units. The true amount of capital consumed becomes apparent only in times of crisis. We have seen this mistake made repeatedly in the short history of trading operations in U.S. power companies.

JOHN PARSONS is a Senior Lecturer at MIT's Sloan School of Management where he is the Executive Director of the Center for Energy and Environmental Policy Research and the Head of the MBA Finance Track.

5. Before the sale closed, the French company EDF successfully made a competing offer which kept Constellation as a public company involved in a joint venture with EDF on certain assets. A penalty payment was paid to Mid-American. Later the joint venture was abandoned, and still later Constellation was acquired by Exelon.