As an analyst and software designer who has spent the past ten years working closely with energy markets, *Sandy Fielden* had no problem identifying what had the most impact on his world in that time – technology. A regular *Energy Risk* contributor for some years, Fielden below traces a decade of energy markets

Ten years of trading

★ The most significant technology event for the energy markets during the last 10 years was clearly the internet. In August of 1996, Microsoft released version 3.0 of Internet Explorer inside the Windows 95 operating system and it rapidly achieved worldwide desktop dominance. The world wide web has subsequently become the pre-eminent business productivity tool.

By linking together trading participants in the world's energy companies with a common interface that could be accessed from anywhere, the internet facilitated online trading, online transaction processing, online scheduling and online billing. At the same time, email made communication of documents and contracts instantaneous. Nowadays instant messaging makes even the phone seem redundant.

Looking back, it almost seems impossible to believe that the deregulation of the energy infrastructure, which began in the mid 1990s in the US, could have occurred without the internet as an information highway. Early use of the technology by the deregulating natural gas industry in the US made the term "bulletin board" common usage among traders and schedulers following the transformation of that industry by the Federal Energy Regulatory Commission's order 636 in 1993. The vast majority of gas trading, scheduling and billing now occurs directly over the internet.

By April of 1997, America's first fully functioning electricity independent system operator (ISO) was up and running – Pennsylvania New Jersey Maryland ISO (PJM). The system initially generated hourly price information for over 2,500 locational marginal price (lmp) points on the grid in near real time (see figure 1). A host of daily system, transmission and operational data was being generated in addition to pricing. That information had to be disseminated to participants throughout the northeastern US, all of whom had complex billing relationships with the grid that were facilitated by private internet access accounts. PJM was followed by similar ISOs in California, New England, New York and Texas. They will be joined next year by the Midwest ISO. The amount of detailed data that these organisations generate every hour is truly hard to grasp, but a recent example from PJM illustrates the point. On October 21, 2004, PJM issued real-time hourly prices for 6,200 lmp points. When coupled with the same set of 6200 lmps for day-ahead pricing, that totals 297,600 prices each day – over two million prices a week!

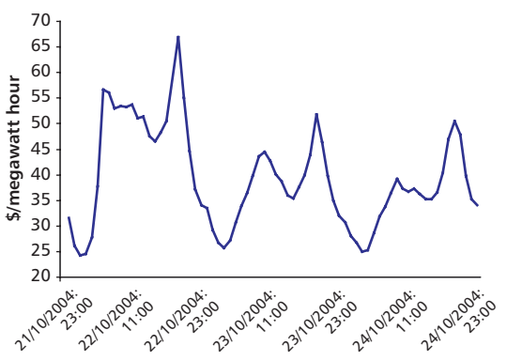
The internet made online trading possible in a way that had not been contemplated before. With deregulation creating a whole new set of market players and increasing the number of market-based transactions, technology was quickly adapted to facilitate the growth.

On November 29, 1999, a new web-based trading operation called Enron Online was born. Two years later by November of 2001, Enron Online was making 6,000 trades a day, with an average daily revenue of $2.5 billion. All of these trades were facilitated electronically by registered parties for no commission.

In March of 2000 a consortium of large energy companies invested in the Intercontinental Exchange (Ice), and it was launched as an online trading exchange. Ice grew rapidly and by July of 2001 was in a position to acquire London's International Petroleum Exchange, the home of trading in benchmark Brent crude oil futures. The Ice platform is accessible from any internet browser (see figure 2).

New trading platforms encouraged an expansion in the number of trading instruments available. In reality, the volume of physical oil, gas and electricity consumed only increased through the old-fashioned mechanisms of supply and demand. In the new electronic marketplace, however, the trend was to trade every

F1. PJM independent system operator



Source: PJM

Hourly day-ahead prices for the Potomac Electric Power Company (Pepco) Zone – one of more than 6,000 locations on the PJM grid that hourly prices are generated for by the PJM ISO.

megawatt and every barrel far into the future as financial derivatives. Derivatives are complex financial mechanisms usually containing a fixed price element and a promise to pay cash for the difference between the fixed price and the price the market ended up trading at when the commodity was actually consumed.

For companies like Enron, but also for many other industry players, trading financial derivatives on the internet offered an easy way to increase profits by trading the same volumes of oil, gas and electricity many times over as financial instruments. This was done in addition to the mundane business of actually drilling, refining and delivering the product to customers.

Attitudes lag technology

This innovation rapidly changed the nature of the business, but often, attitudes lagged behind. Many of the participants had the same approach to trading on the new web-based system as they did when the market was conducted between individuals who knew each other, or via brokers that were known to both sides. The new internet trading systems were more anonymous and less trustworthy, as well as being open to many more players – leading to greater room for errors, transgressions and counterparty defaults.

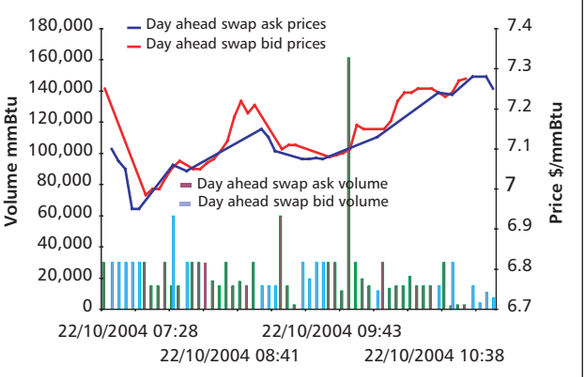
Despite the ease of online trading and the appeal of instant transactions, the great US deregulated energy trading adventure ground to a halt in 2001. The first signs of trouble emerged when a financial crisis in the California energy market caused Governor Gray Davis to declare a state emergency in January 2001. The state of California was forced to bail out deregulated utilities that were burdened with sky-high wholesale market prices that they could not pass on to consumers. Regulators began to re-examine the benefits of deregulation. Then, at the end of that year, in December of 2001, came the collapse of Enron, following revelations of financial improprieties.

In the year that followed the Enron meltdown, the major players in North American electricity and gas markets ramped down their trading operations and cut back their exposure to financial markets, causing widespread loss of money and employment in the trading community. The transactions that had apparently allowed Enron to hide huge losses were put under a microscope. Accounting regulations in the form of the Financial Accounting Standards Board (FASB) 133 directive (January 2001) and then later the Sarbanes-Oxley Act (2002) were introduced. These regulations required companies to pay more attention to detail in reporting the value of trades on their books – particularly derivative prices.

So while the internet made electronic trading very easy, it turned out that there were many more associated headaches for mid- and back-office personnel that came right along with the increase in transactions. One major challenge arose from the need to keep track of transactions, counterparties and positions. Instead of everything coming from one or two energy futures exchanges or brokers, companies suddenly had to handle trades from multiple platforms in different time zones. Although the internet provided the backbone for the communication of deals, it actually increased security problems. Technology managers needed to worry about whether trades were legitimately transacted and whether the billing accurately reflected the deals done. Counterparty credit was more complicated to supervise online – when trading partners could often be anonymous.

More significantly, many of the new derivative instruments traded online could be quite illiquid, which meant that risk managers struggled to find market values for their trading books. Risk managers typically identify a current market value for all deals on their trading book at the end of the day – a process

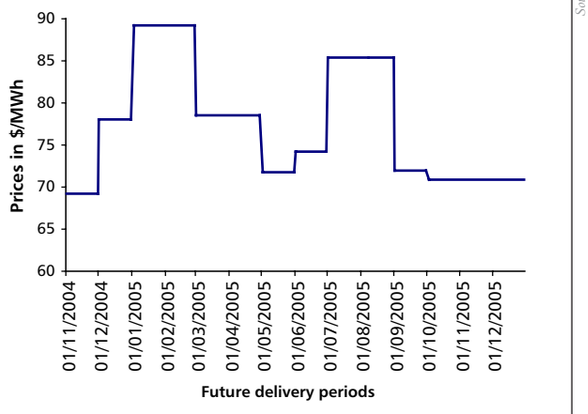
F2. ICE trading: Henry Hub day-ahead



Source: 10X

The bid and ask prices and volumes showing during the day for deals transacted on October 22, 2004 for day-ahead Henry Hub swaps on the Intercontinental Exchange – a widely used internet trading platform.

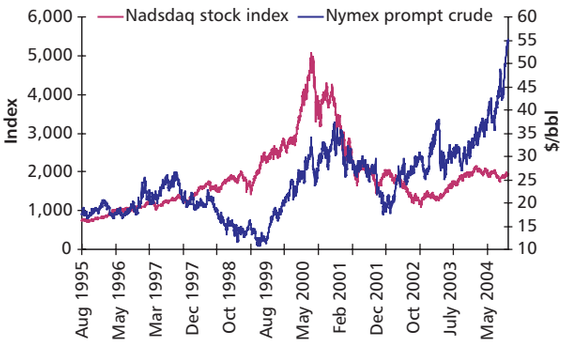
F3. Nymex Clearport settlement forward curve



Source: Nymex

Nymex Clearport settlement forward curve for New York Zone G electricity price derivatives on October 22, 2004. The settlement prices are useful to help risk managers mark their trades to market using publicly quoted prices.

F4. Last 10 years of Nymex crude and the Nasdaq



Source: Nymex, Nasdaq

Nymex front-month crude oil settlement prices and the daily Nasdaq stock market index since 1994. During the internet boom of the late 1990s, the Nasdaq market led the hyperbole, and crude prices followed the hysteria. Since the end of the internet boom, stock prices have fallen. Crude also fell at first, but has recently recovered to all-time highs in contrast to sluggish stock prices.

known as marking to market. During the early part of the deregulation boom, the rules for placing a value on derivative instruments were unclear and risk managers asked their own traders to assess markets they had no prices for. After 2001, the new accounting standards of FASB 133 and then Sarbanes-Oxley, meant that risk managers needed to identify arms-length, market-based pricing for the derivatives deals on their books.

This single issue of mark-to-market price discovery has dominated the business of market information providers ever since 2001. After Enron collapsed, companies retreated from derivative transactions as they struggled to manage the risks associated with deals that were often years from maturity. Traders only entered new deals with closer-by maturities that risk managers could find third-party prices for. The struggle to find dependable prices for transactions was further complicated when it was discovered that many energy trading firms had sent incorrect prices to reporting services. As traders' deal reporting dried up, market liquidity retreated further.

Reforms

Since the end of 2002, the US energy markets have gone through a series of self-regulated reforms to heal the wounds that the earlier deregulation boom inflicted upon them. Trading platforms like Ice took steps to provide insurance against the risk that a counterparty might default on a trade. Ice and its rival the New York Mercantile Exchange (Nymex), began providing daily settlement prices for derivative markets that made risk managers more comfortable with trading see figure 3). The broker community has also provided an end-of-day service to clients who wanted market-based valuations for their trades. The market reporting community, traditionally only associated with the physical trading of energy, has now placed more emphasis on derivative reporting.

Market analysts often look for relationships between stock prices and the energy market. There were some interesting parallels between the boom in internet stocks and the Nymex crude price over the last 10 years. You can see these by looking at the relationship between the Nasdaq Composite Index and daily crude prompt futures prices on Nymex (see figure 4). The internet boom fuelled higher demand for energy in the late nineties, leading crude prices higher. The economic recession following the decline in the stock market from the middle of 2000 was mirrored by lower crude prices. However, the latest rally in crude prices since 2002 is associated with increasing demand in China and uncertainties about supply in the Middle East, Africa and Latin America, and bears little relationship to stock prices.

It is now hard to imagine a world without the internet or an energy trading community that operated 10 years ago with the fax machine as its principal document transfer tool. Energy markets have bloomed with the new technology and will surely continue to flourish. The growth did not come without pain, however, and many a new risk manager owes their livelihood to the pitfalls of the more complicated trading environment that we operate in today. ER

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