ENRON'S MISSED OPPORTUNITY

Enron's Refusal to Build a Collaborative Market
Turned Bandwidth Trading Into a Disaster

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Collaborative Markets

Why did Enron fail? The easy answer is that Enron was a fraud, a Ponzi scheme designed to enrich scoundrels. But beneath the off-balance sheet transactions and partnerships that have drawn such intense scrutiny, Enron's efforts to reduce complex products into tradable commodities represented one of the most promising ideas of the past twenty-five years. Enron's failure was due in part to a business strategy that regarded competitors as ruthless and uncompromising. That mentality led the company to reject the very real possibility that rivals could, working together, create the new markets that in turn would open up profit opportunities for all. Enron's brilliant vision of the New Economy didn't go far enough; it required a New Economy business model that emphasized cooperation among competitors.

Business rivals working together to create new markets, or what we may label *collaborative markets*, represents an important trend in the corporate governance of international business. The new "tools for thought" that define the Digital Age[1] and a shift in US government policy toward the deregulation of finance, telecommunications, energy and other industries have emboldened industry producers, suppliers, trading houses, financial institutions to organize, operate and own markets jointly. Dramatic increases in computer processing speed allowed the development of complex financial modeling techniques, supply chain management software, and credit procedures. Encryption and intellectual property protections permitted between potential buyer and seller the secure interchange of data – including price quotations, product information, credit information – necessary to effect multiple and rapid transactions. Advances in data networking democratized the spread of the new tools of thought beyond the richest institutions, bringing the new markets to smaller entities. The final piece that enabled collaborative markets was the policy emanating from Washington that signaled politicians were willing to tolerate new market forms, even if natural competitors would drive them.

Collaborative markets operate under the explicit governance of the founding interests, unlike traditional public markets, such as stock exchanges and commodity exchanges, which tend to be organized and operated by neutral third parties and regulated by the state. Today's collaborative marketplaces, which include b-to-b exchanges and private commodity exchanges, transact currencies, metals, energy products, automobile parts, chemicals, and dozens of other products.[2]

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[1] Stephen Cohen, Bradford DeLong and John Zysman, "Tools for Thought: What is New and Important about the 'E-conomy,'" Working Paper 138, Berkeley Roundtable on the International Economy, 2000.

[2] Industy interests have a long history as market makers, though it is perhaps more common for industry interests (OPEC, e.g.) to seek to control prices or output rather than to operate the markets per se. Competing agricultural interests created the Chicago Produce Exchange in 1874, which evolved into the Chicago Mercantile Exchange. Similarly, rival dairy merchants created the Butter and Cheese Exchange of New York in 1872, which eventually became the New York Mercantile Exchange. In the case of cotton, an

Collaborative markets offer industry powers a vehicle to procure and sell products in an institutional environment compatible with their interests, even as demand and supply determines the prices of individual transactions. Specific value propositions include price transparency, increased price competition, reduction of sales and marketing costs, control over product quality and reliability, and standardization of billing and credit terms and delivery mechanisms. Perhaps most important, collaborative markets may represent potential barriers to entry from unwanted competitors to the market organizers and, in some cases, may permit the organizers leverage over suppliers regarding product quality and selection.

Collaborative markets represent a break with traditional economic theory by positing an institutional rationale for market participants, including market competitors, to collaborate. Unlike oligopolistic economic models, in which a small number of competitors collaborate to restrict price or output, partners in collaborative markets compete as aggressively as ever, but within a set of market rules of their own design. Collaborative markets are hybrid (and novel) institutions of industry corporate governance: part free market, part directed market.

Enron's attempt to create financial markets from differentiated products – in this article, bandwidth – represents a case study in the shortcomings of a traditional competitive approach in light of recent technological advances and the apparent willingness of government to tolerate industry ownership of markets. Enron might have succeeded in creating a trading marketplace in bandwidth, and indeed in other product markets, had it collaborated with its competitors. The Enron case teaches modern managers an important institutional lesson: businesses should consider collaborating not only with suppliers and customers, but also with rivals to develop new markets, protect market share, and create production efficiencies.

The New Economy of Enron

Enron's attempt to reduce telecommunications capacity to a tradable commodity represented one of the most promising and potentially profitable ideas of the New Economy. Bandwidth trading, as it came to be known, was the centerpiece of Enron's strategy to transform complex products into financial instruments that could be traded, hedged, and financed.[3] In 2000, Schroder's estimated the ultimate worth of Enron's bandwidth trading effort at $36 billion, more than the combined value of Enron's electricity and natural gas business.[4] Bandwidth trading was supposed to transform Enron from "The World's Leading Energy Company" into "The World's Leading

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entire system of private law has evolved dating from the mid-1800's, whereby industry representatives both write and police the rules. (Lisa Bernstein, "Private Commercial Law in the Cotton Industry: Creating Cooperation Through Rules, Norms, and Institutions," University of Chicago Law & Economics, Olin Working Paper, No. 133, August 2001)

[3] Enron was involved in dozens of markets including electricity, natural gas, oil, orange juice, plastics, gold, steel, advertising, and even weather.

[4] Raymond C. Niles and Dale F. Meyerhoeffer, "Bandwidth Trading: Enron," Schroder & Co, Inc., January 12, 2000, p. 13. Skilling produced the same estimate at an investor meeting in 2001 (Adam Levy, "Inside Enron," *Bloomberg Markets*, May 2001, p.31.)

Company."[5] Enron's fate depended on its plan to transform financial markets, epitomized by bandwidth trading, far more than on its accounting practices.

Bandwidth trading was a dismal failure. While domestic energy trading recorded Enron tremendous profits through the bankruptcy year of 2001,[6] bandwidth trading dragged the company into the financial mud. Enron Broadband Services ("EBS"), the telecommunications division, lost $357 million in the third quarter of 2001 and $494 million over the first nine months.[7] By the end of 2001, EBS's $1 billion investments in broadband assets were worth pennies on the dollar.[8] It was little wonder that when Enron executives fabricated transactions, EBS often was involved.[9]

Why did Enron's bandwidth trading effort fail? Some technical experts contend that Enron's idea never made sense. Michael O'Dell, Chief Scientist of WorldCom's UUNet, called bandwidth trading a "largely absurd notion that could only be created by financiers…[that] have no notion of how bandwidth is actually used in building real networks."[10] Leo Hindery Jr., former CEO of Global Crossing added that Enron "was way out of [its] league in the telecommunications business. The [valuation] numbers they throw around are laughable…"[11] In this view, Enron was just another dot.com with a "pie-in-the-sky" "know-it-all" business plan that was at best premature, at worst reckless and maybe criminal.

Some telecommunication analysts argue that the capacity glut doomed bandwidth trading from the start. The overhang in bandwidth was destroying prices throughout 2000 and 2001. Major telecommunications networks were unlikely to support bandwidth trading while prices were plunging, since bandwidth trading would expose to customers the extent of the "buyer's market," and thus potentially accelerate the bandwidth price plunge. Cheap, plentiful bandwidth also implied that users would transact with a network based primarily on reliability, value-added services (including commercial tie-ins) and network solvency, and not on price, the differentiating purpose of a trading market. Enron and bandwidth trading never stood a chance.

The technical challenges and unfavorable market forces obstructing Enron's bandwidth initiative became insurmountable hurdles when executed by Enron's confrontational and impatient business approach. Two strategic choices were decisive:

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[5] Citations widely attributed to former Enron CEO Jeffrey Skilling. By 2001, Fortune had already chosen Enron "America's Most Innovative Company" for six consecutive years.

[6] Gas and power market-making operations and merchant energy operations recorded $717 million in the third quarter and $1,960 million in the first nine months.

[7] Broadband assets were recorded at $1,277 as of September 30, 2001. Enron Corp. 10-Q, Nov. 19, 2001, pp. 44, 54.

[8] *Ibid.*, p. 39.

[9] For instance, EBS sold dark fiber to the off-balance sheet partnership LJM2 for $54 million in spring 2001 to meet second quarter numbers after Enron CFO Andrew Fastow intervened to worsen the transaction terms for EBS. (Enron Corp. 8-K, Jan. 29, 2002, p. 142-144)

[10] Quoted in email message in David Farber, Interesting People Series, at http://lists.elistx.com/archives/interesting-people/200201/msg00123.html.

[11] Levy, *op.cit.*, p. 31.

- Confrontation: "My Way or Else" – Enron chose to impose bandwidth trading on huge telecommunications companies that doubted the technical feasibility of bandwidth trading, the value of transparent and flexible pricing, and, critically, Enron's intentions. In the end, the industry rebelled against Enron's pushiness and perceived arrogance, refusing to physically connect with Enron's facilities and to transact with its traders. New financial markets can only emerge from the cooperation and attention of diverse industry interests.
- Impatience: "Too Much, Too Soon" – Although Enron constructed a telecommunications infrastructure to trade bandwidth, the industry was unprepared to adopt Enron's model. Telecommunications networks and customers lacked the internal processes and infrastructure to sell and buy bandwidth flexibility. Most important, the trading mentality was lacking in company managements, and it would take time and education to convince them that trading in bandwidth was benevolent and inevitable. Enron rushed bandwidth trading, buying into the New Economy myth that major corporations now worked on Internet time, when in reality new financial markets need time to gestate.

Enron might have remained a going-concern and bandwidth trading might be a fledgling industry rather than a meteoric failure, if the company had followed a saner, less antagonistic approach. Enron's bungled strategy to commoditize bandwidth may have represented a missed opportunity of historic proportions. Illustration of Enron's strategic errors implies a collaborative and evolutionary approach that might revive bandwidth trading – it is obviously too late for Enron – and lend guidance for managers looking to execute on Enron's vision of the New Economy.

"Bandwidth: The New Commodity Market,"[12] 1996 to 1999

Deregulation of the telecommunications industry marked by the 1996 Telecommunications Act and the prospect of explosive Internet demand for bandwidth set in motion a revolution in Telecommunications Economics.[13] Seemingly overnight, dozens of backbone networks appeared to compete with what had been a market dominated by the three incumbent long distance networks, AT&T, WorldCom, and Sprint. Joining these "Next Generation" networks were an even greater number and diversity of Content Providers, Web Hosting companies, ISPs, and enterprises of all types and sizes thirsting for once unimaginable quantities of bandwidth. Bernard Ebbers, Chairman of WorldCom, predicted in 2000 that in only three years, UUNET would need to provide network capacity for a single day equal to their total annual capacity today. The (wholesale) market was destined to undergo price uncertainty from the huge supply and demand coming on line. Key ingredients of a robust commodity market were in place: multiple and heterogeneous buyers and sellers, and price volatility.

The bandwidth commodity paradigm promised to solve problems across the telecommunications industry. For the natural bandwidth supplier (typically carrier network), trading in bandwidth offered additional chances to sell excess capacity, to reduce provisioning times and expenses by extending interconnectivity with other networks, and to add capacity at peak times without having to build additional facilities (simplifying the "build versus buy" decision). Many investments in telecommunications networks might never had been ventured in the late 1990s if investors had compared the optimistic projections presented in business plans with revealed forward bandwidth curves. For the purchaser, trading in bandwidth offered price transparency, flexible choice of network suppliers, and the opportunity to buy bandwidth in short-term increments. From an industry vantage, the commodity paradigm promised efficient distribution of bandwidth derived from transparent price signals, faster provisioning times from pressure on networks to pre-provision bandwidth, and more important from Enron's vantage, the possibility of telecommunications companies to manage financial risks. The missing element was a catalyst to jumpstart bandwidth trading.

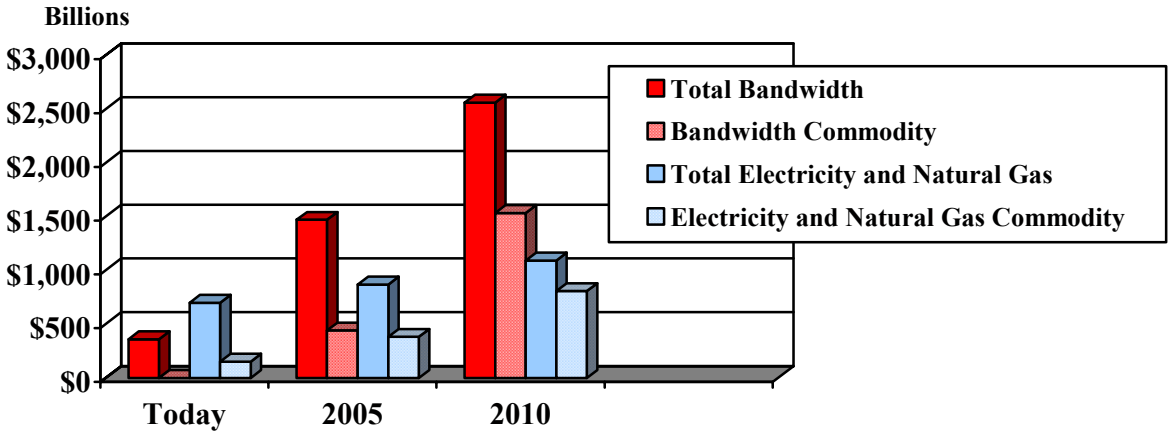
Enron couldn't help but notice that those same dynamics that were transforming telecommunications – government deregulation and technological change – had

[12] Section title from Niles and Meyerhoeffer.

[13] Bandwidth is the telecommunications capacity of a circuit to carry or transmit data measured in bits per second. A typical telephone connection capacity is 64 kilobits per second. Networks may move data at far higher speeds. Common increments include: 45 million bits per second (mbps) or DS-3; 155 mbps or OC-3; 625 mbps or OC-12; 2.5 gigabits per second (gbps) or OC-48; and 10 gbps or OC-192. Most business plans modeled long haul bandwidth, that is, between cities or regions (versus, for example, metro bandwidth).

transformed the electricity and natural gas markets not long before, establishing the foundation for the company's wealth and prestige. The 1996 FERC Order 888 led to the deregulation of the power industry and the creation of a competitive wholesale market. New technology emerged in the 1980s, when natural gas grew from an exploration waste product to the fuel of choice for the power industry. Today, the underlying electricity and natural gas commodity market is over $180 billion; in ten years, it is expected to be over $800 billion. Many analysts believed, Enron as well, that telecommunications offered even greater promise. (See FIGURE 1)

FIGURE 1: Forecasted Markets in Bandwidth and Energy, 2000



The Enron Way to Commoditize Bandwidth, 1999

Enron's initial strategy to commoditize bandwidth addressed two realities. First, the market required a single catalyst willing to devote time and money to design and install the commodity infrastructure. Second, the market required telecommunications industry cooperation and support to respond to skepticism about the entire bandwidth trading enterprise and to devise a Master Services Agreement (MSA) between counter parties to establish standard guidelines.

To transform bandwidth into a tradeable commodity Enron set about creating the two elements fundamental to a liquid commodity market: (1) buyers and sellers with incentives and the will to trade and (2) spot and forward markets. To satisfy the first element, Enron assumed the initiative by preparing the company to take either position – long or short – on a trade, depending on the purpose of the trade. Enron set itself to be not only the architect of bandwidth trading, but the industry's first and largest client, a classic market maker.

On the supply or sell side, Enron set about constructing a huge network able to trade against a standard contract. Overall, the company would spend upwards of $1.2 billion building a North American network of over 14,000 route miles while also operating in Latin America, Europe, and Asia-Pacific. As a network carrier, Enron

would automatically adopt a natural long position, that is, it would be a supplier of bandwidth to sell into the market.

On the demand or buy side, Enron sought to create and distribute fabulously sexy applications that took huge amounts of bandwidth episodically. Through its content management business, Enron sought to link with the potentially highest bandwidth users (for instance, suppliers of movies such as DVD and home video merchant Blockbuster) to create vast pools of bandwidth demand. As a content developer and distributor, Enron would automatically adopt a naturally short position, that is, it would be a consumer of bandwidth to buy from the market.

Enron was far more successful at adding bandwidth supply than demand. Unfortunately, Enron's supply added to what had become a huge overhang on the market, causing bandwidth prices to plunge and destroying the value of Enron's brand new network. Perhaps demand will eventually catch up with supply, resulting in a viable two-way bandwidth trading market, but Enron's short-term failure to generate bandwidth demand left the company vulnerable to the slide in bandwidth prices.

Creation of a spot and forward market was a more complicated affair. A commodity trader, Enron understood that commodity markets (and ultimately risk management) in bandwidth depend on the ability of a buyer to receive the contracted bandwidth and of a seller to deliver it. Consider the counterfactual situation if those conditions were unfulfilled. Assume that Company A sought to lock in a given price and quantity of bandwidth by buying bandwidth forward (in the future) from Company B. If Company B could not deliver the contracted bandwidth to Company A at the contracted time, then Company A would be guaranteed neither price nor quantity. Some markets (such as S&P 500 Stock Index Futures) address this problem by financially settling; the physical commodity does not change hands, only money does. But in the case of bandwidth, most participants will want to transact through the actual product, especially while reliable pricing data is unavailable. Markets that transact in the physical product at the present (or near present) are called spot markets and markets that transact physical product in the future are called forward markets. Both market venues are fundamental to trade commodities and to manage risk.

The Master Services Agreement (MSA)

The link between the physical product and spot (and forward) markets is the standard contract or master services agreement (MSA). An MSA sets basic and mutually agreed upon terms of exchange for all market participants. In telecommunications, MSA specifications may include bandwidth quantity, time increment, delivery location(s), penalties for non-performance (for example, outage), and quality of service (QoS). Previously, telecommunications companies swapped bandwidth bilaterally, executing a mutual service level agreement (SLA). In practice, bilateral MSAs may take months to negotiate. Clearly, market participants could trade actively and smoothly only if bandwidth transactions occurred under common, nonnegotiable terms, as spelled out in an MSA. Enron's attempt to craft an industry acceptable MSA would determine whether the nascent bandwidth trading business would launch.

Enron's initial strategy for drafting the MSA signalled that the company would create a collaborative market in bandwidth. Enron would build a proposed standard contract with cooperation from the industry and offer to sell or buy against it, being fully

willing to educate as you went and modify the contract to fit the changing industry. Enron's market builders understood that market integrity was crucial to convince the industry that bandwidth trading was good for all concerned. To this end, Enron constructed a market framework that allowed the company to monitor and deliver bandwidth, but ensured supervision and oversight by neutral entities.[14]

Enron's first step was to define the basic bandwidth commodity product from the many varieties of bandwidth. Minutes bandwidth, used to connect long distance voice telephone calls, was traded in independent exchanges (Arbinet, Band-X), as well as by major carriers such as ATT. However, telephone minutes is a slow-growth, low-margin business that is certain to be eclipsed by data transfer technologies in the near future. Enron also considered trading packets and specifically Internet Protocol (IP), but found that it currently was technologically and commercially infeasible to deliver packets due to hardware and software complications related to measurement, billing, delivery, and standardization. To take advantage of the ever-increasing flow of Internet information while remaining aware of the state of technology, Enron chose the circuits that networks were using to transmit data over long distances. Specifically, Enron proposed city pair circuits, measured in bits per second, good for a fixed period of time (say, a month), presented at a specified quality of service (QoS), and offered in intervals corresponding to the SONET protocol.[15]

To effect bandwidth delivery, Enron planned to interconnect customers through a series of switching centers or hubs in metropolitan areas ("metros") with high bandwidth usage, including New York, Los Angeles, Washington, Miami, and San Francisco – 23 switches in all by January 2001.[16] Each metro hub was designed to collect (or deliver) bandwidth from carriers and large enterprises located in strategic buildings, and then to transmit it to a distant metro according to the terms of the trade. Enron referred to the points of interconnection (or points of presence, POPs) as pooling points. Once interconnected, bandwidth users could choose among the networks vying to supply long haul capacity, much like travelers could go to the airline terminal and choose between competing airlines. Like the airline traveler, the transmitted bandwidth passed through two hubs [terminals], one at the departing city and a second one at the arriving city (See FIGURE 2).

Enron initiated development of the independent Bandwidth Trading Organization (BTO) with the help of the Competitive Telecommunications Association (Comptel), an industry trade organization, to oversee the legal and financial development of bandwidth trading and assure its integrity. Comprised of the major prospective participants in bandwidth trading, the BTO was empowered to "formulate, monitor, enforce trading and market rules."[17] The BTO's crucial task was to organize and write an industry-acceptable MSA laying out the obligations and responsibilities of parties to a trade.

Enron proposed that PricewaterhouseCoopers (PwC) act as the neutral "Pooling Point Administrator" working under the auspices of the BTO. PwC would act

[14] The following description draws heavily from the Enron Market Development Proposal for Bandwidth Trading 2000 (mimeo).
[15] For a detailed taxonomy of bandwidth trading products see Joshua L. Mindel and Marvin A. Sirbu, April 13, 2001 (mimeo).
[16] Michael Rieke, *Dow Jones Newswires*, November 15, 2000.
[17] Enron, *op. cit.,* p.7.

analogously to an auditor – recording and provisioning bandwidth trades, monitoring and verifying performance and delivery, overseeing BTO fee collection, verify compliance by pooling point operators, and in some case, manage disputes and claims.[18] Although Williams expressed skepticism about Enron's pooling point concept, arguing that companies were already interconnected and had been exchanging bandwidth bilaterally for years, most networks agreed that Enron's pooling point architecture combined with the monitoring of a neutral entity (PwC) facilitated the exchange of bandwidth according to standardized terms.

Bandwidth Trading Skepticism

Enron's bandwidth trading initiative met with a degree of skepticism and opposition within the telecommunications community, as the company had anticipated. Many doubted that bandwidth was a commodity on technical grounds:

- *Bandwidth could not be traded or even standardized.* Most networks manually provisioned (SONET) circuits, resulting in long provisioning times that precluded trading. Moreover, networks were increasingly swapping wavelengths (a broader and more flexible bandwidth variety) rather than (SONET) circuits. Most important, bandwidth could not be standardized since, as networks religiously reminded, the reliability, quality, and bandwidth services varied widely across service providers.
- *Operations and billing software systems (OSS) were unable to manage bandwidth trades.* Although current OSS could switch circuits between networks, in theory, none exists in practice that can rapidly reserve a circuit and then tear down a circuit to correspond with a trade made and then unmade. In addition, network billing systems of carriers are notoriously muddled and unprepared to provision and procure bandwidth suitable for a commodity paradigm.
- *Bandwidth Trading would not solve the "last-mile" problem.* Even with an elaborate pooling point system, bandwidth trading would not interconnect many large enterprises; they are typically located in buildings served predominantly by the Baby Bells (RBOCs).

Others questioned the feasibility of bandwidth trading on competitive and regulatory grounds:

- *Dominant long distance incumbents ATT and WorldCom were likely to oppose bandwidth trading.* Bandwidth trading's main selling points – price transparency and ease of provisioning – threatened the incumbents' customer base and could accelerate the downward spiral of bandwidth prices.[19]
- *Competitors in energy markets, particularly Williams, might block Enron's grab for bandwidth trading.* While promoting bandwidth trading, the energy

[18] *Ibid.* p.8.

[19] Many analysts believed that Sprint, the third major long distance incumbent, would not be threatened by bandwidth trading (and might be an advocate) because the company intended to focus on high-value added enterprise customers rather than compete in the wholesale market.

trading companies sought to limit initiatives that might permit Enron to dominate the business, such as Williams' attempt to discredit Enron's pooling point architecture.

- *Bandwidth trading is doomed if the competitive and regulatory landscape were in constant flux.* Established commodity markets tend to be underpinned by a known and stable set of actors. Long established relationships have led to a measure of trust and routine that smoothes dispute resolution, and clearing and credit procedures. When major suppliers may bankrupt occasionally and major purchasers may simply disappear, as in telecommunications, establishing timeworn practices may be impossible. Stability in telecommunications is unlikely until the regulatory uncertainty surrounding the RBOCs is resolved.

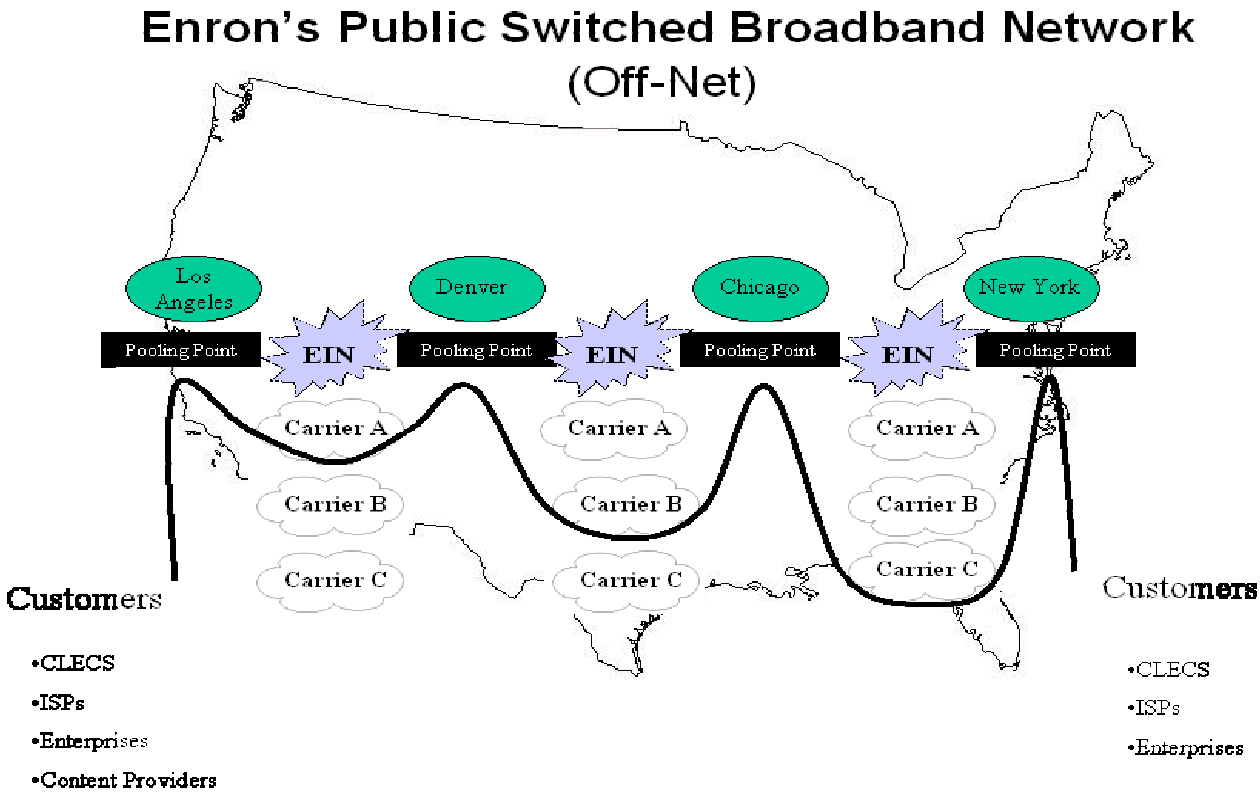
Despite those misgivings, Enron's initiative was too extensive for telecommunications companies to ignore, and most networks were willing to participate in the early stages. Besides, Enron was becoming a large customer to many networks (and vendors such as Lucent), and the networks weren't anxious to alienate a potential revenue source. Level 3's CEO, James Crowe, typified this position when he remarked that he didn't believe bandwidth could be treated like natural resources or agricultural products, but that the company would deal with commodity traders, anyway.[20]

Catalyzed by Enron, a bandwidth trading industry bubbled with hope in 2000. Within a year, telecommunications networks, energy traders, neutral bandwidth exchanges, investment banks, consulting firms, equipment vendors, pooling point operators, data services, and publishers devoted resources to the nascent business. One bandwidth exchange, RateXchange, grew to be worth nearly $1 billion on NASDAQ. Global networks such as Cable and Wireless, Sprint, France Telecom, PSINet, Global Crossing, Aerie Networks, Level 3, Qwest, and Teleglobe actively investigated the new market (without necessarily participating). Startup pooling point developers, such as LighTrade (reportedly financed in part by Lucent), entered the market. Enron and its usual competitors, Williams, Dynegy, El Paso, and Reliant announced bandwidth trades. Support services, too, investment banks such as Morgan Stanley and Goldman Sachs, and consulting firms such as Accenture, KPMG, and Deloitte and Touche devoted resources to bandwidth trading. Well-attended conferences and publications called *The Bandwidth Desk, DJ Bandwidth Trading Alert,* and *Capacity* heralded the new industry. In December 1999, Enron and Global Crossing announced the first bandwidth trade. It was, of course, irrelevant that bandwidth trading barely existed. What mattered was that it might evolve into an industry worth billions.

[20] Cited in Buster Kantrow, "Level 3 CEO: One Company Will Dominate Broadband Market," 1/30/2001.

FIGURE 2: Anatomy of a Bandwidth Trade[21]

Enron offers purchasing customers a choice of carriers from Los Angeles between New York, including the possibility of mixing and matching carriers at Denver and Chicago.



[21] Graphic from Enron Investor Presentation, 3/2000, Distributed in New York, p.20.

Enron Tries to Dominate Bandwidth Trading, 2000

Enron's shift away from a collaborative market approach to a more aggressive and confrontational strategy early in 2000 jeopardized industry support of bandwidth trading. Enron sought to impose obligations upon telecommunications carriers that would increase their costs, expand their network to connect with Enron's facilities, and direct business exclusively to Enron. Remarkably, it accompanied those demands with arrogance and intimidation, which insulted many industry executives. The company evidently believed that the industry had no option but to participate in bandwidth trading on Enron's terms. In shifting from catalyst to aspiring monopolist, Enron sabotaged bandwidth trading and compromised its corporate survival.

First, Enron pushed for a stern liquidated damages provision in the BTO MSA, despite industry resistance. Liquidated damages refer to the reimbursement or penalties that a party to a trade would pay for nonperformance of the contract. Enron argued that bandwidth trades must be "firm," that is, "delivery dates and performance obligations are known and certain and backed by damages, rather than … 'best efforts.'"[22] If a bandwidth provider (seller) could not deliver the contracted bandwidth, it was obligated to pay the buyer a "settlement amount" based on the "replacement value" of the undelivered bandwidth as calculated by the buyer. Contrary to telecommunications industry practice, which was consistent with a "best efforts"- type contract, the liquidated damages provision obligated the network, as supplier, to not only reimburse the buyer the original price of the bandwidth, but also to potential (and hard to calculate) outlays over and above the original sale price. Given that networks partly saw the bandwidth trading market as a channel to sell excess capacity, the possibility that a sale could be negative to the income statement was unacceptable. In 2001, several opposing networks drafted the so-called BTO-2 MSA, which more closely resembled a "best efforts" contract. Few networks were willing to trade according to the Enron-backed BTO MSA.

Second, Enron insisted that industry participants make interconnection arrangements with the Enron pooling points. That was an expensive and time-consuming burden for potential users even when they shared colocation facilities with Enron. Networks still needed to set up equipment and to run fiber within the colocation building to connect to Enron; inside plant provisioning is notoriously expensive and time-consuming.[23] Frequently, a prospective buyer or seller was located in a different building than Enron. In New York, for instance, Enron's pooling point was located not at 60 Hudson Street, the primary interconnection site for many networks, but at 111 8th Avenue.[24] For a network taking delivery of bandwidth from Enron, it needed to arrange bandwidth connections in both the receiving and delivering city (perhaps through a metro provider). Long haul backbone networks were unwilling to commit the financial and human resources to connect with Enron, especially considering that bandwidth trading did not guarantee profitable sales.

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[22] Cited in General Information of Bandwidth Trading Master Agreement, 1/15/2001 http://www.comptel.org/bto/masteragreement.html.

[23] LighTrade, a pooling point developer, met the same problem and folded in 2002. Dynegy, Enron's competitor and former suitor, sought to relieve the metro interconnection problem by creating an interconnected grid or ecosystem among networks.

[24] This example is borrowed from Rieke, *op. cit.*

Consider the economics of the following scenario. Carrier A is interested in buying bandwidth – let's say, an OC-12 (655mbps) – for one year from New York to Los Angeles on EnronOnline. In mid-2001, this circuit cost approximately $12,000 per month (0.4¢ DS-0 mile). Unfortunately, Carrier A is not colocated in the same building in New York as Enron and therefore must purchase connectivity to Enron's building from a metro provider at $8,000 per month to buy the bandwidth.[25] Given this extra cost and the time and trouble to connect with Enron, Carrier A may instead find it worthwhile to pay more for a circuit from a network that it interconnects with already. In addition, Carrier A may have a disincentive to transfer business to Enron since it may have existing agreements with networks to buy bandwidth bundled with value-added services or other commercial tie-ins. Finally, from the supplier side, Carrier B may be unwilling to devote the resources to connect with Enron unless it knows in advance that it will actually sell the bandwidth. Because it could not solve fully the interconnectivity issue between networks, Enron's bandwidth trading initiative was destined to start slowly.

Third, Enron tried to force networks to connect with its pooling points and trade bandwidth exclusively with the company. It sought to cut out other traders, to become a monopolist. As a wedge against holdouts, Enron threatened to buy bandwidth from competitor networks and withhold business. Although wholesale networks were desperate for revenue and could dearly use Enron's business, none were willing to cede the business entirely to Enron. Most networks, which already regarded its chances to dominate telecommunications skeptically, considered Enron's attempt to dictate competitive terms as a potential threat to their independence and so refused to participate in bandwidth trading.

Fourth, Enron acted with a calculated arrogance that alienated the industry. One Enron bandwidth trader reportedly tried to intimidate a vice-president of a global carrier by threatening that either his network could go along with Enron and fare badly, or it could oppose Enron and be entirely marginalized. The enmity between Enron and other networks supposedly grew to such a point that a conference planned in Europe attracted only Enron; the other networks canceled when they learned of Enron's attendance. Enron had unwittingly persuaded the industry that bandwidth trading was a zero-sum game, in which Enron would be a winner and established telecommunications companies would be losers.

Enron's tactics were explicable, even predictable, to some extent. Unforgiving and abrasive personalities are common to a trading culture, where a trader is judged on his latest transaction and may not have the time or patience for conversation. Aggression is an integral part of the game. A visit to a major commodity exchange, for instance, will reveal a locker room of burly young men trying to intimidate one another. Telecommunications carries a more diffident flavor and skill set entirely. Industry executives tend to be more refined and certainly more technically oriented than traders. They work at a far slower pace and consider problems deliberately, frequently choosing the more conservative alternative solution to a problem. Transaction negotiations may take place over months. Ironically, it was the inflexibility of Enron to adjust to the new cultural environment that handicapped its bandwidth trading initiative.

[25] For simplicity we will assume that Carrier A is located in the same building as Enron in Los Angeles to receive the bandwidth.

Enron believed, wrongly, that it could develop and dominate bandwidth trading with the industry having no reasonable choice but to go along. This judgment, however, turned into a catastrophic miscalculation as the industry rejected bandwidth trading. Few companies connected and transacted with Enron. Most of Enron's recorded trades were with the other energy traders seeking to establish price transparency and market awareness.[26] Few real buyers and sellers translated into minimal bandwidth trading.

Reality Bites: Telecommunications, EBS and Bandwidth Trading Collapse, 2000 and 2001

The collapse of the telecommunications sector in 2001 exposed the folly of Enron's confrontational strategy and the weaknesses inherent in the bandwidth trading paradigm. The influx of "Next Generation" competitors to the long distance incumbents lured by the 1996 deregulation and the easy cash from venture firms seeking to churn out billion dollar businesses swamped the bandwidth market, creating levels of oversupply that could be resolved only through an acceleration in Internet demand – the appearance of the so-called Killer App(lication) – or the demise of the new competitors. As we now know, it was the latter shoe that fell; the Killer App failed to materialize and Internet demand continued to "only" grow at about the historic norm of 100%.[27] Bandwidth prices plummeted, eviscerating the revenues of the Next Generations carriers as well as those of incumbent long distance carriers, ATT, WorldCom, and Sprint. The market value of long distance carriers followed bandwidth prices lower, enfeebling several to the point of capitulation.

The new companies serving local markets, called CLECs (Competitive Local Exchange Carriers, including metro providers, DSL providers, managed service providers, etc.) were fairing as poorly as their long distance cousins in 2001. The regulatory relief offered in the Telecommunications Act of 1996 was proving an insufficient foundation for the CLECs to compete against the embedded advantages of the RBOCs, who were already connected to homes and businesses, and had operated a network infrastructure for decades, if a famously inefficient one. Many CLECs were unable to attract enough customers to recoup very high capital outlays[28] and to overcome RBOC operational foot-dragging in providing legally mandated support. The RBOCs, virtual monopolists in local safe havens, remained largely immune to the telecommunications wreckage. Most CLECs, like the Next Generation networks, came apart in 2001.

The collapse of the new competitive telecommunications companies undermined a prime justification for bandwidth trading, namely the existence of multiple buyers and suppliers. Most American markets outside of the great metros would be served only by a handful of companies that would not benefit from the intervention of a third party. In addition, the turmoil's damage to sector balance sheets jeopardized the ability of

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[26] Attorney William Lerach filed suit in Federal Court alleging that there were only "20 legitimate trades…." Cited in C. Bryson Hall, "Enron's Broadband Venture Facing New Scrutiny," in *Yahoo! News*, 12/10/2001.

[27] 2000 growth estimate. See K.G. Coffman and A.M. Odlyzko, "Internet Growth: Is there a "Moore's Law" For Data Traffic?" 6/4/2001 (mimeo).

[28] Local infrastructure cost more to build than long distance, per mile. Laying fiber in the metro is roughly eight times higher than between cities.

companies to commit to buying and delivering bandwidth in the future, a *sine qua non* of bandwidth trading. Moreover, the drop in bandwidth prices – some experts such as George Gilder declare that bandwidth will be nearly free one day – called into question the financial rationale for networks to expend the necessary time and money to connect with Enron's pooling points. Finally, dislocation in telecommunications preoccupied the industry with survival (with the notable exception of the RBOCs), rather than with poorly understood and potentially disruptive initiatives such as bandwidth trading.

At EBS, losses had been mounting through spring 2001. Enron corporate had already made significant efforts to reduce its bandwidth trading efforts by redeploying assets out from EBS to other parts of the company. Ken Rice, President of EBS, resigned in May. Reportedly, Enron tried to sell its network through the spring and summer, with no luck.

Wall Street noticed the hemorrhaging at EBS. From May to August, Enron shares dropped by over half; Skilling blamed the collapse of fiber optic networks, and by extension EBS's failure, as the number one reason for the market value plunge.[29] Still, Enron expected to wait out the turmoil at EBS.

Later that fall, however, Enron's credibility and credit collapsed as the company exposed the infamous off-balance sheet partnerships and admitted to accounting irregularities. At that point, no one was willing to trust a company that had operated with supreme arrogance and had raised expectations among investors. A run on Enron ensued. Enron declared bankruptcy in December.

Bandwidth trading, to the extent it ever existed, faded along with Enron's demise. The other energy traders either closed their bandwidth trading departments entirely (Reliant) or reduced activity substantially (Williams, Dynegy, El Paso). Global Crossing, the carrier with the most aggressive trading effort, couldn't satisfy its debt obligations and finally declared bankruptcy in February 2002. Other global carriers, such as Cable and Wireless, France Telecom, and Sprint, suspended bandwidth trading initiatives. Independent bandwidth marketplaces (RateXchange) abandoned bandwidth trading entirely. Pooling point developers (LighTrade) failed to attract business and folded. Acolytes spoke of a bandwidth trading revival in 2003 or 2004, but most industry analysts remained unmoved.

Whither Bandwidth Trading?, 2002 and Beyond

Thanks to Enron, bandwidth trading will be forever associated with the Great Internet Bubble, and it will be many years, if ever, before it reemerges. The obstacles to a viable bandwidth trading market remain. Despite the appealing logic of Enron's pooling point architecture, it is a matter of debate whether a bandwidth trading market can develop without a recreation of a central hub as in Shreveport, Louisiana for natural gas or pooling points managed by a neutral entity. In addition, it is open to question whether an industry undergoing rapid and unpredictable technological transformation is appropriate for the financial statics of a trading environment. This issue is embodied in the discussion regarding the bandwidth MSA as well as in ever-declining price curve for bandwidth. It also is manifestly unclear whether a commodity market can develop under conditions of disruptive competitive and regulatory flux. The collapse of the "Next

[29] Comments at Senate Bankruptcy Committee Hearing, 2/26/2002

Generation" networks and the CLECs, and the uncertainty surrounding the deregulation of telecommunication's (current) power brokers, the RBOCs, complicate the perceived interests of the relevant players to the possibility of freely traded bandwidth. Resolving these issues will require time and concerted industry commitment.

Enron's timing for bandwidth trading was atrocious. A collaborative market strategy may have been insufficient for Enron to launch bandwidth trading successfully, while most telecommunications companies focused on survival. At the same time, certain factors supporting bandwidth trading are coalescing, if too late to revive the dead industry. Vendors increasingly are designing products that increase interoperability and lower provisioning times. New operations software systems are being developed that could provision bandwidth automatically. The metro interconnectivity or last mile problem is easing due to falling metro prices and colocation costs. Plunging long haul bandwidth prices are encouraging companies to buy short-term contracts of a type ideal for bandwidth trading versus the multiyear contracts (Indefeasible Rights of Use or IRUs) that had been the industry norm. Broadband penetration is ramping up to the 15-20% threshold that analysts consider the critical mass necessary for a burst in Internet traffic. Most important, the demand for accounting openness and the trillions of wasted telecommunications investments justifies the price transparency and risk management that bandwidth trading would enable. Ronald M. Banasek, a bandwidth broker, accurately wrote: "[E]ven with Enron no longer involved in the telecommunications industry all of these benefits [of bandwidth trading] still exist."[30]

Bandwidth trading's disappointed expectations and wasted resources discredited advocates within telecommunications firms. It will be a while before they (or their successors) can make the case for bandwidth trading at a senior corporate level again. To be sure, a paradigm that emphasizes interconnection among carriers, bandwidth differentiation and near real-time provisioning may be more appropriate for the bandwidth market than Enron's inflexible formula for building financial markets. Eventually, bandwidth prices will stabilize and even begin rising over some routes, thus renewing pressure to buy and sell in a liquid forward market. By that time, the next catalyst hopefully will have learned from Enron's mistakes. It will grow the bandwidth trading market and develop a set of new value propositions organically with industry cooperation and with patience. As any commodity trader will tell you, no single company is bigger than the market.

[30] Ronald M. Banasek, "The Future's In Our Hands," *Capacity*, January/February 2002, p. 7.

Lessons from the Collapse of Enron: Collaborative Markets Revisited

Enron might have avoided the worst of the telecommunications collapse in 2001 had the company sought to invoke the support of many disparate players, including rival networks toward the creation of a collaborative market in bandwidth. Firms in other businesses increasingly view collaborative markets as alternative transaction venues. For instance, Goldman Sachs, Morgan Stanley, and several energy traders own the Intercontinental Exchange (ICE), which transacts in financial commodities, energy, and metals. Money center banks and other major financial institutions have pooled resources to create currency exchanges for greater efficiency. B2B exchanges, variants and perhaps precursors of commodity exchanges, operate with the cooperation and typically ownership of key players in several businesses, including: automobiles, cement, trucking, chemicals, and airlines. Managers considering architecting or participating in a collaborative market may draw the following lessons from the Enron bandwidth trading fiasco:

1. Create Value Propositions For Diverse Industry Players, Including Competitors. To attract participation among a variety of interests, construct a collaborative market that lowers operating costs for all players, that introduces new technology and products, that writes rules that help existing incumbents sustain or that grow market share. Enron could have lowered costs for telecommunications companies by facilitating interconnectivity, by writing an MSA that eliminated liquidated damages provisions, and by encouraging buying and selling bandwidth between counterparties other than Enron.
2. Structure Collaborative Market As 3rd Party With Independent Management. Create a true neutral entity to manage the collaborative market, perhaps with diversified industry ownership. 3rd party management will help assuage the concerns of firms distrusting of the participation of competitors and may help persuade government anti-trust regulators that price and output competion will be free, fair, and transparent. Enron's enlistment of PriceWaterhouseCoopers and Comptel and the creation of the supposedly neutral BTO did nothing to convince telecommunications companies that bandwidth trading was nothing more than a scam to allow Enron to dominate telecommuncations.
3. Expect That The Products, Terms Of Trade, and Market Structure of the Collaborative Market Will Evolve. Design the initial product offerings to be easy to standardize, easy to deliver, and easy to bill. Overly complex product offerings at first will put off some executives, who are skeptical of the complex corporate governance of the collaborative market project. Enron sought to create a trading market in bandwidth prematurely, before the industry was convinced it was a commodity. Most experts argued that bandwidth trading would never resemble a trading market of the rapid buy/sell staccato common to today's commodity markets. Enron may have been advised to create first a bandwidth clearinghouse offering interconnection services between diverse carriers and large enterprises. With the collapse

of global networks such as WCOM and Global Crossing and the retreat of international networks such as Telecom Italia and France Telecom in the United States, a series of interconnection hubs between carriers of global regions is clearly necessary, and perhaps a natural precursor of an active bandwidth market.

4. Consider a Collaborative Market Initiative a Long Term Project. Budget and staff a collaborative market assuming that it will mature in no less than 2 to 4 years. Although the technical set up required is likely to be straightforward, the competitive issues, negotiations, and legal arrangements are complex and time consuming. As a point of reference, regulated commodity exchanges research candidate products over a number of years, painstakingly sounding out key suppliers and consumers for interest (trading and hedging) in the new product market and for crafting the terms of a standard agreement. Exchanges organize as a matter of routine conferences and road shows to recruit support from the industry and from financial speculators. Also, exchanges list products that may demonstrate very low trading volumes at first, but may become liquid over time. By contrast, Enron sought to create the bandwidth market in a matter of months, forging ahead in the face of intense industry resistance. They sought to force the major telecommunications companies to adopt the Enron bandwidth trading model in short order before these companies were ready internally to sign on, a strategy that was certain both to alienate the industry and to strain the decision-making capabilities of multinational corporations, who by nature tend to move very deliberately. Ironically, Enron, as one of the world's largest commodity traders, was well aware of the complex negotiations and time commitment inherent in building a commodity market from scratch.

Enron will become forever associated with the unbridled greed, criminality and folly of the New Economy bubble of the 1990s. Bandwidth trading may join Enron as a warning symbol of the dangers of lapses in critical thinking. Yet, the raw materials represented by the Digital Age's "tools for thought" and the salutary US government policy are still in place. Enron's vision of commodity markets covering many differentiated products, including a telecommunications capacity, may yet emerge, especially as collaborative markets increasingly become an accepted and common means of organizing markets activity across wide swatches of business.